Comparative Analysis of (Innovation) Failures and Institutions in Context

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Abstract

Many different legal and non-legal institutions govern and therefore promote or stifle knowledge production. The variety of knowledge and knowledge producers and systems with and within which knowledge and knowledge producers/users interact make it all too tempting to look for reductionist shortcuts, in general but especially when one undertakes the task of comparative institutional analysis. The temptation should be resisted for it leads to either what Demsetz called the Nirvana Fallacy or what Ostrom critiqued as myopic allegories. One easy reductionist step is to focus on a particular dilemma—identify a particular market failure, for example, ignoring or assuming away others—and then compare institutions in terms of effective resolution of the dilemma.

We might, for example, want to use comparative institutional analysis to examine the problem of pharmaceutical development. If we focus on overcoming the potential undersupply of drugs because they are expensive to develop but cheap to copy, and if we identify the FDA approval process (and specifically clinical trials) as the source of many of the costs associated with drug development, we might be inclined to compare patents with other institutions like prizes, grants, and government provided infrastructure for clinical trials. We might then determine that government funding of clinical trials was best because it lowered the cost of bringing drugs to the market and lessened deadweight as compared to patents. That analysis might be useful, as far as it goes, but it would ignore other market failures, such as the demand-side failure that leads to underprovisioning of drugs to smaller or nonexistent markets. This is not to say that there is anything wrong with comparing institutions as solutions to the clinical trial cost problem. But it is to emphasize that we can only design institutions to address problems we recognize, and the risk of myopia is strong in comparative institutional analysis because introducing multiple institutions to compare seems to demand of the analyst a reduction in the scope of problems to which the institutions might be addressed.

We suggest that comparative institutional analysis must be accompanied by comparative failure analysis, by which we mean rigorous and contextual comparative analysis of market, political/government, and community failures. And we argue that

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several different types of failures are relevant to comparative analysis. Some failures originate at the system level - that is, market systems exhibit certain sets of failures, political/government and community systems exhibit other sets. In terms of figuring out what society wants (i.e., from the demand side), the systems rely on different signals, information, processes, and so on. And in terms of satisfying societal demand, the systems rely on different actors, distribution methods, and relationships. Other failures are system independent - they are a function of the resources at issue or the nature of the problem to which the institution is addressed. Institutional design can, of course, exacerbate or ameliorate these failures, but it is useful to understand their fundamental cause.

So as a starting place, we think comparative (failure and institutional) analysis should account for characteristics that vary at the system level and shape both failures and institutions—characteristics such as demand signaling processes, time horizons/discount rates, evaluative criteria (for projects or investments or innovation), and basic capabilities operative within different settings/systems. The correspondence between failures and institutions is obviously not exact, and we suspect that comparative analysis of these and other characteristics will provide guidance for continued comparative analysis. We strongly believe that solid comparative analysis will require theory and empirical work in tandem rather than in isolation from each other. Comparative (failure and institutional) analysis is necessarily contextual.

Introduction

There has been much discussion lately about trends in intellectual property scholarship over the last decade and looking into the future - where the fertile ground for research might be, and where there might be quicksand and already stripped mines. We think that many of the most significant contributions in the coming years in the field of intellectual property/ information / innovation law and policy will be made by scholars engaged in comparative institutional analysis. One of the most significant lessons of the last decade's work is the importance of context,[1] and empirical work continues to show significant variation in the need for, and effect of, intellectual property and other innovation-related laws across industries, types of actors, etc. The best work going forward will necessarily involve interdisciplinary collaboration, mixed

[1] See DAN L. BURK & MARK A. LEMLEY, THE PATENT CRISIS AND HOW THE COURTS CAN SOLVE IT (U. Chicago Press, 2009); JAMES BESSEN & MICHAEL MEURER *PATENT FAILURE: HOW JUDGES, BUREAUCRATS, AND LAWYERS PUT INNOVATORS AT RISK* (PRINCETON UNIVERSITY PRESS 2008); Michael W. Carroll, *One Size Does Not Fit All: A Framework for Tailoring Intellectual Property Rights*, 70 Ohio St. L.J. 1361 (2009).

methods, and humility - the latter precisely because grand theories are unlikely to reflect the context-sensitivity necessary.

Some of this work has, of course, already been started, as a number of authors have performed "comparative institutional analysis" in one way or another related to innovation. One line of research has compared different types of institutions for incentivizing innovation. Scholars have, for example, compared patents with prizes[2] and tax incentives.[3] And several scholars have considered the roles of particular kinds of intellectual property alongside other appropriation mechanisms like lead time, secrecy, and contract.[4] A different line of work deals with the comparative advantages or disadvantages of certain institutions within the existing intellectual property framework – asking whether courts, Congress, or some government agency should make certain kinds of decisions or certain modifications to existing law;[5] whether government agencies can handle certain tasks or those tasks should be privatized;[6] or what should be the relationship between the PTO and the FDA regarding pharmaceuticals.[7] Yet another set of work compares the various institutions of intellectual property law to each other – evaluating the role of patent, copyright, and trademark laws in achieving certain ends.[8]

As this partial catalog demonstrates, one reason it is hard to describe comparative institutional analysis with much specificity is the openness of the concept of an "institution." These studies variously refer to government and market actors, legal rights and private ordering mechanisms, and even particular legal rules as relevant "institutions." All of these fit within the broad definition of "institution" typically used by institutional economics, which includes any structure or mechanism that governs the behavior of a set of individuals. This does not make the concept of institutions meaningless, but it does mean that the field of study is a much larger one than intellectual property scholars often appreciate.

In this paper we identify and seek to remedy two shortcomings of the existing

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2 Michael Burstein & Fiona Murray, ; Roin; Fisher and Syed (forthcoming); Abramowicz.

3 Daniel Jacob Hemel & Lisa Larrimore Ouellette, *Beyond the Patents-Prizes Debate*, 92 TEX. L. REV. 303 (2013); Joshua Sarnoff, *Government Choices in Innovation Funding (with Reference to Climate Change)*, 62 EMORY L.J. 1087 (2013); Frischmann (2000).

4 *Id*. Merges; Jonathan Barnett, *Private Protection of Patentable Goods*, 25 CARDOZO L. REV. 1251 (2004); Michael Burstein, *Exchanging Information Without Intellectual Property*, 91 TEX. L. REV. 227 (2012).

5 Arti Rai; Sapna Kumar

6 Irina Manta, *Privatizing Trademarks*, 51 ARIZ. L. REV. 381 (2009).

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8 Viva Moffat, *The Copyright/Patent Boundary*, 48 UNIV. OF RICHMOND L. REV. 611 (2013); Mark P. McKenna, *(Dys)functionality*, 48 HOUSTON L. REV. 823 (2012); Gideon Parchomovsky & Peter Siegelman, *Towards an Integrated Theory of Intellectual Property*, 88 VA. L. REV. 102 (2002)

body of research.[9] First is the persistent ambiguity in IP scholarship about the proper normative baseline. Comparative institutional analysis presumes some objective and evaluates different institutions in terms of their ability to accomplish that objective. Yet the various comparative institutional analyses lack a common objective, or at least an objective described at a common level of generality. This makes it difficult – perhaps impossible – to aggregate comparative institutional analyses or to compare them to each other. Given the range of different possible normative justifications for different innovation regimes, it may not be possible for comparative institutional analysis to *solve* this problem. We can, however, ask at least for greater transparency about the underlying normative premises.

We also think that scenario analysis can be a useful tool to bridge the range of normative premises. Specifically, we think one fruitful approach might be to consider a range of different normative premises and evaluate institutional structures in light of those premises. It may be that certain institutional arrangements work across a variety of different premises such that second-order agreement might be possible. But scenario analysis might also help illuminate the relationship between normative premises and institutional arrangements by highlighting the ways different normative premises lead to preferences for different institutional arrangements.

Second, we argue that comparative institutional analyses are prone to suffer from myopia—for example, identifying a particular dilemma (type of market failure), ignoring or assuming away others, and then comparing institutions in terms of effective resolution of the chosen dilemma. The bulk of this paper is devoted to our argument for a more inclusive approach that involves *comparative analysis of failures and institutions in context*. We particularly emphasize the role of comparative failure analysis in this process, and we try to differentiate between failures that are a function of a particular institutional arrangement (which we call system-dependent failures) and failures that transcend those arrangements and affect a variety of different types of institutions (system-independent failures).

We conclude with some tentative applications of our ideas. Specifically, we sketch some potential studies relating to short-sightedness and the concept of Progress, and we highlight a few examples of existing work that we think serve as exemplars of what we're advocating.

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[9] A third shortcoming that we do not seek to address in this paper is the lack of a shared methodology or framework for comparative analysis in this context. Simply put, it is incredibly difficult to put the various studies together and learn from them. Yet surely that must be an important goal for the community of scholars doing the comparative work. One of us is currently involved with the development and use of a framework for institutional analysis for studying knowledge commons. There are close affinities between that project and this one, but we do not pursue them here.

I. Normative baselines first

To engage in comparative institutional analysis requires careful attention to the basis for comparison. What all of the types of studies we have mentioned have in common is that they attempt to compare institutions in their effectiveness in achieving some end. That end, however, is often either taken for granted, left unspecified, or could be identified and described at such a wide range of levels of generality that the end might as well be unspecified. Take, for example, "progress of science and the useful arts," the Constitutional basis for patent and copyright law in the United States. What counts as progress in this sense?

Much of the IP literature assumes that the Constitutional mandate is to be understood in utilitarian terms, commanding maximization of utility, welfare, or output in some sense. There are a number of problems with that assumption. First, despite all that has been written about the Progress clause, there is really no solid legal basis for choosing utilitarianism over any other particular normative framework.[10] And choosing utilitarianism has important consequences: it marginalizes alternative normative objectives and stunts both normative debate and comparative analysis of institutions across various objectives, which we describe below. At worst, it precludes deeper consideration of the range of objectives society might pursue through copyright and patent. But even short of such preclusion, it generally sets a strong default position, putting a heavy burden of proponents of alternative – equally reasonable – objectives.

Second, and more problematic for doing comparative institutional analysis, even accepting that the Progress clause imposes a consequentialist frame, such that copyright and patent are properly conceived of as *means* and Progress in Science and the Useful Arts as the *end*, we are left with precious little information or guidance about what Progress in Science and the Useful Arts actually entails. As one of us has previously argued,

> Within the legal community, where we debate the contours of the legal systems nominally designed to promote cultural and scientific Progress, we know too little about that which we seek to promote. We place too much emphasis on easily observable and measurable outputs—works and inventions—and figure the more the merrier. As Boyle noted, the romantic conception of the author/inventor is intimately connected with our narrow product-focused vision. But that is only one of many possible paths along which our culture may progress, by which our cultural environment may evolve. There are others. We might, for example, imagine Progress as measured by the degree of participation in creative and inventive

[10] We make this argument more extensively in Brett Frischmann & Mark P. McKenna, *Intergenerational Progress*, 2011 Wisc. L. Rev. 123.

> activities; participation in such activities yields outputs, to be sure, but participation also educates, builds human capital, skills, and ultimately may unlock human potential.[11]

"Progress in Science and the Useful Arts" is simply too abstract a concept to give meaningful concrete policy guidance. Indeed, any of the following understandings of "Progress" seem to us perfectly reasonable from an interpretive, historical, and normative standpoint:

- advancement of the relevant knowledge frontiers—scientific, technological, aesthetic, cultural, etc.[12]
- advancement in the distribution of existing knowledge—making more of what is known by some, known to all—possibly framed in terms of education, human capital, or otherwise
- quantitatively more outputs—works and inventions (of some types)
- qualitatively better outputs—works and inventions, subject to persistent ambiguity regarding the criteria for judging some outputs "better"
- broader participation in creative and inventive activities—possibly framed in terms of education, human capital, and/or access to the means of production
- increased social welfare—*where social welfare means …*
- economic growth
- sustainable development

These different objectives may seem like shades of grey, but the (sometimes subtle) variations likely matter quite a bit in terms of institutional design. For we might well think that different institutions are best suited to maximizing, for example, *production* of works and inventions, *distribution* of knowledge, and *participation* in creative and inventive activities. Yet the Progress clause gives absolutely no guidance about which particular objective or mix of objectives we ought to pursue. It is tempting to ignore these potential differences and simply assume that the Progress clause refers to one or another of these objectives, or simply to brush the issue under the rug by hiding the ambiguity in a general claim that IP should promote "innovation," as if "innovation" were one thing, and in fact claims that certain legal systems better "promote innovation" are quite common despite all the evidence that has accumulated about the differential effects of various policies across industries.

The temptation to characterize the end at this level of generality is rooted in expediency and the need to make analysis tractable, but rendering analysis tractable is hardly a defensible way to settle such a complex normative question. Alternatively, analysis might choose to ignore differences in normative baseline because they believe

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[11] Frischmann, 74 U. Chi. L. Rev. 1083, 1095 (2007)

[12] Even here, ambiguity persists, since "advancement" remains open to interpretation.

that normative analysis is beyond the scope of institutional design or comparative institutional analysis. But that belief is problematic. First, as we explain further below, the normative question must be addressed for comparative institutional analysis to be meaningful. One simply cannot compare institutions without some sense of what the institutions are supposed to accomplish. Second, while it is true that the choice between different objectives is not itself an institutional design question, the allocation of the decision about which objectives to pursue--effectively, the *who* decides question--quite clearly is an institutional design question.[13]

At the most basic level, the "who decides" question appears to be settled because, in the context of IP, Congress gets to decide on the objective(s).[14] In theory, this means that the political process should provide information about what the public needs, wants, or demands.[15] But there are plenty of circumstances in which courts, administrative agencies, and even private actors necessarily make judgments about objectives. This is especially true where Congress assigns certain decision-making tasks to those other parties and leaves those actors interpretive room.[16]

Legal scholars are well-suited to engage in descriptive analyses of existing legal frameworks and prescriptive analyses of institutional designs given existing legal frameworks and some external normative objective. Our expertise, after all, is institutional design. Clients, those with whom clients interact, and society at large tend to supply the normative ends. Lawyers craft institutional solutions to overcome obstacles, dilemmas, problems, and so on that impede their clients' efforts to make progress in satisfying their needs, wants, desires, or more generally, ends. Lawyers generally do not supply the ends. We supply means to achieving ends determined by

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[13] Komesar. There are other reasons one might sidestep the normative baseline question.

[14] Under the Supreme Court's current jurisprudence, this seems correct. The Court will apply rational basis review to IP legislation and will not give substance to the Progress clause. *Golan*; *Eldred*. Alternatively, courts might interpret the clause to have some substantive meaning that guides and/or constrains Congress. Read on its own or in conjunction with the First Amendment or even other sources of normative commitment, the Progress clause could support a range of objectives, as suggested in the text above.

[15] We raise at least two very difficult questions about societal needs/wants/preferences/values: "First, how do we know what we want? Second, how do we learn to want whatever it is that we want? Answering these questions requires considerable analysis of the dynamic interplay between how we figure out what we want, how we manifest our demands, who gets to do the valuing (or ranking of values), and how the environment within which we are situated and the opportunities it affords simultaneously enables, constrains, and shapes our wants/values." Frischmann, 74 U. Chi. L. Rev. at 1095.

[16] We leave aside for now a discussion of how the systems in which these actors operate generate the information needed to make these determinations of objectives and the various ways in which system failures might distort the articulation of public needs/wants/demands.

others.[17] Lawyers' normativity makes the most sense when they are engaged in comparative institutional analysis and the normative evaluation is really a comparison of means. That is, when a lawyer says A is preferable to B, they are making a normative statement, but the statement only makes sense (as a product of legal analysis, reasoning, or expertise) when the lawyer is comparing A and B as means to achieving some particular objective, and the objective is not itself up for grabs, ambiguous, or selected by the lawyer. Otherwise, the comparative analysis is suspect. (Indeed, absent comparative analysis, it is hard even to evaluate normative claims. Not surprisingly, the basic "compared to what" question is a tried-and-true favorite at faculty workshops.)

One way of dealing with the intractability of the normative baseline problem is to engage in a variety of analyses that expressly assume a particular objective and evaluate the institutional arrangements best suited to achieving those objectives. Rather than simply determining how different copyright regimes fare as means for promoting one or another of the objectives we identified above, for example, we might make more progress by conducting a comprehensive series of comparative analyses of the regimes best suited to promote different objectives—in fact, this could be the overarching objective of a meta-analysis project. This might take the form of scenario analyses where scenarios are defined according to different objectives.[18]

One can imagine, for example, one scenario (S1) in which Congress decides the public needs/wants/demands institutions that meet objective A, scenario two (S2) in which Congress decides the public needs/wants/demands institutions to meet objective B, … scenario n (Sn) in which Congress decides the public needs/wants/demands objective X_n. And we might consider scenarios in which the objective might be some function of A, B, … X_n, where various objectives are weighted. Thus, one scenario might involve an equal weighting across possible objectives or even complete uncertainty about what the public needs/wants/demands.[19] It may turn out that particular institutional arrangements make sense across a range of objectives, and that might allow us to draw some conclusions without having to settle on any particular objective. Or it might allow us to determine that particular institutional arrangements make sense for a certain cluster of objectives, and that different arrangements make sense for another

[17] It is therefore somewhat ironic how much American legal scholarship aims to be normative, to identify and elevate specific ends over others.

[18] There is a rich literature on the approach. In his book, *The Economic Dynamics of Law*, David Driesen argues for the use of scenario analysis in various contexts, with particular emphasis on environmental law where scenario analysis would supplement and/or replace cost-benefit analysis.

[19] This is obviously akin to specifying social welfare functions. We recognize the similarity, but do not commit to employing those techniques. For our purposes, it is enough to recognize the apparatus that could be used and perhaps must be used in some contexts. The comparative analysis itself is not dependent on these techniques. They are (may be) complementary.

cluster. This approach would at least help illuminate the relationship between institutional structure and normative goal – to see which institutional design features are sensitive to normative goal and under what circumstances.

There is, of course, a risk that this could quickly get messy and possibly intractable, depending on the range of scenarios analyzed, but it's not necessary that every possible scenario be analyzed in one study. In fact, conceiving of this kind scenario analysis as the broad framework for research should enable individual analysts to focus self-consciously on particular scenarios and frame the findings in relation to other similar scenario analyses.

Another related approach would be to group the studied scenarios at different levels of micro-meso-macro context and specificity. Consider the following possibilities:

1) *Micro, Small-Scale Contextual*

These studies would begin with a defined, well-understood context within which a specific objective is well defined and politically acceptable. There might be some useful negotiation over how to articulate the objective, but this process should take place ex ante, for it certainly will be done ex post—that is, the articulation of the objective and scope of investigation will always be contestable, and the comparative analyst should understand and expect as much. So for example, we might consider the context of drug development and articulate the objective in terms of supplying drugs to the public that deliver demonstrably large health-related benefits (perhaps measures in terms of QALYs). We could also narrow down the agreed-upon objective, perhaps to lowering the cost of delivering existing drugs or drug-related innovations with substantial health benefits. Or we could narrow it even further to focus on specific health problems. Thus, Brett might conduct a comparative analysis of institutions aimed at delivering drugs (health care improvements) to deal with malaria; Mark might do the same with respect to AIDS; Kelly with respect to obesity; and Maria with respect to autism.

Whatever the level of specificity, the important first step is choosing a defined, well-understood context within which we can identify a particular objective that is politically acceptable (and perhaps even politically established). We can then engage in a comparative analysis of failures and institutions within that context and make some headway in understanding how well different institutions serve the defined objective. If there are unavoidably multiple objectives, then the scenario analysis suggested above might be necessary, but it would be more tractable in the more manageable micro-context.

There are, of course, limitations to this approach. Working at this level

necessarily requires the analyst to bracket important questions: Why focus on this context rather than another? Why this objective? Why, to take our examples above, malaria rather than AIDS, obesity, or autism? But there are also real advantages to these types of studies. For one thing, they can at least be done in an open, transparent fashion such that assumptions and choices can be interrogated. When they are done well, these studies can provide useful information that might be sufficiently close to the real world that it can be practically useful and perhaps even point to some politically feasible policy intervention. They might be particularly useful where it seems very likely that something will be done one way or another in the context under study, such that the comparative analysis will be relevant. And, of course, if these kinds of studies are done as part of the kind of scenario analysis we described above, we might be able to aggregate them and draw some lessons at a higher level of generality.

2) *Meso, Sector-Specific Context, With Somewhat More Generic Articulation of the Objective*

Here the analyst would begin with a well-understood context defined in terms of a cognizable (industrial, economic, technological, cultural) sector within which the relevant set of intellectual activities, actors, relationships, and so on can be reasonably well understood, and then try to articulate a well-defined and politically acceptable objective for the sector. It is likely that such an objective will have to be stated at a rather high level of abstraction to accommodate the diversity of actors and beliefs about what "success" ("progress") within the sector might entail.[20] In a sense, this is the sector's general purpose, and in at least some situations, that purpose might provide a satisfactory basis for evaluation. It might be necessary, once more, to look for more concrete objectives and employ scenario analysis. Or it might be useful to conduct a series of more micro, small-scale comparative analyses within the sector.

Of course, there are obstacles and limitations to sector-specific comparative analysis. Some are the same as seen at the micro-level—for example, why this sector rather than another? Others concern line drawing and the definition or delineation of sectors themselves. (This is done imperfectly already, however, and there would be no reason to reinvent the wheel.) One analytical concern is the extent of spillovers across sectors, both in terms of the impacts that institutions in one sector might have on others and in terms of the impacts that R&D and other activities in one sector might have on others. Obviously, this can occur at the more micro-level as well.

Sector-specific comparative analysis at least reduces the scope of the analysis and the corresponding range of objectives, and it also may be useful for analytical reasons.

[20] Relatedly, we think it would be interesting to study the beliefs of actors within the identified sector. What counts as success within the sector? What is progress? Etc.

Specifically, the comparative analysis of failures and institutions is likely to be more tractable and manageable within sectors.

3) *Macro, Not Constrained by Context or Sector, Framed at the Broad Level of National Political and Economic Systems, With a Generic Articulation of Objective(s)*

It is tempting to conduct comparative analysis at a macro level and thus offer prescriptions with the broadest impact. But for such work to be credible, it requires a basis for evaluation, a broad but well-defined and politically acceptable overall objective - one that is stated at a high enough level of abstraction to accommodate the diversity of actors and beliefs about what "success" ("progress") might entail. There are a few candidates, including objectives framed in terms of social welfare or economic growth.

For reasons we'll discuss later, these candidates have serious flaws. Most simply, they can only be assumed. There is no basis for concluding that the people (through the political process) manifest a commitment to academics' construction of objectives (or social welfare functions, etc.) framed in these terms. Indeed, our list of understandings of the constitutional concept of Progress indicates significant disagreement about objectives even among academics focused on intellectual property and innovation. That such disagreement persists suggests that the evidence for any particular understanding is quite ambiguous and subject to contrary evidence. And that is just among legal scholars. In our view, the way that the political process manifests demand is simply too coarse and distorted to provide any meaningful support for a public commitment to economic growth or welfare maximization.

Still, in theory, comparative analysis under various scenarios at the macro-level would be useful. That is, for the reasons explained above, it would be informative at least to know how different institutional regimes fared in various scenarios (where the scenarios involve different objectives or weighting of objectives). It might be the case that certain institutional designs were preferable regardless of the scenario or perhaps for a wider range of scenarios than others—this would be good to know. For example, a comparative evaluation of different institutions (patent, prize, tax, and so on) or even different designs for a particular institution (patent) as means for pursuing different visions of Progress (economic growth, social welfare, and so on) would be incredibly useful.

In *The Wealth of Networks* (2006), Yochai Benkler does something similar to what we have in mind. Benkler conducts comparative institutional analysis across a range of normative values. He carefully analyses *commons-based peer production* as a provisioning system in comparison with *market-organized* and *firm-organized*

proprietary-based provisioning. These provisioning systems are, or at least can be understood as, macro-level *means* that involve complex institutional structures. Accordingly, it seems to us that Benkler in engaged in comparative institutional analysis at the macro-level.

In a sense, Benkler "supplies" the ends because he chooses liberal political theory as the baseline. But some such choice must be made. What we find most important is that he is explicit, wide-ranging, and substantive in his engagement with the normative values. The normative values Benkler discusses include: autonomy (Chapter Five), democratic participation in both the political sphere (Chapter Seven) and the construction of culture (Chapter Eight), justice and human development (Chapter Nine), and community (Chapter Ten).

> The normative thrust of the book is that the emerging nonmarket production systems should be allowed, if not encouraged, to emerge within the core of the information economy rather than consigned to the periphery. The dynamic changes to the technological and economic conditions of the information environment enable nonmarket production to coexist and in some instances rival market production. Not surprisingly, dominant market players may resist the emergence of nonmarket production systems for a variety of reasons. Incumbents may see emergent systems as direct substitutes or as disruptive technologies that will enable new entrants to challenge the incumbents' market positions. In addition, incumbents may see emergent systems as "free riders" that unfairly benefit from existing proprietary systems. Finally, incumbents may seek to control the development and emergence of these systems so as to ensure a "cut" of the eventual benefits. The critical prescriptive point, made most clearly and forcefully in Part III, is that society should avoid optimizing legal, technological, economic, and other socially constructed conditions—the institutional ecology—for the industrial or proprietary modes of production.[21]

Although Benkler might not have viewed his book as an example of comparative institutional analysis, the above summary of the normative section of his book reveals how Benkler approached the macro-level institutional design choice about which provisioning systems to rely on and support; he did not argue in favor of one at the exclusion of others, but rather he argued for the preservation of freedom for all, despite the persistent pressures to optimize the institutional ecology. And this final point highlights, as Komesar emphasized in his seminal work on comparative

[21] Frischmann (2007) (reviewing The Wealth of Networks).

institutional analysis, that the "*who decides*" question is perhaps the most important and hotly contested institutional choice.

To conclude this Part, we think it is necessary to begin with the end(s) that serve as the underlying basis for comparative evaluation of failures and institutions in context. Without attention to the normative end(s), which we've described in terms of objectives, there is really no basis for comparative evaluation. We don't want to overstate the point. Comparative analysis in a more descriptive vein might be possible—where the analyst describes the way various institutions function, and the effects of those institutional arrangements. But such comparative analysis does not constitute evaluation because it lacks a basis for judgment.

We think that as you move from the micro to meso to macro level of analysis, you're losing something. You're losing relevance and connectedness to real-world systems, and you're diluting information about what people need/want/demand. From a purely normative perspective – focusing on the well-defined and politically acceptable objective that serves as the basis for comparing institutions and failures – the more micro you go, the more trustworthy the analysis. Yet the more micro you go, the more open you are to being challenged on the limitations noted above, whether generalization is possible, and whether prescriptions for legal reform can be developed.[22] Finally, as we explore in more detail below, the level of analysis might also affect the relevance of different (market, political, communal) system failures and institutions. There may be a question of fit. Failures and institutions may vary across levels, just as the objectives vary.

II. Comparative analysis of failures and institutions in context

As we have suggested above, comparative institutional analysis must consist in substantial part of comparative failure analysis, by which we mean rigorous and contextual comparative analysis of market, political/government, and community failures. In this Part, we first briefly explain *why* and then we explain *how*. The *why* section explains how distorting myopia creeps into analyses of institutions aimed at promoting innovation. The distortions dramatically limit what we can learn from the comparative studies. In the *how* section, we begin with a preliminary diagnosis of failures and, in particular, develop the distinction between system-independent and system-dependent failures. We then discuss the relationships between institutions and these various failures.

A. The Importance of Comparative Failure Analysis

[22] This triggers the various concerns over uniformity costs, which scholars who have advocated some form of tailoring have dealt with at length.

Many different legal and non-legal institutions govern and therefore promote or stifle knowledge production. The variety of knowledge and knowledge producers and systems with and within which knowledge and knowledge producers/users interact make it all too tempting to look for reductionist shortcuts, in general but especially when one undertakes the task of comparative institutional analysis. The temptation should be resisted for it leads to either what Demsetz called the Nirvana Fallacy or what Ostrom critiqued as myopic allegories.[23] One easy reductionist step is to focus on a particular dilemma—identify a particular market failure, for example, ignoring or assuming away others—and then compare institutions in terms of effective resolution of the dilemma.

At the macro level, for example, the dominant framing of the problem to be solved by intellectual property laws is the basic public goods problem, often described in terms of the free rider allegory.[24] Simply put, because intellectual resources are public goods (nonrival and (non)excludable),[25] they may be undersupplied within markets. The inability to cheaply exclude competitors and nonpaying consumers (free riders) presents a risk to investors perceived ex ante (prior to production of the good), and this risk may lead to undersupply.

Many analysts assume (1) the free rider allegory describes a normal rather than exceptional problem, and consequently (2) that a binary institutional solution set follows: production subsidized by government or by intellectual property-enabled markets. Government subsidization does not involve introducing constraints on consumption; instead, the underproduction problem is dealt with directly. Government allocates funds to research activities that yield intellectual resources and thus investment risks no longer matter. These intellectual resources can be shared openly

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[23] H. Demsetz, "Information and Efficiency: Another Viewpoint," Journal of Law and Economics 12 (April 1969) (critiquing the comparison of reality (or realistic alternatives) with unrealistic idealized alternatives); Ostrom, E. (2007), "A Diagnostic Approach For Going Beyond Panaceas", Proceedings of the National Academy of Sciences, 104(39): 15181-15187 (critiquing reliance on allegories such as the tragedy of the commons as well as appealing to panaceas); Ostrom, E. (1990), Governing the Commons: The Evolution of Institutions for Collective Action, New York: Cambridge University Press (same); Frischmann, Enduring Lessons (2013).

[24] Lemley (2005)

[25] We use nonrivalry (without the parentheses) because this characteristic in inherent or fixed for intellectual resources, and we use (non)excludability because this characteristic is context-dependent, is variable with the costs of exclusion, and can be addressed through various institutional interventions. See Frischmann, Infrastructure, 254 n.1. For thorough discussion of public goods, see id., ch. 3, for thorough discussion of intellectual public goods, see id., ch. 12.

and freely without concern, because the under-production problem has been solved on the front end. On the other hand, intellectual property rights, such as patents and copyrights, lower the costs of exclusion, enable transactions, and mitigate the risk to investment posed by free riders. Intellectual property rights thus enable markets to function more effectively in supplying intellectual resources.

Unfortunately, both of the assumptions are oversimplifications, at best. First, free riding may describe a normal or an exceptional problem; we simply do not know for sure.[26] There is insufficient empirical evidence to support a general macro-level claim either way. The relevance of the free riding risk is best evaluated empirically in context. Where it is irrelevant, it is not a problem to be solved at all; in fact, it may very well be beneficial for society. Second, in theory and practice, the solution set is considerably more diverse and nuanced. Note how the binary thinking frames the macro-institutional choice (market vs. government) and leaves alternative provisions systems (e.g., commons) out of view.[27] Moreover, while this framing leads to some neat, compartmentalized divisions of labor between government and market, it (all too conveniently) ignores a host of complications internal to the market and government institutions, what we discuss below as system-dependent failures. The allegory blinds us to the various problems and solutions, and even when it doesn't, it too easily subordinates them.[28]

The concern about myopia is not limited to the macro level. At the meso level, we might, for example, want to use comparative institutional analysis to examine the pharmaceutical industry. If we focus on overcoming the potential undersupply of drugs because they are expensive to develop but cheap to copy, and we attribute the undersupply problem to the risk of potential free riders, we might choose one narrow set of institutions to compare--for example, differently designed patent regimes, prizes, and tax incentives. Our concern is not only with the free rider problem, however. If we identify the FDA approval process (and specifically clinical trials) as the source of many of the costs associated with drug development, we might be inclined to compare a different set of institutions--for example, patents with other institutions like prizes, grants, and government provided infrastructure for clinical trials.[29] With regard to the

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[26] Developing empirical work, however, is pointing toward the problem being exceptional rather than normal.

[27] See, e.g., Benkler (2006); Frischmann (2013); see also Ostrom (2007).

[28] There is much more we can say about the distortions associated with this framing. For example, it happens to work very well with the *linear model of innovation*--another terribly flawed model that is nonetheless widely adopted because of its tractability.

[29] This highlights another reason why a broader framework for comparative institutional analysis is important: most existing studies consider only a narrow range of alternatives. Sometimes the studies are constrained by existing alternatives. Other times the analysis is confined because it can only be tractable within defined limits, and particularly because alternatives are difficult to compare when there are few common dimensions along which to draw the comparisons. Hence, while we see

latter, we might then determine that government funding of clinical trials was best because it lowered the cost of bringing drugs to the market and lessened deadweight as compared to patents.

That analysis might be useful, as far as it goes, but it would ignore still other problems, such as the demand-side failure that leads to under-provisioning of drugs to smaller or nonexistent markets. This is not to say that there is anything wrong with comparing institutions as solutions to the free rider or clinical trial cost problem. But it is to emphasize that we can only design institutions to address problems we recognize, and the risk of myopia is strong in comparative institutional analysis because introducing multiple institutions to compare seems to demand of the analyst a corresponding reduction in the scope of problems to which the institutions might be addressed.

B. Comparing Institutional Failures

Recall that in previous section, we suggested that one must start with a defined objective (end) and context (level of analysis). Here, we assume that this has been done. In other words, the relevant objectives (ends) are settled, even if only in functional terms or as part of a scenario, and we're ready to evaluate means.[30]

We might begin with the biggest institutional choice question -- what provisioning system to choose as means? What are the options? Markets? Governments? Communities? Comparing these systems requires recognition not just of the comparative strengths of different institutions, but also of the ways those institutions fail. We use "fail" here capaciously - and particularly we mean it more broadly than the "market failure" frequently referred to within IP discussions. According to the dominant theoretical account, intellectual property rights are necessary to remedy a particular kind of market failure that arises because of the public goods nature of inventions and works of authorship. Specifically, inventions and works of authorship are costly to create but, owing to their non-rivalry and non-excludability, easy to copy and distribute at price that would prevent the developer from recapturing its investment. We certainly don't mean to argue that this kind of market failure is irrelevant, only to highlight that this is only one type of failure that needs to be considered.

Some of those other failures have to do with the nature of the institution under

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comparisons of patents and prizes or tax incentives, we do not see (to our knowledge, at least) comparisons between intellectual property laws and investment in music and art education as means of producing greater or better creative output. We note this not to be critical, but to note that comparisons are only meaningful as between those things that are compared, and it is important to understand the limitations of any particular comparative analysis.

[30] We understand that there are problems with neatly separating means and ends. For now, we leave that aside.

consideration. Certain failures, for example, will be common to government institutions; other failures will be common to market-based institutions. Some failures will relate to the nature of the task an institution will be expected to undertake. Administration of prizes, whether administered by the government or a private entity, depends on the administering entity's ability to gather information about the desired output and the structure and size of the prize necessary to induce that output. And some failures will result from the combination of the institution and the type of task.

It therefore might be necessary, or at least helpful, to identify preliminarily the *system-independent* failures / problems / dilemmas that will need to overcome to achieve the stated objective. These might influence the macro level options and evaluation. Then we can proceed to consider / compare the *system-dependent* failures and institutional options.

1. *System independent failures*

Some obstacles to getting what we want -- to achieving our stated objectives -- are a function of variables, characteristics, or circumstances that do not depend on the provisioning system. We call these *system-independent* failures, and they occur across all systems and are not a product of the system. In essence, they are a function of the *resource-environment* or of *human nature*. These obstacles might be seen as exogenous to the system, although as we will see that might go too far since the systems may lessen or aggravate the obstacles in various ways. Consider three examples: shortsightedness as an example of a characteristic of human beings; (non)rivalry as an example of a resource characteristic; and externalities that can be a combination of the two.

Shortsightedness afflicts human beings,[31] and it can be exacerbated or aggregated or controlled or adjusted within any of the systems. Political systems may be designed to extend or shorten time horizons; the same is true of markets, of course. But the problem of shortsightedness originates with individual human beings and characteristics of human behavior and decision-making. We use shortsightedness to refer to decision-making that *irrationally* preferences the short-run over the long-run, or put another way, decision-making that *irrationally* discounts the future.[32] One could

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[31] We could discuss a host of behavioral economic concerns here.

[32] **define rational / tie in behavioral econ lit.**. [placeholder: Ostrom (2000) critiqued reliance on the rational actor model when analyzing collective action and social dilemmas. After establishing a series of "well-substantiated facts" about human behavior based on extensive fieldwork: "I believe that one is forced by these well-substantiated facts to adopt a more eclectic (and classical) view of human behavior" (Ostrom, 2000: 141). She developed a "second-generation model of rationality" in which humans are "complex, fallible learners who seek to do as well as they can given the constraints that they face and who are able to learn heuristics, norms, rules, and how to craft rules to improve achieved outcomes"

engage in short-sighted decision-making either by favoring short-run gains over significantly larger long-run gains, by choosing policies that generate short-run gains but larger long-term costs, or by avoiding short-run costs when the consequence is more significant longer-term costs. A variety of psychological biases contribute to the problem.[33] Shortsightedness constitutes a system independent problem because of its origins in human behavior and because it distorts individual and collective decision making regardless of provisioning system.

Another example is the *rivalrousness of physical resources* and *nonrivalrousness of ideas*.[34] The resource characteristics give rise to obstacles (even governance dilemmas)[35] that exist regardless of which systems society chooses to rely on as a means for provisioning or governing the resources. Of course, the obstacles may vary in magnitude or form across systems, and again, the systems can be designed to exacerbate or lessen the dilemmas. But the point is that the resource characteristics that give rise to obstacles or dilemmas are exogenous or independent of the provisioning systems.

A third example is *externalities*. Although often described as a type of market failure, this is a mistake. Externalities are really system-independent, at least at a rather fundamental level where we examine what causes external effects to be external or outside of people's accounting or view or decision making process. Externalities are, by definition, third party effects; they exist when one person acts in a fashion (or even when two people jointly act in an interdependent manner) that leads to costs or benefits

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(Ostrom, 1998: 9). The second-generation model of rationality predicts that reciprocity, reputation, and trust as "core relationships" can lead to increased net benefits (Ostrom, 1998: 13). This theoretical model identifies "individual attributes" that are particularly important in explaining behavior in social dilemmas: these attributes include "[1] the expectations individuals have about others' behavior (trust), [2] the norms individuals learn from socialization and life's experiences (reciprocity), and [3] the identities individuals create that project their intentions and norms (reputation)" (Ostrom, 1998: 14).

33 *See infra* Part III. Shortsightedness is one of the examples / applications we will explore.

34 We tend to emphasize failures associated with nonrivalrousness, but rivalrousness can be equally problematic. Whether the marginal cost of consuming something is zero or positive, different complications may arise for suppliers. In a sense, rivalrousness creates information problems--how much of a resource should be supplied? To determine provisioning, one needs to know who needs/wants/demands how much of what. Governments may struggle, and markets may thrive, in overcoming this problem by use of the price mechanism, but reliance on markets for rivalrous goods creates demand for a certain type of governance institution--exclusive rights to possession and use--without which markets may struggle. Nonrivalrousness doesn't eliminate the information problem--we still need to know what to supply and to whom, but it is different in certain respects. This is not the place to fully describe the obstacles. Frischmann has discussed them extensively elsewhere.

35 Another way to frame this would be to say that the resource characteristics themselves give rise to societal demand for governance.

that are not factored into the actor's (actors') decision making process. In the context of markets, the idea is that an individual's willingness to pay doesn't account for the external benefits or costs realized by others. But of course, there is nothing inherent about externalities that makes them more susceptible to full accounting (internalization) within political systems. To the contrary, people cast votes and otherwise exercise political power in various ways that cause or fail to account for external effects. It may be the case the markets and political systems fail differently or more (less) frequently with respect to different types of externalities, or perhaps that institutions within those systems are better suited to dealing with externalities. And it may be the case that externality problems are made worse within different systems--e.g., relying on markets to guide environmental resource allocation may systematically fail because of externalities. But our basic point holds. Externalities are not dependent on the provisioning system; rather, they are a product of interdependence among people and resources.

Another resource-related system independent failure is what Frischmann (2000) referred to as innovative process market failure. Though he erroneously framed the problem in terms of a market failure, the problem he identified was not dependent on the choice of the market as the provisioning system. Rather, the problem he identified concerned the innovative process itself. Here is how he explained it:

> Innovative process market failure (IPMF) occurs when the dynamic nature of the innovative process and its uncertain progression press investors toward more applied research than is socially desirable. IPMF has two defining characteristics: (1) dynamic dependence, i.e., future innovative progress depends on the existing state, and (2) prospective uncertainty, i.e., risks, time horizons, expenditures, and spillovers are uncertain as estimated ex ante. Limited public and private investment resources require a careful balance between applied and basic innovation projects over time to ensure efficient progress. However, in the face of prospective uncertainty, investors skew innovation investment from the socially optimal distribution between applied and basic research, irrespective of public goods market failures. ...
>
> The social costs of IPMF are an interesting brand of opportunity costs, ranging from slowed technological development within an industry to significant macroeconomic effects on competitiveness in emerging industries. As commentators have noted, under-investment in basic research will likely undercut the supply of new ideas and, equally important, the supply of future avenues of research. Moreover, innovative process market failures interact with public goods market failures and the corrective institutional mechanisms employed by the government.

Our reason for identifying system independent failures, dilemmas, or obstacles is, among other things, to prevent conflation with system dependent failures, dilemmas, or obstacles. Importantly, identification and analysis of the system independent obstacles will help frame the analysis of the provisioning system choice as well as the subsidiary comparative institutional analysis.

We need to emphasize here that identifying a particular failure or obstacle as system independent does not imply that its significance or magnitude is entirely independent of institutional design. To the contrary, many system independent failures can be ameliorated or exacerbated in certain institutional settings. The point is that doing *comparative* institutional analysis requires recognition that these failures will be relevant across different institutions, which should draw more attention to the ways institutional design can affect them.

2. *System dependent failures*

As we suggested above, markets, political systems, and communities serve as *means*. These systems comprise the rules of the game and structure the opportunities that people have to act in pursuit of their interests.[36] The systems don't have independent existence. They are socially constructed, whether designed or emergent. They are provisioning systems—systems through which we are provided with the outputs we desire. But to function as provisioning systems, they must also be able to figure out what to provide, to assess social demand. Markets achieve this matching of supply and demand through the price mechanism; political systems achieve this matching through elections and governance; communities achieve this matching through (generally more informal) social interactions.

Market systems exhibit certain sets of failures, government other sets, and non-governmental community systems still others. Of course, there is overlap. But in terms of figuring out what society wants (i.e., from the demand side), the systems rely on different signals, information, processes, and so on. And in terms of satisfying societal demand, the systems rely on different actors, distribution methods, and relationships.

[36] Consider antitrust law as an institution. Its primary (perhaps only) objective is maximizing [consumer welfare] [economic welfare] [social welfare]. To accomplish this objective, the institution is designed to achieve an intermediate objective, the preservation of [the competitive process] [competition] [the underlying operating system of the market]. In fact, antitrust law is tied directly to the provisioning system itself. The "who decides" question at the macro level is determined. Congress then specifies the law in very generic terms, in effect delegating to courts how to work out the institutional details. This is another macro level "who decides" determination. Within antitrust law, the comparative institutional analysis focuses on doctrinal rules, presumptions, burdens of proof, and so on.

We think comparative institutional analysis should account for characteristics that vary at the system level and shape both failures and institutions—characteristics such as demand signaling processes, evaluative criteria (for projects or investments or innovation), and basic capabilities operative within different settings/systems. The correspondence between failures and institutions is obviously not exact, and we suspect that comparative analysis of these and other characteristics will provide guidance for continued comparative analysis. We believe that solid comparative analysis will require theory and empirical work in tandem rather than in isolation from each other. Comparative (failure and institutional) analysis is necessarily contextual.

System failures – market failures and political system failures and community system failures – describe failures that occur within the system and are a product of the system. In essence, they derive from societal use of the system as a means. For example, markets as means depend on a certain architecture, basic operating system, set of operating procedures, and so on. Perhaps the most basic defining feature of the operating system of a market is reliance on the price mechanism. This has consequences and can, when compared to alternative systems as means, fail. Demand side market failures can be understood as situations in which markets allocate resources, structure relationships, and shape activities based on consumers' willingness to pay,[37] and as a result, the market system underperforms relative to another system in achieving some specified objective (end). In prior work, Frischmann discussed this in terms of social demand exceeding private demand, usually because of external effects from public and social goods that are not reflected in private willingness to pay, but this [may be] [is] flawed. As Demsetz implied by the Nirvana Fallacy, the analysis must be comparative.

Just as we emphasized above that characterizing a certain failure or obstacle as system independent does not mean that institutional design is irrelevant, we need to emphasize here that the consequences of system dependent failures may frequently be felt outside of that system. To take one basic example, failures in the government's provisioning of basic infrastructure are likely to affect market-based systems for provisioning other goods or services. Thus, analysts focused on system dependent failures need to be attentive to extra-system effects.

III. Applications and Examples

In this Part, we discuss some examples that we'd like to explore as this project develops. For the most part, we have focused on potential applications of our approach, in part by highlighting some contexts in which others have already done work that coincides with what we have described. Here we try to fit these applications within the

[37] This includes allocating resources, structuring relationships, and shaping activities based on demand derived from consumers' willingness to pay—that is, upstream.

typology we developed above, and we highlight strengths of the existing work while identifying issues for future elaboration.

A. Shortsightedness

In previous work, we attempted to lay the groundwork for a broader understanding of the goals of IP law in the United States, particularly by arguing that there is room for a normative commitment to intergenerational justice.[38] And we suggested that intellectual property law as an institution was not as future-regarding as it could be, primarily because it relies so heavily on the market and the market is [inherently] [systematically] short-sighted. This we regarded as a missed opportunity, because the subject matter of IP makes it particularly susceptible to the promotion of intergenerational progress.

In fact, we began this project where we left off that previous work, intending to focus here on the ways we could promote intergenerational progress by alternating some rules within the IP system and by increasing our focus on other institutions that might be used to supplement IP rules and partially offset their short-sightedness. To put things in the terms we have used above, we began by identifying a particular problem - failure of the IP system adequately to provision goods and services with longer-range or broader social value. We took for granted a normative commitment to intergenerational equity, or at least left a complete defense of that commitment to a later date. We then identified a cause of that failure, specifically the delegation to "the market" of decisions about what types of cultural, scientific, and intellectual progress we want.[39] We therefore argued that non-market institutions - including various government, non-profit, and other social institutions - were needed to supplement intellectual property in order to provide the kinds of goods and services we had in mind.

We anticipated building on that work and engaging in a comparative analysis of institutions for solving the short-sightedness problem, and we still hope to carry out that project. As we considered how to structure such an analysis, however, we realized that we needed a broader framework within which to conceive of our work. We recognized that short-sightedness is neither caused by, nor unique to, the market as an institution. It is rather a consequence of a number of human behavioral characteristics - hyperbolic

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[38] Frischmann & McKenna, Intergenerational Progress, 2011 Wisconsin Law Review 123.

[39] To be clear, we recognized that there is obviously some logic to such an approach, and we do not deny that IP systems optimally designed to facilitate markets would lead to progress and improve the welfare of future generations at least in some respects. Our argument was instead that progress need not, and indeed should not, be conceived of in linear, binary terms (more progress or less). Progress instead should be seen as contextual, in the sense that progress takes place within a particular information ecosystem, and the defining characteristics of that ecosystem shape the path along which we progress.

discounting most significant among them. These behavioral characteristics afflict decision-makers in a variety of institutional settings. They are system independent obstacles, to use our previous terminology. Nevertheless, we think shorts-sightedness is clearly exacerbated by the market, relative to other mechanisms.

The challenge of a well-executed comparative institutional analysis relating to the problem of short-sightedness will be to define with greater particularity the kinds of outputs we want some provisioning system to provide, evaluate who is best position to make those particularized judgments (and what signals they will use to decide), and to consider how other institutions can be structured to ameliorate the shorts-sightedness problem and the potential effects of such institutional arrangements on the market actors in the IP context. And we think it will be important to be sensitive to context here, for the short-sightedness problem (and the problems attendant to its solution) will almost certainly vary considerably by industry or setting.

B. Climate change

Climate change is one of the most pressing dilemmas society will face in our lifetimes. There is widespread agreement that innovation may (should) provide means for addressing some of the many problems we face. Thus, we believe it is fair to say that there is (or at least, will be) a reasonably well-specified and accepted political commitment to support R&D investments in this context. We might state the objectives as promoting (the development and widespread deployment of) (1) innovation to reduce GHG emissions and (2) innovation to mitigate the economic and social effects of climate change. We might articulate others, and we might articulate more specific subsidiary objectives already encompassed by (1) and (2). Moreover, social/political commitments or normative objectives will depend substantially on the scale and community chosen.

A comparative analysis would need to address a wide range of failures and institutions. There are a host of system independent problems, obstacles or dilemmas to confront, including all that we mentioned in the previous Part: short-sightedness, the nonrivarousness and rivalrousness of various environmental and knowledge resources, externalities of various types, and innovative process failures.

We suspect that the provisioning system choice may not be resolvable; all available provisioning systems may need to be harnessed in certain situations. That is, we suspect there will be complementary roles for government provisioning, market provisioning, and community-based / commons-based provisioning. It might not be terribly useful to do a comparative analysis at the macro-level because of the difficulty in choosing a provisioning system. But such a choice might be more easily made in more specific contexts with more concrete objectives in mind.

Josh Sarnoff recently published an exemplary starting point for this kind of analysis.[40] Here is the abstract for his paper:

> Huge amounts of money will soon be spent by governments and private entities to develop technology to reduce the costs of climate change mitigation and adaptation, and to deploy new energy and transportation infrastructures. Incredibly, we still lack any good idea of the best means of providing massive amounts of government or private money so as to promote the most innovation and technology diffusion at the lowest cost. This Article seeks to support better analyses of, and decision making regarding, the choices of government innovation-funding mechanisms by discussing the limits of current analyses and providing a taxonomy of such measures. It also proposes future work to better analyze what we know about these choices and their relative effectiveness, and it discusses new measures to expand our knowledge base, which include: (1) better tracking of government innovation-funding inputs and outputs; (2) better documentation of and self-conscious decision making regarding funding choices; and (3) creating experiments that go beyond existing natural experiments.

Sarnoff analyzes the comparative institutional analysis literature that focuses on innovations and concludes: "we do not know very much yet about important issues that should inform our decisions. We do not know: what government innovation choices have actually been made, their results, and their effectiveness across a number of dimensions; why we have made those choices; how those choices might compare to alternatives; what factors influence the comparative effectiveness of those choices; and the extent to which those factors are driven by particular cultural considerations that may be subject to manipulation."

And he then makes "three proposals [to] help improve evaluations of such choices and consequently help government decision making regarding them in the first instance. These proposals are: (1) better tracking of government-innovation expenditure decisions and their outcomes; (2) self-conscious and documented legislative and agency decision making regarding expenditure form choices; and (3) controlled experiments that go beyond existing natural experiments." He then develops a useful taxonomy of government institutions: "(a) subsidization; (b) procurement; (c) direct development; (d) constructed commons; and (e) product, process, and market regulation."

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[40] *Government Choices in Innovation Funding (with Reference to Climate Change)*, 62 EMORY L.J. 1087 (2013).

In the end, though Sarnoff does not engage in the comparative analysis of failures and institutions in context, though his proposals and taxonomy would be useful in such an analysis.[41]

B. Neglected Diseases

Terry Fisher and Talha Syed are working on a book that engages in a rigorous comparative analysis of failures and institutions in the neglected disease context. Though we have not obtained access to the full book (yet), some of the chapters are available online.[42] The book builds from their published article, *Global Justice in Healthcare: Developing Drugs for the Developing World* (2007).

In that article, Fisher and Syed (1) identify a social crisis -- "Each year, roughly nine million people in the developing world die from infectious diseases"; (2) develop a rigorous analysis of the normative arguments in favor of a social / political commitment to overcoming the crisis, (3) identify two "obstacles" to achieving this objective -- (i) "the majority of the most effective drugs are covered by patents, and the patentees typically pursue pricing strategies designed to maximize their profits"; and (ii) pharmaceutical firms concentrate their research and development ("R & D") resources on diseases prevalent in Europe, the United States, and Japan — areas from which they receive 90-95% of their revenues — and most of the diseases that afflict developing countries are uncommon in those regions."

The first two accomplishments together are quite useful in developing a normative baseline for evaluation and for articulation of a well-specified, politically acceptable (though still contestable) objective. With respect to the normative baseline, it still might be useful to engage in scenario analysis where different normative baselines serve to differentiate the scenarios. But they have identified an objective.

The two obstacles are interesting in the sense that they are system-dependent and to some degree, institution-dependent. That is, both "obstacles" really seem to describe the consequences of choosing the market as the macro-level provisioning system and further the choice of patents as the market-modifying institution to determine or drive progress.

It is not clear whether the authors engage in a comparative analysis of institutional options. Rather, it appears that they examine different institutions almost

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[41] Taxation, Innovation, and Environmental Policy, OECD (2010) http://www.oecd-ilibrary.org/docserver/download/2310051e.pdf?expires=1386179372&id=id&accname=ocid177459&checksum=AFF805C28DECF4BAE9DBB5C6704E406D

[42]

independently, motivated in part by the fit between the institution and a perceived problem. In a sense, they explain the gains that society might achieve through the use of particular institutional arrangements or reforms. But it is not clear that this is done in a comparative fashion.

C. Progress in Science and/or Progress in the Useful Arts

What we'd like to do here is [play with] [work out] the macro-level analysis if we were to identify the objective as an equal weighting across all reasonable objectives described in Part I. We might constrain the context to a degree by focusing separately on (1) Progress in Science and (2) Progress in the Useful Arts. We might also constrain the means to those specified in the IP Clause and thus compare in (1) differently designed copyright regimes, and in (2) differently designed patent regimes. We suspect that when framed in this fashion, certain design principles will emerge.