Reply

Re-Marking the Progress in Frischmann

Lawrence Lessig†

Simple ideas fix public policy. Simple ideas, taken for granted, by a generation that rules. These ideas were learned. They did not come naturally. They were taught on the basis of the best that was known, at the time this generation last learned. They are not argued for. They are not disputed. They set the background against which public policy decisions get made.

There is a set of simple ideas that now guides telecommunications policy. At its core is a view about the utility of regulation. Regulation, this view holds, is disfavored. More precisely, a very good reason is needed if private ordering is to be disturbed. Thus, markets should be left alone unless some strong reason for intervention is shown. Market failure alone is not sufficient since government failure can defeat any gain that government intervention might seek.

I agree with these simple ideas. But I also believe that with respect to networks, there is a gap in our understanding about when regulation makes sense. There is not yet a good theory for explaining this gap, nor will there be one until economists frame such a theory in their own language. For now, there is only a set of powerful intuitions, but powerful intuitions do not compete with simple ideas.

Brett Frischmann takes this debate beyond powerful intuitions. In *An Economic Theory of Infrastructure and Commons Management*, Frischmann offers a model for understanding the infrastructure of telecommunications networks.[1] His model teaches a different communications policy than that schooled

† John A. Wilson Distinguished Faculty Scholar and Executive Director of the Center for Internet and Society, Stanford Law School.

1. Brett M. Frischmann, *An Economic Theory of Infrastructure and Commons Management*, 89 MINN. L. REV. 917 (2005).

by simple ideas. It shows us the value in regulating these networks differently.

This is an important lesson to learn. The United States continues to fall behind other major industrial nations in broadband penetration. Today, we are thirteenth.[2] Part of the difference between us and these other nations is our attitude about the government's place in securing broadband penetration. We have left the matter solely to private actors whereas other nations have supplemented private action with government support. Our policy fits the reigning simple ideas about how such markets work. Frischmann's article shows us the possible error in these simple ways.

My aim in this Reply is to summarize and extend. Frischmann's article is rich and complex. Frischmann clears the way for important new work in economics. I point to some additional work left to be done.

I. NONRIVALROUS RESOURCES AND INFRASTRUCTURE

Resources are different, and rivalrousness is one dimension of difference. For some resources, their consumption rivals the opportunity for others to consume the same resource. For other resources, it does not. If you drink my coffee, I cannot. Coffee is rival. If I recite your poem, that does not interfere with your opportunity to recite the same poem. Poems are not rival.

One simple idea that has captured a generation of policy makers is that nonrivalry creates trouble.[3] The trouble is not static. Instead, it affects the resource's supply. Nonrival (NR) resources invite free riding.[4] And if the resource is the sort that needs effort to create—if it is songs rather than sunshine—then free riding can sap the incentives needed to supply the NR resource. If you can free ride off of what I create, then my incentive to create is less than it would be if you paid for the benefit you received. Because of free riding, I create less. Free riding

2. *See* Int'l Telecomm. Union, *ITU Strategy and Policy Unit Newslog*, *at* http://www.itu.int/osg/spu/newslog/2004/09/ (Sept. 15, 2004).

3. Frischmann extends this concept of nonrivalry to include partially nonrival (NR) resources. *See* Frischmann, *supra* note 1, at 942–56. This concept is an important part of the analysis he provides, but it is unnecessary for the purposes of my summary. Wherever I describe NR resources, one could substitute "nonrival and partially nonrival resources."

4. Technically, as Frischmann explains, free riding requires that the NR resource also be nonexcludable. *See* Frischmann, *supra* note 1, at 947–49. In the ordinary case, absent regulation or private effort, they are.

thus costs something, its name notwithstanding. It costs the incentive that would otherwise exist had there been payment for the benefit, and that cost reduces its supply.

The proper response to a cost is to find a way to eliminate it. The standard response is to eliminate free riding by granting an exclusive right. If access to the resource can be made conditional—if excludability can be engineered into the frame—then access to the resource can be conditioned on paying for the benefit. The marginal incentive to produce can be preserved if exclusive rights can be secured.

This is a perfectly fine solution for some resources. In particular, it is a fine solution for consumption goods. If the NR resource is simply meant to be consumed, then there is a benefit to solving the free rider problem (to align incentives) and not much cost. There is, however, some cost—the cost of whatever mechanism is invoked to solve the free-riding problem. So long as the benefit to incentives outweighs that cost, it makes sense to restrict the NR resource to those who are willing to pay.

So much is commonplace among the simple ideas that I referred to at the start. But it is here that Frischmann begins drawing his map. He helps to distinguish cases where the ordinary solution (stop free riding) works, and cases where it might not. Some resources are meant to be consumed (consumption goods). Other resources are inputs into the production or creation of other goods; these resources are intermediate, and they complicate the question of whether the ordinary solution to the free-riding problem is really a helpful solution. For if these intermediate goods are used to create other goods, then blocking access to them through an exclusive right could block the creation of these other goods. The cost of solving the free-riding problem is therefore not just the cost of the mechanism that solves that problem. Rather, the cost now includes the loss produced by not being able to create these other goods.

There is a simple response, however, to this potential loss. If the NR resource is an input to some other good, then for the same reason that NR-consumption resources can be regulated by the market, NR-input resources could be regulated by the market as well. The consumer of that second good could simply pay the price necessary to assure access to the input. The problem is the same as the NR-consumption good, one step removed.

For example, imagine that an advertising agency wants a jingle for a new campaign. It invites composers to submit songs.

As with any creative work, such songs would be NR resources—once composed, they could be consumed by others without diminishing the amount available to anyone else. If nothing protected my composition, then you could copy it, and undercut me in selling it to the agency.[5] To solve that problem, the law gives me an exclusive right (a copyright) once I compose my song. You then can no longer (legally) free ride on my work.

On paper, however, my song is not really worth anything to the advertising agency. Its value is made possible when someone records it. The composition itself therefore is a consumption good. The composition is an input (in the notation I have developed here, a NR-input). Thus, the exclusive right the law gives me might be thought to create a barrier for the musicians who would record it. They now cannot get access (legally) unless they pay me.

But that is not a barrier within a market economy. It is a means for allocating the NR-input to its highest valued users. My good may be an input, but those who need the input can pay me for it. It is a NR resource, and even an intermediate good, but the property law does not interfere with any creativity. Again, so long as the gain in incentives to me outweighs the cost of the restrictions, both primary and secondary, solving the free rider problem makes sense.

Among NR-inputs, there is a further distinction to draw. A subset of all NR-inputs has one further feature: they are generic rather than specific inputs to the creation of other goods. Such NR-generic-inputs feed many different ultimate goods. These ultimate goods can be both commercial and noncommercial. It is these NR-generic-inputs that Frischmann suggests we call "infrastructure."[6] Infrastructure is thus that set of intermediate goods for which three conditions are true: the resource is (1) NR; (2) an input into some other good; and (3) an input into "a wide range of goods and services, including private goods, public goods and nonmarket goods."[7]

It is the third condition that creates a potential problem for the standard solution to the free-riding problem. Remember that the solution to the second condition was premised on a well-functioning market. Giving a property right to my NR-

5. Your price would drive toward your marginal cost, zero, yet that price would be far below the costs it took me to compose the song.

6. Frischmann, *supra* note 1, at 956.

7. *Id.*

input was no barrier so long as a market could properly regulate access by other goods. The third condition creates the possibility that this market will not function well. If the NR-input is sufficiently generic, and if it is an input into a sufficiently diverse range of goods, then the market will not regulate access to the good well. An exclusive right in these cases may do more harm than good. The opportunity cost of restricting access, in other words, may outweigh any gain.

There is an even further distinction to be drawn here. If an infrastructure is a NR-generic-input, then infrastructures can be of three different kinds. There could be infrastructures that feed exclusively commercial goods, and resources that feed public and social goods in addition to commercial goods. If the NR-generic-input feeds public and social goods, then our reasons for being sanguine about the restrictive effect of an exclusive right disappear. Again, the exclusive right is (relatively) costless if and only if there is a market to regulate it. But NR-generic-inputs that supply social and public goods are infrastructures that cannot depend on a market to regulate them. The nature of these ultimate goods means markets will either be absent or incomplete. Hence, the opportunity cost of an exclusive right may be greater than its benefit.

Again, if the infrastructure exclusively supports commercial goods, then the market may adequately regulate its supply. Antitrust concerns may infect that regulation, and antitrust law must therefore continue to police such markets. But *if* there is no antitrust concern, then there is no reason not to leave this resource to the market. It will, as well as any mechanism would, reckon the value that would produce the necessary incentives.

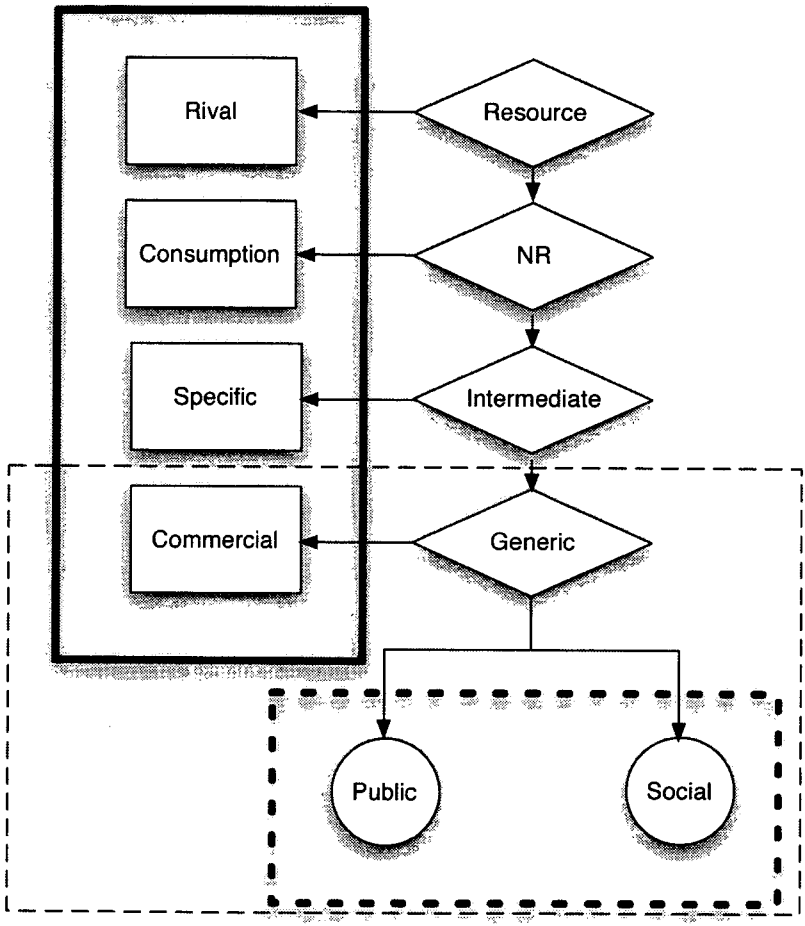
We are thus at the end of the string of careful distinctions that sets up the argument that Frischmann's article delivers. Figure 1 maps these distinctions.

Each diamond marks a distinction. Resources are either rival or NR. If they are NR, they are either consumption or intermediate. If they are intermediate, they are either specific or generic. If they are generic, they support either commercial goods exclusively, or public or social goods as well. The column on the left includes those categories for which the market is presumptively an adequate mechanism.[8] The row at the bottom

8. Presumptively, because they all must be regulated by the principles of antitrust.

contains those goods for which even well-functioning markets would fail to adequately value the resource. Finally, the larger of the two boxes at the bottom includes all goods properly considered infrastructure.

Figure 1: Mapping Infrastructure



Careful analysis thus identifies the category of infrastructure that motivates Frischmann's normative argument. That argument, in turn, comes in two parts.

II. INFRASTRUCUTRE, OPEN ACCESS, AND MARKET FAILURE

I have compressed rich detail into a very simple map. The map is no substitute for the detail. The map, however, helps speed identification of the types of infrastructure that presumptively would suffer market failure. Call that category "type C infrastructure." That category sets the stage for Frischmann's central, normative point: type C infrastructure should be supplied through an open access regime.[9]

The first part of that claim—that type C infrastructure suffers market failure—will be uncontroversial enough if we think about traditional examples of this infrastructure. Roads, telephone networks, and governance systems are all NR-generic-inputs that feed both commercial and noncommercial ends. To the extent that they serve noncommercial ends, the ability of the market to adequately reckon infrastructure supply is drawn into doubt—that is the market failure. With each of these traditional resources, there is a long history of the government playing a central role in assuring the resource supply.

As illustrated in figure 1, Frischmann's map shows how that tradition generalizes: more infrastructure than traditional infrastructure will present the same market failure. If highways are infrastructure, then we can see why the information superhighway is infrastructure. If information highways are type C infrastructure, then we can see why they too would present market failure.

This is not the end of Frischmann's argument, but even here, important conclusions about current policy debates emerge. Frischmann points to one such debate in a note at the very end of his article.[10] This is the story of wireless broadband in Philadelphia.

The City of Philadelphia announced a program to fund the deployment of a wireless Internet infrastructure within the city.[11] More than forty percent of Philadelphia neighborhoods had no access to broadband Internet.[12] Thus, this collective re-

9. Frischmann, *supra* note 1, at 1020–22.

10. *See id.* at 1021 n.406.

11. *Id.*

12. *See* Matt Lake, *Is Municipal Wi-Fi Doomed in the United States?*, CNET REVIEWS, Jan. 18, 2005, *at* http://reviews.cnet.com/4520-6028_7-5621367.html.

sponse seemed fairly sensible to anyone believing that Internet access is an important social and economic good.

Yet before the project could even begin, the state legislature passed a law, promoted heavily by private network providers, that banned municipalities from providing wireless broadband connectivity.[13] That law responded to a simple idea: if the market could supply a good, the government need not, and therefore, should not provide that good.

Frischmann's analysis shows us why that conclusion does not follow. The market will undoubtedly provide some broadband access. If Internet access, however, is a form of type C infrastructure—as it plainly is—then the access that the market provides will be less than what is socially optimal. Just as private roads would be fewer than public, or United Parcel Service (UPS) would be more restrictive than the U.S. Postal Service, Internet provided exclusively by a private market is likely to be access that is socially inadequate.

III. EVALUATING OPEN ACCESS AND GOVERNMENT REGULATION

So far there is little in Frischmann's account that I would criticize, and there is even less with which I disagree. It is Frischmann's final proposition, however, that is the most important to his argument, and this final proposition is not yet proven.

Type C infrastructure, Frischmann demonstrates, presents a market failure. That failure invites us to interrogate other mechanisms by which type C infrastructure might be regulated. Frischmann describes two alternatives: government regulation and open access. Either would value type C infrastructure differently than the market. In principle, both could better optimize access to type C infrastructure. Thus, to carry Frischmann's argument to its final point, we need a way to know which alternative—open access or government—is better.

Now, of course, the simple idea that I described at the start is enough to bias this question in Frischmann's favor. But Frischmann cannot rely on that simple idea. He needs something more to map the conditions under which one solution is superior to the other. Yet the argument so far offers little more than a sketch.

---

13. *Id.*

Consider a particular recommendation that Frischmann discusses: the regulation of access to the Internet. The Internet is plainly type C infrastructure. It follows from the argument summarized in Part II that we cannot rely on the market alone to determine access to such a resource. The market will undervalue the social value of such a network. More importantly, the market would skew the development of the network because it could not see such alternative value. An alternative regulator is required, and the question is which regulator is proper.

Frischmann picks open access as the regulator, by which he means a regime that assures that the network will remain open for any application or any content to compete equally on this network. Such competition is the consequence of the Internet's end-to-end design. Frischmann argues—rightly, it seems to me—that we should preserve this end-to-end design.

But we have not yet seen the argument that proves that intuition. Frischmann points to two alternatives that, from his perspective, would be inferior.[14] Neither the market alone, nor the government, could do the work that end-to-end performs. At least the government should not subsidize applications because the government is bad at picking winners. The market should not do it, at least where last generation's winners could veto their own competition. These market and government failures lead Frischmann to recommend something else: open access.

Again, I agree with the conclusion, but we will need more to convince those who do not. There is no doubt a cost to either the government or the market in making this choice. But we need a clearer sense of the parameters for deciding when open access is a solution. Moreover, we need a better way to measure the benefit. Put differently, what is the sensitivity of this particular conclusion? On what does it depend? What would make it different?[15]

IV. END-TO-END, "INNOVATION," AND INFRASTRUCTURE

Finally, let me consider the one part of Frischmann's argument where he means to disagree with what I have written. I am not convinced that we have a meaningful disagreement.

---

14. Frischmann, *supra* note 1, at 1020–22.

15. I point to some relevant factors in LAWRENCE LESSIG, THE FUTURE OF IDEAS: THE FATE OF THE COMMONS IN A CONNECTED WORLD 89–93 (2001).

Frischmann's argument ends with the type C infrastructure that currently presents the most hotly contested policy battles, the Internet. As Frischmann describes, the Internet was born with an end-to-end architecture.[16] That architecture shifts intelligence in this network to the ends, or edge, so far as that is possible, and seeks to keep the network itself as simple as possible. The original motivation for that design was adaptability. A large, decentralized network would grow most easily if network owners did not need to approve every service designed for this network. End-to-end thus became the moniker by which this commitment to network simplicity is described.

However, as Barbara van Schewick demonstrates, there have been at least two end-to-end arguments in the history of the network.[17] Both arguments describe where functionality should be placed in the network. The first and more technical determines placement on the basis of necessity.[18] This argument maintains that functionality that could only be performed completely at the edge of the network should not be placed within its core.[19] That requirement later became more of a policy: there was a general preference that functionality be shifted to the edge, even if in principle, it could live in the core.

Understood as policy rather than rule, the end-to-end principle is a thumb on the scale of any network design. All things being equal, the policy says, select an end-to-end design over one that is not. In some versions, the policy is more constitutional: like the First Amendment imposes a strong preference against speech regulation, end-to-end imposes a strong preference against designs that interfere with it.

Frischmann strongly favors this end-to-end principle, as do I. He rightly links this technical design to an infrastructure commons that it produces. Tim Wu and I reach a similar conclusion, but for different reasons: our focus is the innovation that such a design encourages, and policies to protect end-to-end, in turn, are defended on the basis of this innovation.[20]

---

16. Frischmann, *supra* note 1, at 1012.

17. *See generally* Barbara van Schewick, Architecture & Innovation: The Role of the End-to-End Arguments in the Internet (2004) (unpublished Degree of Dr. Ing. dissertation, Technical University of Berlin) (on file with author).

18. *Id.* at 116–23.

19. *Id.*

20. Letter from Timothy Wu, Associate Professor, University of Virginia School of Law, & Lawrence Lessig, Professor of Law, Stanford Law School, to Marlene H. Dortch, Secretary, FCC 3 n.3 (Aug. 22, 2003), *available at* http://faculty.virginia.edu/timwu/wu_lessig_fcc.pdf.

Frischmann, however, argues that "innovation" is too narrow.[21] It connotes to him commercial innovation only. And, of course, as commercial infrastructure is the weakest ground on which to argue that there is market failure, it would weaken the argument for end-to-end to see it solely in commercial terms. Something broader is at stake, Frischmann maintains. Not just innovation, but infrastructure.

But I do not see innovation as tied to commerce at all. Indeed, in the sense I use the term, the most important Internet innovations have very little to do with commerce. Blogs, wikis, and even Internet Relay Chat, are all innovations enabled by the end-to-end architecture of the Internet. My aim is to preserve the opportunities for these, as much as for Google or Amazon.

Thus, this difference between us seems more semantic than real. Beyond semantics, however, there is an importantly underspecified part to Frischmann's argument that we should mark, but cannot complete. *How* should the end-to-end commons be preserved? What norm, or rule, should be imposed to secure it?

Details matter here. Policy debates have bounced between two very different strategies. One, which was familiar in the late 1990s, is the open access strategy. Open access in this sense was the specific requirement of network owners that they enable interconnection by competitors to their physical infrastructure. Thus, open access was the principle under which Digital Subscriber Line (DSL) providers could compete to get access to the wire owned by the telephone company. The law was held to require that the owners of last-mile copper share access to the customers at the other end.[22]

The aim of this requirement was competition in access providers. Such competition, it was thought, would disrupt the conditions under which it would make sense for network providers to interfere with end-to-end. Open access was thus an indirect means to preserving end-to-end; it was not itself end-to-end.

A second strategy for preserving the Internet commons is more recent. Promoted by the Chairman of the Federal Communications Commission, Michael Powell, this strategy would

---

21. Frischmann, *supra* note 1, at 1012–15.

22. Mark A. Lemley & Lawrence Lessig, *Open Access to Cable Modems*, 22 WHITTIER L. REV. 3, 27–29 (2000).

not insist on physical interconnection.[23] Instead, it would require that network providers secure, as Powell described it, "Internet freedoms."[24] Four principles defined "Internet freedoms," but the essence of the four together is that a network provider not bias or hinder the choice consumers have.[25] Such a regime would assure that the network remained "neutral," in at least one sense of that word.

Frischmann insists that no network is "neutral," which, of course, is correct. The aim of those pursuing network neutrality, however, is not some imagined neutrality, but rather the elimination of certain kinds of discrimination (just as most policies favoring equality focus on rules against certain forms of discrimination). Rules or protocols that have the purpose of tilting network functionality strategically are the target of proponents of neutrality. Scholars such as Tim Wu have outlined relatively simple techniques that might help outline such a strategy.[26]

The choice between these two strategies is hard. The economics of physical interconnection is complex; the inherent games are unavoidable. And more interestingly, it is not even clear that competition in the physical layer would preserve end-to-end neutrality. As van Schewick has demonstrated, under plausible assumptions, competition at the physical layer would not staunch incentives by network providers to bias the network.[27]

Likewise, the mechanics of a "network neutrality" policy are not simple either. The neutral network has produced spam and viruses, as well as instant messaging and Voice over Internet Protocol. The network begs for more discrimination, but where and how, consistent with neutrality, is impossibly hard to specify. More importantly, any rule that aims to specify such neutrality needs to avoid persistent intervention in market operations. The rule needs to be clear ex ante, so ex post enforcement is feasible.

It is not my aim here to resolve this choice between open access as a means to the end-to-end infrastructure that

---

23. *See* Michael K. Powell, *Preserving Internet Freedom: Guiding Principles for the Industry*, 3 J. ON TELECOMM. & HIGH TECH. L. 5, 11–12 (2004).

24. *Id.*

25. *See id.*

26. *See generally* Tim Wu, *Network Neutrality, Broadband Discrimination*, 2 J. ON TELECOMM. & HIGH TECH. L. 141 (2003).

27. van Schewick, *supra* note 17, at 233–85.

Frischmann and I endorse, and network neutrality as the means to securing an end-to-end infrastructure. My aim instead is to insist that there is more to be done to resolve it. Even after we recognize the kinds of infrastructure that need support, and even if we were convinced that a commons was the best way to support those infrastructures, we would be left with the very difficult question of how we actually construct the commons. That critical question remains unanswered.

V. CONCLUSION

Simple ideas fix public policy, but simple ideas also break it. A simple idea about how markets in networks should function has fixed U.S. policy regulating those networks. That idea is also slowly breaking those networks. The Internet is not cable television. The opportunity costs in allowing it to become cable television are huge. Yet increasingly, government policy is relaxing any regulation that might secure this infrastructure commons. The market, alone, is thought to be a sufficient regulator.

Frischmann has cleared the way to answering that confusion. His conclusions need to be echoed in the work of economists; the model needs to be extended to resolve the questions it does not yet answer. Frischmann has made a critical contribution to an extraordinarily important debate. We can now see a way to prove what to our forefathers seemed intuitive—at least until a generation of simple ideas confused that intuition.