VERIFIED STATEMENT

of

Kevin Caves and Hal Singer[1]

ASSIGNMENT

We are competition economists with extensive experience and publications in the area of access pricing and regulated rates.[2] We have been asked to assess the economic testimony submitted in this proceeding to date, and to offer economic opinions relating to three questions:

(1) *Is stand-alone cost ("SAC") an appropriate standard for setting the rates paid by captive shippers?*;

(2) *Is revenue adequacy an appropriate standard for setting the rates paid by captive shippers?*;

(3) *Assuming revenue adequacy is an appropriate standard, how should the Surface Transportation Board ("STB") implement that standard when a railroad is revenue adequate?*

SUMMARY OF CONCLUSIONS

In considering the two rate standards, the STB should not lose sight of its stated overarching objective—to approximate the economically efficient Ramsey outcome. Under Ramsey, prices are allowed to diverge from the *incremental cost* of each service in proportion to the inverse elasticity of demand for the service; these margins must provide sufficient cash flows to cover the railroad's unattributable *fixed costs* plus a reasonable return on investment. The revenue adequacy standard is best understood as serving as the constraint to the optimization problem in the Ramsey framework, which computes prices that maximize total welfare (equal to economic surplus net of total costs), while still allowing sufficient markups over marginal cost to recover the firm's fixed costs plus a reasonable rate of return.

When the revenue adequacy constraint is not satisfied—that is, when a railroad is not revenue adequate at prevailing rates—prices are, by definition, below the levels implied by the Ramsey result, and must rise to permit further fixed-cost recovery. But when a railroad earns revenues significantly in excess of what would be required to cover its costs and earn a reasonable rate of return, economic welfare can be improved by narrowing the gap between price and marginal cost. In contrast to Ramsey, the SAC standard focuses the regulator on the inefficiently high costs of a hypothetical network, and inappropriately rewards the railroad for its incumbent position by linking its prices to those of a less-efficient hypothetical rival. In this way, focusing on SAC to the exclusion of Ramsey principles gives incumbents with market power both the incentive and the ability engage in inefficient and unconstrained monopoly pricing in perpetuity.

I. The Stand-Alone Cost Standard

Economists define the stand-alone cost of a given service (or group of services) as the cost that a firm would incur if it were to provide the service on its own, without offering any additional services.[3] Any shared costs or other efficiencies that the firm may enjoy by virtue of offering additional services in the actual world are, by definition, excluded from consideration in the but-for world contemplated by SAC. In the railroad industry, SAC has traditionally been used as a reference point by regulators to delineate an upper bound to the price that a regulated incumbent is permitted to charge a captive shipper. Unfortunately, SAC does not inform the economically efficient pricing structure, which is given by the answer to a Ramsey pricing problem. Ramsey prices permit incumbents to recover, via a markup over incremental costs, all fixed costs plus a reasonable return to investment, while simultaneously maximizing economic efficiency by preventing prices from rising to fully monopolistic levels. Focusing on SAC to the exclusion of Ramsey principles

---

[3] *See, e.g.,* Gerald R. Faulhaber, *Cross-Subsidy Analysis With More Than Two Services*, 1(3) JOURNAL OF COMPETITION LAW & ECONOMICS 441-448 (2005).

gives incumbents with market power both the incentive and the ability engage in inefficient and unconstrained monopoly pricing.

A. Review of the Stand-Alone Cost Standard in the ICC's *Coal Rate Guidelines*

According to the *Coal Rate Guidelines* issued by the Interstate Commerce Commission ("ICC"), the SAC test provides a proxy for the rate that a hypothetical entrant, free of barriers to entry or exit, would charge the captive shipper. The ICC noted that

> A rate level calculated by the SAC methodology *represents the theoretical maximum rate* that a railroad could levy on shippers without substantial diversion of traffic to a hypothetical competing service.[4]

According to the ICC, the SAC was designed to simulate the competitive discipline that a hypothetical competitive entrant would provide. However, the hypothetical entrant is granted the benefit of operational efficiently (i.e., cost minimization) *only over the network chosen by the hypothetical entrant,* which in practical application, is virtually always substantially smaller than that of the actual incumbent.

As the ICC made clear in the passage below, the entrant is, by definition, deprived of any efficiencies that may accrue to the incumbent over the remainder of its network:

> If the current carrier is fully efficient and realizes economies of scale, scope and density, its existing configuration will yield the lowest overall cost structure. *If not*, a captive shipper can have its rates based on the lower costs of an alternative, 'stand-alone' systems in which the plant size and traffic base are designed to maximize the efficiencies and production economies.[5]

Thus, the ICC recognized that the "lowest overall cost structure"[6] could be the result of efficiencies that, by definition, are available only to the integrated railroad, rendering irrelevant the comparatively inefficient cost structure of a hypothetical stand-alone network. Nevertheless, captive shippers are assumed to be deserving of

---

[4] Coal Rate Guidelines – Nationwide, 1 I.C.C. 2d 520 (1985) (hereafter, "Coal Rate Guidelines") at 528 (emphasis added).
[5] *Id.* at 542 (emphasis added).
[6] *Id.*

rates based on SAC *only* in the event that the hypothetical stand-alone network somehow achieves greater efficiencies than the existing integrated network.

Such a scenario appears highly implausible, given that the stand-alone network will generally be able to capture only a fraction of the efficiencies available to its fully integrated counterpart. Even if the stand-alone railroad is assumed to capture the same volume of traffic on a given route for a given product, it would still be deprived of scale economies from traffic on complementary routes, as well as scope economies relating to shared equipment (e.g., locomotives, switches), and shared overhead (e.g., managerial costs). Indeed, to the extent that there are *any* economies of scale and scope that the stand-alone railroad lacks, the stand-alone railroad is presumptively less efficient than the integrated railroad. This presumption disappears only if one assumes that the integrated railroad somehow fails to capture all of the efficiencies available to it. But this would squarely contradict elementary economic principles, according to which firms minimize costs in the process of maximizing profits.[7]

Setting aside whether the fully integrated network would be more or less efficient than the hypothetical stand-alone network, the ICC's reasoning presumes that the SAC could fall below the incumbent's profit-maximizing monopoly price, which (if true) would bring at least *some* relief to some captive shippers. The ICC's logic is revealed in the passage below:

> We recognize that a stand-alone facility would, in reality, seldom, if ever, be constructed. However, by identifying the costs that would be incurred if it were, an appropriate rate cap can be determined. In this way, railroads functioning in a noncompetitive market will be required to price as if alternatives to their services were available.[8]

The requirement that an incumbent in a noncompetitive market charge prices no higher than the SAC implies that the incumbent would otherwise be tempted to increase profits by pricing above the SAC. Yet as we explain below, the SAC could easily exceed the railroad's profit-maximizing monopoly price, in which case the

---

[7] *See, e.g.,* HAL VARIAN, MICROECONOMIC ANALYSIS 81 (W.W. Norton & Company, 3rd. ed. 1992) (explaining the relationship between profit maximization and cost minimization).
[8] Coal Rate Guidelines at 542.

standard provides no relief whatsoever to captive shippers. The frequency with which the SAC exceeds the profit-maximizing price is an empirical question, the answer to which turns on the size of the elasticity of demand and the magnitude of the scale and scope economies available to the integrated network. However, even when the SAC is less than the monopoly price, there is still reason to believe that the SAC standard would confer little relief to shippers, as explained below.

More fundamentally, a price cap based on SAC cannot be expected to maximize economic efficiency, because it fails (even in theory) to offer the relief called for under the Ramsey approach. The basic principle underlying Ramsey pricing is to maximize economic welfare by narrowing the gap between prices and marginal costs, while still allowing the incumbent to earn sufficient margins to cover fixed costs plus a reasonable return on capital. In an industry with constant returns to scale, there is no need to invoke Ramsey pricing; economic welfare is maximized when price is set equal to marginal cost. However, when fixed costs are high relative to marginal costs, strict marginal-cost pricing may be financially infeasible, because marginal cost may lie below average cost. The challenge lies in determining the extent to which different prices should be permitted to rise above marginal costs. Ramsey pricing solves this problem by recognizing that the increase should be proportional to the inverse elasticity of demand for each product in order to minimize the resulting distortions in economic activity.[9]

B.   **Economic Opinion**

In this section, we explain why SAC fails to achieve economic efficiency. We also explain key flaws in the arguments put forth by the railroads, and by economists on behalf of the railroads.

---

[9] *See, e.g.*, JEAN-JACQUES LAFFONT & JEAN TIROLE, A THEORY OF INCENTIVES IN PROCUREMENT AND REGULATION 200 (MIT Press 1993). To illustrate, note that raising the price of a product with a nearly vertical demand curve is not very distortionary, because the quantity bought and sold does not change by very much. In contrast, a product with a nearly horizontal demand curve would exhibit a large quantity response if its price were increased by the same amount.

1. The SAC Standard Does Not Inform or Approximate A Rate Structure Consistent With Economic Efficiency

As the ICC's explanation of Ramsey pricing makes clear,[10] the SAC simply does not inform the social-welfare-maximizing rate. In particular, the Ramsey approach permits sufficient markups over an efficient incumbent's *actual* incremental costs such that the excess revenues permit the incumbent to recover the *actual* fixed costs of the efficient integrated network, as well as reasonable returns to investment (the "revenue adequacy" constraint). Stand-alone costs, which are based on the *hypothetical* costs that would be incurred by a *less-efficient* competitor, simply do not enter the Ramsey calculus.

To see what incremental protection (if any) the SAC standard affords a shipper, consider the following hypothetical negotiation *in the absence of regulation*. Suppose the railroad and the shipper agree that the SAC is $50 million, which amounts to $10 for every ton shipped. Suppose further that the railroad's profit-maximizing monopoly price is $15 per ton. The railroad might initiate the negotiation by demanding $15 for every ton shipped. The shipper might attempt to gain leverage by threatening to walk away from the negotiation and construct its own stand-alone alternative at a cost of only $10 per ton, which may induce the railroad to marginally reduce its price. However, the negotiated rate will approach the SAC only if this threat of self-supply is credible. In other words, incumbents have presumably priced that "best alternative" *discounted by its probability* into the rate on captive lines. Thus, the SAC is partially (if not fully) imputed in the negotiated rate absent any regulation. Therefore, under the most generous interpretation, the STB's use of SAC can be understood as attempting to increase the credibility of the shipper's outside option of self-supply. Indeed, the ICC itself characterizes the SAC standard as "netting out"[11] barriers to entry in the railroad industry. Two cases should be considered, both of which highlight the fact that SAC-based regulation is likely ineffectual in many cases:

---

[10] *See* Part II.A, *infra*.
[11] Coal Rate Guidelines at 529.

Case 1: SAC>IMP Importantly, the SAC could easily *exceed* the railroad's profit-maximizing independent monopoly price (IMP), particularly when the shipper's elasticity of demand is relatively low, and when the integrated network enjoys substantially greater efficiencies than would be available to even the most efficient stand-alone network. When the SAC exceeds the monopoly price, offering shippers the SAC does not constitute meaningful relief, because the railroad can fully exploit its monopoly power without exceeding the SAC.

Case 2: SAC<IMP Even when the SAC is less than the independent monopoly price, offering shippers the SAC confers relief only to the extent that the STB-enforced SAC (which assumes away barriers to entry, such as environmental permits) differs from the outcome that would be negotiated in the absence of regulation. The negotiated outcome is determined by a shipper's best alternative to a negotiated agreement (BATNA), which may or may not differ substantially from the STB-enforced SAC. In particular, to have any hope of gaining the right to pay the STB-enforced SAC, complainants must incur substantial costs and risks, which may mirror the barriers to entry associated with self-supply in the absence of regulation.[12] Even in cases where the STB-enforced SAC offers non-trivial relief relative to the monopoly price, there is no basis for concluding that the outcome would replicate the socially optimal rate, even approximately.[13]

It bears emphasis that reverting from the incumbent's efficient network (which enjoys very substantial economies from shared routes and other shared inputs), to a stand-alone network (which does not), perversely rewards the railroad for its incumbent position. The Ramsey framework guarantees at least a portion of

---

[12] *See* Verified Statement of Gerald Faulhaber, Sept. 5 2014 (hereafter, "Faulhaber Statement") at 9-10.

[13] Of course, if captive shippers are assumed to price-takers, then the bargaining framework does not apply, and the monopoly price will prevail.

the cost savings associated with an efficient network will be passed on to customers; the SAC standard does not.[14]

2. Response to Comments in the Record

Comments submitted by the Association Of American Railroads ("AAR") endorse the SAC test as the "best and most reliable standard for determining the reasonableness of rail rates on market dominant traffic,"[15] because it "embraces the competitive market framework for rate regulation by identifying a competitive price in a contestable market that assumes away barriers to entry."[16] Similarly, Professor Kalt opines that "the core insights of contestable market theory have been successfully applied to the rail industry by considering how the benefits of competitive entry (or its threat) would constrain railroad pricing assuming entry were feasible."[17]

While recognizing correctly that contestable market theory assumes away barriers to entry and exit, Professor Kalt and the AAR endorse an STB-enforced SAC standard that purports to simulate the existence of a contestable market by removing such costs from the calculation when implementing the SAC test. However, this appeal to contestable market theory does not withstand scrutiny for several reasons. *First*, the contestable market framework applies to a regulated industry constrained to earn zero economic profits.[18] In reality, no such constraint applies to railroads. *Second*, contestable market theory assumes that competitive entry can occur more rapidly than prices can be adjusted by incumbent firms; if this condition does not hold, then equilibrium prices may substantially exceed competitive levels.[19] In the railroad industry, it is highly unrealistic to assume that a new firm could enter—or that a shipper could bring a successful complaint— without granting the incumbent years of leeway to charge supracompetitve prices.

---

[14] Faulhaber Statement at 8 ("[I]f a particular service is offered at stand-alone cost, then by definition, it is sharing *none* of the benefits of scale and scope.") (Emphasis in original).
[15] Opening Comments Of The Association Of American Railroads, Sept. 5 2015, at 5.
[16] *Id.*
[17] Verified Statement of Joseph P. Kalt, Sept. 5 2014 (hereafter, "Kalt Statement") at 27.
[18] Faulhaber Statement at 6-8.
[19] *See* W. KIP VISCUSI, JOHN M. VERNON, & JOSEPH E. HARRINGTON, ECONOMICS OF REGULATION AND ANTITRUST, (MIT Press 2nd ed. 1996), at 164.

Third, and perhaps most importantly, when prices are based on SAC, contestable markets do not (even in theory) achieve economically efficient pricing; the contestable market framework was developed to prevent prices from rising to the point that entry by inefficient competitors would be induced—not to prevent prices from rising above economically efficient levels.[20] Would-be entrants are therefore assumed to submit competitive bids to serve a less-efficient, stand-alone component of the network. But no matter how competitive the bidding, the resulting price structure cannot be expected to reflect efficiencies not available to stand-alone entrants. It is therefore unsurprising that the adoption and application of the SAC test in the railroad industry has been found to suggest "only a tenuous connection with its claimed intellectual foundations."[21]

II. The Revenue-Adequacy Standard

SAC has traditionally been the only regulatory standard applied in the railroad industry, in part because no railroad had consistently achieved revenue adequacy. Given substantial improvements in railroad profitability in recent years, the STB is now considering how it might develop a means of implementing the revenue adequacy standard. Fortunately, the ICC has already established important conceptual foundations to guide the implementation of such a standard, recognizing correctly that revenue adequacy defines the key constraint embedded in the Ramsey framework. Consistent with Ramsey principles, the revenue adequacy standard articulated by the ICC allows an efficient railroad to recover, via margins above incremental costs, all fixed costs plus a reasonable rate of return. Revenue adequacy cannot be meaningfully assessed based on the stand-alone costs of individual network components; if one were to sum these costs, the result would substantially exceed the total costs that would be incurred by an efficient incumbent. Indeed, the AAR's own economist endorses a Ramsey-compatible revenue-adequacy standard, by acknowledging that the revenue-adequacy constraint should reflect the full range

---

[20] *See, e.g.,* Russell Pittman, "Against the Stand-Alone-Cost Test in U.S. Freight Rail Regulation," 38 *Journal of Regulatory Economics*, 313-326 (2010), at 319-320.
[21] *Id.* 313.

of efficiencies available to hypothetical entrant capable of providing "*all* of the service for *all* of the incumbents' traffic," [22] (as opposed to only a portion of it).

A. Review of the Revenue Adequacy Standard in the *Coal Rate Guidelines*

The ICC articulated a revenue adequacy standard grounded in the basic economic principle that the railroad industry, like any other sector of the economy, must ultimately cover its costs and deliver sufficient returns to attract and retain investment over the long run.[23] To satisfy this standard, a railroad's markups over incremental costs should be sufficient to cover not only its fixed costs, but also to deliver a normal return on the capital investments that the railroad ultimately relies on to fund its operations. In other words, the incumbent should recover the opportunity costs associated with deploying assets in a railroad and not elsewhere in the economy. Importantly, the ICC also recognized that the revenue adequacy standard also implies the existence of an upper limit to the rates that should be paid by captive shippers, noting that "captive shippers should not be required to continue to pay differentially higher rates than other shippers when some or all of that differential is no longer necessary to ensure a financially sound carrier capable of meeting its current and future service needs."[24]

In its discussion of Ramsey pricing as a theoretical template for rate regulation, the ICC correctly recognizes the connection between Ramsey pricing and revenue adequacy: Ramsey prices are the result of a constrained optimization problem, and revenue adequacy is what defines the relevant constraint:

> Under Ramsey pricing, each price or rate contains a mark-up above *the long-run marginal cost* of the product or service to cover a portion of the unattributable costs. The unattributable costs are allocated among the purchasers or users in inverse relation to their demand elasticity. Thus, in market [sic] where shippers are very sensitive to price changes, a highly elastic market, the mark-up would be smaller than in a market where shippers are less price sensitive. The sum of the mark-ups equals the *unattributable costs of an efficient producer*. Applied to the railroad industry,

---

[22] Kalt Statement at 28 (emphasis added).
[23] Coal Rate Guidelines at 535. ("If railroads cannot earn the fair market rate of return, their ability both to retain existing investments and obtain new capital will be impaired, because both the existing and prospective funds could be invested elsewhere at a more attractive rate of return.")
[24] *Id.* at 535-36.

> Ramsey pricing would permit an efficient carrier to cover all of its costs (including the cost of capital) and thus become *revenue adequate*.[25]

As the ICC observes, Ramsey pricing is based on two costs of the network provider: (1) the long-run incremental costs; and (2) the unattributable or fixed costs of an efficient network that exploits all available efficiencies (such as economies of scale and scope). Conspicuously absent from the discussion is any notion of stand-alone costs: because the Ramsey result is designed to maximize total economic welfare, it focuses on the most efficient cost structure permitted by existing technologies and production techniques, as opposed to inefficient alternatives derived from artificially constraining the exploitation of these efficiencies.

B.   Economic Opinion

In this section, we explain why the ICC was correct in equating revenue adequacy with the key constraint in the Ramsey problem. We also respond to arguments put forth by the railroads, and by economists on behalf of the railroads.

1.   Revenue Adequacy Defines the Key Constraint Governing Ramsey Pricing

The ICC correctly identified revenue adequacy as the key constraint embedded in the Ramsey-optimization framework. The revenue adequacy standard articulated by the ICC is consistent with Ramsey principles because it allows an incumbent railroad to recover, via margins over incremental costs, all fixed costs plus a reasonable rate of return, taking all relevant efficiencies into account. The stand-alone costs of individual network components cannot meaningfully inform the revenue adequacy constraint. If one were to sum the stand-alone costs of the various components that make up a rail network, the result would substantially exceed the total costs that would be incurred by an efficient incumbent. (For example, any shared costs would be duplicated). The AAR and its economists are therefore incorrect to argue that the revenue-adequacy constraint can be ignored, or that SAC can serve as a viable proxy for the constraint.

---

[25] *Id.* at 526-27.

Even the AAR's own economist endorses a Ramsey-compatible revenue adequacy standard, by acknowledging that the revenue adequacy constraint should reflect the full range of system-wide efficiencies. Professor Kalt agrees with the ICC that revenue adequacy requires that an incumbent recover sufficient revenues to cover all relevant costs, including the cost of attracting capital,[26] and endorses a Ramsey-compatible revenue adequacy standard to satisfy this constraint. Professor Kalt observes correctly that "adequate revenues…are the revenues that would be realized under a SAC test for a SW-SARR – i.e., a hypothetical entrant capable of providing *all* of the service for *all* of the incumbents' traffic,"[27] that would "seek to design and operate itself as efficiently as possible."[28] Importantly, note that the stand-alone cost for such a railroad is merely a synonym for the total, system-wide costs of after all available economies of scope and scale have been exploited. Professor Kalt's system-wide SAC test is therefore a restatement of the Ramsey constraint, which allows the railroad *as a whole* to recover, via margins on variable costs, all fixed plus a reasonable return to capital.

2. Response to Comments in the Record

Professor Kalt claims incorrectly that revenue adequacy "must be understood with reference to a competitive standard – i.e., based on what a railroad would earn in equilibrium over the long term if it was compelled by competition to charge rates consistent with competition."[29] Professor Kalt fails to recognize that one can assess the revenue adequacy of a railroad without any consideration of the market structure (or market performance) in which the railroad operates. To illustrate, suppose that a railroad's fixed costs (plus reasonable return) came to $100 million. It is clear that *any* a rate structure that permits recovery of $100 million from the margins earned above incremental costs will satisfy the definition of revenue adequacy, because it will permit the railroad to attract and retain sufficient financial capital to fully fund its operations. This result is obtained no

---

[26] Kalt Statement at 28.
[27] *Id.* (emphasis added).
[28] *Id.*
[29] *Id.* at 27.

matter what one assumes about the competitive conditions facing the railroad in its output markets.

Professor Kalt also makes the inapposite claim that "a finding of revenue adequacy provides no basis for concluding that every movement or group of movements is paying rates that are unreasonably high."[30] This is beside the point; a finding of revenue adequacy implies that the railroad is earning revenues significantly in excess of what is required to cover all of its costs and to deliver a reasonable return to this investors. Under these circumstances, Ramsey principles tell us that economic welfare can be increased by lowering *some* rates. In particular, the markups for captive shippers should not reflect differentially higher rates to the extent that the differential between price and incremental cost is no longer necessary to cover the railroad's fixed costs.

Union Pacific criticizes the revenue adequacy framework through its economist Kevin Murphy. Professor Murphy offers a series of straw-man arguments against revenue adequacy.[31] He first argues that such a standard would somehow automatically deny railroads the chance to earn a return in excess of its cost of capital when demand is strong to offset losses when demand is weak. The unstated assumption in this argument is that the revenue adequacy standard would focus only on short-run investment returns, while ignoring the long run. Yet there is nothing to prevent the STB from calibrating revenue adequacy based on returns to investment over the long run. For example, the *Coal Rate Guidelines* suggest that the duration of a typical macroeconomic business cycle may help to delineate the appropriate timeframe.[32] On the other hand, if revenue adequacy is simply ignored, as Professor Murphy proposes, railroads would be permitted to earn excess returns on captive shippers in perpetuity. This is flatly inconsistent with Ramsey principles,

---

[30] *Id.* at 38.
[31] Verified Statement of Kevin M. Murphy, Sept. 5 2014 (hereafter, "Murphy Statement").
[32] Coal Rate Guidelines at 536. According to the National Bureau of Economic Research, for the years 1945-2009, the average business cycle duration was between 58.4 and 69.5 months, depending on how the cycles are measured. *See* http://www.nber.org/cycles.html.

which show how economic welfare can be improved by placing a constraint on such returns.

Professor Murphy also claims incorrectly that a finding of revenue adequacy gives the STB "no guidance"[33] in identifying unreasonable rates. To take Professor Murphy's own example, if 80 percent of a railroad's traffic is presumptively competitive, and if the railroad is found to be earning revenues in excess of revenue adequacy, the STB can infer that the remaining 20 percent of traffic is, on average, paying rates in excess of the levels implied by Ramsey principles. It bears emphasis that any adjustment that lowers these rates closer to incremental cost yields a net economic benefit, because it allows for additional transactions to occur in which the benefit to the shipper exceeds the incremental cost to the railroad. Professor Murphy claims that adopting a revenue adequacy standard would harm railroad investment. [34] But this would be the case only if railroads were constrained to earn returns insufficient to cover their cost of capital over the long run. As long as revenue adequacy is properly calibrated, incumbents' incentives to invest will be maintained.

Norfolk Southern criticizes the revenue adequacy framework through its economist Bradford Cornell. His first critique of the revenue adequacy standard is that a system-wide measure of a railroad's financial health fails to inform whether any particular rate is reasonable.[35] This is directly analogous to Professor Murphy's critique that finding of revenue adequacy gives the STB "no guidance"[36] in identifying unreasonable rates. As noted previously, a finding of revenue adequacy implies that economic welfare can be increased by lowering some rates closer to their incremental cost. Because the STB has jurisdiction only over the rates charged to captive shippers, it is obvious these rates, or some subset of them, should be adjusted downward. Precisely which rates are adjusted, and by how much, will depend on the benchmark that is employed. Nevertheless, Ramsey principles tell us

---

[33]   Murphy Statement at 26.
[34]   *Id.* at 28.
[35]   Verified Statement of Bradford Cornell, Sept. 5 2014 (hereafter, "Cornell Statement") at 30.
[36]   Murphy Statement at 26.

that *any* adjustment that moves prices closer to incremental costs (while still satisfying the revenue adequacy constraint) delivers increased economic efficiency.

Professor Cornell's next critique is that return-on-investment metrics are short-term and backward looking, whereas investors must expect to earn their cost of capital over the next 20 years.[37] This is best characterized not as a critique of the revenue adequacy a standard itself, but rather as one point of view in the dispute over how best to measure revenue adequacy. There are clearly tradeoffs involved in selecting the optimal timeframe for assessing revenue adequacy; the thrust of Professor Cornell's critique is that choosing too short of a timeframe may fail to capture the relevant time horizon from investors' perspective. At the opposite extreme, if too long a timeframe is chosen, railroads will be permitted to charge inefficiently high monopoly prices to captive shippers in near perpetuity. Similarly, Professor Cornell opines that capping returns at the cost of capital would prevent railroads from earning the cost of capital in the long run, discouraging investment.[38] As before, this is best viewed as a critique over the optimal implementation of the revenue adequacy standard, which should allow the *average* returns across the relevant period to exceed cost of capital.

Professor Cornell also claims that the revenue adequacy standard, by placing limits on investment returns, would suppress important market signals and discourage innovation.[39] Yet the cost of capital is, by definition, the rate of return required to bring forward investment. As long as investors can expect to receive such returns, investment and innovation will not suffer. Investment would be diminished only if returns were constrained below the cost of capital on average over the relevant period.

Professor Cornell also claims that improvements in system-wide financial health are driven largely by greater efficiency and productivity on a railroad's competitive traffic (as opposed to on its captive traffic), and that "[t]riggering by competitive traffic does nothing to…protect shippers that may lack effective

---

[37]   Cornell Statement at 31.
[38]   *Id.* at 32.
[39]   *Id.* at 34.

transportation alternatives; it instead confuses matters by sending a false signal that railroads need new price regulation."[40] Given that the STB has no authority to regulate competitive traffic, it is not clear what Professor Cornell means by "new price regulation." In any case, to the extent that railroads are able to recover all (or nearly all) of their fixed costs from competitive traffic via margins above incremental costs, this provides more (not less) justification for price cuts in the captive segment, which should not jeopardize revenue adequacy. To illustrate, suppose that 99 percent of lines are presumptively competitive in period 1, and suppose the railroad is not revenue adequate in that period. Suppose further that increases in efficiencies on competitive routes in period 2 permit the firm to be freshly revenue adequate (over some reasonable time horizon). At this point economic efficiency can be enhanced by reducing rates in the 1 percent of the market over which the regulator has jurisdiction.

III. IMPLEMENTING REVENUE ADEQUACY WHEN A RAILROAD IS REVENUE ADEQUATE

Recent evidence indicates that a significant proportion of railroads have achieved revenue adequacy. To the extent that the revenue adequacy constraint is now amply satisfied for these railroads, there may be scope for improving economic welfare by lowering rates to captive shippers. Accordingly, we present two potential methods—the Yardstick Method and the Rebate Method—that could be used to calibrate rates closer to economically efficient levels.

A. Recent Evidence On Revenue Adequacy

Several Class 1 railroads have been revenue adequate for some time. In November 2013, the Senate Committee on Commerce, Science, and Transportation issued a report that reviewed the financial health of rail industry.[41] The report found that the industry is highly profitable, as indicated by improving operating ratios,[42]

---

[40]   *Id.* at 36.
[41] Senate Committee on Commerce, Science, and Transportation Update on the Financial State of the Class I Freight Rail Industry, Nov. 21, 2013, available at http://nitl.org/UpdatedCommerceCommRpt-FinancialStateofRRs11.21.13.pdf (accessed Oct. 28, 2014).
[42] *Id.* at 5.

increasing operating income,[43] and record earnings per share.[44] The Committee reviewed STB revenue adequacy filings to determine whether a railroad was earning its cost of capital in any given year from 2002 through 2012.[45]. For example, with the exception of 2009, Norfolk Southern's ROI has either exceeded, met, or come close to meeting the cost of capital in every year since 2003.[46] While CSX was reporting ROIs below the cost of capital in from 2003 to 2005, the company has come within a few basis points of meeting, or has exceeded, its cost of capital since 2010.[47] Union Pacific has earned an ROI in excess of its cost of capital since 2010.[48] In 2014, the STB determined five carriers (BNSF, Grand Trunk, Norfolk Southern, Soo Line Corporation, and Union Pacific) to be revenue adequate for 2013, in the sense that they enjoyed returns on investment in excess of the industry's cost of capital (11.32 percent).[49]

Depending on the relevant timeframe for assessing revenue adequacy, it is possible that the revenue adequacy standard could have a differential impact on the railroads in terms of liability. For example, if one required revenue adequacy to be achieved, hypothetically, for four out of the last five years, then Union Pacific would be subject to a rate decrease on its captive routes only if it achieved revenue adequacy in 2013 (year four) or 2014 (year five). In contrast, CSX would not face a rate adjustment on its captive routes until 2016 at the earliest (assuming it was revenue adequate from 2013 through 2016).

B.   Ramsey Pricing and the Revenue Adequacy Constraint

Revenue adequacy must always be achieved for a pricing structure to be consistent with Ramsey principles. If the railroad is not achieving adequate revenues, the Ramsey framework dictates that prices should be increased over

---

[43] *Id*. at 6.

[44] *Id*. at 6.

[45] *Id*. at 7.

[46] *Id*. at 9.

[47] *Id*. at 9.

[48] *Id*. at 9.

[49] Surface Transportation Board, Docket No. EP 552 (Sub-No. 18), Railroad Revenue Adequacy—2013 Determination, *available at* http://www.stb.dot.gov/decisions/readingroom.nsf/fc695db5bc7ebe2c852572b80040c45f/697d356f1bf8e07385257d47004db520?OpenDocument.

incremental costs to cover fixed costs. In contrast, when a railroad is earning revenues safely in excess of what would be required to cover its costs and earn a reasonable rate of return, Ramsey principles imply that economic welfare can be enhanced by lowering rates to captive shippers. This holds true even if it is infeasible to compute the Ramsey prices precisely.

For illustrative purposes, Figure 1 provides a simple example using a single-product railroad (one route, one product). The vertical axis measures the price charged for service, while the horizontal axis measures quantity. The downward-sloping curve gives the shipper demand schedule facing the railroad, while the horizontal line gives the marginal cost (MC) that an (efficiently operated) railroad would incur. For illustrative purposes, assume that MC = $100; in addition, assume that the railroad also incurs an additional fixed cost (FC) of $5,000, regardless of the quantity shipped over its network. (For ease in exposition, we will assume that these costs include the railroad's cost of capital). Finally, let the market price for the route, P, be given the function P = $500 – 4Q, where Q is market quantity demanded. This implies that the intercept in Figure 1—the "choke price," where Q is zero—is equal to $500.

FIGURE 1: SINGLE-PRODUCT EXAMPLE OF RAMSEY PRICING
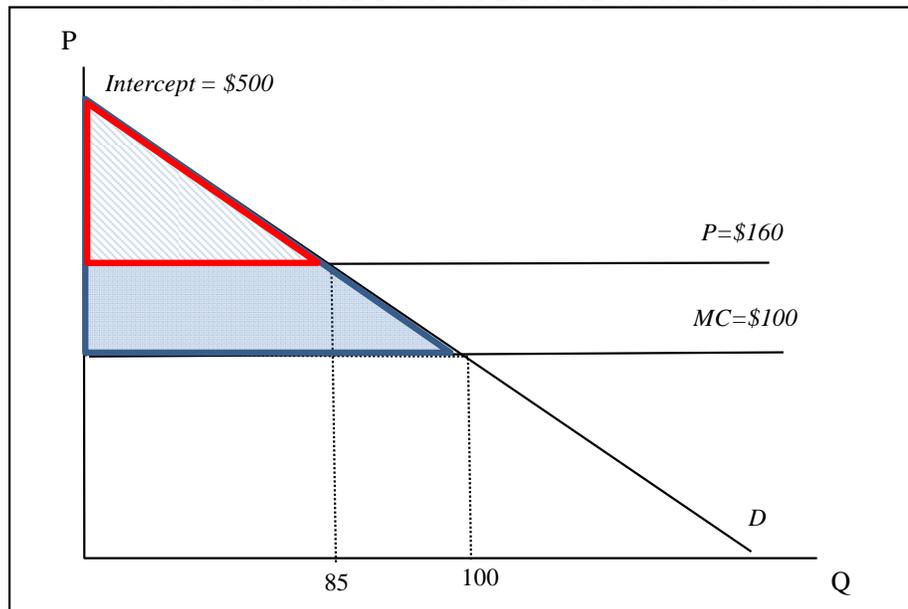
Within this framework, aggregate economic welfare would be maximized by setting P = MC = $100, resulting in a market quantity of 100 shipments (note that $100 = $500 – 4*100). This would yield consumer surplus (CS) valued at $20,000 (equal to the large blue triangle under the shipper demand curve and above MC, or 0.5*100*(500-100)). The net economic benefit to society would be $15,000 (equal to CS – FC). Unfortunately, the railroad's total revenue of $10,000 would cover only its incremental costs (equal to $100*100), and not its fixed costs. Accordingly, the railroad is not revenue adequate, and in fact incurs losses of $5,000.

To achieve revenue adequacy, price must therefore rise above MC. However, the more prices diverge from marginal costs, the more the net economic benefit to society decreases. Therefore, Ramsey principles dictate that price should rise only by enough for the railroad to achieve revenue adequacy. In this example, revenue adequacy is achieved when the railroad charges a price of approximately $160, resulting in a market quantity of approximately 85 shipments (note that $160 = $500 – 4*85). The railroad's total revenues (85*$160) are now approximately equal to its total costs (85*$100 + $5,000). However, at this higher price, CS is now valued at only about $14,450 (equal to the smaller, red triangle, or 0.5*85*($500-$160)). After accounting for producer surplus of approximately $5,100 (equal to 85*($160 –

$100), the net economic benefit to society comes to approximately $14,450 + $5,100 - $5,000 = $14,550.

Therefore, total economic welfare has fallen by about $450, relative to the case where P = MC. Further, it is evident that, the more that prices rise above marginal costs, the higher the net economic loss to society will be.[50] Therefore, to be *fully* consistent with Ramsey principles, prices must be set to approximately $160, because this is the only price that maximizes economic welfare while still satisfying the revenue adequacy constraint. However, note also that *any* adjustment that moves rates closer to MC—while still satisfying revenue adequacy—will deliver economic benefits to society.

But how can Ramsey principles be implemented in practice? Below we present two methodologies designed to approximate Ramsey pricing. Although computing exact Ramsey prices exactly is almost certainly infeasible (outside of stylized examples), it bears emphasis that even an approximate solution can result in substantial improvements in economic efficiency: whenever the revenue adequacy constraint is satisfied, adjusting prices downward towards incremental costs decreases the aggregate deadweight loss in the system, even if full Ramsey pricing is not achieved. Stated differently, whenever the revenue adequacy constraint is satisfied, moving prices further away from marginal costs will generate additional economic losses to society.

C.   The Yardstick Approach

Because profit-maximizing firms set prices in (inverse) proportion to demand elasticities, the rates observed on competitive routes can provide a useful proxy for the Ramsey rate. Accordingly, one potential solution for bringing rates closer to economically efficient levels is for the captive shipper to pay the rates observed in comparable movements of competitive traffic (the "yardstick approach"). With sufficient pricing and shipment data, one could predict the

---

[50] To illustrate, note that the profit-maximizing monopoly price in this example is $300 (triple the marginal cost) and the monopoly quantity is Q = 50. Aggregate economic welfare under monopoly pricing falls to just $10,000. Thus, monopoly pricing leads to substantial economic losses to society, compared with the net economic benefits under Ramsey pricing (approximately $14,550).

competitive rate for a given route-product pair. Importantly, the yardstick approach works for high-fixed-costs industries where marginal cost is less than average cost so long as the competitive benchmark permits the firm to earn a positive margin that contributes towards paying down the fixed costs. We suspect that rates in so-called competitive areas are not so close to incremental costs so as to prevent any fixed-cost recovery.[51] Furthermore, given that even so-called competitive areas are typically served by duopolies, and given that the railroads and their economists readily concede that the railroad industry is far from perfectly contestable,[52] there is reason to believe that the yardstick approach is inherently conservative.

To the extent that the margins in the competitive segment are *not* sufficient to cover the railroad's fixed costs (plus a reasonable return), then the railroad is relying on the non-competitive segment to achieve revenue adequacy. Rates could still be lowered even here if current margins in the non-competitive segment are significantly higher than what is necessary to make up the difference. In the alternative, it might be impossible to lower rates in the non-competitive segment without making the railroad revenue-inadequate. In general, competitive rates can be imported into the non-competitive segment, except when doing so jeopardizes the railroad's global revenue adequacy. This would have to be handled on a case-by-case basis.

Professor Jean Tirole, this year's winner of the Nobel Prize in economics, recognized the value of the yardstick approach in his seminal book on regulation:

> Because informational asymmetries between the regulator and the firm reduce the efficacy of regulation, the regulator ought to use all available information to reduce these asymmetries. One way of learning about the technology parameter is to compare the firm's performance to that of other firms facing a similar technological environment.[53]

He explained the challenge facing the adoption of the yardstick approach:

---

[51] A number of the railroads claimed that their financial condition has improved over the years because they have higher revenues in competitive markets. *See, e.g.,* Opening Comments Of Union Pacific Railroad Company, Sept. 5, 2014, at 22-39.

[52] *See, e.g.,* Kalt Statement at 27.

[53] LAFFONT & TIROLE, *supra*, 84 (MIT Press 1993).

> Similar clauses indexing an electric utility's price to the fuel cost of other electric utilities are meant to filter out the common shocks in the price of fuel and encourage the utility to purchase its fuel at a low cost. However, despite its attractive properties, relative performance evaluation has not been used much in regulation. The problem is that regulated firms are not often comparable. That is, idiosyncrasies often prevail over common features. Nevertheless, we can expect an increased use of yardstick competition in segments of regulated industries such as water and electricity distribution. [54]

Indeed, the Federal Communications Commission has embraced the use of yardsticks to regulate the price of must-have programming that is owned by a cable operator. To eliminate the influence of vertical integration, which induces the network to drive a harder bargain, one can look at the price of comparable independent networks.[55]

A study by Escalation Consultants ("Escalation") provides an illustration of the type of price-cost margin data that could inform the yardstick method. Escalation analyzed nearly 50,000 chemical records in the Public Use Waybill Sample; the study found that revenue per chemical carload increased over 25 percent from 2005 to 2010, and that chemical shippers pay higher rates than other key commodity groups.[56] In 2010, 75 percent of all chemical traffic that originated or terminated in the United States was subject to rates with revenue-to-variable-cost (RVC) ratios in excess of 180 percent, an increase from 60 percent in 2005.[57] Escalation calculated the "premium" paid by shippers of a given type of chemical (for example, chlorine, plastic, or alcohols) for carloads with RVC in excess of 180 percent (the "high RVC group") by assuming that those shippers, in a more competitive environment, would pay the *average* RVC on carloads with RVC below 180 percent for the same chemical type and same territory (the "low RVC group"); the difference in the average rates from the high RVC group and the average rates from the low RVC group multiplied by the number of cars in the high RVC group

---

[54]   *Id.* at 85-86.

[55]   *See* Kevin Caves, Chris Holt & Hal Singer, *Vertical Integration in Multichannel Television Markets: A Study of Regional Sports Networks*, REVIEW OF NETWORK ECONOMICS (2013).

[56] Escalation Consultants, Inc., Analysis of Freight Rail Rates for Chemical Shippers, Dec. 2012, Exhibit 1.

[57] *Id.* at 2.

(controlling for product type and territory) yielded an aggregate premium of nearly $4 billion in 2010.[58] The estimated premium on plastics ($1.0 billion) and alcohols ($0.5 billion) accounted for 28 and 13 percent, respectively, of the aggregate premium paid by chemical shippers.[59] The largest rate difference between high RVC and low RVC groups was for chlorine ($4,810 per carload).[60]

To the extent that the low RVC group serves as a reasonable proxy for the competitive rate on comparable traffic, this methodology could prove fruitful in estimating a yardstick. It is possible that certain carloads observed in the high RVC group are competitively served in the sense that shippers have more than a single choice in transport, even though its associated RVCs exceeds 180 percent. Conversely, the low RVC group may include shipments are not competitively served, even through the RVC is less than 180 percent. In other words, the low RVC group could be under-inclusive or over-inclusive. Despite this issue, we are optimistic that a similar method could be used to develop competitive benchmarks or yardsticks in future ratemaking cases. Finally, in Canada, where inter-switching mandates allow an industry to have access to all of the railroads that serve a station within 18 miles of the station, chemical shippers enjoyed significantly lower rates—for example, 40 percent of Canadian chemical carloads enjoy RVCs below 180 percent (compared to only one quarter of chemical carloads in the United States).[61] This suggests that Canadian rates for comparable traffic could serve as a yardstick.

D.   The Rebate Approach

An alternative approach would be to rebate captive shippers, relative to extant rates, the "excess" revenue (over and above revenue adequacy) *from only the captive routes on the railroad's network* in proportion to various factors, such as the amount of traffic, the ratio of revenue to variable costs, etc. If one were attempting to replicate Ramsey results, then the effective price net of the rebate would consider the incremental cost of providing the service (which the STB keeps) and the

---

[58] *Id.* at 3.
[59] *Id.* at Exhibit 3.
[60] *Id.* at Exhibit 5.
[61] *Id.* at 6-7.

shipper's elasticity of demand, which would be estimated from transaction and (shipper) cost data or inferred from an observed price-cost margin using the monopoly-pricing rule.

The rebate approach effectively places a ceiling on the amount that the incumbent network is permitted to charge to captive shippers. Consistent with Pittman (2010), the fundamental objective would be to combine "the efficiency properties of differential pricing with some limitation on the railroad's ability to exploit its monopoly position vis-à-vis particular shippers."[62]

To illustrate, suppose that there are two shippers that, absent regulation, would pay monopoly prices of $10 and $7.50 based entirely on differences in demand elasticities. If the railroad's variable cost to serve each shipper is $5, then the incumbent earns monopoly margins of 50% and 33% on the two shippers, implying that their respective demand elasticities are 1/0.5 = 2.0 and 1/0.33 = 3.0. The rebate approach could be operationalized by paying rebates that leave both shippers with lower prices, without upsetting their relative price-cost margins. For example, if each of the incumbents' margins were lowered by a factor of one half, the adjusted price-cost margins would be 25% and 16.7%. This adjustment would leave the relative price-cost margins in proportion to the relative elasticities, consistent with Ramsey principles. (The adjusted prices would come to $6.67 and $6.00).

IV. CONCLUSION

As the STB itself has observed, the revenue adequacy standard is properly understood as the constraint to the optimization problem in the Ramsey framework. When a railroad earns revenues significantly in excess of what would be required to cover its costs and earn a reasonable rate of return, Ramsey principles show that economic welfare can be improved by narrowing the gap between price and marginal cost. In contrast, the SAC standard focuses the regulator on the inefficiently high costs of a hypothetical network, and inappropriately rewards the railroad for its incumbent position by presupposing that the railroad's pricing

---

[62] Pittman, *supra,* at 324.

should be constrained only by whatever competitive discipline a less-efficient hypothetical rival might be able to muster. Accordingly, the STB should develop workable methodologies, such as the yardstick and benchmark approaches, to approximate Ramsey pricing outcomes for captive shippers whenever a railroad's revenues are sufficiently adequate.

APPENDIX 1: CURRICULUM VITAE

HAL J. SINGER

Office Address

Economists Incorporated
2121 K Street, NW
Suite 1100
Washington, DC 20037
Phone: (202) 747-3520
singer.h@ei.com

Education

Ph.D.   The John Hopkins University, 1999; M.A. 1996, Economics

B.S.   Tulane University, *magna cum laude*, 1994, Economics. Dean's Honor Scholar (full academic scholarship). Senior Scholar Prize in Economics, 1994.

Current Position

ECONOMISTS INCORPORATED, Washington, D.C.: Principal 2014-present.

PROGRESSIVE POLICY INSTITUTE, Washington, D.C.: Senior Fellow, 2013-present.

Employment History

NAVIGANT ECONOMICS, Washington, D.C.: Managing Director, 2010-2013.

GEORGETOWN UNIVERSITY, MCDONOUGH SCHOOL OF BUSINESS, Washington, D.C.: Adjunct Professor, 2010, 2014.

EMPIRIS, L.L.C., Washington, D.C.: Managing Partner and President, 2008-2010.

CRITERION ECONOMICS, L.L.C., Washington, D.C.: President, 2004-2008. Senior Vice President, 1999-2004.

LECG, INC., Washington, D.C.: Senior Economist, 1998-99.

U.S. SECURITIES AND EXCHANGE COMMISSION, OFFICE OF ECONOMIC ANALYSIS, Washington, D.C.: Staff Economist, 1997-98.

THE JOHNS HOPKINS UNIVERSITY, ECONOMICS DEPARTMENT, Baltimore: Teaching Assistant, 1996-98.

Authored Books and Book Chapters

THE NEED FOR SPEED: A NEW FRAMEWORK FOR TELECOMMUNICATIONS POLICY FOR THE 21ST CENTURY, co-authored with Robert Litan (Brookings Press 2013).

Net Neutrality Is Bad Broadband Regulation, co-authored with Robert Litan, in THE ECONOMISTS' VOICE 2.0: THE FINANCIAL CRISIS, HEALTH CARE REFORM AND MORE (Aaron Edlin and Joseph Stiglitz, eds., Columbia University Press 2012).

Valuing Life Settlements as a Real Option, co-authored with Joseph R. Mason, in LONGEVITY TRADING AND LIFE SETTLEMENTS (Vishaal Bhuyan ed., John Wiley & Sons 2009).

An Antitrust Analysis of the World Trade Organization's Decision in the U.S.-Mexico Arbitration on Telecommunications Services, co-authored with J. Gregory Sidak, in HANDBOOK OF TRANS-ATLANTIC ANTITRUST (Philip Marsden, ed. Edward Elgar 2006).

BROADBAND IN EUROPE: HOW BRUSSELS CAN WIRE THE INFORMATION SOCIETY, co-authored with Dan Maldoom, Richard Marsden, and J. Gregory Sidak (Kluwer/Springer Press 2005).

Are Vertically Integrated DSL Providers Squeezing Unaffiliated ISPs (and Should We Care)?, co-authored with Robert W. Crandall, in ACCESS PRICING: THEORY, PRACTICE AND EMPIRICAL EVIDENCE (Justus Haucap and Ralf Dewenter eds., Elsevier Press 2005).

Journal Articles

Econometric Tests for Analyzing Common Impact, 26 RESEARCH IN LAW AND ECONOMICS (2014), co-authored with Kevin Caves.

Is the U.S. Government's Internet Policy Broken?, 5 POLICY AND INTERNET (2013), co-authored with Robert Hahn.

Avoiding Rent-Seeking in Secondary Market Spectrum Transactions, 65 FEDERAL COMMUNICATIONS LAW JOURNAL (2013), co-authored with Jeffrey Eisenach.

Vertical Integration in Multichannel Television Markets: A Study of Regional Sports Networks, 12(1) REVIEW OF NETWORK ECONOMICS (2013), co-authored with Kevin Caves and Chris Holt.

Assessing Bundled and Share-Based Loyalty Rebates: Application to the Pharmaceutical Industry, 8(4) JOURNAL OF COMPETITION LAW AND ECONOMICS (2012), co-authored with Kevin Caves.

Assessing Competition in U.S. Wireless Markets: Review of the FCC's Competition Reports, 64 FEDERAL COMMUNICATIONS LAW JOURNAL (2012), co-authored with Gerald Faulhaber and Robert Hahn.

An Empirical Analysis of Aftermarket Transactions by Hospitals, 28 JOURNAL OF CONTEMPORARY HEALTH LAW AND POLICY (2011), co-authored with Robert Litan and Anna Birkenbach.

Addressing the Next Wave of Internet Regulation: Toward a Workable Principle for Nondiscrimination, 4 REGULATION & GOVERNANCE (2010), co-authored with Robert Hahn and Robert Litan.

Class Certification in Antitrust Cases: An Economic Framework, 17 GEORGE MASON LAW REVIEW (2010), co-authored with Robert Kulick.

The Economic Impact of Eliminating Preemption of State Consumer Protection Laws, 12 UNIVERSITY OF PENNSYLVANIA JOURNAL OF BUSINESS LAW 781 (2010), co-authored with Joseph R. Mason and Robert B. Kulick.

Why the iPhone Won't Last Forever and What the Government Should Do to Promote its Successor, 8 JOURNAL ON TELECOMMUNICATIONS AND HIGH TECHNOLOGY LAW 313 (2010), co-authored with Robert W. Hahn.

What Does an Economist Have to Say About the Calculation of Reasonable Royalties?, 14 INTELLECTUAL PROPERTY LAW BULLETIN 7 (2010), co-authored with Kyle Smith.

Is Greater Price Transparency Needed in the Medical Device Industry?, HEALTH AFFAIRS (2008), co-authored with Robert W. Hahn and Keith Klovers.

Evaluating Market Power with Two-Sided Demand and Preemptive Offers to Dissipate Monopoly Rent, 4 JOURNAL OF COMPETITION LAW & ECONOMICS (2008), co-authored with J. Gregory Sidak.

Assessing Bias in Patent Infringement Cases: A Review of International Trade Commission Decisions, 21 HARVARD JOURNAL OF LAW AND TECHNOLOGY (2008), co-authored with Robert W. Hahn.

The Effect of Incumbent Bidding in Set-Aside Auctions: An Analysis of Prices in the Closed and Open Segments of FCC Auction 35, 32 TELECOMMUNICATIONS POLICY JOURNAL (2008), co-authored with Peter Cramton and Allan Ingraham.

A Real-Option Approach to Valuing Life Settlement Transactions, 23 JOURNAL OF FINANCIAL TRANSFORMATION (2008), co-authored with Joseph R. Mason.

The Economics of Wireless Net Neutrality, 3 JOURNAL OF COMPETITION LAW AND ECONOMICS 399 (2007), co-authored with Robert W. Hahn and Robert E Litan.

Vertical Foreclosure in Video Programming Markets: Implication for Cable Operators, 3 REVIEW OF NETWORK ECONOMICS 348 (2007), co-authored with J. Gregory Sidak.

The Unintended Consequences of Net Neutrality, 5 JOURNAL ON TELECOMMUNICATIONS AND HIGH TECH LAW 533 (2007), co-authored with Robert E. Litan.

Does Video Delivered Over a Telephone Network Require a Cable Franchise?, 59 FEDERAL COMMUNICATIONS LAW JOURNAL 251 (2007), co-authored with Robert W. Crandall and J. Gregory Sidak.

The Competitive Effects of a Cable Television Operator's Refusal to Carry DSL Advertising, 2 JOURNAL OF COMPETITION LAW AND ECONOMICS 301 (2006).

Uberregulation without Economics: The World Trade Organization's Decision in the U.S.-Mexico Arbitration on Telecommunications Services, 57 FEDERAL COMMUNICATIONS LAW JOURNAL 1 (2004), co-authored with J. Gregory Sidak.

The Secondary Market for Life Insurance Policies: Uncovering Life Insurance's "Hidden" Value, 6 MARQUETTE ELDER'S ADVISOR 95 (2004), co-authored with Neil A. Doherty and Brian A. O'Dea.

Do Unbundling Policies Discourage CLEC Facilities-Based Investment?, 4 TOPICS IN ECONOMIC ANALYSIS AND POLICY (2004), co-authored with Robert W. Crandall and Allan T. Ingraham.

Foreign Investment Restrictions as Industrial Policy, 3 CANADIAN JOURNAL OF LAW AND TECHNOLOGY 19 (2004), co- authored with Robert W. Crandall.

Regulating the Secondary Market for Life Insurance Policies, 21 JOURNAL OF INSURANCE REGULATION 63 (2003), co-authored with Neil A. Doherty.

Interim Pricing of Local Loop Unbundling in Ireland: Epilogue, 4 JOURNAL OF NETWORK INDUSTRIES 119 (2003), co-authored with J. Gregory Sidak.

The Benefits of a Secondary Market for Life Insurance, 38 REAL PROPERTY, PROBATE AND TRUST JOURNAL 449 (2003), co- authored with Neil A. Doherty.

The Empirical Case Against Asymmetric Regulation of Broadband Internet Access, 17 BERKELEY TECHNOLOGY LAW JOURNAL 954 (2002), co-authored with Robert W. Crandall and J. Gregory Sidak.

How Can Regulators Set Nonarbitrary Interim Rates? The Case of Local Loop Unbundling in Ireland, 3 JOURNAL OF NETWORK INDUSTRIES 273 (2002), co-authored with J. Gregory Sidak.

Vertical Foreclosure in Broadband Access, 49 JOURNAL OF INDUSTRIAL ECONOMICS (2001) 299, co-authored with Daniel L. Rubinfeld.

Open Access to Broadband Networks: A Case Study of the AOL/Time Warner Merger, 16 BERKELEY TECHNOLOGY LAW JOURNAL 640 (2001), co-authored with Daniel L. Rubinfeld.

Cable Modems and DSL: Broadband Internet Access for Residential Customers, 91 AMERICAN ECONOMICS ASSOCIATION PAPERS AND PROCEEDINGS 302 (2001), co-authored with Jerry A. Hausman and J. Gregory Sidak.

Residential Demand for Broadband Telecommunications and Consumer Access to Unaffiliated Internet Content Providers, 18 YALE JOURNAL ON REGULATION 1 (2001), co-authored with Jerry A. Hausman and J. Gregory Sidak.

Determining the Source of Inter-License Synergies in Two-Way Paging Networks, 18 JOURNAL OF REGULATORY ECONOMICS 59 (2000).

A General Framework for Competitive Analysis in the Wireless Industry, 50 HASTINGS LAW REVIEW 1639 (2000), co-authored with J. Gregory Sidak and David Teece.

Capital Raising in Offshore Markets, 23 JOURNAL OF BUSINESS AND FINANCE 1181 (1999), co-authored with Ian Gray and Reena Aggarwal.

Expert Testimony Since 2005

Lindsay Kamakahi and Justine Levy, et al v. American Society for Reproductive Medicine and Society for Assisted Reproductive Technology, Case No.: 3:11-CV-1781 JCS (N.D. Ca.).

Salud Services, Inc. et al v. Caterpillar, Inc., Case No.: 1:12-cv-23927 (S.D. Fl.).

Gnanh Nora Krouch v. Wal-Mart Stores, Inc., Case No. CV-12-2217 (N.D. Ca.).

In the Matter of Petition for Rulemaking to Eliminate the Sports Blackout Rule, MB Docket No. 12-3 (Federal Communications Commission).

In the Matter of Review of Wholesale Services and Associated Policies, File No. 8663-C12-201313601 (Canadian Radio-Television and Telecommunications Commission).

Crafting a Successful Incentive Auction: Stakeholders' Perspectives (U.S. Senate, Committee on Commerce, Science, and Transportation).

Altergy Systems v. Enersys Delaware, Inc., Case No. 74-198-Y-001772-12 JMLE (American Arbitration Association).

In re New York City Bus Tour Antitrust Litigation, Master Case File No. 13-CV-07I1 (S.D. NY).

SOCAN Tariff 22.A (Online Music Services, 2011-2013), CSI Online Music Services (2011-2013), SODRAC Tariff 6 - Online Music Services, Music Videos (2010-2013) (Copyright Board Canada).

Imperial Premium Finance, LLC, v. Sun Life Assurance Company of Canada (S.D. Fl.).

Michelle Downs and Laurie Jarrett v. Insight Communications Company, L.P., Civil Action No. 3:09-Cv-93-S (W.D. Ky.).

The Satellite Television Law: Repeal, Reauthorize, or Revise? (U.S. House of Representatives, Committee on Energy and Commerce).

Marchbanks Truck Service, et al. v. Comdata Network Inc., et al., Civil Action No. 07-1078-JKG (E.D. Pa.).

Patricia Reiter v. Mutual Credit Corporation, et al., Case No. 8:09-cv-0081 AG (RNBx) (C.D. Ca.).

In re Photochromic Lens Antitrust Litigation, MDL Docket No. 2173 (M.D. Fl.).

In the Matter of the Arbitration Between Washington Nationals Baseball Club v. TCR Sports Broadcasting Holdings, L.L.P. (Major League Baseball Revenue Sharing Definitions Committee).

Miguel V. Pro and Davis Landscape et al. v. Hertz Equipment Rental Corporation, No. 2:06-CV-3830 (DMC) (D.N.J.).

Game Show Network, LLC v. Cablevision Systems Corp., File No. CSR-8529-P (Federal Communications Commission).

In Re Florida Cement and Concrete Antitrust Litigation, Master Docket No. 09-23493-Civ-Altonaga/Brown (S.D.Fl.).

Karen Ann Ishee Parsons et al. v. Bright House Networks, Case No. CV-09-B-0267-S (N.D. Al.).

In Re Cox Enterprises, Inc. Set-Top: Cable Television Box Antitrust Litigation, Case No. 5:09-ML-02048-C (W.D.Ok.).

Review of the Regulatory Framework Relating to Vertical Integration, Broadcasting Notice of Consultation CRTC 2010-783 (Canadian Radio-television Telecommunications Commission).

Apotex, Inc., v. Cephalon, Inc., Barr Laboratories, Inc., Mylan Laboratories, Inc., Teva Pharmaceutical Industries, Ltd., Teva Pharmaceuticals USA, Inc., Ranbaxy Laboratories, Ltd., and Ranbaxy Pharmaceuticals, Inc.,. Case No. 2:06-cv-02768-MSG (E.D. Pa.).

United States, et al. v Amgen, Inc., International Nephrology Network, et al., Civ. Action No. 06-10972-WGY (D. Mass.).

Carl Blessing et al. v. SIRIUS-XM Radio, Inc., Case No. 09-cv-10035 (HB) (S.D. N.Y.).

DISH Network L.L.C., v. Comcast Corporation, Comcast SportsNet California, Inc., Case No. 16 472 E 00211 10 (American Arbitration Association).

In Re Airline Baggage Fee Antitrust Litigation, Civil Action No. 1:09-Md-2089-Tcb (N.D. Ga.).

Applications of Comcast Corporation, General Electric Company and NBC Universal, Inc. for Consent to Assign Licenses or Transfer Control of Licensees, MB Docket No. 10-56 (Federal Communications Commission).

T-Mobile West Corporation v. Michael M. Crow, et al., Case No: 2:08-cv-1337 PHX-NVW (D. Az.).

Metlife Insurance Company of Connecticut and General American Life Insurance Company v. Thomas Petracek, Minnesota Estate

Service, Inc., Michael J. Antonello, and Michael J. Antonenllo & Associates, Ltd., No. 08-CV-06095 DSD-FLN (D. Minn).

Tennis Channel, Inc. v. Comcast Cable Communications, LLC, File No. CSR-8258 (Federal Communications Commission).

MEMdata, LLC, v. Intermountain Healthcare, Inc., and IHC Health Services, Inc., Civil No. 2:08-cv-190 (C.D. Utah).

Caroline Behrend, et al. v. Comcast Corporation, Civil Action No. 03-6604 (E.D. Pa.).

In the Matter of Distribution of the 2000-03 Copyright Royalty Funds, Dkt. No. 2008-2 CRB CD 2000-03 (Copyright Royalty Judges).

Cindy Johnson et al. v. Arizona Hospital and Health Care Association et al., Case No. 07-01292 (SRB) (D. Az.).

Southeast Missouri Hospital, et al. v. C.R. Bard, Inc., Case No. 1:07CV0031 TCM (E.D. Mo.).

TCR Sports Broadcasting Holding, L.L.P. v. Comcast Corporation, File No. CSR-8001-P (Federal Communications Commission).

Meijer, Inc. & Meijer Distribution, Inc., et al. v. Abbott Laboratories, Case No. C 07-5985 CW (N.D. Ca.).

NFL Enterprises LLC. v. Comcast Cable Communications, LLC, File No. CSR-7876-P (Federal Communications Commission).

Medical Mutual of Ohio Inc. v. GlaxoSmithKline PLC and SmithKline Beecham Corporation, Civil Action No. 05-396 (E.D. Pa.).

TCR Sports Broadcasting Holding, L.L.P., D/B/A Mid-Atlantic Sports Network v. Time Warner Cable Inc., American Arbitration Association, Case No. 12 494 E 000326 07 (Federal Communications Commission).

Coors Brewing Company v. Hipal Partners Ltd., Case No. 71 155 00358 07 (American Arbitration Association).

Natchitoches Parish Hosp. Serv. Dist., et al. v. Tyco Int'l, Ltd. et al., Civil Action No. 05-12024 (D. Mass.).

Ralph O. Stalsberg, et al. v. New York Life Insurance Company, New York Life Insurance and Annuity Corporation, Case No. 2:07-Cv-29-Bj (D. Utah).

In Re Tricor Indirect Purchaser Antitrust Litigation, C.A. No. 05-360 (KAJ) (D. Del.).

White Papers

The Consumer Benefits of Efficient Mobile Number Portability Administration (prepared for Neustar) (Mar. 8, 2013).

Economic Analysis of the Implications of Implementing EPA's Tier 3 Rules (prepared for Emissions Control Technology Association), co-authored with George Schink (June 14, 2012).

Are Google's Search Results Unfair or Deceptive Under Section 5 of the FTC Act? (prepared for Google), co- authored with Robert Litan (May 1, 2012).

Bundles in the Pharmaceutical Industry: A Case Study of Pediatric Vaccines (prepared for Novartis), co-authored with Kevin Caves (July 13, 2011).

Are U.S. Wireless Markets Effectively Competitive? A Critique of the FCC's 14th and 15th Annual Wireless Competition Reports (prepared for AT&T), co-authored with Gerald R. Faulhaber, Robert W. Hahn (July 11, 2011).

Do Group Purchasing Organizations Achieve the Best Prices for Member Hospitals? An Empirical Analysis of Aftermarket Transactions (prepared for Medical Device Manufacturers Association), co-authored with Robert Litan (Oct. 6, 2010).

The Economic Impact of Broadband Investment (prepared for Broadband for America), co-authored with Robert Crandall (Feb. 23, 2010).

Why the iPhone Won't Last Forever and What the Government Should Do to Promote Its Successor (prepared for Mobile Future), co-authored with Robert Hahn (Sept. 21, 2009).

The Economic Impact of Eliminating Preemption of State Consumer Protection Laws (prepared for the American Bankers' Association), co-authored with Joseph R. Mason (Aug. 21, 2009).

Economic Effects of Tax Incentives for Broadband Infrastructure Deployment (prepared for the Fiber to the Home Council), co-authored with Jeffrey Eisenach and Jeffrey West (Dec. 23, 2008).

The Effect of Brokered Deposits and Asset Growth on the Likelihood of Failure (prepared for Morgan Stanley, Citigroup, and UBS), co-authored with Joseph Mason and Jeffrey West (Dec. 17, 2008).

Estimating the Benefits and Costs of M2Z's Proposal: Reply to Wilkie's *Spectrum Auctions Are Not a Panacea* (prepared for CTIA), co-authored with Robert W. Hahn, Allan T. Ingraham and J. Gregory Sidak (July 23, 2008).

Irrational Expectations: Can a Regulator Credibly Commit to Removing an Unbundling Obligation? AEI-Brookings Related Publication No. 07-28, co-authored with Jeffrey Eisenach (Dec. 30, 2007)

Is Greater Price Transparency Needed in The Medical Device Industry? (prepared for Advanced Medical Technology Association), co-authored with Robert W. Hahn (Nov. 30, 2007).

Should the FCC Depart from More than a Decade of Market-Oriented Spectrum Policy? Reply to Skrzypacz and Wilson (prepared for CTIA), co-authored with Gerald Faulhaber and Robert W. Hahn (Jun. 18, 2007).

Improving Public Safety Communications: An Analysis of Alternative Approaches (prepared for the Consumer Electronics Association and the High Tech DTV Coalition), co-authored with Peter Cramton, Thomas S. Dombrowsky, Jr., Jeffrey A. Eisenach, and Allan Ingraham (Feb. 6, 2007).

The Budgetary Impact of Eliminating the GPOs' Safe Harbor Exemption from the Anti-Kickback Statute of the Social Security Act (prepared for the Medical Device Manufacturers Association) (Dec. 20, 2005).

Reply to "The Life Settlements Market: An Actuarial Perspective on Consumer Economic Value" (prepared for Coventry First), co-authored with Eric Stallard (Nov. 15, 2005).

19. The Competitive Effects of Telephone Entry into Video Markets (prepared for the Internet Innovation Alliance), co-

authored with Robert W. Crandall and J. Gregory Sidak (Nov. 9, 2005).

How Do Consumers and the Auto Industry Respond to Changes in Exhaust Emission and Fuel Economy Standards? A Critique of Burke, Abeles, and Chen (prepared for General Motors Corp.), co-authored with Robert W. Crandall and Allan T. Ingraham (Sept. 21, 2004).

Inter-City Competition for Retail Trade in North Texas: Can a TIF Generate Incremental Tax Receipts for the City of Dallas? (prepared for Harvest Partners), co-authored with Thomas G. Thibodeau and Allan T. Ingraham (July 16, 2004).

An Accurate Scorecard of the Telecommunications Act of 1996: Rejoinder to the Phoenix Center Study No. 7 (prepared for BellSouth), co-authored with Robert Crandall (Jan. 6, 2004).

Competition in Broadband Provision and Implications for Regulatory Policy (prepared for the Alcatel, British Telecom, Deutsche Telekom, Ericsson, France Telecom, Siemens, Telefónica de España, and Telecom Italia), co- authored with Dan Maldoom, Richard Marsden, and Gregory Sidak (Oct. 15, 2003).

The Effect of Ubiquitous Broadband Adoption on Investment, Jobs, and the U.S. Economy (prepared for Verizon), co-authored with Robert W. Crandall (Sept. 17, 2003).

The Deleterious Effect of Extending the Unbundling Regime on Telecommunications Investment (prepared for BellSouth), co-authored with Robert W. Crandall (July 10, 2003).

Letter Concerning Spectrum Auction 35 to the Honorable Michael K. Powell, Chairman, Federal Communications Commission, from Peter C. Cramton, Robert W. Crandall, Robert W. Hahn, Robert G. Harris, Jerry A. Hausman, Thomas W. Hazlett, Douglas G. Lichtman, Paul W. MacAvoy, Paul R. Milgrom, Richard Schmalensee, J. Gregory Sidak, Hal J. Singer, Vernon L. Smith, William Taylor, and David J. Teece (Aug. 16, 2002).

Speaking Engagements

New Principles for a Progressive Broadband Policy,
PROGRESSIVE POLICY INSTITUTE, Washington, D.C. Mar. 13, 2014.

The Open Internet: Where Do We Go From Here?
PROGRESSIVE POLICY INSTITUTE, Washington, D.C. Jan. 29,
2014.

*Does Platform Competition Render Common Carriage Irrelevant
in an IP world?* PROGRESSIVE POLICY INSTITUTE,
Washington, D.C. Nov. 20, 2013.

*The 41st Research Conference on Communication, Information
and Internet Policy*, TELECOMMUNICATIONS POLICY
RESEARCH CONFERENCE, George Mason University School
of Law, Arlington, VA, September 27, 2013.

*The Broadband Technology Explosion: Rethinking
Communications Policy for a Mobile Broadband World*,
Pepperdine School of Public Policy, Menlo Park, CA. June 20,
2013.

Net Neutrality: Government Overreach or the Key to Innovation?,
NORTHWESTERN JOURNAL OF TECHNOLOGY AND
INTELLECTUAL PROPERTY EIGHTH ANNUAL
SYMPOSIUM, Chicago, IL., Mar. 8, 2013.

*Internet Everywhere: Broadband as a Catalyst for the Digital
Economy*, The Brookings Institution, Washington, D.C., Nov.
27, 2012.

Can Broadband Power an Economic Recovery?, Advanced
Communications Law & Policy Institute at New York Law
School, Washington, D.C., July 10, 2012.

Using Regression in Antitrust Cases, UNIVERSITY OF
PENNSYLVANIA LAW SCHOOL, Philadelphia, PA., April 12,
2012.

Mergers: The Road to Duopoly or Path to Competitive Panacea?
NATIONAL ASSOCIATION OF REGULATORY UTILITY
COMMISSIONERS, Los Angeles, CA., July 20, 2011.

State of the Mobile Net, CONGRESSIONAL INTERNET
CAUCUS, Washington, D.C., May 27, 2011.

*Waves of Innovation: Spectrum Allocation in the Age of the Mobile
Internet*, INFORMATION TECHNOLOGY & INNOVATION
FOUNDATION, Washington D.C., May 17, 2011.

With or Without Merit, Class Certification Requires Commonality, ABA SECTION OF ANTITRUST LAW 59TH ANNUAL SPRING MEETING, Washington, D.C., Mar. 30, 2011.

4th Annual Future of Private Antitrust Enforcement Conference, AMERICAN ANTITRUST INSTITUTE, Washington, D.C., Dec. 7, 2010.

Jobs and Technology, NEW DEMOCRATIC LEADERSHIP COUNCIL, Washington, D.C., Sept. 22, 2010.

Regulation and Broadband, ADVANCED COMMUNICATIONS LAW & POLICY INSTITUTE, NEW YORK LAW SCHOOL, New York, N.Y., July 14, 2010.

13th Annual Symposium on Antitrust, GEORGE MASON LAW REVIEW, Washington, D.C., Feb. 4, 2010.

Broadband Infrastructure and Net Neutrality, ADVISORY COMMITTEE TO THE CONGRESSIONAL INTERNET CAUCUS' STATE OF THE NET, Washington, D.C., Jan. 22, 2010.

The Consequences of Net Neutrality Regulations, AMERICAN CONSUMER INSTITUTE CENTER FOR CITIZEN RESEARCH, Washington, D.C., Nov. 19, 2009.

Wireless Innovation Luncheon, MOBILE FUTURE, Washington, D.C., Nov. 3, 2009.

Second Life Settlements & Longevity Summit, INSURANCE-LINKED SECURITIES & LIFE SETTLEMENTS, New York, N.Y., Sept. 30, 2009.

Perspectives on Investment and a National Broadband Plan, AMERICAN CONSUMER INSTITUTE, Washington, D.C., Sept. 4, 2009.

Markets and Regulation: How Do We Best Serve Customers?, Wireless U. Communications Policy Seminar, UNIVERSITY OF FLORIDA PUBLIC UTILITY RESEARCH CENTER, Tampa, FL., Nov. 13, 2008.

The Price Of Medical Technology: Are We Getting What We Pay For? HEALTH AFFAIRS BRIEFING, Washington, D.C., Nov. 10, 2008.

Standard Setting and Patent Pools, LAW SEMINARS INTERNATIONAL, Arlington, VA., Oct. 3, 2008.

The Changing Structure of the Telecommunications Industry and the New Role of Regulation, INTERNATIONAL TELECOMMUNICATIONS SOCIETY BIENNIAL CONFERENCE, Montreal, Canada, June 26, 2008.

The Debate Over Network Management: An Economic Perspective, AMERICAN ENTERPRISE INSTITUTE CENTER FOR REGULATORY AND MARKET STUDIES, Washington, D.C., Apr. 2, 2008.

Merger Policy in High-Tech Industries, GEORGE MASON UNIVERSITY SCHOOL OF LAW, Washington, D.C., Feb. 1, 2008.

Telecommunications Symposium, U.S. DEPARTMENT OF JUSTICE ANTITRUST DIVISION, Washington, D.C., Nov. 29, 2007.

Wireless Practice Luncheon, FEDERAL COMMUNICATIONS BAR ASSOCIATION, Washington, D.C., Nov. 29, 2007.

Association for Computing Machinery's Net Neutrality Symposium, GEORGE WASHINGTON UNIVERSITY, Washington, D.C., Nov. 12, 2007.

Regulators' AdvanceComm Summit, NEW YORK LAW SCHOOL, New York, N.Y., Oct. 14, 2007.

Annual Conference, CAPACITY USA 2007, New York, N.Y., Jun. 26, 2007.

William Pitt Debating Union, UNIVERSITY OF PITTSBURGH, SCHOOL OF ARTS & SCIENCES, Pittsburgh, PA., Feb. 23, 2007.

Annual Conference, WIRELESS COMMUNICATIONS ASSOCIATION INTERNATIONAL, Washington, D.C., June 27, 2006.

Annual Conference, MEDICAL DEVICE MANUFACTURERS ASSOCIATION, Washington, D.C., June 14, 2006.

Annual Conference, ASSOCIATION FOR ADVANCED LIFE UNDERWRITING, Washington, D.C., May 1, 2006.

Entrepreneur Lecture Series, LAFAYETTE COLLEGE, Easton, PA., Nov. 14, 2005.

Editorials and Magazine Articles

Life After Comcast: The Economist's Obligation to Decompose Damages Across Theories of Harm, ANTITRUST (Spring 2014) (co-authored with Kevin Caves).

The FCC's Incentive Auction: Getting Spectrum Right, PROGRESSIVE POLICY INSTITUTE PAPER (Nov. 2013).

Clash of the Titans: How the Largest Commercial Websites Got That Way, MILKEN INSTITUTE REVIEW (Second Quarter 2013), co-authored with Robert Hahn.

Lessons from Kahneman's Thinking Fast and Slow: Does Behavioral Economics Have a Role in Antitrust Analysis?, The ANTITRUST SOURCE (August 2012), co-authored with Andrew Card.

Wireless Competition: An Update, GEORGETOWN CENTER FOR BUSINESS AND PUBLIC POLICY ECONOMIC POLICY VIGNETTES (May 3, 2012), co-authored with Robert Hahn.

Book Review of Tim Wu's The Master Switch, MILKEN INSTITUTE REVIEW (January 2012).

Economic Evidence of Common Impact for Class Certification in Antitrust Cases: A Two-Step Analysis, ANTITRUST (Summer 2011).

The AT&T/T-Mobile Deal: Should We Fear Wireless Consolidation? FORBES, June 3, 2011.

In FCC's Report on Wireless Competition, an Agenda?, HARVARD BUSINESS REVIEW, Apr. 15, 2011, co-authored with Gerald Faulhaber.

Will the Proposed Banking Settlement Have Unintended Consequences? HARVARD BUSINESS REVIEW, Mar. 29, 2010, co- authored with Joseph R. Mason.

Should Regulators Block AT&T's Acquisition of T-Mobile?, HARVARD BUSINESS REVIEW, Mar. 22, 2010.

The Black Hole in America's Retirement Savings, FORBES, Dec. 21, 2010, co-authored with Robert Litan.

Broken Compensation Structures and Health Care Costs, HARVARD BUSINESS REVIEW, Oct. 6, 2010, co-authored with Robert Litan.

Net Neutrality Is Bad Broadband Regulation, THE ECONOMISTS' VOICE, Sept. 2010, co-authored with Robert Litan.

Why Net Neutrality Is Bad for Business, HARVARD BUSINESS REVIEW, Aug. 13, 2010, co-authored with Robert Litan.

Why the iPhone Won't Last Forever and What the Government Should (or Shouldn't) Do to Promote Its Successor, MILKEN INSTITUTE REVIEW (First Quarter 2010), co-authored with Robert W. Hahn.

Streamlining Consumer Financial Protection, THE HILL, Oct. 13, 2009, co-authored with Joseph R. Mason.

Foxes in the Henhouse: FCC Regulation through Merger Review, MILKEN INSTITUTE REVIEW (First Quarter 2008), co-authored with J. Gregory Sidak.

Don't Drink the CAFE Kool-Aid, WALL STREET JOURNAL, Sept. 6, 2007, at A17, co-authored with Robert W. Crandall.

The Knee-Jerk Reaction: Misunderstanding the XM/Sirius Merger, WASHINGTON TIMES, Aug. 24, 2007, at A19, co-authored with J. Gregory Sidak.

Net Neutrality: A Radical Form of Non-Discrimination, REGULATION, Summer 2007.

Telecom Time Warp, WALL STREET JOURNAL, July 11, 2007, at A15, co-authored with Robert W. Crandall.

Earmarked Airwaves, WASHINGTON POST, June 27, 2007, at A19, co-authored with Robert W. Hahn.

Not Neutrality, NATIONAL POST, Mar. 29, 2007, at FP19.

Should ATM Fees Be Regulated?, NATIONAL POST, Mar. 8, 2007, at FP17, co-authored with Robert W. Crandall.

Life Support for ISPs, REGULATION, Fall 2005, co-authored with Robert W. Crandall.

No Two-Tier Telecommunications, NATIONAL POST, Mar. 7, 2003, at FP15, co-authored with Robert W. Crandall.

Memberships

American Economics Association

American Bar Association Section of Antitrust Law

Reviewer

Journal of Risk and Insurance

Journal of Competition Law and Economics

Journal of Risk Management and Insurance Review

Journal of Regulatory Economics Managerial and Decision Economics Telecommunications Policy

KEVIN W. CAVES

Office Address

Economists Incorporated
2121 K Street, NW
Suite 1100
Washington, DC 20037
Direct Dial: (202) 833-5222
Mobile: (301) 787-6781
caves.k@ei.com

Education

Ph.D. Economics, University of California at Los Angeles, December 2005
       Fields of Study: Industrial Organization, Applied Econometrics

M.A.   Economics, University of California at Los Angeles, May 2002

B.A.   *Magna cum laude*, Departmental Honors in Economics,
       Haverford College, May1998

Current Position

Senior Economist, Economists Incorporated

Employment History

Director, Navigant Economics, March 2011 to 2013

Associate Director, Navigant Economics, February 2010 to March 2011

Vice President, Empiris LLC, September 2008 to February 2010

Senior Economist, Criterion Economics LLC, October 2006 to September 2008

Senior Consultant, Deloitte & Touche LLP, September 2005 to October 2006

Teaching Fellow, Department of Economics, UCLA, January 2002 to June 2004

Assistant Economist, Federal Reserve Bank of New York, August 1998 to June 2000

Publications and Research Papers

Life After Comcast: The Economist's Obligation to Decompose Damages Across Theories of Harm, 28 ANTITRUST (Spring 2014), co-authored with Hal J. Singer.

Mobile Wireless Performance the EU and the US: Implications for Policy, 93 COMMUNICATIONS & STRATEGIES (Q1 2014), co-authored with Erik Bohlin and Jeffrey A. Eisenach.

Econometric Tests for Analyzing Common Impact, co-authored with Hal J. Singer, in THE LAW AND ECONOMICS OF CLASS ACTIONS: 26 RESEARCH IN LAW AND ECONOMICS 135-160 (James Langenfeld, ed., Emerald Publishing 2014).

Testing for Antitrust Impact with Common Econometric Methods, AMERICAN BAR ASSOCIATION (Spring 2013), co-authored with Hal J. Singer.

Vertical Integration in Multichannel Television Markets: A Study of Regional Sports Networks, 12 REVIEW OF NETWORK ECONOMICS 61-92 (2013), co-authored with Hal J. Singer and Chris Holt.

Assessing Bundled and Share-Based Loyalty Rebates: Application to the Pharmaceutical Industry, 8 JOURNAL OF COMPETITION LAW & ECONOMICS 889-913 (2012), co-authored with Hal J. Singer.

Modeling the Welfare Effects of Net Neutrality Regulation: A Comment on Economides and Tåg, 24 INFORMATION ECONOMICS & POLICY 288-292 (2012).

Economic and Legal Aspects of FLSA Exemptions: A Case Study of Companion Care, 63 LABOR LAW JOURNAL 174-202 (2012), co-authored with Jeffrey A. Eisenach.

"What Happens When Local Phone Service Is Deregulated?," *Regulation* (Fall 2012), co-authored with Jeffrey A. Eisenach.

The Bottle and the Border: What can America's failed experiment with alcohol prohibition in the 1920s teach us about the likely effects of anti-immigration legislation today? 9 THE ECONOMISTS' VOICE (June 2012).

"What a Nobel-Prize Winning Economist Can Teach Us About Obamacare," *The Atlantic* (May 23, 2012), co-authored with Einer Elhauge. Reprinted in *Obamacare on Trial*.

Quantifying Price-Driven Wireless Substitution in Telephony, 35 TELECOMMUNICATIONS POLICY 984-998 (December 2011).

Structural Identification of Production Functions, ECONOMETRICA (co-authored with Daniel Ackerberg and Garth Frazer, revise and resubmit, December 2006).

State Dependence and Heterogeneity in Aggregated Discrete Choice Demand Systems: An Example from the Cigarette Industry (UCLA Dissertation, December 2005).

White Papers

Mobile Wireless Performance in Canada: Lessons from the EU and the US (prepared with support from TELUS, co-authored with Erik Bohlin and Jeffrey A. Eisenach, September 2013).

Mobile Wireless Performance in the EU & the US (prepared with support from GSMA, co-authored with Erik Bohlin and Jeffrey A. Eisenach, May 2013).

Estimating the Economic Impact of Repealing the FLSA Companion Care Exemption (prepared with support from National Association for Home & Hospice Care, co-authored with Jeffrey A. Eisenach, March 2012).

The Impact of Liberalizing Price Controls on Local Telephone Service: An Empirical Analysis (prepared with support from Verizon Communications, co-authored with Jeffrey A. Eisenach, February 2012).

Bundles in the Pharmaceutical Industry: A Case Study of Pediatric Vaccines (prepared with support from Novartis, co-authored with Hal J. Singer, July 2011).

Evaluating the Cost-Effectiveness of RUS Broadband Subsidies: Three Case Studies (prepared with support from The National Cable & Telecommunications Association, co-authored with Jeffrey A. Eisenach, April 2011).

Video Programming Costs and Cable TV Prices: A Reply to CRA (prepared with support from The National Association of Broadcasters, co-authored with Jeffrey A. Eisenach, June 2010).

Modeling the Welfare Effects of Net Neutrality Regulation: A Comment on Economides and Tåg (prepared with support from Verizon Communications, April 2010).

Retransmission Consent and Economic Welfare: A Reply to Compass-Lexecon (prepared with support from The National Association of Broadcasters, co-authored with Jeffrey A. Eisenach, April 2010).

The Benefits and Costs of Implementing "Return-Free" Tax Filing in the U.S. (prepared with support from The Computer & Communications Industry Association, co-authored with Jeffrey A. Eisenach & Robert E. Litan, March 2010).

The Benefits and Costs of I-File (prepared with support from The Computer & Communications Industry Association, co-authored with Jeffrey A. Eisenach & Robert E. Litan, April 2008).

The Effects of Providing Universal Service Subsidies to Wireless Carriers (prepared with support from Verizon Communications, co-authored with Jeffrey A. Eisenach, June 2007).

Expert Reports and Filings

In the Matter of Petition of USTelecom for Forbearance Pursuant to 47 U.S.C. § 160(c) from Obsolete ILEC Regulatory Obligations that Inhibit Deployment of Next-Generation Networks, Expert Declaration of Kevin W. Caves, Federal Communications Commission (October 6, 2014).

In the Matter of 2014 Quadrennial Regulatory Review – Review of the Commission's Broadcast Ownership Rules and Other Rules Adopted Pursuant to Section 202 of the Telecommunications Act of 1996, (MB Docket No. 14-50), Expert Report of Kevin W. Caves and Hal J. Singer: "Competition in Local Broadcast Television Advertising Markets" Federal Communications Commission (August 2014).

In the Matter of Special Access for Price Cap Local Exchange Carriers; AT&T Corporation Petition for Rulemaking To Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services (WC Docket No. 05-25 & RM-10593), Declaration of Kevin W. Caves and Jeffrey A. Eisenach, Federal Communications Commission (March 2013).

In the Matter of Amendment of the Commission's Rules Related to Retransmission Consent, (MB Docket No. 10-71), Reply Declaration of Jeffrey A. Eisenach and Kevin W. Caves, Federal Communications Commission (June 2011).

In the Matter of Amendment of the Commission's Rules Related to Retransmission Consent, (MB Docket No. 10-71), Declaration of Jeffrey A. Eisenach and Kevin W. Caves, Federal Communications Commission (May 2011).

Guardian Pipeline, L.L.C., v. 295.49 acres of land, more or less, in Brown County, Calumet County, Dodge County, Fond du Lac County, Jefferson County

and Outagamie County, Wisconsin, et al., Case No. 08-C-28 (E.D. Wis.), Declaration Of Kevin W. Caves, Ph.D. (September 2010).

Speaking Engagements

Competition and Monopsony In Labor Markets: Theory, Evidence, and Antitrust Implications, New York State Bar Association, Antitrust Law Section, New York, NY, (April 23, 2014).

Econometric Tests of Common Impact, Covington & Burling LLP, Washington, DC., (May 23, 2013).

Vertical Integration in Cable Networks: A Study of Regional Sports Networks, Federal Communications Commission (May 21, 2013).

Regression Methods: Theory and Applications of Fixed-Effects Models, O'Melveny & Myers LLP, Washington, DC., (July 16, 2012).

Regression Methods: Theory and Applications, Antitrust Practice Group, Cohen Milstein Sellers & Toll PLLC, Washington, DC., (June 4, 2012).

Using Regression in Antitrust Cases, University of Pennsylvania Law School, Philadelphia, PA., (April 12, 2012).

Interview with *IT Business Edge* on Rural Utilities Service Broadband Subsidies (May 17, 2011).

Reviewer

Review of Network Economics

International Journal of the Economics of Business

Honors and Awards

Howard Fellowship for Excellency in Teaching, University of California at Los Angeles, Spring 2005.

Graduate Fellowship, University of California at Los Angeles, 2000 – 2004.

Departmental Honors in Economics, Haverford College, May 1998.

Phi Beta Kappa Society, elected May 1998.