

**BEFORE THE
SURFACE TRANSPORTATION BOARD**

300039

**STB DOCKET NO. EP 761
HEARING ON REVENUE ADEQUACY**

ENTERED
Office of Proceedings
November 26, 2019
Part of
Public Record

**STB DOCKET NO. EP 722
RAILROAD REVENUE ADEQUACY**

**WRITTEN TESTIMONY OF
THE AMERICAN CHEMISTRY COUNCIL**

American Chemistry Council
700 2nd St., N.E.
Washington, DC 20002

By its attorneys:

Jeffrey O. Moreno
Jason D. Tutrone
Thompson Hine LLP
1919 M St. NW Suite 700
Washington, DC 20036
(202) 331-8800

Dated: November 26, 2019

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I. INTRODUCTION.

The American Chemistry Council (“ACC”) hereby submits its written testimony in response to the Notice of Public Hearing served by the Surface Transportation Board (“Board”) in the above-captioned proceedings on September 12, 2019 (“Notice”). The Notice solicits input on four recommendations regarding revenue adequacy that have been presented in a Report issued by the Board’s Rate Reform Task Force (“RRTF”) on April 25, 2019 (“RRTF Report”). In addition, the Notice has been issued under STB Docket No. EP 722, *Railroad Revenue Adequacy*, in which the Board has sought comment on its methodology for determining revenue adequacy, the revenue adequacy component for judging the reasonableness of rail rates, and what, if any, changes the Board should consider. ACC participated actively in EP 722. In this testimony, ACC addresses issues from both the RRTF Report and EP 722.

A. ACC’s Identity and Interest.

ACC is an industry association that represents America’s leading chemical companies. Its members produce and manufacture a wide variety of chemicals, polymers, and related products

that make our lives and our world healthier, safer, more sustainable, and more productive. ACC members depend on the nation's railroads for the safe, efficient, and secure transportation of their products. In 2017, U.S. Class I railroads originated 2.1 million carloads of chemicals carrying 175.9 million tons and yielding \$10.3 billion in gross revenue. With significant new production capacity coming on line by 2022, rail shipments of chemical products are expected to increase by more than 300,000 carloads annually.

A fair and accessible rate review process is critical to ACC's members. The rail traffic of ACC's members moves mainly in carload service and tends to have few modal alternatives. Most of the commodities they transport by rail are STCC 28, which accounts for the highest number of manifest carloads compared to all other 2-digit STCC groups.¹ Recent attempts to use the Stand-Alone Cost ("SAC") rate reasonableness methodology for carload traffic, which moves in small volumes to hundreds of destinations that can change frequently, have proven to be extremely complex, expensive and time-consuming. This places ACC-member traffic at a high risk of unreasonable pricing, which drives up the cost of raw materials and finished products. It also jeopardizes the competitive position of ACC members in the marketplace.

From 2000 to 2017, real freight rail rates for all commodities increased by more than 30%. ACC members have experienced significant rail rate increases, well above the rate of inflation, almost annually for nearly two decades. There was a brief pause for just one year during the "Great Recession" and, even then, rates either did not increase or increased less significantly. At no point did ACC members experience rate decreases even though rates

¹ Surface Transp. Bd., 2-Digit STCC Summary Statistics Report, https://www.stb.gov/stb/industry/econ_reports.html [hereinafter 2 STCC Report] (follow "here" hyperlink under "2-Digit STCC Summary Statistics Report" heading) (last visited December 5, 2018).

decreased for all other modes during the recession. Over that time, at least three of the Class I railroads have achieved and consistently maintained revenue adequacy and the others have made great strides in that direction. The enhanced revenue adequacy of the rail industry opens the door to considering new and additional regulatory remedies, including new methods to determine when rail rates are unreasonable for revenue-adequate carriers. ACC commends the Board for creating the RRTF and initiating this proceeding to consider such remedies.

B. Summary of Testimony.

ACC's testimony focuses on three specific issues. First, ACC proposes a new methodology for determining maximum reasonable rates for revenue-adequate Class I railroads in accordance with 49 U.S.C. § 10701. Second, ACC comments on the proposed definition of "long-term revenue adequacy" in the RRTF Report. Third, ACC comments on the bottleneck changes proposed in the RRTF report.

ACC engaged Dr. Kevin W. Caves, a Senior Economist at Econ One Research, Inc., to develop a method for determining the maximum reasonable rate for any challenged movement on a revenue adequate rail carrier. Dr. Caves and ACC refer to this as the "Benchmark Method." The details of the Benchmark Method are set forth in the attached Verified Statement of Dr. Caves and associated electronic work papers ("Caves V.S.").²

The Benchmark Method would implement the revenue adequacy constraint in *Coal Rate Guidelines, Nationwide*, 1 I.C.C. 2d 520 (1985) ("*Guidelines*"). It is predicated upon the same

² This is the same verified statement that Dr. Caves submitted in support of the Coalition Associations' opening comments in EP 755, *Final Offer Rate Review* (filed Nov. 12, 2019). The electronic workpapers have been filed under seal because they contain data from the Confidential Costed Waybill Sample. Any party desiring access to these workpapers is advised to submit an appropriate request for waybill access to the Board. Once a party has signed the appropriate waybill access agreements with the Board, Thompson Hine may share the workpapers with that party.

economic principles that are the bedrock of the Board's current standards adopted in *Guidelines*. Specifically, in *Guidelines*, the Interstate Commerce Commission ("ICC") held that revenue adequacy is a constraint upon captive rail rates. "Captive shippers," the agency declared, "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."³ Furthermore, the approach is entirely consistent with the policy objectives that Congress articulated in the Rail Transportation Policy, 49 U.S.C. § 10101.

The Benchmark Method employs a two-step approach to determining maximum reasonable rates of revenue-adequate rail carriers. Step One predicts the competitive benchmark rate for a captive movement. Step Two determines the degree of differential pricing above the predicted competitive rate that is necessary to maintain the long-term revenue adequacy of the defendant rail carrier. The first step applies an econometric model (the "Benchmark Model")⁴ developed by Dr. Caves to predict competitive benchmark rate levels for captive movements based upon the characteristics of competitive movements that most explain their rates. The second step applies a concept called the "Competitive Threshold" ("CT"), which Dr. Caves designed to determine the degree of differential pricing above the predicted competitive benchmark rate that is necessary to maintain the long-term revenue adequacy of the defendant rail carrier. The maximum prescribed rate for a market dominant movement would be the predicted competitive benchmark rate determined in Step One as subsequently adjusted by the

³ *Guidelines* at 535. [emphasis added].

⁴ As used herein, the term "Benchmark Model" has a different meaning than "Benchmark Method." The former refers to the regression model developed in Step One, whereas the latter refers to the entire process encompassed by Steps One and Two.

CT in Step Two. This can be summarized as follows: ***Maximum Reasonable Rate = Competitive Benchmark Rate * CT (for defendant carrier)***

The results of Dr. Caves modeling work provide evidence of a potential market failure in the rail sector. Using the Confidential Costed Waybill Sample (“CCWS”) data available to him (limited to masked data for 2006-2013), Dr. Caves demonstrates that rates for non-competitive shipments significantly exceed predicted rates for competitive shipments. On average across the entire group of non-competitive CCWS movements, the actual rates exceeded the predicted rates by approximately 48%, which suggests this is the average level of differential pricing across the Class I railroads. For 12% of the non-competitive moves, the actual rates were more than double the predicted competitive rates. As demonstrated in Dr. Caves’ verified statement, the Benchmark Method is designed to determine what portion, if any, of the rate differential for any captive shipment is necessary to allow the railroad to be long-term revenue adequate. Running the model with the latest unmasked waybill data would provide critically important data to inform the Board’s deliberations on issues raised in this hearing.

ACC, through the Opening Comments of the Coalition Associations in Docket No. EP 755, *Final Offer Rate Review* (“Ep 755”), has identified the Benchmark Method as a methodology that is ideally-suited for the Final Offer Rate Review (“FORR”) process. In this proceeding, ACC also urges the Board to formally adopt this new methodology as a fully-equivalent alternative to the SAC methodology which also is derived from *Guidelines*.

To implement the Benchmark Method on a consistent basis, as opposed to ad hoc implementation through the FORR process proposed in EP 755, the Board must adopt a specific econometric model and CT methodology. Dr. Caves has developed the Benchmark Model for the Board’s consideration. His methods, data, and assumptions are set forth in his verified

statement for review and comment. Dr. Caves also has developed a method for calculating the CT and presented a “proof of concept” illustration of how to apply the CT to the results of the Benchmark Model to obtain a maximum reasonable rate for any market dominant movement. Both the Benchmark Model and CT methodology can be modified as the Board deems appropriate. The Board itself readily can update the model annually with the latest movement data from the CCWS and determine the appropriate CT multipliers for each revenue-adequate rail carrier.

In addition to the workings of the Benchmark Method developed by Dr. Caves for determining a maximum reasonable rate, this testimony also discusses corollary issues related to rate prescriptions under the Benchmark Method. ACC envisions that the Board would solicit public comment on these matters as part of a rulemaking to adopt a Benchmark Model and CT methodology.

Once the Board settles upon an econometric model, a method for calculating and applying the CT, and rules for rate prescriptions, the key components needed to apply the Benchmark Method in a rail case will be in place. ACC envisions a process by which an entire rate case under the Benchmark Method could be processed to a final decision in 129 to 150 days (the longer period applies if there are discovery disputes) at a fraction of the cost for even the simplest of existing rate case methods. Nearly all the discovery and litigation would pertain to market dominance. Once market dominance is established, the maximum reasonable rate is determined by inputting the key movement characteristics into the Benchmark Model to obtain the predicted competitive rate and multiplying that rate by the CT.

A working definition of “long-term revenue-adequacy” is an essential element of the Benchmark Method. The proposed definition in the RRTF Report, thus, is well-timed for

consideration. ACC has offered a slightly different definition in its Benchmark Method proposal, but either method is economically supported and adequate to the task.

Finally, ACC supports the proposed bottleneck changes in the RRTF Report. The substantially improved financial condition of the rail industry today calls into question the rationale of the Bottleneck Decisions⁵ which held that shippers could not require a carrier to short-haul itself by quoting bottleneck segment rates unless the shipper makes a full-blown competitive access case. As discussed in EP 711 (Sub-No. 1), *Reciprocal Switching*, slip op. at 8-9 (served July 27, 2016), the competitive access rules are an insurmountable barrier that is no longer justified due to significant changes in the rail industry. Because the restrictive result of the Bottleneck Decisions was justified by the revenue-inadequacy of the rail industry at that time, the achievement of revenue adequacy by a large segment of the rail industry today warrants reconsideration of the Bottleneck Decisions as to revenue adequate carriers. Relaxing those decisions will enhance competition among rail carriers, thereby reducing the need to invoke regulatory remedies to establish reasonable rail rates.

II. THE BENCHMARK METHOD.

A. Purpose And Objectives.

1. There is a need for an economically supported alternative rate case standard that is accessible to carload shippers.

The Board's current procedures for determining maximum reasonable rail rates have proven to be ineffective for, and inaccessible to, the clear majority of captive rail shippers. For over 20 years, the only method was the SAC process, which was "too costly, too time

⁵ See *Cent. P & L Co. v. S. Pac. Transp. Co.*, 1 S.T.B. 1059 (1996), *clarified*, 2 S.T.B. 235 (1997), *aff'd sub nom. MidAmerican Energy Co. v. STB*, 169 F. 3d 1099 (8th Cir. 1999).

consuming, and too unpredictable.”⁶ Despite efforts to develop alternatives to SAC, the resulting procedures also have been cumbersome, costly, and ineffective, as they have tried to mimic SAC results. For these and other reasons, Board members have stated in recent cases involving carload traffic that finding an alternative to SAC should be a priority.

A SAC case is an enormous undertaking, and “[e]ven the most straightforward SAC case . . . involves a lengthy and complex proceeding.”⁷ From start-to-finish, a SAC case can take over five years, not including appeals. Litigation costs for unit train coal shippers were upwards of \$5 million, in 2007.⁸ They are even more costly for carload shippers who often must design a more extensive network to serve scores of origin-destination pairs with more complex operations.

To develop a SAC case, a shipper must design and construct a hypothetical railroad (called a “Stand-Alone Railroad” or “SARR”), accounting for everything from the number, type, and transportation costs of rail ties; to the terrain the railroad traverses; to maintenance requirements.⁹ To defend against the shipper’s case, the defendant must assess the feasibility of this hypothetical railroad, effectively developing its own SARR.¹⁰ Not only does this process disadvantage shippers and encourage railroads to dispute issues,¹¹ but also it “require[s] the

⁶ *Total Petrochemicals & Refining USA, Inc. v. CSX Transp.*, NOR 42121, slip op. at 48 (STB served Sept. 14, 2016) (Begeman, dissenting) (“*Total*”).

⁷ *E.I. DuPont de Nemours & Co. v. Norfolk S. Ry.*, NOR 42125, slip op. at 6 (STB served Dec. 23, 2015).

⁸ See *Simplified Standards for Rail Rate Cases*, EP 646 (Sub-No. 1), slip op. at 30 (STB served Sept. 5, 2007) (“*Simplified Standards*”).

⁹ *Consumers Energy Co. v. CSX Transp., Inc.*, NOR 42142, slip op. at 22, 99, 208-09 (STB updated Mar. 14, 2018) (“*Consumers*”).

¹⁰ See *id.* at 42 n. 47.

¹¹ See *Pub. Serv. Co. of Colo. v. Burlington N. & Santa Fe Ry.*, STB No. 42057, slip op. at 5 (STB served Jan. 19, 2005) (“In SAC cases, the railroad has the advantage of having much greater knowledge and experience in how to construct and operate a railroad. Moreover, as a

collection, analysis, and presentation of massive quantities of detailed data” and involves “enormous evidentiary burdens and costs on both parties”¹² As a result, the parties submit evidentiary filings that involve “thousands of pages of evidence and workpapers, along with massive electronic spreadsheets”¹³

SAC cases are burdensome even for the Board.¹⁴ According to Chairman Begeman, “hundreds, if not thousands, of calls are made at the Board that lead up to its determination of whether a rate is unreasonable.”¹⁵ Many of these calls involve “disputes over minutiae . . . that . . . seem far removed from the core question at issue – the reasonableness of a rate.”¹⁶ This includes “arguments over details of the imaginary restrooms needed for the imaginary crew for the imaginary railroad”¹⁷

In addition to being burdensome, the Board’s SAC methodology is poorly connected to its economic roots. The economist who originally developed the SAC concept characterizes the Board’s SAC test as “so far from the models in which it was originally developed as to be unrecognizable.”¹⁸ Those models involved profit-constrained monopolies whose prices were fully regulated, and in the context of those models, SAC identifies the rate at which a cross-

potential repeat participant in SAC cases, the defendant carrier may have an incentive to contest every detail of a SAC presentation.”)

¹² *Duke Energy Corp. v. CSX Transp. Inc. (Duke/CSXT)*, 7 S.T.B. 402, 415 (2004).

¹³ *Duke Energy Corp. v. Norfolk S. Ry. (Duke/NS)*, 7 S.T.B. 394, 395 (2004).

¹⁴ *See Duke/CSXT*, 7 S.T.B. at 415.

¹⁵ *See Sunbelt Chlor Alkali P’ship v. Norfolk S. Ry., NOR 42130*, slip op. at 32 (STB served Jun. 30, 2016) (Begeman, dissenting) (“*Sunbelt*”).

¹⁶ *See Consumers*, slip op. at 74 (Miller, commenting).

¹⁷ *Id.* at 74 (Begeman, dissenting).

¹⁸ Verified Statement of Gerald R. Faulhaber at 2, Reply of Concerned Shipper Ass’ns, *Railroad Revenue Adequacy*, EP 722 (Nov. 4, 2014) (attached as Ex. 1).

subsidy occurs and a competitive railroad would enter the market if it were contestable.¹⁹ But the railroad industry is not contestable, not fully profit-constrained, and not a monopoly industry.²⁰ Additionally, under the SAC test, the only competitive option is a wholly-independent SARR that transports the complainant's traffic from its origin to its ultimate destination. While this is consistent with the economic models used to develop SAC, in which the *only* alternative was a new entrant, it does not jibe with a railroad industry where captivity typically is limited to a bottleneck segment at the origin or destination.²¹

These problems with the SAC test cannot be remedied with tweaks. In the latest rate case decision, Chairman Begeman observed that the Board's latest SAC tweaks were not effective: "The Board has taken several recent actions to help expedite the SAC process for future cases, as directed by the Surface Transportation Board Reauthorization Act of 2015. But with every SAC case, it seems that more and more issues are raised for the Board to resolve pertaining to the hypothetical railroad, which increases the burden on the parties and makes meeting the new expedited deadlines all the more difficult."²²

Chairman Begeman has stressed that "[i]t may not be easy (or very fast) to ultimately develop a new approach, but it has to be a top Board priority."²³ Former Board member Miller has made similar calls, stating in 2016 that "I believe that now is the time for the Board to begin a major review and discussion of alternatives to SAC."²⁴ Thus, there is a clear and urgent need

¹⁹ *Id.* at 2.

²⁰ *Id.* at 2-3.

²¹ *Id.* at 4-6.

²² *Consumers*, slip op. at 74 (Begeman, commenting).

²³ *Total*, slip op. at 48 (Begeman, dissenting).

²⁴ *Sunbelt*, slip op. at 44 (Miller, concurring).

for concrete proposals like the Benchmark Method to move the process of achieving those objectives towards a conclusion.

2. Rate benchmarking is a practical and economically meaningful alternative rate case methodology.

The Benchmark Method is far more expedient and cost-effective than any of the Board's current rate reasonableness methodologies, while adhering to the economic principles underlying those methodologies in *Guidelines*. The approach developed by Dr. Caves addresses rate reasonableness determinations in two steps:

- First, Dr. Caves developed and tested an econometric model to predict competitive benchmark rates for captive rail movements based upon economically relevant shipment characteristics of competitive rail movements using real-world data, including the CCWS.
- Second, in recognition of the Board's regulatory objective to permit the differential pricing of captive traffic above competitive rate levels only to the extent necessary to achieve and maintain revenue adequacy, Dr. Caves developed the CT, which is a multiplier that is applied to the Benchmark Model's predicted competitive rate to determine the appropriate degree of differential pricing consistent with the Board's rail revenue adequacy standard. *Caves V.S.* ¶2.

The Benchmark Method would prescribe a maximum reasonable rate based upon the characteristics of the rail movement to which the challenged rate applies and application of the CT multiplier. As that process would be virtually automatic, the time and expense of rate case litigation effectively would be reduced to the market dominance question.

The Benchmark Method avoids the high cost and complexity of SAC cases and can be litigated far more quickly. Shippers and railroads would no longer need to spend millions of

dollars constructing and evaluating a hypothetical SARR. Nor would they need to litigate myriad disagreements over the SARR's design and operations. In fact, there would be little litigation regarding the maximum rate determination because the model relies upon objective factual inputs about a movement, such as distance and commodity type, over which there should be little, if any, reasonable disagreement. Additionally, the algorithm would not vary by case, eliminating the need for case-specific litigation of the model that has plagued SAC.

The model also increases the predictability of rate relief, which both improves access to rate remedies and reduces the need for access. At the outset of a SAC case, shippers and railroads have little understanding of the relief that may be granted. This promotes a “kitchen sink” approach to litigation, where both parties dispute as much as possible not knowing what battles are worth fighting. It also keeps many shippers with valid complaints on the sidelines, fearing that they could spend millions of dollars and half a decade litigating a rate case only to lose on a technicality, a novel issue raised by the railroad, or a variety of seemingly inconsequential issues that result in a death by a thousand cuts. Even if a shipper prevails, petitions for reconsideration and appeals are likely to drag out for years or the relief may be inconsequential. A benchmarking model that is not prone to a case-by-case attack on hundreds of fronts will give shippers the predictability they need to challenge a rate and help all stakeholders avoid wasteful litigation.

As an offshoot of increased predictability, railroads and shippers will be more likely to reach commercial agreement on rates. During the rate negotiation process, they can use the Benchmark Method to identify the maximum reasonable rate and immediately determine whether a rate is unreasonable without any need to resort to the Board. This should drive railroads and shippers to agree on a reasonable rate and avoid situations where a shipper must

choose between a high contract rate, which may be unreasonable, but cannot be challenged, and an even higher tariff rate, which can be challenged only at an astronomical expense and with little predictability.

The Benchmark Method also has clear benefits for the Board. It eliminates the need for the Board to make “hundreds, if not thousands, of calls” to determine whether a rate is unreasonable.²⁵ Moreover, by providing greater predictability to shippers and railroads, it helps free the Board’s docket, both in terms of limiting the number of cases and reducing the number of issues the Board must decide in cases that are brought before it, while simultaneously providing captive shippers with greater accessibility to rate remedies. This enables the Board to direct more resources to other pressing matters.

The Benchmark Model is similar in concept to an econometric analysis that the TRB developed and presented in a study mandated by Congress in the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users of 2005.²⁶ TRB presented its report to the Board at a public hearing in STB Docket No. EP 722, *Railroad Revenue Adequacy*, held on July 23, 2015.²⁷ Whereas TRB constructed illustrative models as a “proof of concept” to demonstrate how an econometric model might be implemented in practice to show market dominance,²⁸ Dr. Caves has built upon that foundation to illustrate how an econometric model could be employed to predict a competitive rate for market dominant movements and to

²⁵ See *Sunbelt*, slip op. at 32 (Begeman, dissenting) (noting the myriad decisions the Board makes in resolving a SAC case).

²⁶ Public Law 105-59, Section 9007.

²⁷ Transportation Research Board, *Modernizing Freight Rail Regulation*, Special Report 318, National Academies of Sciences, Engineering, and Medicine (2015), available at <http://www.trb.org/Main/Blurbs/172736.aspx> (“TRB Report”).

²⁸ *Id.*, pp. 141-43, 225-58.

prescribe a maximum reasonable rate that permits an economically appropriate degree of differential pricing relative to the predicted competitive rate.

The Benchmark Method also is conceptually similar to, but economically more robust than, the existing Three-Benchmark approach, which is the rate reasonableness standard that the Board originally adopted for use in small rate cases in the 1996 *Simplified Standards* decision. The Three Benchmark approach is a simplistic comparison of the average R/VC ratio for a “comparable” traffic group selected from the CCWS through a final offer selection process and adjusted up or down based upon the defendant’s degree of revenue adequacy or inadequacy. This benchmark comparison group, however, does not attempt to draw comparisons with competitive movements and is not determined by statistical methods. Also, litigation is necessary to decide between each party’s benchmark group. In contrast, Dr. Caves’ approach employs objective criteria to identify a group of competitive movements and applies established statistical techniques to develop a model that predicts competitive rate levels for captive movements based upon the factors that have the greatest influence upon competitive rate levels. He then develops the CT to reflect the degree of differential pricing above the predicted rate level that, when applied to all captive movements, is needed to maintain revenue adequacy. Furthermore, unlike the Three-Benchmark approach which necessarily relies upon URCS to determine R/VC ratios, the Benchmark Method avoids URCS, which the TRB has described as fundamentally flawed.²⁹ The Benchmark Method thus is a more direct and robust application of economic principles in *Guidelines* than the Three-Benchmark method.

²⁹ TRB Report, pp. 110-19.

As Chairman Begeman has stated, the Board “must develop a new approach and provide a better rate review process for all stakeholders.”³⁰ In January 2018, she created the RRTF “to recommend improvements to the existing rate review processes and to propose new rate review methodologies that are more attuned to the realities of the current transportation world.”³¹ The RRTF Report contains multiple ideas and recommendations that merit further examination and development. But a glaring omission from that Report is any proposal to implement the revenue adequacy constraint in *Guidelines*. The Benchmark Method fills that void by providing an economically sound alternative to the SAC test that will improve access to rate relief and substantially reduce the burden of the rate review process.

3. The Board can and should adopt the benchmark method as a matter of law and policy.

The Board’s authority to adopt the Benchmark Method is clear. Congress has authorized the Board to regulate rail rates, and the Benchmark Method is within the parameters Congress set for the Board’s rate regulation. The Benchmark Method also furthers the Rail Transportation Policy.

Rate regulation is unquestionably within the Board’s authority. Congress expressly enabled the Board to determine whether a rate is reasonable³² and prescribe the maximum reasonable rate a carrier may charge for movements over which the carrier possesses market dominance.³³ The Board has developed and applied various methodologies to assess rate reasonableness and prescribe a maximum reasonable rate. The Benchmark Method is an

³⁰ *Consumers*, slip op. at 74 (Begeman, commenting).

³¹ RRTF Report at 1.

³² 49 U.S.C. § 10701(d).

³³ 49 U.S.C. § 10704(a)(1).

alternative to the existing rate-reasonableness methodologies and is predicated upon the same principles from *Guidelines* that are the foundation of those methodologies.

Although Congress placed limits on the Board's authority to regulate rates, the Benchmark Method falls within these limits. Congress set three conditions on the Board's power to regulate rates: it can prescribe rates only for traffic over which a rail carrier has market dominance;³⁴ it must consider three statutory factors, called the Long-Cannon factors, when determining rate reasonableness;³⁵ and it must help carriers attain revenue adequacy.³⁶ The Benchmark Method satisfies each of these conditions.

First, it applies only to traffic over which a railroad has market dominance, as determined under the Board's traditional market-dominance inquiry. This proposal does not seek to alter that requirement or the Board's existing standards for determining market dominance.

Second, the Benchmark Method accounts for the Long-Cannon factors. It is predicated upon the economic principles that the Board adopted in *Guidelines*, which give due consideration to the Long-Cannon factors.³⁷ By employing an econometric model to set the baseline for rate reasonableness at a competitive rate level and allowing a carrier to retain any excess revenue earned from rates on competitive traffic, the Benchmark Method incentivizes a pricing structure where most, if not all, of a carrier's traffic is contributing to going-concern value (Factor 1) and

³⁴ 49 U.S.C. 10701(d)(1).

³⁵ 49 U.S.C. § 10701(d)(2). These factors are: (a) the amount of traffic which is transported at revenues which do not contribute to going concern value and the efforts made to minimize such traffic; (b) the amount of traffic which contributes only marginally to fixed costs and the extent to which, if any, rates on such traffic can be changed to maximize the revenues from such traffic; and (c) the carrier's mix of rail traffic to determine whether one commodity is paying an unreasonable share of the carrier's overall revenues.

³⁶ 49 U.S.C. § 10704(a)(2).

³⁷ See *Guidelines*, 1 I.C.C. 2d at 540-41.

the carrier is maximizing its revenue from such traffic (Factor 2). Through the CT, the Benchmark Method addresses the extent to which a commodity is paying an unreasonable share of a carrier's overall revenues (Factor 3).

Third, the Benchmark Method furthers the policy of railroad revenue adequacy. As a threshold matter, it only applies to carriers that have attained long-term revenue-adequacy. In addition, it prevents rate prescriptions from causing a railroad to lose its revenue-adequate status.

The Benchmark Method also is consistent with, and in many cases promotes, the policy objectives that Congress articulated in the Rail Transportation Policy, 49 U.S.C. § 10101:

- It “allow[s], to the maximum extent possible, competition . . . to establish reasonable rates for transportation by rail.”³⁸ The Benchmark Method uses rates for competitive traffic as the baseline for determining rate reasonableness. It does nothing to limit rates or railroad profits earned from competitive traffic or from captive traffic priced at competitive levels.
- It promotes “fair and expeditious regulatory decisions”³⁹ and “provide[s] for the expeditious handling and resolution of [rate] proceedings.”⁴⁰ The Benchmark Method is more expedient and cost-effective than the Board's existing methodologies, which have proven to be ineffective and inaccessible to carload shippers. Because it is inexpensive, predictable and easy to apply, the Benchmark Method also minimizes the need for Federal regulatory control by facilitating parties' ability to negotiate reasonable commercial agreements without resort to the Board.
- It is consistent with the policy “to promote a safe and efficient rail transportation system by allowing rail carriers to earn adequate revenues.”⁴¹ The Benchmark Method employs a conservative approach that protects revenue adequacy and avoids lower-than-competitive rate prescriptions.
- It is consistent with the policy to “foster sound economic conditions in transportation and [] ensure effective competition . . . between rail carriers”⁴² The Benchmark Method will not disturb a carrier's revenue-adequate status. Also, by predicting a competitive

³⁸ 49 U.S.C. § 10101(1).

³⁹ 49 U.S.C. § 10101(2).

⁴⁰ 49 U.S.C. § 10101(2).

⁴¹ 49 U.S.C. § 10101(3).

⁴² 49 U.S.C. § 10101(5).

rate in an economically valid fashion, the Benchmark Method will incentivize a carrier which lacks effective competition to price as if effective competition existed.

- It helps “to maintain reasonable rates where there is an absence of effective competition and where rail rates provide revenues which exceed the amount necessary to maintain the rail system and to attract capital.”⁴³ The Benchmark Method ensures that reasonable rates are accessible where there is a lack of effective competition, because it provides an expeditious, low-cost method to identify reasonable rates for captive traffic. It also only addresses rates that provide revenue more than what is necessary for the carrier to maintain revenue adequacy.
- It “encourage[s] honest and efficient management of railroads.”⁴⁴ By applying a competitive standard to rates, the Benchmark Method induces railroads to manage their traffic honestly and efficiently.⁴⁵
- It “provide[s] for the expeditious handling and resolution of all proceedings...permitted to be brought under this part.” The Benchmark Method is as expeditious, if not more so, than any of the Board’s existing rate reasonableness methodologies. As such, the Benchmark Method also fulfills the Board’s statutory mandate “to establish a simplified and expedited method for determining the reasonableness of challenged rail rates in those cases in which a full stand-alone cost presentation is too costly, given the value of the case.”⁴⁶

The Benchmark Method thus is consistent with the Board’s rate-regulation authority and furthers the public-policy objectives that Congress specified for rail regulation.

B. Development Of The Benchmark Model

In his verified statement, Dr. Caves describes econometric modeling in general, followed by a discussion of the data he used to develop the Benchmark Model, the filters he employed to identify competitive rail movements in the data, and the defining characteristics of competitive moves that he employed as explanatory variables in the regression equation. He then analyzes the statistical significance of the results and discusses limitations that he encountered based upon

⁴³ 49 U.S.C. § 10101(6).

⁴⁴ 49 U.S.C. § 10101(9).

⁴⁵ See *Guidelines*, 1 I.C.C. 2d at 528, 534 (explaining that competitive pricing promotes efficient carrier management).

⁴⁶ 49 U.S.C. § 10701(d)(3).

the data available to him and how the Board's access to more complete data would improve those results. The following subparts summarize those points, identify the issues encountered as part of the process, and explains how those issues have been addressed in the Benchmark Model.

1. Description of econometric modeling

Econometrics is a statistical technique that focuses on the analysis of non-experimental data (i.e., data not obtained from controlled experiments) to estimate economic relationships, test economic theories, and evaluate and implement policies for both government and business. Caves V.S. ¶4. Econometric techniques are widely employed in academia, government and private business and are commonly accepted by courts in litigation. *Id.* ¶5.

Dr. Caves has employed regression analysis, which is the standard econometric tool for analyzing relationships between a dependent variable and a set of explanatory variables, to develop an econometric model of the relationship between rates and multiple shipment characteristics of competitive rail movements. *Id.* ¶¶5-6. In the Benchmark Model, the dependent variable is the rate (measured in dollars per ton-mile) paid for a competitive rail movement and the explanatory variables are economically relevant shipment characteristics. The model estimates the statistical relationship between the shipment characteristics and the rates of competitive rail movements and uses that relationship to predict competitive benchmark rate levels for captive movements based upon the same set of shipment characteristics for those captive movements. *Id.* ¶6.

2. Data sources.

Dr. Caves utilized multiple data sources to develop the Benchmark Model. The predominant data source is the CCWS. Caves V.S., ¶¶ 8-11 and Table 1. The CCWS is a statistical sampling of railroad waybills for shipments that railroads collect and maintain for use by the Board pursuant to procedures set out at 49 C.F.R. Part 1244. The Board granted ACC's

outside lawyers and consultants access to the CCWS for the years 2006-2013 to develop and test alternative rate case methodologies.⁴⁷ The Board, however, declined ACC's request for access to unmasked rates and to more recent years of the CCWS. More recently, the Board denied a second request by ACC to prepare a more robust presentation of its methodology in both this docket and EP 755.⁴⁸ The accuracy of the model and the strength of its results would be enhanced using unmasked revenue data and more current data which are available to the Board. *Id.* ¶¶ 8, 11. In view of the Board's reticence to provide ACC's consultants and counsel with the CCWS data needed to make a more robust presentation, Dr. Caves has provided instructions that enable the Board itself to substitute unmasked revenues and additional years of data in the model and to calculate a true CT. *Id.*, App. 1.

Dr. Caves also employed other data sources in combination with the CCWS to measure the competitive alternatives that may have been available to the shipper for any given movement in the CCWS. For example, he used the railroad network geographic information system data from the Centralized Station Master database and Port Series data published by the U.S. Army Corps of Engineers to assess the availability of competitive rail and water alternatives for each CCWS movement. *Id.* ¶¶ 12-13 and Table 1.

3. Defining the competitive sample.

The first step in developing the Benchmark Model required Dr. Caves to identify a sample of competitive movements from the CCWS (the "Benchmark Group"). Caves V.S. ¶14. Dr. Caves included a CCWS movement in the Benchmark Group if it satisfied any one of four criteria. *Id.*, ¶ 14.

⁴⁷ Waybill Request WB17-44, Letter from William Brennan to Jeffrey O. Moreno (April 17, 2018).

⁴⁸ Waybill Request WB19-48, Letter from William Brennan to Jeffrey Moreno (Sept. 30, 2019).

First, Dr. Caves included all CCWS movements of “exempt” traffic, pursuant to 49 U.S.C. § 10502 and identified at 49 C.F.R. Part 1039. An exemption means that the Board has determined that regulation of such traffic is not necessary to carry out the national rail transportation policies at 49 U.S.C. § 10101 and is not needed to protect shippers from abuse of market power. *Id.* This definition of competitive traffic may be over-inclusive given that many exempt commodity shippers currently are seeking to revoke their exemptions on grounds that they are not truly competitive.⁴⁹

Second, Dr. Caves included CCWS movements in the Benchmark Group that he identified as *potentially* subject to rail competition because the *same* competing Class I railroad operates within five miles of *both* the origin and destination. *Id.* This is a conservatively over-inclusive definition of competitive rail movements because many origins and destinations within five miles of an alternative railroad do not have access to that railroad at either or both end points. This is evident from Tables 2A and 2B of Dr. Caves’ verified statement which shows unrealistically high numbers of rail-competitive shipments in column 4 for *all* 2-digit STCCs. Dr. Caves applied a five-mile distance to minimize the effects upon the Benchmark Model of incorrectly identifying too many captive CCWS movements as rail-competitive.⁵⁰ By requiring the *same* Class I railroad at both the origin and destination, Dr. Caves also sought to include in the Benchmark Group only CCWS movements with potential competing single line alternative routes.⁵¹

⁴⁹ *E.g.*, STB Docket No. EP 704 (Sub-No. 1), *Review of Commodity, Boxcar and TOFC/COFC Exemptions* (served March 23, 2016).

⁵⁰ Dr. Caves tested rail distances of 5, 25 and 50 miles in his Benchmark Model regressions and determined that the R-squared value was consistently higher in all possible combinations of rail distances with the same distance variations for potential water competition. Caves V. S., Table 3.

⁵¹ Use of the term “single-line” above is in reference only to the route of the movement as reported in the CCWS. For example, a Rule 11 CCWS movement from origin to an interchange

Third, Dr. Caves included CCWS movements in the Benchmark Group that he identified as *potentially* subject to water competition because at least one port on the same waterway was located within five miles of both the origin and destination stations. Caves V.S., ¶ 14. This almost certainly is an over-inclusive definition of competitive water movements because some commodities may not be amenable to water transport and/or transloading from truck to water vessel, a port may not be capable of handling a commodity, or a CCWS movement may be a Rule 11 movement where the origin or destination is an interchange that would require an inefficient double transload between truck, rail, and vessel. Just as he did for potentially competitive rail movements, Dr. Caves selected a five-mile distance parameter to minimize the effects upon the Benchmark Model of incorrectly identifying too many captive CCWS movements as water-competitive. Dr. Caves required the CCWS origin and destination to be on the same waterway to ensure that a water route exists for the full movement distance.

Fourth, Dr. Caves included CCWS movements in the Benchmark Group that he identified as *potentially* subject to truck competition because the movement was less than 200 miles and the shipment size was less than five carloads. *Id.* ¶ 14. The Board has evaluated a variety of different distance thresholds to determine the effectiveness of truck competition, with 150-500 miles being the predominant range, often varying with the commodity.⁵² By using 200 miles as

is considered a single-line movement. The Benchmark Model accounts for cost differences between movement types that can influence rates by including an explanatory variable for each Rebill Code in the CCWS (Local Shipment, Originated-Delivered, Received-Delivered, and Received-Terminated). *Id.*, ¶10 n. 16.

⁵² See e.g., *Union Pac. R.R.—Abandonment—In New Madrid, Scott & Stoddard Counties, MO*, STB Docket No. AB-33 (Sub-No. 261), 2009 STB LEXIS 268, at *11 (STB June 17, 2009) (UP argues that trucks are competitive in “similar short-haul markets” of 280 miles); *Rail Gen. Exemption Auth.—Exemption of Paints, Enamels, Lacquers, Shellacs, Etc.*, Ex Parte No. 346 (Sub-No. 33), 1998 STB LEXIS 107, at *8-9 (STB April 20, 1998) (noting CMA testimony that 300-600 mile hauls preclude trucks as viable competitors); *Dep’t of Transp.*, 3 S.T.B. 62, 64 n.5 (1998) (scrap metal moving less than 600 miles is vulnerable to truck competition); *Union Pac.*

the threshold for classifying a CCWS movement as truck-competitive, Dr. Caves has minimized the risk of false positives skewing the results of the Benchmark Model. Also, by imposing a 5-car shipment size maximum, Dr. Caves eliminates high volume CCWS movements that would require too many trucks to be feasible.

Dr. Caves notes that his classification scheme for competitive movements has the potential to commit two types of errors, neither of which undermines the reliability of his Benchmark Model. Caves V.S., ¶19. A Type I error mistakenly omits a competitive movement from the competitive sample. A Type II error mistakenly includes a captive movement in the competitive sample. A Type I error does not render the Benchmark Model unreliable because an under-inclusive classification scheme does not imply that the resulting sample is not effectively competitive. *Id.* Conversely, a Type II error that misclassifies a captive movement as competitive merely dilutes the degree of competition represented in the competitive sample (i.e. the Benchmark Group). This error renders the Benchmark Model more conservative by predicting competitive rates that are slightly higher than a true competitive level. *Id.*, ¶ 20. This

Corp.—Control & Merger—S. Pac. Rail Corp., 1 S.T.B. 233, 392 (1996) (KCS study considers trucks non-competitive above 500 miles); *Rail Gen. Exemption Auth.—Exemption of Grease or Inedible Tallow, Etc.*, 10 I.C.C.2d 453, 461 (1994) (adopting 500 mile threshold for truck competition); *Rail Gen. Exemption Auth. Exemption of Rock Salt, Salt*, 10 I.C.C.2d 241, 246 (1994) (trucks are dominant mode at 100-150 miles); *Rail Gen. Exemption Auth.—Pet. of AAR to Exempt Rail Transp. of Selected Commodity Groups*, 9 I.C.C.2d 969, 975-77 (1993) (exemptions granted where most traffic moves at distances under 200 miles, which are less than the system averages); *Union Pac. Corp. —Control—Mo.-Kan.-Tex. R.R.*, 4 I.C.C.2d 409, 442-43 (1988) (finding that trucks can be effective competitors for grain up to 250 miles); *CSX Corp—Control—Sea-Land Freight Serv., Inc. & Intermodal Sys., Inc.*, 3 I.C.C.2d 512, 530 (1987) (rail has “a decided competitive edge over motor carriers for COFC movement of about 500 miles or longer”); *Chi., Milwaukee, St. Paul and Pac. R.R.—Reorganization—Acquisition by Grand Trunk Corp.*, Finance Docket No. 28640 (Sub-No. 9), 1984 ICC LEXIS 288, at *206 (ICC Sept. 12, 1984) (truck competition not effective above 425 miles); *CSX Corp.—Control—Am. Commercial Lines, Inc.*, 2 I.C.C.2d 490, 548-49 (1984) (“trucks compete effectively for [grain] traffic on movements of [150-200 miles]”); *Nationwide Increased Freight Rates & Charges*, 1977, 359 I.C.C. 312, 331 (1978) (truck competition for caustic soda exists up to 200 miles).

also explains why Dr. Caves has applied competitive screens at the low end of the distance parameters for rail, water, and truck competitive options, so as to mitigate the dilutive impact of Type II errors. What matters most when defining a competitive sample is to establish an economically reasonable and workable set of criteria for identifying CCWS movements subject to effective competition and applying those criteria consistently. *Id.* ¶ 18.

Dr. Caves has reported the results of applying these competitive screens to the CCWS from the years 2006-2013 in Tables 2A and 2B of his Verified Statement. He reports the percent of CCWS movements that satisfy each individual screening filter and any single one filter at the two-digit STCC level. Approximately 76% of the CCWS movements have been included in the competitive sample, which is approximately 80% of total movements when the CCWS expansion factors are applied, because they satisfy at least one of the competitive filters. *Id.*, ¶¶ 15 & 17. The percentages vary widely by 2-digit STCC, which is to be expected because some commodities are more amenable to alternative transportation modes than others. Table 1 below, which is excerpted from Table 2B in the Caves Verified Statement illustrates these variations:

TABLE 1: COMPETITIVE SCREENS (WEIGHTED BY EXPANSION FACTORS)

Commodity Name	STCC Code (2-Digit)	Share of CCWS Shipments Satisfying Screen 1 (Deregulation)	Share of CCWS Shipments Satisfying Screen 2 (Paired Class I RR within 5 Miles of O & D)	Share of CCWS Shipments Satisfying Screen 3 (Port within 5 Miles of O & D on Same Waterway)	Share of CCWS Shipments Satisfying Screening Screen 4 (<200 Miles, <5 Cars)	Share of CCWS Shipments Satisfying Any Screen
ALL	ALL	25.9%	67.2%	6.9%	5.1%	80.0%
Farm Products	1	33.1%	68.2%	1.4%	5.0%	79.9%
Forest Products	8	0.0%	71.6%	0.4%	0.6%	71.6%
Metallic ores	10	0.0%	28.4%	5.0%	6.4%	33.1%
Petroleum (Crude)	13	0.0%	17.4%	1.3%	2.6%	18.8%
Pulp, Paper or Allied Products	26	63.0%	45.9%	5.1%	6.1%	83.1%
Chemicals or Allied Products	28	2.6%	42.4%	15.2%	15.3%	54.9%
Petroleum/Coal Products	29	2.6%	44.3%	12.4%	15.9%	53.5%
Clay, Concrete, Glass or Stone Products	32	44.9%	26.2%	4.9%	12.8%	57.9%
Waste Hazardous or Waste Hazardous Substances	48	0.0%	31.6%	7.1%	7.4%	41.0%

The large number of total movements identified as competitive likely reflects a Type II error (i.e. misidentifies captive movements as competitive), which means the Model's predicted competitive rate levels will be conservatively higher than reality.

4. The econometric model.

After identifying a competitive sample of CCWS movements, Dr. Caves used that sample to estimate the econometric model. Caves V.S., ¶ 21. The dependent variable that the model is designed to predict is the natural log of revenue per ton-mile. *Id.* The model also includes fixed effects that control for: (1) different commodities at the 5-digit STCC level; (2) different

railroads; and (3) different years. *Id.* The latter two fixed effects are controlled by the same indicator variables that Dr. Caves employs to control for revenue masking in the CCWS since the

TABLE 2: DATA FIELDS USED IN BENCHMARK MODEL

Data Field	Source/Details
Revenue ⁵³	CCWS: Freight Revenue (Code 15) + Transit Charges (Code 16) + Miscellaneous Charges (Code 17) + Fuel Surcharges (Code 202)
Weight	CCWS: Billed Weight Tons (Code 99)
Deregulation Flag	CCWS: Deregulation Flag (Code 96)
Distance	CCWS: Total Distance (Code 123)
Revenue per Ton-Mile	[Revenue]/[Weight*Distance]
Shipment Size	CCWS: Number of Carloads (Code 5)
# of RRs in Movement	CCWS: Junction Frequency (Code 87) + 1
Private Car Indicator	CCWS: Car Ownership Category (Code 93)
3 & 5-digit STCC	CCWS: Commodity Code (non-HAZMAT STCC) (Code 76)
Hazardous Materials Indicator	CCWS: Based on 49 series Commodity Code (STCC-HAZMAT) (Code 12)
Rule 11 Indicator	CCWS: Rebill Code (Code 24)
Reporting Railroad Indicator	CCWS: Reporting Railroad (Code 31)
Longest Railroad Indicator	CCWS: Based on longest Railroad Distance (Codes 113-119)
Year Indicator	CCWS Year
Masking Factor Indicator	Separate Indicator for Each Unique Combination of Reporting Railroad, Year, 3-digit STCC
Number of Alternative Class 1 Rail Road Stations Within 10 Miles of Origin and Destination	CCWS, Station Master Data, GIS
Number of Water Ports Within 10 Miles of Origin and Destination	CCWS, Port Series Data, GIS

Board declined ACC's request for unmasked revenue. *Id.* Dr. Caves also included explanatory variables for individual movement characteristics such as distance and size. *Id.* Table 3 in Dr. Caves' verified statement identifies each explanatory variable in the first column. Table 1 in Dr.

⁵³ Revenue figures are adjusted to 2009 dollars using the Consumer Price Index as reported by the St. Louis Federal Reserve, available at <https://fred.stlouisfed.org/>

Caves' verified statement, which is reproduced as Table 2 above, summarizes all the above data and their sources. Finally, the model contains a random error term which is standard for any econometric model and weights each observation by the CCWS expansion factor. *Id.*

5. Benchmark model results.

After developing the Benchmark Model, Dr. Caves applied the regression equation to 3.5 million data points for the Benchmark Group and evaluated the results. Caves, V.S., ¶ 23. He tested nine different permutations of the Benchmark Group. The base group employs the 5-mile distance parameter for identifying both competitive rail and water movements; the other eight groups are combinations of 5, 25- and 50-mile distance parameters for identifying competitive rail and water movements. *Id.*, ¶ 22 and Table 3.

The Benchmark Model produced results that were both highly statistically significant and made economic sense. The Model for the base Benchmark Group explains approximately 57% of the variation in (masked) revenue per ton-mile, which would be expected to increase with the substitution of unmasked revenue. *Id.*, ¶ 23. This R-squared measure is particularly significant given the very large size of the Benchmark Group (76% of CCWS movements from 2006-13). *Id.*, ¶¶ 15 & 23 n. 32.

The coefficients for each explanatory variable also were highly statistically significant and made economic sense. For example, the coefficients of the distance variable were consistently negative, which indicates that increases in distance are associated with decreases in revenue per ton-mile. *Id.*, ¶ 23. Similarly, the coefficient of the hazardous materials variable was positive, indicating that hazardous materials are more costly to transport than non-hazardous materials. *Id.*, ¶ 24. Table 3 of Dr. Caves' verified statement presents complete results for all the explanatory variables.

Next, Dr. Caves applied the Benchmark Model to the 24% of CCWS movements that did not satisfy any of the four competitive filters applied to select the Benchmark Group and compared the actual rates for those movements to the Model's predicted competitive rates. *Id.*, ¶¶ 25-29. Dr. Caves presents the results in Table 4. Excerpts for selected STCCs are presented in Table 3 below.

TABLE 3: RATIO OF ACTUAL RATE TO COMPARABLE PREDICTED COMPETITIVE RATE FOR BASELINE BENCHMARK GROUP (5MI RR, 5MI WATER)

Commodity Name	STCC Code (2-Digit)	Avg. Ratio	% with Ratio > 1.5	% with Ratio > 2	% with Ratio > 3	% with Ratio > 5
ALL	ALL	1.48	26.1%	11.6%	3.7%	0.9%
Farm Products	1	1.34	18.3%	5.8%	2.0%	0.9%
Forest Products	8	1.25	19.7%	8.8%	1.5%	0.0%
Metallic ores	10	1.68	16.4%	10.5%	2.9%	2.6%
Petroleum (Crude)	13	1.21	8.4%	2.1%	1.1%	0.6%
Pulp, Paper or Allied Products	26	1.24	21.1%	7.4%	1.7%	0.4%
Chemicals or Allied Products	28	1.33	24.8%	10.0%	2.5%	0.5%
Petroleum	29	1.28	14.2%	4.6%	1.9%	0.6%
Clay, Concrete, Glass or Stone Products	32	1.29	24.9%	8.1%	2.0%	0.4%
Waste Hazardous or Waste Hazardous Substances	48	1.16	15.5%	7.8%	3.3%	1.7%

On average across this entire group of non-competitive CCWS movements, the actual rates exceeded the predicted rates by approximately 48%, which suggests this is the average level of differential pricing across the Class I railroads. For 26% of the non-competitive CCWS moves, the actual rates exceeded the predicted competitive rates by more than half; 12% by more than double; 4% by more than triple; and 1.0% by more than five times. *Id.*, ¶ 28 and Table 4. This

reflects the degree of differential pricing based upon demand elasticity. Dr. Caves also calculated these values for each group of 2-digit STCC movements.

C. Application Of The Benchmark Model To Rate Regulation.

As demonstrated in the preceding Part II.B, the Benchmark Model is a highly statistically significant tool for predicting competitive rate levels for captive movements. A straight-forward application of the Benchmark Model's results to rail rate regulation, however, does not account for a rail carrier's potential need to differentially price captive traffic above competitive rate levels to achieve and maintain revenue adequacy. Therefore, an additional step is needed to determine the appropriate level of differential pricing above the Model's predicted competitive rate. To accomplish this, Dr. Caves developed the "Competitive Threshold," or "CT," to determine the maximum ratio by which rates for market dominant movements would be permitted to exceed competitive rates while still satisfying the Board's rail revenue adequacy standard. The following sections: (1) address the relationship between CT and Constrained Market Pricing, or "CMP;" and (2) describe the mechanics of developing and applying the CT and illustrate the results when applied to the Benchmark Model.

1. The Competitive Threshold is based upon Constrained Market Pricing principles.

In *Guidelines*, the ICC adopted CMP as the economic basis for determining the reasonableness of captive rates. The agency determined that "the cost structure of the railroad industry necessitates differential pricing of rail services" because "[r]ailroads' long-run marginal costs are less than their long-run average costs, and this differential cannot be assigned directly to specific movements."⁵⁴ These "unattributable costs" must be covered through differential

⁵⁴ 1 I.C.C. 2d at 526.

pricing in the form of higher rates paid by captive traffic.⁵⁵ The ultimate objective of CMP is to determine the degree to which captive traffic should pay higher rates than competitive traffic.

The ICC adopted a flexible approach towards applying CMP to the rate analysis from one of four perspectives:⁵⁶

(1) appropriate level and minimum cost of efficient service to the captive shipper (in the stand-alone cost analysis); (2) the appropriate level of carrier revenue needs (in the revenue adequacy examination) (3) the other available means of meeting (or eliminating) those revenue needs (through the scrutiny of the carrier's efficiency); and (4) the public interest in minimizing economic disruptions [phasing].⁵⁷

The ICC concluded that, through application of these pricing constraints, “[c]arriers will be effectively limited in the rates they can charge on captive traffic and will have the necessary incentive to maximize the net revenue contribution from competitive traffic.”⁵⁸

The ICC adopted CMP as a substitute for “Ramsey pricing.”⁵⁹ Ramsey pricing is “pricing in accordance with demand,” which is a “widely recognized method of differential pricing” by which unattributable costs “are allocated among the purchasers or users of rail service in inverse relation to their demand elasticity.”⁶⁰ The ICC concluded, however, that it was not “practical to impose pure Ramsey pricing as a regulatory requirement for across-the-board

⁵⁵ *Id.*

⁵⁶ Each of these four so-called “constraints” implement one or more the following four CMP objectives: (1) a captive shipper should not be required to pay more than is necessary for the rail carrier to earn adequate revenues; (2) a captive shipper should not be required to pay more than is necessary for efficient service; (3) a captive shipper should not bear the costs of any facilities or services from which it derives no benefit; and (4) shipper responsibility for the costs of shared facilities and services should be apportioned according to demand elasticities. *Id.* at 523-24.

⁵⁷ *Id.* at 524 [emphasis added].

⁵⁸ *Id.*

⁵⁹ *Id.* at 533-34.

⁶⁰ *Id.* at 526-27.

application in all cases,” because it was too difficult and burdensome to calculate both the marginal cost and the elasticity of demand for every movement.⁶¹ The ICC concluded that “CMP approaches the same task more directly” because, “[a]s with Ramsey pricing, services are priced according to market demand and to cover only the total costs of an efficient carrier.”⁶²

“CMP provides two approaches for determining the revenue requirements of an efficient carrier” consistent with Ramsey pricing.⁶³ The first approach determines a carrier’s revenue requirements on a system-wide basis by applying the revenue adequacy and management efficiency constraints; alternatively, the SAC constraint determines the revenue requirements for a hypothetical plant size and traffic base that is designed to maximize efficiencies and production economies.⁶⁴ In either case, “CMP will have defined the total amount of unattributable costs to which the shipper must contribute and focused on the traffic which can reasonably be expected to pay those costs. . . . The result of this process is a rate structure which reflects long-run marginal costs, demand elasticity, and differential pricing of unattributable costs – the same result that occurs under Ramsey pricing.”⁶⁵

Thus, pursuant to *Guidelines*, revenue adequacy is a constraint upon the permissible degree of differential pricing because “[c]arriers do not need greater revenues than this standard permits, and we believe that, in a regulated setting, they are not entitled to any higher revenues.”⁶⁶ “Captive shippers,” the agency declared, “should not be required to continue to pay

⁶¹ *Id.* at 527.

⁶² *Id.*

⁶³ *Id.*

⁶⁴ *Id.* at 534, 542.

⁶⁵ *Id.* at 534.

⁶⁶ *Id.* at 535. [emphasis added].

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.”⁶⁷

Since the adoption of *Guidelines* in 1985, however, nearly all rail rate reasonableness determinations have been made under the SAC constraint. There have been few attempts to apply a system-wide approach based on revenue adequacy due to a combination of factors, including uncertainty over how to do so and the fact that few if any carriers were deemed revenue adequate over time prior to the past decade. As explained in the next section, Dr. Caves has developed the CT concept to establish the minimum mark-up above the Benchmark Model’s predicted competitive rates for captive traffic that a railroad would need to charge to maintain revenue adequacy. That mark-up, or some higher level that the Board may select for policy reasons, could establish the maximum level of differential pricing permitted on captive traffic based upon CMP principles.

2. Calculation of the Competitive Threshold.

The CT is a multiplier that is applied to the Benchmark Model’s predicted competitive rate for a captive movement to determine the prescribed maximum reasonable rate. The level of the CT is based on an analysis of the defendant-railroad’s revenue adequacy over time. To the extent that a railroad can achieve and maintain revenue adequacy at competitive rate levels, no mark-up would be warranted, and the Benchmark Model would set the prescribed rate. But if some degree of differential pricing is needed to maintain revenue adequacy, the CT prevents that level from exceeding what is necessary, consistent with *Guidelines*.⁶⁸ Because the Benchmark

⁶⁷ *Id.* at 535-36.

⁶⁸ *Id.*

Model would never prescribe a rate below the predicted competitive level, the defendant would retain all such revenue even if its total revenue exceeds the revenue adequacy threshold.⁶⁹ Dr. Caves explains how the CT works in Part III of his Verified Statement (§§ 31-42).

To develop the CT, Dr. Caves first had to decide over what time to measure revenue adequacy. Based upon his prior testimony to the Board in Docket No. EP 722 (Sub-No. 2),⁷⁰ Dr. Caves selected the most recent six-year period of CCWS data provided by the Board, which covered 2008-2013. Caves V.S., ¶ 36. Six years is the average business cycle in the post-World War II period.⁷¹ For illustrative purposes, however, Dr. Caves also looked at the three-year period from 2011-2013 to exclude anomalous one-time aberrations caused by the “Great Recession” which extended from December 2007 through June 2009 and continued to exhibit weak economic conditions in its immediate aftermath. *Id.*, ¶ 36 & n. 39. The RRTF Report has proposed a different definition of “long-term revenue-adequacy” that Dr. Caves also desired to model, but the Board denied ACC’s request for the additional CCWS data needed to do so.⁷²

For each Class I railroad, Dr. Caves developed a multi-year version of the Board’s annual revenue adequacy calculations to compare each railroad’s weighted average ROI to the weighted average industry cost of capital for each of the six- and three-year time periods he studied. *Id.*,

⁶⁹ For this reason, the CT is not a revenue cap any more than SAC is a revenue cap. A railroad is free to earn revenue that exceeds a revenue adequate level so long as it does so at competitive rate levels. It may not do so, however, on the backs of captive shippers.

⁷⁰ Reply Comments submitted by Concerned Shipper Associations, Ex Parte No. 722 (Sub-No. 2), Railroad Revenue Adequacy, Verified statement of Kevin Caves and Hal Singer, pp.13-14 (dated Nov. 4, 2014).

⁷¹ 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>.

⁷² Waybill Request WB19-48, Letter from William Brennan to Jeffrey Moreno (Sept. 30, 2019).

¶ 37. In both time periods, BNSF, NS and UP were all found to be revenue adequate. *Id.*, ¶¶ 38-39 & 42-43.

After determining which railroads were revenue adequate over these two time periods, Dr. Caves estimated the impact of the Benchmark Model's predicted competitive rate levels upon each of those railroads' total revenue. He did this by applying the Benchmark Model's predicted competitive rate to every movement from the captive group of movements in the CCWS. *Id.*, ¶ 33. This is a conservative approach because his assumptions that shippers would challenge their rates for every such movement and that the Board would find market dominance in every circumstance are unrealistic. *Id.* Because of these conservative assumptions, railroads will continue to retain the excess revenue they receive on unchallenged rates for captive movements even when those rates otherwise are unreasonable. Dr. Caves also conservatively assumed that railroad revenue would fall in direct proportion to rate reductions, without any offsetting revenue from higher demand spurred by those same rate reductions. *Id.*, ¶ 34. Because the CCWS is a random sample of each railroad's total movements, Dr. Caves weighted the revenue reductions for the CCWS movements by their expansion factors to estimate the total impact of applying the Benchmark Model's predicted competitive rates to every potentially captive CCWS movement. *Id.*, ¶ 38 n. 42.

Finally, to calculate the minimum viable CT for each of these revenue adequate railroads, defined as the lowest value that would still maintain revenue adequacy for the railroad, Dr. Caves calculated a Revenue Reduction Factor ("RRF") for each CCWS movement previously identified as potentially non-competitive. *Id.* The RRF is a value implied by the Benchmark Model's rate adjustment that, when multiplied by the revenue per ton-mile of the affected CCWS movement, brings the rate in line with a selected CT value. *Id.* Dr. Caves calculated a weighted

average RRF across all the CCWS movements in both the three- and six-year study periods, with each movement weighted by its CCWS expansion factor and the railroad's annual freight revenue. *Id.* The weighted average RRF provides an estimate of the extent to which each railroad's total freight revenue would be reduced if all the rates for all potentially non-competitive movements were adjusted down to the selected CT level. *Id.* The objective is to identify the lowest CT value that maintains a railroad's total revenue at a level that preserves its revenue adequacy over the relevant time periods. Ultimately, whether the Board sets each railroad's CT at the minimum viable level or some higher point is a policy determination.

For illustrative purposes only, Dr. Caves calculated a CT for BNSF, NS and UP, in both the three- and six-year study periods, that would preserve the revenue adequacy of each railroad over those same periods. *Id.*, ¶¶ 38-42, Tables 5 & 6. Table 5 below provides the CT that Dr. Caves estimated for each of the three revenue-adequate railroads in the two time periods studied:

Table 5: Illustrative CT Calculations

	2008-2013	2011-2013
BNSF	1.70	1.0
NS	2.30	1.8
UP	1.45	1.0

For the full six-year analysis that included the Great Recession, the CT multiplier would increase the Benchmark Model predicted rates by 70% for BNSF, 130% for NS, and 45% for UP. Excluding the Great Recession years, there would be an 80% increase for NS and no increase for BNSF or UP.⁷³

⁷³ Dr. Caves did not have sufficient data to calculate a CT over his recommended six-year period when excluding the Great Recession years.

These results are only illustrative because Dr. Caves did not have access to unmasked CCWS revenues. Although Dr. Caves could apply statistical tools to generate statistically significant results in the Benchmark Model's regression equation, despite masked revenues, there are no such tools for determining an appropriate CT. Dr. Caves, however, has provided instructions that permit the Board to readily substitute unmasked revenue into the model and add more years of CCWS data. Caves V.S., Ex. 1. This would enable the Board both to develop real-world CT and to substitute the RRTF Report's proposed definition of long-term revenue-adequacy.

D. Rulemaking Request.

Through this testimony, ACC asks the Board to initiate an informal rulemaking proceeding to adopt the Benchmark Method as an economically-supported methodology for determining the reasonableness of rates published by revenue-adequate railroads on market dominant movements. Such methodology should be treated as the economic equal to SAC, not as a simplified methodology that is subject to restrictions because it is deemed less robust economically.

Dr. Caves has offered the Board a working model to serve as a baseline proposal upon which to build an economically sound and practical to implement Benchmark Method. First, he has employed well-established statistical tools to develop a specific Benchmark Model for consideration. The resulting regression equation has proven to yield statistically significant results in the form of predicted competitive rates for captive traffic. Second, Dr. Caves has developed explicit procedures for calculating the CT, which determines the degree of differential pricing that is permitted above the predicted competitive rate to maintain the defendant railroad's long-term revenue adequacy. Together, these procedures constitute a rate reasonableness standard that is based upon the same economic principles of CMP that underlay the Board's

existing rate reasonableness methods, but without the time, cost, and complexity associated with those methods.

There are multiple subjects that the Board would need to address as part of a rulemaking proceeding to adopt the Benchmark Method for challenging the rates of revenue adequate railroads using a combination of the Benchmark Model and the CT. Such a proceeding would need to address the following subjects:

- Develop and adopt a Benchmark Model for predicting competitive rates for captive traffic.
 - Determine the explanatory variables to model in the regression equation.
 - Determine the data sources and time periods to model in the regression equation.
 - Determine the appropriate filters used to identify competitive movements from the rail movement data.
- Determine a method for calculating the CT.
 - Define long-term revenue adequacy.
 - Determine data sources.
- Address rate prescription issues and procedures for updating the Benchmark Model and CT.
- Address joint rate prescription issues.
- Adopt a process and timeline for Benchmark Method cases.

In each of the following subparts, ACC discusses the details that should be addressed with respect to each of the foregoing subjects.

As a threshold matter, because the Board has declined to grant ACC access to unmasked waybill revenue and more current data, the Board itself should re-run both the Benchmark Model

and CT calculations with the latest available unmasked revenue so that this proposal can be fully evaluated without the distortions of masking.⁷⁴

1. Develop and adopt a benchmark model for predicting competitive rates for captive traffic.

The Benchmark Model is the foundation of the Benchmark Method because it establishes the baseline rate from which to determine the degree of differential pricing to be permitted by the CT. Therefore, the Board should solicit comments on the concept of competitive rate benchmarking through regression analysis and the specific Benchmark Model developed by Dr. Caves.

a. Explanatory variables.

The Benchmark Model attempts to identify the most significant and practical to determine factors that explain the rates for competitive rail movements and to apply those factors to predict competitive rate levels for captive movements. Part II.B.4. above discusses the explanatory variables that Dr. Caves employed in his proposed model. The Board should solicit comment on the strength and relevance of those factors and any other factors that should be tested, including potential data sources for those factors.

b. Data sources and time periods.

Dr. Caves has developed his Benchmark Model with the data sources identified in Part II.B.2, above. The confidential CCWS is the core data source to populate the model with real-world rail movements. Other data sources that are publically available have been used to develop and apply the filters for categorizing each CCWS movement as potentially competitive

⁷⁴ The Board has access to the unmasked revenues and Dr. Caves has provided instructions for substituting those revenues for the masked revenues in his work papers to generate more accurate results. Caves V.S., Ex. 1.

or captive. The Board should solicit comment on the reasonableness of relying upon these data sources and potential alternative and/or supplemental data sources.

In addition, the Board should solicit comment on the effects of data time lags. The CCWS, the Board's annual rail industry cost-of-capital and revenue adequacy determinations, and potentially other data sources are produced with a 1-2-year time lag. As a result, a rail rate challenge based upon the Benchmark Method necessarily must rely upon data that may not fully reflect current market conditions. But these are not issues of first impression for the Board, which utilizes CCWS and other data with time lags in the existing Three-Benchmark methodology for small rate cases and employs multiple years of data to smooth out aberrations.⁷⁵ The data relied upon in SAC cases also is several years old by the time the Board issues its final decision four or more years after the original complaint. Moreover, SAC relies upon forecasts that look 10-20 years forward and change over the course of the SAC litigation. The Benchmark Model relies upon multiple years of CCWS data and includes an independent variable for each year. Similarly, the CT would be based upon multiple years of data (Dr. Caves has used six years). Do these facts sufficiently address any issues caused by a 1-2 year data time lag? Are there other practical measures that the Board could or should take to address or mitigate the impact of this time lag? Is the impact of such time lags any greater than it is for SAC cases?

The Board also should solicit comment on how many years of CCWS data to include in the Benchmark Model. More data provides a more robust model. Market conditions and explanatory variables, however, may evolve over time. Dr. Caves' proposed model accounts for differences over time by including the year as an explanatory variable in the model, but does there come a point when that is insufficient? The most logical choices are to pick a start date and

⁷⁵ *Simplified Standards* slip op. at 80, 84-85.

simply add new CCWS movements each year or choose a rolling time-period (e.g. 10 years) where the newest year of CCWS data replaces the oldest year of data annually. If the latter choice is selected, should the rolling time period correspond with the time period for determining revenue adequacy in the CT calculation?

c. Competitive movement filters.

As discussed in Part II.B.3, the Benchmark Model requires some means to identify potentially competitive movements in the CCWS. Are the filters Dr. Caves used reasonable? Are there other filters that are practical to apply using available data that should supplement or replace Dr. Caves' filters?

Although Dr. Caves observes that classifying CCWS movements as competitive or non-competitive with broad brush filters will result in some misclassification, he also explains that the two types of potential errors, omission of a competitive movement from the competitive sample (Type I) and including a captive movement in the competitive sample (Type II), do not render the Benchmark Model's results inaccurate for Type I errors and generate conservatively higher predicted rates for Type II errors. Caves V.S., ¶¶ 19-20. Thus, the resulting prescribed rates are likely to be higher than they otherwise would be if a more accurate and practical method existed for identifying competitive CCWS movements. Parties should be asked to comment on the impacts of Type I and II classification errors. Do the benefits of applying broad brush factors outweigh the benefits of greater precision through means that are impractical or impossible to implement without the expenditure of significant time and expense?

2. Competitive Threshold.

As discussed in Part II.C. above, the CT concept has been designed to apply the revenue adequacy constraint in *Guidelines*. The Board, as a general matter, should solicit comment on the economic support for a rate reasonableness methodology based upon application of the CT to

the Benchmark Model's predicted competitive rate to determine an appropriate degree of differential pricing, including any alternatives to the methodology that Dr. Caves has developed.

In addition to the broader questions about the benchmarking and CT concepts, the Board should solicit comment on certain matters related to development of the CT. The most significant such question is the time period for determining revenue adequacy. Dr. Caves has proposed six years which is the average business cycle in the post-World War II period.⁷⁶ In *Guidelines*, 1 I.C.C. 2d at 536, noting that in any industry there are "business cycles" that produce years when earnings exceed projection and years when they fall short, the ICC emphasized that "revenue adequacy is a long-term concept that calls for a company, *over time*, to average return on investment equal to its cost of capital." [emphasis in original]. Thus, examining revenue adequacy over the average length of a modern business cycle appears to provide a reasonable time period for calculating the CT for application in rate reasonableness proceedings. The Board should solicit comment on this approach and alternative time periods.

The RRTF recently proposed a similar approach to defining "long-term revenue adequacy."⁷⁷ Instead of selecting a fixed period of time, however, the RRTF recommended "the shortest period of time, not less than five years, that includes both a year in which a recession began and a year that follows a year in which a recession began."⁷⁸ It is not clear from the RRTF Report whether this definition is based upon weighted or simple averages. The Board should use a weighted average and it should be cautious about looking back ten years to the worst recession since the 1930's, which is not representative of typical recessions. Therefore, Dr. Caves chose to

⁷⁶ See notes 66 & 67 above.

⁷⁷ See RRTF Report, pp. 32-36.

⁷⁸ *Id.* at 33.

analyze time periods that both did, and did not, include the most recent year in which the Great Recession began. Caves V.S., ¶ 36.

The Board also must decide at what level to set the CT. As detailed in Part II.C.2. above, the approach illustrated by Dr. Caves begins with the conservative assumption that all non-competitive traffic in the CCWS over the revenue adequacy measurement period would pay the benchmark competitive rate level even though that is highly unlikely. If the total potential revenue reduction after applying the CCWS expansion factor still leaves the defendant railroad revenue adequate, the CT would be set at 1.0, which means a shipper would pay the predicted competitive rate without a differential pricing mark-up because differential pricing is not warranted on captive traffic when a railroad is revenue adequate at competitive rate levels. But if the total potential revenue reduction would cause the defendant-railroad to become revenue inadequate, the minimum CT would be a multiplier that preserves total revenue at the revenue adequate level. The Board, however, may have policy reasons consistent with its statutory mandates for setting the CT at a higher level. The Board should solicit comment on the existence of such policies and how those policies should affect the level of the CT, especially in view of the conservative assumptions that Dr. Caves already has built into his model which will provide smaller rate reductions than a truly competitive rate would merit.

3. Rate prescription issues and updating the benchmark method.

Once the Benchmark Method determines a reasonable rate, what happens? For example, how long should a rate prescription last; should the prescribed rate be indexed or subject to other adjustments periodically; what happens if a rail carrier becomes revenue inadequate during the rate prescription period; and whether and when to recalibrate the benchmark model and/or CT as more current data becomes available? These are appropriate subjects for a rulemaking.

There are several permutations for addressing these issues in combination. First, the Board could prescribe a rate for a finite number of years as it does in SAC, Simplified-SAC and Three-Benchmark cases, subject to a petition to reopen for changed circumstances. That rate then could be indexed over the prescription period. Alternatively, if the Board updates the Benchmark Model and CT annually by adding a new year of CCWS movements to the model and recalculating the CT based upon a new rolling six years of data, there would be no need to index the prescribed rate but only to recalculate it based on the updated data. If a carrier were to become revenue inadequate (based upon a rolling 6-year calculation) during the prescription period, the Board might consider that to be a changed circumstance which merits immediate termination of the rate, or the Board could decide that revenue inadequacy should have no impact on active rate prescriptions even though it would preclude new prescriptions. If the Board adopted the latter position, indexing would be the most viable rate adjustment option while the carrier remains revenue inadequate.

Alternatively, because the Benchmark Method is easy to apply once it has been developed, the Board could prescribe a rate only one year at a time. Assuming the Board updates the Benchmark Model and CT annually as described above, a new rate prescription would apply rather than indexing the original prescription. If the carrier became revenue inadequate, the rate prescription would be suspended. There remains a question as to whether this process should continue indefinitely or for a finite period before the shipper must bring a new complaint. There is no reason to require a new complaint except to address changes in the market dominant status of the challenged movement over time. That could be addressed, however, through a petition to reopen for changed circumstances rather than arbitrarily requiring

the shipper to relitigate market dominance every few years even though little is likely to have changed.

The foregoing issues will be partially informed by how often the Board updates the Benchmark Model and CT. It is logical for the Board to do so annually because it also updates the CCWS, cost-of-capital, and revenue adequacy determination annually. Once the Board formally adopts a Benchmark Model and CT methodology, it will have completed the most difficult and time-consuming tasks. Updating the model annually is mostly a matter of importing the new CCWS data and recalculating the CT in accordance with pre-established formulas. This will consume far, far fewer Board resources than a single SAC case or even a Three-Benchmark case. As part of a rulemaking, the Board should solicit comment on the frequency and process for updating the Benchmark Model and CT.

4. Joint rate prescription issues

The Benchmark Method requires the Board to address issues concerning joint rates that do not exist for the Board's other rate case methods. Joint rates apply to movements that include two or more carriers in the route and those carriers choose to quote a single consolidated rate for the entire distance instead of providing individual rates for their separate route segments. Each carrier receives a division of the joint rate. The Benchmark Method, however, only applies to revenue-adequate carriers and the CT is a railroad-specific calculation based upon each railroad's degree of revenue adequacy. Those facts pose certain questions regarding how to apply the Benchmark Method to joint rates.

First, if all railroads participating in a joint rate are revenue adequate, the Board needs to consider how it will take each railroad's different degrees of revenue adequacy into consideration when prescribing a joint rate. The Benchmark Model will provide the predicted competitive joint rate. But a different CT must be applied to each railroad separately. One

means of doing so is to reduce each railroad's division by the percentage reduction in the challenged rate to the predicted competitive rate and then applying the respective CT to the resulting division of each railroad. The sum of those divisions then becomes the prescribed joint rate.

Second, the Board must determine whether and how to apply the Benchmark Method when one of the railroads participating in a joint rate is not revenue adequate. Although the Board could decide that all carriers participating in a joint rate must be revenue adequate to invoke the Benchmark Method, there is no reason why it must do so. The Board still could prescribe a joint rate that leaves the divisions of the revenue-inadequate carrier(s) unchanged. In a slight variation upon the process described in the preceding paragraph, the Board could reduce the divisions of *just the revenue-adequate carrier(s)* by the percentage reduction in the challenged rate to the predicted competitive rate, and then apply the CT multiplier for such carrier(s) to determine its divisions. Lastly, the adjusted division(s) of the revenue-adequate carrier(s) would be added to the unadjusted divisions of the revenue-inadequate carrier(s) to obtain the new prescribed joint rate.

Third, joint rates that include a shortline railroad pose questions similar to joint rates that involve revenue-inadequate carriers. The Benchmark Method cannot be applied to shortlines because there is insufficient information to calculate the CT. But shortline railroad divisions can be preserved just the same as divisions of revenue-inadequate carriers are preserved in the preceding paragraph.

A rulemaking proceeding should solicit comment upon the foregoing questions and options for addressing joint rates under the Benchmark Method.

5. Benchmark rate case process.

Finally, the Board should establish a process and timeline for prosecuting rate cases under the Benchmark Method. ACC believes that the entire process could be completed in a matter of months, even more efficiently than the nine months for Three-Benchmark cases because there are very few questions that require litigation under the Benchmark Method.

The principal issue to be litigated under the Benchmark Method is market dominance. ACC, as part of the Coalition Associations, has proposed a bifurcated market dominance procedural schedule in EP 756 that could be completed in 84 to 105 days, depending upon the existence of discovery disputes.⁷⁹ Because the Benchmark Method itself is unlikely to be subject to litigation if the Board adopts the necessary Benchmark Model and CT formulas in a rulemaking proceeding, there is no reason why the entire case could not be presented within that time frame. Therefore, the Board should consider adopting that schedule, or something similar, for rate cases under the Benchmark Method.

There is no doubt that, as the RRTF has concluded, “[t]he market dominance inquiry...is a costly and time-consuming undertaking.”⁸⁰ But compared against the time and expense of a SAC case, market dominance consumes just a fraction of the total time and expense associated with a rate case (although still significant in absolute terms). In two recent SAC cases for carload traffic, the Board bifurcated market dominance from rate reasonableness, which gives us a glimpse into the time required to submit evidence. For example, in *M&G Polymers USA, LLC v. CSX Transp., Inc.*, Dkt. No. NOR 42123 (served May 6, 2011), the Board adopted a procedural schedule for submitting market dominance evidence for 69 separate movements with

⁷⁹ Opening Comments of the Coalition Associations, EP 756, *Market Dominance Streamlined Approach*, at 20-23 (filed Nov. 12, 2019).

⁸⁰ RRTF Report at 52.

just 30 days between opening and reply evidence and reply and rebuttal evidence. Similarly, in *Total Petrochemicals & Refining USA, Inc. v. CSX Transp., Inc.*, Dkt. No. NOR 42121 (served April 5, 2011), the Board adopted a market dominance evidence schedule with identical time frames to *M&G* for 105 movements. Clearly some time for discovery concerning market dominance must be permitted, but this could be expedited by requiring certain initial disclosures and limiting the number of discovery requests.⁸¹ Benchmark cases, which would encompass far fewer lanes than the *M&G* and *Total* cases, presumably could address market dominance in less time than those examples.

Once market dominance has been established, no litigation should be required to determine the maximum prescribed rate using the Benchmark Method. The only facts needed are the issue movement characteristics for input into the Benchmark Model's regression equation. Those are objective standards upon which the shipper and railroad should be able to agree. Whether there is disagreement can be quickly determined by requiring each party to make an initial disclosure of their respective inputs simultaneous with filing their Complaint and Answer, and a Joint Submission of movement characteristics prior to filing their evidence. The Board currently employs a similar joint submission procedure for determining variable costs in market dominance determinations. Any disagreement can be litigated contemporaneous with market dominance.

Based upon the foregoing, ACC offers the following procedural schedule for the Board's consideration in a Benchmark Method rate case when market dominance is contested:

- Day 0 – Complaint (including Complainant's initial disclosures); Discovery begins
- Day 20 – Defendant's answer to complaint (including defendant's initial disclosures)
- Day 30 – Joint submission of variable costs Benchmark Model shipment characteristics

⁸¹ See 49 C.F.R. §§ 1111.1(b), 1111.9(a)(2), and 1114.21(a)(3).

Day 45 – Motions to Compel consolidating all discovery disputes (balance of procedural schedule is tolled while motions are presented under an expedited 21-day schedule)

Day 55 – Discovery closes

Day 69 – Opening Evidence

Day 99 – Reply Evidence

Day 129 – Rebuttal Evidence

Any discovery disputes should be resolved under the 21-day expedited process described in the Opening Comments of the Coalition Associations in EP 756.⁸²

If the railroad admits to market dominance in its Answer, the Board immediately should issue a rate reasonableness decision based upon the shipment characteristics submitted by the parties. If the parties do not agree on all shipment characteristics, the Board should expedite the presentation of evidence on the disputed characteristics to be just seven days apart, instead of the 30 days in the above schedule.

III. DEFINITION OF LONG-TERM REVENUE-ADEQUACY

In *Guidelines*, the ICC concluded that “revenue adequacy is a long-term concept that calls for a company, *over time*, to average return on investment equal to its cost of capital.”⁸³ In making that pronouncement, the agency linked long-term revenue adequacy to a business cycle. The RRTF Report therefore proposes to define “long-term revenue-adequacy” over an entire business cycle.

ACC believes that the proposed definition is reasonable and supported by both economic principles and the Board’s own precedent, but only if the definition is based upon a weighted average of the years measured. Although ACC has proposed a slightly different measure in its

⁸² Opening Comments of the Coalition Associations, EP 756, *Market Dominance Streamlined Approach*, at 21 (filed Nov. 12, 2019).

⁸³ *Guidelines* at 536 [emphasis in original].

application of the Benchmark Method, both definitions are pegged to a business cycle. ACC's proposal to measure revenue adequacy based upon the average post-World War II business cycle of six years is more consistent and easier to apply. Nevertheless, it is not unreasonable to consider the most recent actual business cycle regardless of duration as the RRTF has proposed.

ACC cautions the Board, however, to be careful with how it applies the RRTF's proposed definition with respect to the current business cycle. The current cycle is the longest in the post-WW II period and it began with the deepest recession since the Great Depression, which renders it anomalous in two respects. As Dr. Caves observes, "[b]arring another economic crisis of historic proportions, this time period is unlikely to be representative of the economic conditions that would be expected to prevail going forward." Caves V.S., ¶ 36. The Board should take such exceptional circumstances into account in whatever definition it ultimately adopts.

IV. BOTTLENECK CHANGES

The RRTF Report, at pp. 39-41, observes that reversing the Bottleneck Decisions as to revenue-adequate carriers, could be seen as advancing, rather than upsetting, the statutory objectives. This could allow the Board to find sufficient justification in a carrier's long-term revenue-adequate status to deny that carrier its long-haul rights under the statute so that a shipper can reap the benefits of competition from an existing alternative railroad that can provide the non-bottleneck portion of the service. This assessment has support in the statute, Board precedent, and economic theory.

The long-haul provision of the statute, at 49 U.S.C. § 10705(a)(2), is not absolute. The statute contains multiple exceptions, one of which permits the Board to short-haul a carrier when it decides that the alternate route "is needed to provide adequate, and more efficient or economic, transportation." 49 U.S.C. § 10705(a)(2)(C). Another exception exists for reciprocal switching, which is a short distance bottleneck, when the Board finds such switching "to be practicable and

in the public interest” or “necessary to provide competitive rail service.”⁸⁴ Competition is the most proven means to ensure adequate, efficient and economic service. The Bottleneck Decisions, however, have taken a narrower view of the statute, only recognizing an exception to a carrier’s long-haul rights when shippers make a full-blown competitive access case.⁸⁵ Although this determination was within the Board’s discretion, it was not mandated by the statute.

In affirming the Bottleneck Decisions, the Eighth Circuit focused upon the discretionary nature of the Board’s determination. In particular, the Court noted the tension between the provisions of the statute that grant broad discretion to carriers in setting rates and routes, and those that protect shippers against monopoly power.⁸⁶ The Court was well aware that the Bottleneck Decisions foreclose competition by extending short distance bottlenecks over long distance routes,⁸⁷ and that requiring carriers to short-haul themselves “would prevent them from exploiting bottlenecks and charging rates up to SAC for complete origin-to-destination service.”⁸⁸ Nevertheless, the Court deemed the Board’s decision to be a reasonable reconciliation of competing rail transportation policies because otherwise a carrier’s inability to extend its bottleneck over the entire route “would impede the industry’s efforts to achieve

⁸⁴ 49 U.S.C. §§ 10705(a)(2)(A) & 11102(c)(1).

⁸⁵ 1 S.T.B. at 1065-67

⁸⁶ 169 F. 3d at 1106.

⁸⁷ *Id.* at 1103 (“This precluded MidAmerican from using BN as a carrier from Wyoming to Council Bluffs, essentially extending the bottleneck over the entire 750-mile route.”). *See also, id.* at 1108 (“Although this would not allow the utilities to take advantage of the competition over the non-bottleneck segments, it would ensure that carriers will exploit bottleneck segments only to the extent needed to achieve revenue adequacy.”).

⁸⁸ *Id.* at 1109. *See also, id.* at 1106-07 (noting the importance of differential pricing to achieving revenue adequacy).

revenue adequacy....”⁸⁹ Once a rail carrier has achieved revenue-adequacy, however, the Board can and should revisit the Bottleneck Decisions as to that revenue-adequate carrier to create a better balance between the pro-competitive and revenue adequacy policies in the statute.

Eliminating the bottleneck rule for revenue adequate carriers also is economically supported. Specifically, it would cure a major flaw in the SAC methodology. In EP 722, the Concerned Shipper Associations submitted testimony from the creator of SAC, Gerald Faulhaber, that was critical of the SAC test as it has evolved in the regulation of rail rates.⁹⁰ Among his many criticisms, Professor Faulhaber observed that SAC should only be applied to the bottleneck segment of the rail route because that is the only portion of the route over which there is a need to “mimic” competition.⁹¹ Requiring shippers to present a SAC case for the total route only makes sense when there are no alternatives over any portion of the route.⁹² The SAC test, therefore, should be restricted to the bottleneck segment.⁹³ The Bottleneck Decisions, however, have been an impediment to that economic principle. Professor Faulhaber’s point also exposes the myth that applying SAC to the entire route mimics competition at all because, if it did, the maximum rate would be the SAC rate for the bottleneck segment and the lowest competitive rate for the non-bottleneck segment.

ACC, therefore, urges the Board to initiate an informal rulemaking proceeding to adopt procedures and standards for shippers to obtain a prescribed through route that short-hauls a

⁸⁹ *Id.*

⁹⁰ *See* Exhibit 1.

⁹¹ *Id.*, pp. 3-6.

⁹² *Id.*, p. 6.

⁹³ *Id.*, p. 6 n. 15.

revenue-adequate carrier pursuant to the exceptions at 49 U.S.C. § 10705(a)(2)(A) or (C). The following factors should be incorporated into the standards the Board adopts:

1. The carrier must be “long-term revenue adequate,” as defined in the RRTF Report.
2. No other transportation mode provides effective competition over the route.
3. The Board will only require a carrier to quote a bottleneck rate to an existing interchange.

It will not require the carrier to establish a new interchange where none currently exists.

4. The Board will not require a bottleneck rate to an interchange that is not operationally feasible or would be unsafe for the traffic to which the rate would apply. This last factor would be the railroad’s burden to prove.

The foregoing factors would provide an alternative standard to the current competitive access rules, which provide the only existing standards for obtaining a bottleneck rate under the Bottleneck Decisions.

V. CONCLUSION

ACC commends the Board for creating the RRTF and holding this hearing to consider the recommendations in the RRTF Report for regulatory reforms that would apply to revenue-adequate rail carriers. The principle thrust of ACC’s testimony, however, is to fill a gap in the RRTF Report, which omitted any proposal for applying the revenue adequacy constraint in CMP to determine the maximum reasonable rate of a revenue-adequate rail carrier. ACC has offered its own detailed proposal for doing so, the Benchmark Method, which ACC asks the Board to consider in a rulemaking proceeding. ACC also generally supports the RRTF’s proposed definition of “long-term revenue adequacy,” which ACC notes is very conservative. Lastly, ACC supports the RRTF proposal to reverse the Bottleneck Decisions as to revenue-adequate carriers to require them to provide bottleneck segment rates. ACC has proposed four factors that

it believes establish a reasonable basis for short-hauling rail carriers under the statute for the purpose of requiring bottleneck segment rates.

Respectfully submitted,

/s/ Jason D. Tutrone
Jeffrey O. Moreno
Jason D. Tutrone
THOMPSON HINE LLP
1919 M St. NW Suite 700
Washington, D.C. 20036
(202) 331-8800

Dated: November 26, 2019

*Counsel for the American Chemistry
Council*

Exhibit 1

VERIFIED STATEMENT

of

Gerald R. Faulhaber*

STAND-ALONE COST – RESPONSE TO COMMENTS

In their filings before the Surface Transportation Board in Docket Ex Parte No. 722, September 5, 2014, a number of railroads and their consultants discussed the Stand-Alone Cost test, calling it the “gold standard” of rate setting and noting that it “mimicked competition,” among other items. Unfortunately, they did not have the opportunity to read my September 5 comments (submitted with the Concerned Shipper Associations filing) that debunked these claims, based on my original paper¹ and the follow-on work by Baumol, Panzar and Willig². This response provides the opportunity to discredit these overblown claims in detail.

I group the incorrect statements made in these filings into three categories: (1) Stand-Alone Cost is the “gold standard” for testing rate reasonableness; (2) the Stand-Alone Cost test “mimics competition”; and (3) Stand-Alone Cost (and its simplifications) are practical and effective regulatory tools. I cover each category in turn.

1. Claim: “Stand-Alone Cost is the ‘gold standard’ for rate reasonableness”

This common claim is repeated in all the railroad filings. Here are several examples:

“The Stand-Alone Cost test, which judges the reasonableness of a challenged rate by comparison to the rate that would prevail in a competitive market, rests on a sound economic foundation...”³

“The Stand-Alone-Cost test—which is rooted in sound economics—is available to all shippers...”⁴

* Professor Emeritus, Wharton School, University of Pennsylvania and Law School, University of Pennsylvania.

¹ Faulhaber, G.R. (1975) “Cross Subsidization: Pricing in Public Enterprises” *American Economic Review*, 65, pp.966-977.

² Baumol, W.J., Panzar, J.C., & Willing, R.D. (1982) *Contestable Markets and the Theory of Industry Structure* New York: Harcourt, Brace Jovanovich.

³ Association of American Railroads (2014), comments in Railroad Revenue Adequacy, STB Docket Ex Parte No. 722, September 5 pp. 39-40.

⁴ Norfolk Southern Railway (2014) comments in Railroad Revenue Adequacy, STB Docket Ex Parte No. 722, September 5, p. 25.

“Stand-Alone Cost is indisputably the ‘most accurate procedure available for determining the reasonableness of rail rates where there is an absence of effective competition.’”⁵

“...the Stand-Alone Cost constraint...is widely and consistently recognized by the Board, courts, and economists as the gold standard.”⁶

“Stand-Alone Cost is the acknowledged gold standard for rate reasonableness analysis.”⁷

Response: As the original author of SAC, I should be quite flattered by all these encomia ... if any of it were true. Unfortunately, the use of Stand-Alone Cost in railway rate regulation is so far from the models in which it was originally developed as to be unrecognizable. Let’s review the economic model in which Stand-Alone Cost was developed:

Economic World of Stand-Alone Cost/Contestable Markets

Monopoly; there is only one firm that produces the good or service in question.

Profit-constraining regulation; prices are regulated to ensure the entire firm makes no more than its cost of capital.

Each and every price is regulated; as is investment, innovation, entry and exit.

The key question asked in the Faulhaber (1975) paper was cross-subsidy; under what conditions did the regulated prices lead some services to provide a subsidy to other services? For example, the industry that best fit the Stand-Alone Cost economic model was the then-regulated telecommunications industry: was long-distance service providing a subsidy to local exchange service? The Faulhaber (1975) paper provided an economically sound approach to answering that question, within the context of a fully-regulated monopoly telecommunications market of the 1970s. The Baumol, Panzar Willig work (1982) extended this work to encompass competition, expressed using the concept of contestable markets. In the former work, Stand-Alone Cost measured whether a particular service (or group of services) was providing a subsidy to other services. In the latter work, Stand-Alone Cost was a measure of whether a particular service (or group of services) would attract competitive entry in the specialized world of contestable markets.

Economic World of Class I US Freight Railroads

Four major rail freight carriers; down from dozens due to consolidation, that compete for much (but not all) traffic.

⁵ *op cit.* p. 25.

⁶ *op cit.* p. 77.

⁷ CSX Transportation (2014) comments in Railroad Revenue Adequacy, STB Docket Ex Parte No. 722, September 5, p. 28.

Only prices to captive shippers are regulated by the Surface Transportation Board; rail prices in competitive markets are completely deregulated.

No firm-wide profit constraint: because all prices in competitive markets are completely deregulated, the Staggers Act constrains the Board from imposing a firm-wide profit constraint upon railway firms.

These two worlds are completely different economic models; conclusions from one set of papers addressing one economic model have no relevance to addressing problems encountered in a completely different economic model. As I pointed out in Faulhaber⁸, if the firm is not profit-constrained, the stand alone cost has no meaning in the context of cross-subsidy. As a consequence, the use of the stand alone cost test by the STB has nothing to do with cross-subsidy, as railroads are not subject to a profit constraint and by any measure are highly profitable today. But perhaps the Baumol, Panzar, Willig (BPW) may provide such justification for using Stand-Alone Cost in rail rate regulation? Unfortunately, no; in Baumol, Panzar, Willig, the firm is also assumed to be a profit-constrained enterprise for which regulators control all the prices of the enterprise, which also apply to services (not individuals). Again, the BPW model simply doesn't fit the STB-regulated rail firms; it is not even close. This provides no economic justification for imposing stand-alone cost regulation. None.

2. Claim: The proper test for rate reasonableness is to "mimic" (or simulate) competition in a contestable market

This claim was made by most railroad parties, but particularly by the economic consultants:

"The Stand-Alone Cost test, which judges the reasonableness of a challenged rate by comparison to the rate that would prevail in a competitive market..."⁹

"the Stand-Alone Cost test in the rail industry prevents the abuse of market power and implements the "mimic competition" principle of rate regulation in the public interest...the Stand-Alone Cost test rest on the economics of "contestable markets."¹⁰

"The Stand-Alone Cost constraint is intended to simulate a competitive rate, which the Board specifies as 'the rate a hypothetical efficient railroad would need to charge to serve the complaining shipper, while fully covering all of its costs, including a reasonable return on investment.' This competitive rate is precisely the sort of protection that the Board has been charged with making available to shippers for movements where effective competition is absent."¹¹

⁸ Faulhaber, G.R. (2005), "Cross-Subsidization with More Than Two Services" *Journal of Competition Law & Economics*, 1(3), 441-448.

⁹ American Association of Railroads, *op cit.* pp. 39-40.

¹⁰ *op cit.*, Verified Statement of Joseph Kalt. p.26

¹¹ Norfolk Southern Railway *op cit.* Verified Statement of Bradford Cornell p. 5.

"In 2014, the U.S. Court of Appeals for the District of Columbia reaffirmed the intent of the Stand-Alone Cost constraint, commenting:

'The ultimate aim of the Stand-Alone-Cost test is to require that 'railroads functioning in a noncompetitive market . . . price as if alternatives to their services were available' to the captive shipper.'"¹²

"This regulation is designed to afford shippers that lack effective competition the protection they would enjoy in a contestable market."¹³

Response: I am in complete agreement with all these filings insofar as they claim, to quote the DC Circuit Court, that "the ultimate aim...is to require that 'railroads functioning in a noncompetitive market price as if alternatives were available' to the captive shipper", using the assumptions of contestable markets. I am in complete *disagreement* that, in the world of today's railroad industry, the Stand-Alone Cost test is the proper tool to simulate contestable market competition. In fact, it is precisely the *wrong* tool to accomplish this laudable objective.

This might appear to fly in the face of the Baumol, Panzar, Willig work (1982) on contestable markets, in which Stand-Alone Cost was indeed used as the measure of potential entry by firms outside the monopoly. But to do so would be to ignore the major differences in the regulated monopoly market of Faulhaber (1975) and Baumol, Panzar, Willig (1982) as discussed in the previous section.

In particular, in the monopoly world posited by the earlier work, the *only alternative* to the monopoly supplier would be a totally new entrant, with no existing facilities or operations in the business at hand. Thus, the Stand-Alone Cost measured the only way in which competition might occur in that market.

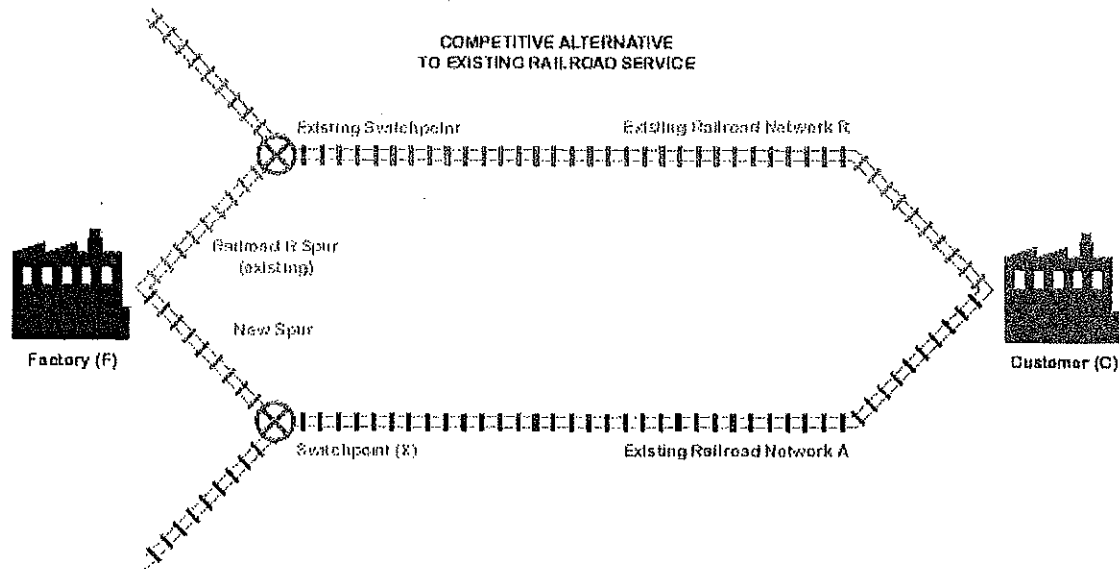
In the actual world of the railroad industry, there is no monopoly; there are, in fact, seven Class I freight railroads operating in the US, any of which could be a potential source of competition (in a contestable market). If the purpose of the cost exercise is, and the DC Circuit Court opinion noted above, to simulate competitive options for shippers, then all competitive options available in today's actual world of the railroad industry, assuming contestable markets, must be considered, not just the option of a wholly independent Stand-Alone railroad to serve the particular shipper's needs.

An example suffices to demonstrate such competitive options. Suppose we have a chemical shipper whose factory is at location F, shipping sulfur to a customer at location C; it is currently a captive shipper of railroad R, which has built a spur from F to its nearest switch point on its US rail network, over which it ships the sulfur from F to C. Should the shipper object to the rate charged by R, it would have to design and cost out an entire rail network between F and C (the

¹² *op cit.* pp. 5-6

¹³ *op cit.*, Verified Statement of David Sappington p. 5-6.

Stand-Alone railroad) and compare the total cost to the rate it is currently being charged. This assumes that a potential competitor, under the assumption of a contestable market, would have to build an entirely new rail network to carry this traffic, a very unlikely scenario. Far more likely, a competitor could build a spur from F to the next-nearest railroad switch point X to connect with the existing alternative railroad A. That railroad would then charge the shipper its competitive rate to ship sulfur from X to C, as shown in the figure below.



Again assuming a contestable market, railroad A would be willing to ship the sulfur at its already-established market-based rate.¹⁴ In this case, what is the price of this competitive alternative? It is (i) a price sufficient to cover the Stand-Alone Cost of building and operating the spur from F to X plus (ii) the market-based price of railroad A to carry the sulfur from X to C. And this should be a price that would "mimic competition," and should thus be compared to the rate that railroad R is actually charging the captive shipper. We note that in this example, this competitive option is simply one of perhaps many competitive options, using access to existing railroads at existing (or new) switch points, each of which would have a price, calculated as above. Clearly, the lowest price so calculated would best "mimic competition" when judging the rate reasonableness being charged the captive shipper by railroad R.

It could be argued that in practice, the next-nearest railroad A may choose not to carry the shipper's sulfur, perhaps because of a tacit understanding with railroad R. We acknowledge that such an outcome is certainly possible, perhaps likely, in today's transportation marketplace, but recall that we are assuming a contestable market in order to "mimic competition;" in this world, firms aggressively pursue new business, and are willing to provide

¹⁴ Should a market-based competitive rate not be available, contestable market theory suggests that railroad A would be willing to carry this traffic at any price in excess of its (long-run) incremental cost of carriage. Thus, long-run incremental cost could be used as an alternative to an actual market-based price.

service if it can be offered at a price that covers its cost of doing that business. The “mimic competition” model of regulation that the STB has used for decades is based on the contestable market assumption, in which competition which may not occur in existing markets will take place.

Note that one competitive alternative is to build and operate a totally self-contained *de novo* rail system, specifically for this shipper’s traffic. Doing so corresponds to the current Stand-Alone Cost test. I certainly agree that such an alternative could in theory be computed. However, it is highly unlikely that this competitive option would be the least-cost option, and a complaining shipper should be free to choose which competitive option it presented for analysis, limited only by the existing rail system.¹⁵

Limiting shippers to only use one competitive option, a totally self-contained *de novo* system, only makes economic sense within the model of regulated monopoly, in which no alternative suppliers are available. Since this is not the world in which we live, shippers should be able to choose which option they present for testing rate reasonableness.

I conclude that I am in full agreement that “mimicking competition” is an excellent way to test for rate reasonableness, but using only Stand-Alone Cost to do so is a grave mistake. Shippers should be permitted to construct the competitive option(s) that best “mimic competition” for its business, and use these options to test for rate reasonableness. Such options should be constrained by the existing rail network structure and pricing, as well as making use of contestability theory. Only then will the STB truly “mimic competition” in testing for rate reasonableness.

3. Stand-Alone Cost (and its simplifications) are practical and effective regulatory tools

Again, a few examples from the filings:

“Over time, the SAC test evolved organically as new issues were presented, litigated, and ultimately ruled upon by the ICC or STB. Indeed, full SAC cases have evolved from little more than a concept nearly thirty years ago in *Coal Rate Guidelines* to a sophisticated package of interactive algorithms and computer models today. In this evolution, some element of complexity has been inevitable and is not unwarranted. The network enterprise of railroading is complex and modeling a railroad is complex. But many vexing issues have been overcome.

The pattern that has emerged over time is that new issues are presented by the parties in individual rate cases. This inevitably introduces new complexity and temporary

¹⁵ Another, perhaps preferable, alternative would be for the shipper to request service from F to X from railroad R, and then arrange with railroad A to complete the shipment to C. The rate railroad R would be permitted to charge the captive shipper for shipment from F to X would be no more than the Stand-Alone Cost of this spur. Of course, the shipper would also be responsible for paying railroad A’s rate from X to C, presumably reflecting actual market conditions at X.

uncertainty into the SAC process. The issues are then debated vigorously, often in a series of cases, sometimes even on appeal. Eventually, the ICC or STB settles the issue.”¹⁶

“To the extent there are concerns with the high cost of using SAC to determine “mimic competition” rate levels, the proper approach is to seek to *simplify* the procedures for implementing SAC as the Board has successfully done in the past,”¹⁷

Response: The thrust of these comments is that for almost thirty years, Stand-Alone Cost test methodology has been enormously complex and costly for both shippers and the STB, and continues to be so. The best advice this filing can muster is to simplify it, as if the ICC and the STB hadn’t considered this over the past three decades.

The reason that Congress suggested simplified versions of the Stand-Alone Cost test, and that the STB has come up with easier means to prove a rate is excessive, demonstrates that the current implementation of the Stand-Alone Cost test is unwieldy in the extreme: unnecessarily complex and expensive to implement, and (in the case of carload shippers) unlikely to ever meet the demands of the STB (and railroad interveners) to capture every last jot and tittle of railroad costs. The extreme complexity is no accident and should be no surprise; it evolved as part and parcel of the regulatory process.

Could this have been avoided? Definitely; what is missing is that the STB has failed to develop a general Stand-Alone Cost computer model, into which shippers, regulators or railroads could plug in parameters and data particular to their issue and have the model calculate the Stand-Alone Cost. Such a model would have built into it the complexities and connections of building and operating a Stand-Alone railroad, and would be approved for use by the STB. Having shippers build their own model for each rate case is extraordinarily wasteful and duplicative, and in the end unsuccessful. Two decades ago, the Federal Communications Commission faced a similar problem when it adopted a long-run incremental cost standard for rate-making purposes; its solution was to commission a model to be built which permitted the calculation of incremental costs, called TELRIC (total element long-run incremental cost), which became the standard regulatory cost model. Requests for rate approval and challenges to rates all used TELRIC, drastically reducing the costs of everyone, not least the FCC, of conducting business. The STB has developed a model for determining variable costs, the Uniform Railroad Costing System (URCS), for use as an industry standard, apparently successfully. For whatever reason, STB has chosen not to introduce a stand-alone cost model in spite of having developed URCS, leading to a huge waste of time and money for the parties involved.

Another point causing some confusion:

¹⁶ Association of American Railroads, *op cit.* p. 45.

¹⁷ Association of American Railroads, *op cit.* Verified Statement of Joseph Kalt p.39

“driv[ing] rates on some regulated traffic down below SAC levels – i.e., below the level necessary to cover full long-run costs – contrary to the competitive market principles underlying the Board’s approach to rate regulation.”¹⁸

Response: This is simply an economic error. The rate level required to cover long-run costs for any portion of the railroad’s business is long-run *incremental* cost; i.e., the *additional* cost that the service/product/customer in question causes the railroad. Stand-Alone Cost is the cost of the service/product/customer in question if a separate railroad is built for just that traffic. As a rule, long-run incremental cost is much less than Stand-Alone Cost, particularly in a business characterized by scale and scope economies.

“Railroads and shippers regularly resolve disagreements over rates by reference to the likely outcome of SAC cases. A practice of “regulatory contestability” has taken hold in the rail sector. That is to say, potential litigants avoid the costs and other burdens of complex rate litigation by simulating the likely outcomes of litigation through negotiated resolution of disputes....— a successful regime should result in *fewer*, not more, cases.”¹⁹

“...the fact that most shippers never feel the need to bring rate cases is not a sign of regulatory failure—it is a sign of regulatory success.”²⁰

Response: This claim was mentioned throughout the reviewed filings. The point is that rate cases are only brought if there is disagreement among the parties about the outcome of such a case. If there is no disagreement, then the case will be settled prior to legal action via negotiation. This is true, but not because the regulation in question is *good*, but only that it is *certain*. If both parties are completely certain of the outcome of a case, they will indeed bargain to that solution rather than file rate cases. But this is true if the outcome is inefficient or unfair, as well as if the outcome is efficient and fair. It is therefore not true that failure to bring cases “is a sign of regulatory success.” It is a sign of regulatory certainty, not regulatory success.

4. Conclusion

The fundamental flaw in the reviewed filings is that the Stand-Alone Cost test is the economically appropriate standard for testing rate reasonableness because it “mimics competition.” In fact, while “mimics competition” is a very plausible standard for testing rate reasonableness, the Stand-Alone Cost test does not do this in the economic world of the rail industry; it is not even close. Stand-Alone Costs were developed for an economic world of profit-constrained rate regulated monopoly, which is not at all like the largely unregulated, not profit-constrained and world of seven major rail networks that constitute this industry. I have

¹⁸ American Association of Railroads, *op cit.* p. 41

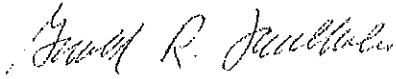
¹⁹ *op cit.* pp. 46-47.

²⁰ Norfolk Southern Railroad, *op cit.* p.82

given a simple example of how competitive options could be developed for this world, based on the same principles of Faulhaber (1975) and Baumol, Panzar, Willig (1982), that would be far more suitable for testing rate reasonableness. In sum, there are several possible right answers to how to test for rate reasonableness, but the Board's current Stand-Alone Cost model is without doubt the wrong answer.

VERIFICATION

I, Gerald R. Faulhaber, verify under penalty of perjury that I have read this Verified Statement, that I know the contents thereof, and that the same are true and correct based on my knowledge, information and belief. Further, I certify that I am qualified and authorized to file this Statement.



Gerald R. Faulhaber

Executed on November 3, 2014

Verified Statement of Dr. Kevin W. Caves

BEFORE THE
SURFACE TRANSPORTATION BOARD

STB DOCKET NO. EP 755
FINAL OFFER RATE REVIEW

STB DOCKET NO. EP 761
HEARING ON REVENUE ADEQUACY

Verified Statement of
Kevin W. Caves, PhD
On Behalf of
The American Chemistry Council

Dated: November 12, 2019

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INTRODUCTION

1. In the Board's 2015 hearings in the above-captioned matter, I provided expert testimony describing, in general terms, how an econometric model ("Benchmark Model") could be developed for providing meaningful and economically justified rate relief to captive shippers.¹ Broadly speaking, a Benchmark Model would use statistical methods to compare a rail rate paid by a captive shipper to rates paid by similar shipments in competitive markets. The more the captive shipper's actual rate exceeds the predicted rate, the more likely it is that the differential is attributable to the exercise of market power. A finding of a sufficiently large differential would make that rate a candidate for further scrutiny, potentially setting in motion procedures designed to reduce it.² The Transportation Research Board ("TRB") has constructed illustrative models as a "proof of concept" demonstrating how a Benchmark Model might be implemented in practice to prove market dominance.³

2. I have been asked by the American Chemistry Council "ACC" to (1) to demonstrate the empirical implementation and viability of a Benchmark Model to determine maximum reasonable rates for revenue adequate railroads using real-world data, including the STB's Confidential Waybill Sample ("CWS"); and, (2) to demonstrate, using the Benchmark Model and railroad financial data, the implementation of the Competitive Threshold ("CT"), defined as the maximum ratio by which captive rates would be permitted to exceed competitive rates while still satisfying the regulatory requirements of railroad revenue adequacy.

¹ Public Hearing, STB Docket No. Ex Parte 722 & STB Docket No. Ex Parte 664, *Consolidated Hearing Testimony of Jeffrey O. Moreno, Paul M. Donovan, Dr. Kevin W. Caves, Thomas D. Crowley, and Henry J. Roman On Behalf of the Concerned Shipper Associations*, Surface Transportation Board (July 23, 2015) [hereafter, 2015 Consolidated Testimony].

² *Id.*

³ Transportation Research Board, *Modernizing Freight Rail Regulation*, Special Report 318, National Academies of Sciences, Engineering, and Medicine (2015), available at <http://www.trb.org/Main/Blurbs/172736.aspx>.

SUMMARY OF CONCLUSIONS

- My analysis demonstrates that a Benchmark Model encompassing all commodities in the CWS can be implemented empirically using the CWS and publicly available data.
- Although unmasked revenue data from the CWS have not been made available to me, I have implemented statistical measures to control for the noise introduced by masking, and the resulting Benchmark Model yields statistically significant and economically reasonable results. These results are robust to variations in the definition of the competitive sample on which the Benchmark Model is estimated. Of course, the accuracy of the Benchmark Model could only improve if it were implemented using unmasked revenue data, which are available to the STB.
- I applied the Benchmark Model to predict comparable competitive rates for potentially noncompetitive shipments. In my baseline Benchmark Model, the actual rates for potentially noncompetitive shipments in the CWS exceed the predicted rates for comparable competitive shipments by approximately 48 percent on average.
- For approximately 26 percent of potentially noncompetitive shipments, the actual rate exceeds the predicted competitive rate by more than 50 percent (the ratio exceeds 1.5). For approximately 12 percent of potentially noncompetitive shipments, the actual rate is more than double the predicted competitive rate. For approximately four percent of potentially noncompetitive shipments, the actual rate is more than triple the predicted competitive rate. For approximately one percent of potentially noncompetitive shipments, the actual rate is more than five times the predicted competitive rate.
- In my illustrative analysis of the Competitive Threshold, I use a multi-year approach to assessing revenue adequacy. The analysis shows that three of the major Class I Railroads (BNSF, NS, and UP) are found to be revenue adequate for the six-year period from 2008 – 2013, despite the fact that this time period includes the Great Recession and its aftermath.
- Moreover, these three railroads would have remained revenue adequate, even under the assumption that the rates for all of their potentially noncompetitive traffic would have been subject to regulation based on the Benchmark Model. Revenue adequacy would have been maintained even in the presence of substantial downward adjustments to more closely align potentially noncompetitive rates with comparable competitive pricing benchmarks.

QUALIFICATIONS

3. My name is Kevin W. Caves. I am a Senior Economist at Econ One Research Inc. I have applied my expertise to a variety of industries, including cable, broadcasting, energy, finance, freight rail, Internet & tech platforms, healthcare, wireless and wireline networks, payment cards, pharmaceuticals, and professional sports. My published work has appeared in numerous popular and academic outlets, including *Antitrust*, *The Antitrust Source*, *The Atlantic*, *Broadcasting & Cable*, *The Capitol Forum*, *Communications & Strategies*, *Competition Policy International*, *Econometrica*, *The Economist*, *The Economists' Voice*, *Forbes*, *George Mason Law Review*, *Information Economics & Policy*, *Journal of Competition Law & Economics*, *Labor Law Journal*, *Regulation*, *Research in Law & Economics*, *Review of Network Economics*, and *Telecommunications Policy*. I have published two book chapters, and I serve on the Editorial Advisory Board of the *Journal of Transportation Law, Logistics, & Policy*. In conjunction with my co-authors in academia, I have developed econometric techniques that have been integrated into STATA, a leading statistical software package used globally by economists and empirical analysts in a range of disciplines. A copy of my CV is attached at Appendix 2.

I. STATISTICAL BENCHMARKING METHODS ARE GENERALLY ACCEPTED AND WIDELY USED IN ACADEMIA, GOVERNMENT, AND THE PRIVATE SECTOR

4. The Benchmark Model developed in this report is grounded in standard and generally accepted statistical techniques. In this report, I will use the term “econometrics” to refer to the statistical techniques underlying the Benchmark Method. Econometrics is distinguished from other branches of mathematical statistics because it focuses on the analysis of nonexperimental data—that is, data not obtained from controlled experiments—as is the case

here.⁴ Econometric methods are “based upon the development of statistical methods for estimating economic relationships, testing economic theories, and evaluating and implementing government and business policy.”⁵

5. As such, econometric methods are widely used by economists and other analysts in academia, government, and private businesses.⁶ Many government agencies (including the STB) employ economists trained in econometrics.⁷ Econometric techniques are also commonly accepted by courts for use in litigation. The Federal Judicial Center’s *Reference Manual on Scientific Evidence* characterizes regression analysis (the standard econometric tool for analyzing

⁴ See, e.g., JEFFREY M. WOOLDRIDGE, *INTRODUCTORY ECONOMETRICS: A MODERN APPROACH* (South-Western 2009 4th ed.) [hereafter, “Wooldridge,”] at 2 (“Econometrics has evolved as a separate discipline from mathematical statistics because the former focuses on the problems inherent in collecting and analyzing nonexperimental economic data. Nonexperimental data are not accumulated through controlled experiments on individuals, firms, or segments of the economy. (Nonexperimental data are sometimes called observational data, or retrospective data, to emphasize the fact that the researcher is a passive collector of the data.)”)

⁵ *Id.* at 1.

⁶ *Id.* See also R. CARTER HILL, WILLIAM E. GRIFFITHS, & GEORGE G. JUDGE, *UNDERGRADUATE ECONOMETRICS* (John Wiley & Sons 2nd ed. 2001) [hereafter “Hill et. al.”], at 1 (“The importance of econometrics extends far beyond the discipline of economics. Econometrics is a set of research tools also employed in the business disciplines of accounting, finance, marketing, and management. It is also used by social scientists, specifically researchers in history, political science, and sociology. Econometrics plays an important role in such diverse fields as forestry, and in agricultural economics...Thus research methods employed by economists, which comprise the field of econometrics, are useful to a broad spectrum of individuals.”) See also CHRISTIAAN HEU ET. AL., *ECONOMETRIC METHODS WITH APPLICATIONS IN BUSINESS AND ECONOMICS* (Oxford University Press 2004), at Introduction (“Decision making in business and economics is often supported by the use of quantitative information. Econometrics is concerned with summarizing relevant data information by means of a model. Such econometric models help to understand the relation between economic and business variables and to analyse the possible effects of decisions...Nowadays econometrics forms an indispensable tool to model empirical reality in almost all economic and business disciplines.”) See also B. ESPEN ECKBO, ED. *HANDBOOK OF CORPORATE FINANCE: EMPIRICAL CORPORATE FINANCE*, Vol. 1 (North Holland 2007), Part I (reviewing various econometric applications in corporate finance). See also JEFFREY D. CAMM ET. AL. *ESSENTIALS OF BUSINESS ANALYTICS* (South-Western 2nd ed. 2016).

⁷ A partial list at the federal level, based on recent job postings, includes the Census Bureau, the Bureau of Economic Analysis, the Bureau of Labor Statistics, the Department of the Treasury, the Department of Justice, the Congressional Budget Office, the Energy Information Administration, the Environmental Protection Agency, Fannie Mae, the Federal Communications Commission, the Federal Deposit Insurance Corporation, the Federal Energy Regulatory Commission, the Federal Housing Finance Agency, the Federal Trade Commission, the Federal Reserve System, the Food and Drug Administration, the Government Accountability Office, the Office of the Comptroller of the Currency, and the Securities and Exchange Commission. See, e.g., *Job Openings for Economists*, available at <https://www.aeaweb.org/joe/>.

relationships between variables) as “a well-accepted scientific methodology.”⁸ Econometric techniques “occupy a central place in antitrust litigation,”⁹ and have frequently been used in other forms of litigation as well.¹⁰

6. Econometric models predict an outcome (the “dependent variable”), using a set of predictors (the “explanatory variables”). In the Benchmark Model, the dependent variable is the rate (measured in dollars per ton-mile) paid for a competitive shipment, while the explanatory variables include economically relevant shipment characteristics. Once the statistical relationship between shipment characteristics and rates has been established (that is, once the econometric model has been estimated), this relationship is used to predict the rates that would be expected to prevail under competitive conditions, using the shipment characteristics from potentially non-competitive shipments. The effectively competitive sample serves as a benchmark because only effectively competitive shipments are used to estimate the econometric model (and thus to predict the relationship between shipment characteristics and competitive rates). To illustrate, the diagram below provides a simplified depiction of a Benchmark Model, with a single explanatory variable equal to the distance traveled for a given shipment.¹¹

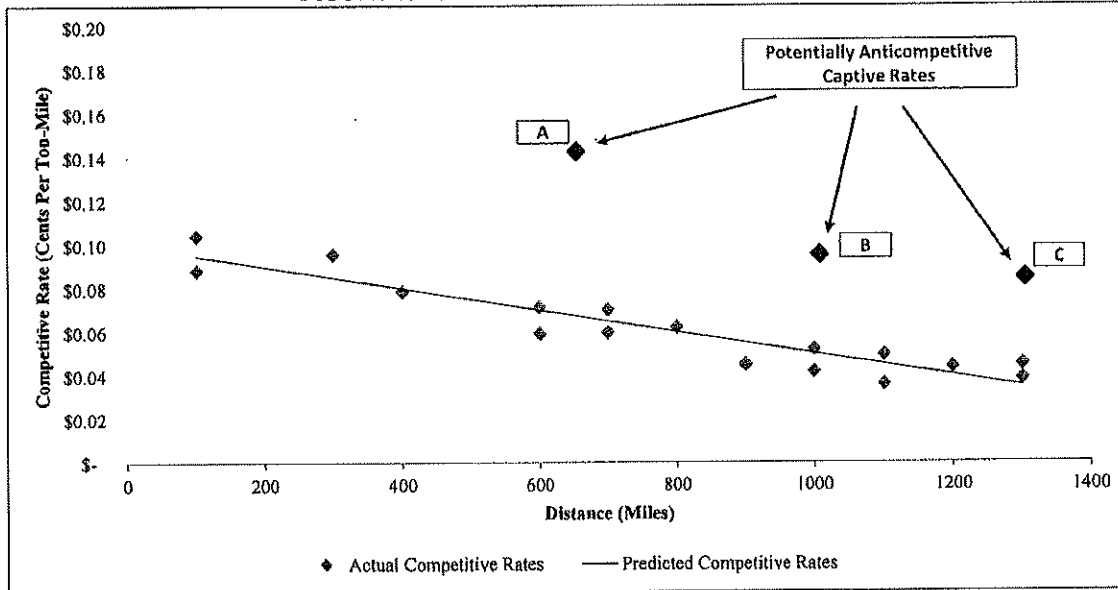
⁸ FEDERAL JUDICIAL CENTER, REFERENCE MANUAL ON SCIENTIFIC EVIDENCE (The National Academies Press 3rd ed. 2011) [hereafter “Reference Manual”], at 308 (“Because multiple regression is a well-accepted scientific methodology, courts have frequently admitted testimony based on multiple regression studies...”)

⁹ Justin McCrary & Daniel L. Rubinfeld, “Measuring Benchmark Damages in Antitrust Litigation,” 3(1) *Journal of Econometric Methods* 63-74 (2004).

¹⁰ Reference Manual at 306-307 (“Over the past several decades, the use of multiple regression analysis in court has grown widely. Regression analysis has been used most frequently in cases of sex and race discrimination, antitrust violations, and cases involving class certification (under Rule 23). However, there are a range of other applications, including census undercounts, voting rights, the study of the deterrent effect of the death penalty, rate regulation, and intellectual property.”)

¹¹ See 2015 Consolidated Testimony Part III.B.1.

FIGURE 1: ILLUSTRATIVE BENCHMARK MODEL



7. As seen above, the illustrative model depicts a simple linear relationship between the distance traveled (in miles), and rate charged for competitive shipments (in cents per ton-mile). Shipments over greater distances tend to charge lower prices per ton-mile.¹² The higher a captive rate is above the regression line, the more likely it is that the observed rate reflects a lack of competition. Conversely, rates that are close to (or below) the regression line would not raise anticompetitive concerns. Predictive analyses of this nature are a standard tool of econometrics.¹³ Moreover, the specific circumstances of the freight rail industry—in which market-based rates have arisen over time as result of deregulation—make the Benchmark Model particularly applicable to the industry.

¹² TRB Report at Appendix B, Tables B-2, B-5, B-8, B-11 (showing negative and statistically significant distance coefficients).

¹³ See, e.g., Wooldridge at 206 – 215.

II. THE BENCHMARK MODEL

8. In this section, I describe the Benchmark Model that I have developed using CWS data for each of the years made available to me (2006 – 2013).¹⁴ Although unmasked revenue data from the CWS have not been made available to me, I have implemented statistical measures to control for the noise introduced by masking, and the Benchmark Model yields statistically significant and economically reasonable results. Of course, the accuracy of the Benchmark Model could only improve if it were implemented using unmasked revenue data, which are available to the STB. The data and programs used to generate the results summarized in this report are being produced to the STB, along with instructions on how to modify the analysis to incorporate (1) unmasked CWS data; and, (2) CWS data from more recent time periods. Appendix 1 summarizes this production.

A. Data

9. In this section, I describe the data used to implement the Benchmark Model. The dependent variable, which the Benchmark Model is designed to predict, is the revenue per ton-mile for a given movement in the CWS. Because contracted rates are confidential, railroads are permitted to disguise (or “mask”) their contract revenues by “factoring them by a scalar value at the three-digit STCC level.”¹⁵ In contrast, tariffed rates are not confidential and therefore are not masked. The CWS also includes a data field (the “calculated rate flag”) indicating whether or not the revenue for a given waybill is masked. In the version of the CWS made available to me, the revenues of the contracted rates are masked. In addition, the “calculated rate flag” is not

¹⁴ For purposes of my analysis, I limited the CWS to shipments within the United States.

¹⁵ See *2013 Surface Transportation Board Carload Waybill Sample Reference Guide* (October 21, 2014) at 176.

populated. It is therefore not possible to determine whether a masking factor has been applied to a given shipment, and (if so) what that masking factor is.

10. To predict revenue per ton-mile, the Benchmark Model uses shipment characteristics available in the CWS, data fields calculated from the CWS, and other data sources. All in all, the Benchmark Model uses approximately 10,000 factors to predict competitive rates. As summarized in Table 1 below, these include the total distance of the shipment, the size of the shipment (measured by number of carloads), the number of railroads involved in the movement, a private car indicator, and an indicator for hazardous materials. Also included is the “Rebill Code,” which is used to identify joint line moves under Rule 11.¹⁶ Additional control variables include “fixed effects” for each individual 5-digit STCC (which control for factors that cause rates for one commodity to be higher or lower, on average, than other commodities), fixed effects by year (which control for factors that cause rates for one year to be higher or lower, on average, than in other years), and fixed effects by railroad (which control for pricing differences between railroads).¹⁷

11. Finally, to control for measurement error introduced by masking, the model also includes indicator variables specific to each unique combination of a 3-digit STCC, railroad, and year. (As explained above, in each year of the CWS, each railroad can apply a different masking factor to each 3-digit STCC). These masking factor indicators control for factors that cause rates

¹⁶ Under Rule 11, each railroad involved in a joint movement typically invoices the shipper separately for only that railroad’s portion of the movement. The Rebill Code can take on four different values (Local Shipment, Originated-Delivered, Received-Delivered, and Received-Terminated). The latter three categories indicate that the shipment is part of a Rule 11 movement. My regression model includes separate controls for each of these categories.

¹⁷ There are eleven Class 1 Railroads in the data set, owned by seven entities: BNSF, Canadian National, Canadian Pacific, CSX, Kansas City Southern, Norfolk Southern, and Union Pacific. When multiple railroads were involved in a shipment, the railroad accounting for the longest distance was used.

for a particular 3-digit STCC commodity shipped on a particular railroad during a particular year to be higher or lower, on average, than any other combination of 3-digit STCC, railroad, and year.

TABLE 1: DATA FIELDS USED IN BENCHMARK MODEL

Data Field	Source/Details
Revenue ¹⁸	CWS: Freight Revenue (Code 15) + Transit Charges (Code 16) + Miscellaneous Charges (Code 17) + Fuel Surcharges (Code 202)
Weight	CWS: Billed Weight Tons (Code 99)
Deregulation Flag	CWS: Deregulation Flag (Code 96)
Distance	CWS: Total Distance (Code 123)
Revenue per Ton-Mile	[Revenue]/[Weight*Distance]
Shipment Size	CWS: Number of Carloads (Code 5)
# of RRs in Movement	CWS: Junction Frequency (Code 87) + 1
Private Car Indicator	CWS: Car Ownership Category (Code 93)
3 & 5-digit STCC	CWS: Commodity Code (non-HAZMAT STCC) (Code 76)
Hazardous Materials Indicator	CWS: Based on 49 series Commodity Code (STCC-HAZMAT) (Code 12)
Rule 11 Indicator	CWS: Rebill Code (Code 24)
Reporting Railroad Indicator	CWS: Reporting Railroad (Code 31)
Longest Railroad Indicator	CWS: Based on longest Railroad Distance (Codes 113-119)
Year Indicator	CWS Year
Masking Factor Indicator	Separate Indicator for Each Unique Combination of Reporting Railroad, Year, 3-digit STCC
Number of Alternative Class I Rail Road Stations Within 10 Miles of Origin and Destination	CWS, Station Master Data, GIS
Number of Water Ports Within 10 Miles of Origin and Destination	CWS, Port Series Data, GIS

12. The Benchmark Model also utilizes data to measure the competitive alternatives that may have been available to a shipper for a given CWS movement. One indicator of potential competition is the number of Class I railroads within a given distance of the origin and destination

¹⁸ Revenue figures are adjusted to 2009 dollars using the Consumer Price Index as reported by the St. Louis Federal Reserve, available at <https://fred.stlouisfed.org/>

stations of a given CWS movement. To determine the proximity of potentially competitive rail alternatives, the location of each station in the CWS was identified based on the standard point locator code ("SPLC"), freight station accounting code ("FSAC"), and railroad name included in the waybill information. Taken together, these data provided the latitude and longitude of the origin and destination of each shipment in the CWS. To measure the proximity of potential competition from Class I railroads, I used the railroad network geographic information system (GIS) data for Class I railroads available from the Centralized Station Master (CSM) database.

13. Another indicator of potential competition is the presence of commercial water ports on the same waterway.¹⁹ To determine the proximity of potentially competitive water-based alternatives, I used Port Series data published by the U.S. Army Corps of Engineers to identify commercial ports.²⁰ I used GIS data to measure the proximity of each origin and destination station in the CWS to each commercial water port.

B. Econometric Analysis

1. Defining a Competitive Sample

14. Before the Benchmark Model can be implemented, a sample of competitive movements (a "Benchmark Group") must be identified. A CWS movement was included in the competitive sample if it satisfied any of four criteria. *First*, all deregulated (exempt) shipments were included in the competitive sample. For exempt commodities, regulation has been deemed "not needed to protect shippers from the abuse of market power."²¹ According to the TRB, the

¹⁹ A port is assigned to one or more waterway systems based on its location. The waterway systems are: The Mississippi River and its tributaries, the Great Lakes and Erie Canal, the Columbia River, the West Coast (excluding Alaska), the East Coast, the Gulf Coast, Puget Sound, and Alaska.

²⁰ For example, ferry terminals, recreational vessel docks, and other non-commercial ports are excluded.

²¹ 49 USC §10502.

“practical capability to be moved by truck”²² became “the de facto standard for deciding whether a commodity should be considered inherently competitive and granted a categorical exemption.”²³ In addition to trucking competition, water-based competition is also considered in commodity exemptions.²⁴ *Second*, all shipments potentially subject to rail competition were also included in the competitive sample. I classified a movement as subject to rail competition if there was at least one competing Class I railroad operating within five miles of the origin station, provided that the same Class I railroad also operated within five miles of the destination station of the movement.²⁵ *Third*, all shipments subject to water-based competition were also included in the competitive sample. I classified a CWS movement as subject to water-based competition if at least one port on the same waterway was located within five miles of both the origin station and the destination station. *Fourth*, all shipments subject to trucking competition were also included in the competitive sample. I classified a CWS movement as subject to trucking competition if the movement was less than 200 miles, and if the size of the shipment was less than five carloads.²⁶ Finally, although a movement’s revenue-to-variable-cost (“R/VC”) ratio determines whether the

²² TRB Report at 20, n. 18.

²³ *Id.*

²⁴ United States Government Accountability Office, *Freight Rail Pricing: Contracts Provide Shippers and Railroads Flexibility, but High Rates Concern Some Shippers* (December 2016), at 5 (“Some commodities were later exempted from STB’s jurisdiction, primarily commodities that could be shipped by boxcar or intermodal containers, in part because these goods can also be transported by other competitive alternatives such as barge or truck and are therefore unlikely to be captive.”) See also STB Docket No. Ex Parte 722, *Review of Commodity, Boxcar, and TOFC/COFC Exemptions, Notice of Proposed Rulemaking*, Surface Transportation Board (March 23, 2016) (“When steel production was located primarily in the Great Lakes region, water carriage was an option for transportation—e.g., over the Great Lakes themselves—but is now less so after the migration to the South.”)

²⁵ I confirmed that my results are robust to alternative distance thresholds. See Table 3 below.

²⁶ As explained above, exempt commodities may be subject to trucking competition, and are also included in the competitive sample.

rate is legally eligible to be challenged, I did not use R/VC to screen shipments into the competitive sample.²⁷

15. As seen in Table 2A, approximately 25 percent of all CWS shipments are deregulated; approximately 64 percent of all CWS shipments have potential rail competition; about 7 percent have potential water-based competition, and approximately 5 percent satisfy the trucking screen. Altogether, approximately 76 percent of the movements in the CWS fall within the competitive sample. Therefore, about 24 percent of shipments in the CWS are classified as potentially noncompetitive.

16. Unsurprisingly, the percentage of shipments classified as competitive varies significantly from one two-digit STCC to the next. For several commodities, 100 percent of the CWS movements are classified into the competitive sample. For example, all Textile Mill Products movements are deregulated. Therefore, all Textile Mill Products shipments are included in the competitive sample. For other commodities, a significant percentage falls outside the competitive sample. For example, in the case of Chemicals or Allied Products, about three percent of movements are deregulated; about 42 percent have potential rail competition, about 15 percent have potential water competition, and about 15 percent satisfy the trucking screen. Altogether, about 54 percent of Chemicals or Allied Products shipments in the CWS fall within the competitive sample. Therefore, about 46 percent of Chemicals or Allied Products shipments are classified as potentially noncompetitive.

²⁷ Given that unmasked revenues have not been made available to me, such a screen would not accurately capture shipments that fall above or below the statutory R/VC screen of 180. Even if unmasked data were available, I would be reluctant to apply a competitive screen based on a legal standard in the absence of economic evidence supporting such a screen. In contrast, the R/VC screen would be applied when implementing the competitive threshold analysis in Part III below, because rates with R/VC below 180 are not subject to regulation under current law.

TABLE 2A: COMPETITIVE SCREENS (UNWEIGHTED)

Commodity Name	STCC Code (2-Digit)	Share of CWS Shipments Satisfying Screen 1 (Dereg.)	Share of CWS Shipments Satisfying Screen 2 (Paired Class I RRR within 5 Miles of O & D)	Share of CWS Shipments Satisfying Screen 3 (Port within 5 Miles of O & D on Same Waterway)	Share of CWS Shipments Satisfying Trucking Screen 4 (<200 Miles, <5 Cars)	Share of CWS Shipments Satisfying Any Screen
ALL	ALL	24.7%	63.5%	6.5%	4.7%	76.2%
Farm Products	1	19.3%	47.3%	1.7%	3.1%	54.8%
Forest Products	8	0.0%	71.5%	0.4%	0.6%	71.5%
Fresh Fish or Other Marine Products	9	100.0%	81.5%	4.8%	0.9%	100.0%
Metallic ores	10	0.0%	65.4%	1.8%	1.5%	66.5%
Coal	11	0.0%	29.4%	1.3%	0.1%	29.7%
Petroleum (Crude)	13	0.0%	11.4%	0.7%	1.2%	12.1%
Non Metal Minerals	14	47.2%	19.2%	5.6%	4.2%	57.5%
Ordnance or Accessories	19	0.0%	23.3%	1.6%	0.0%	23.3%
Food or Kindred Products	20	26.9%	53.8%	5.5%	5.3%	65.1%
Tobacco	21	0.0%	100.0%	0.0%	0.0%	100.0%
Textile Mill Products	22	100.0%	74.4%	2.3%	4.2%	100.0%
Apparel or Other Textile Products or Knit Apparel	23	100.0%	66.7%	2.2%	1.4%	100.0%
Lumber or Wood Products Exc. Furniture	24	100.0%	28.8%	1.5%	20.2%	100.0%
Furniture or Fixtures	25	100.0%	66.2%	4.0%	0.2%	100.0%
Pulp, Paper or Allied Products	26	63.0%	45.9%	5.2%	6.2%	83.1%
Printed Products	27	100.0%	86.6%	1.4%	0.2%	100.0%
Chemicals or Allied Products	28	2.5%	41.7%	14.8%	14.6%	53.8%
Petroleum/Coal Products	29	6.6%	44.2%	12.5%	13.8%	54.7%
Rubber or Miscellaneous Plastics Products	30	80.3%	71.9%	4.6%	1.0%	90.5%

Commodity Name	STCC Code (2-Digit)	Share of CWS Shipments Satisfying Screen 1 (Dereg.)	Share of CWS Shipments Satisfying Screen 2 (Paired Class I RR within 5 Miles of O & D)	Share of CWS Shipments Satisfying Screen 3 (Port within 5 Miles of O & D on Same Waterway)	Share of CWS Shipments Satisfying Trucking Screen 4 (<200 Miles, <5 Cars)	Share of CWS Shipments Satisfying Any Screen
Leather or Leather Products	31	100.0%	57.2%	0.8%	0.2%	100.0%
Clay, Concrete, Glass or Stone Products	32	45.6%	26.5%	4.8%	11.8%	59.9%
Primary Metal Products, Including Galvanized Coating or Other Allied Processing	33	100.0%	49.4%	10.1%	16.6%	100.0%
Fabricated Metal Exc. ordnance, Machinery, or Transportation Equipment	34	94.1%	73.6%	2.9%	1.1%	98.8%
Machinery	35	75.3%	67.0%	2.9%	1.3%	89.4%
Electrical Machinery, Equipment or Supplies	36	98.8%	70.7%	4.5%	0.3%	99.5%
Transportation Equipment	37	91.1%	63.7%	6.1%	7.9%	96.7%
Instruments, Goods, Optical Goods, Watches or Clocks	38	100.0%	74.3%	0.8%	1.4%	100.0%
Miscellaneous Products	39	100.0%	70.9%	3.0%	0.2%	100.0%
Waste or Scrap Materials Not Identified by Producing Industry	40	78.5%	54.6%	5.0%	14.5%	92.9%
Miscellaneous Freight Shipments	41	15.6%	69.2%	2.1%	0.9%	74.7%
Containers, Carriers or Devices, Shipping, Returned Empty	42	0.3%	78.6%	7.8%	3.2%	79.2%
Mail, Express or Other Contract Traffic	43	0.0%	94.8%	19.6%	0.0%	94.8%
Freight Forwarder	44	0.0%	91.5%	9.9%	0.1%	91.6%
Shipper Association or Similar Traffic	45	0.0%	78.8%	5.1%	0.0%	78.8%
Miscellaneous Mixed Shipments	46	0.0%	82.6%	6.3%	0.2%	82.7%
Small Packaged Freight Shipments	47	0.0%	96.5%	2.3%	0.0%	96.5%
Waste Hazardous or Waste Hazardous Substances	48	0.0%	32.3%	8.4%	7.1%	41.3%

17. Table 2B repeats the same exercise, this time weighting each data point by its CWS expansion factor. As seen below, approximately 80 percent of the weighted movements fall within the competitive sample. Conversely, approximately 20 percent of the weighted CWS movements do not, and are therefore potentially noncompetitive. As before, there is significant variation from one two-digit STCC code to the next.

TABLE 2B: COMPETITIVE SCREENS (WEIGHTED BY EXPANSION FACTORS)

Commodity Name	STCC Code (2-Digit)	Share of CWS Shipments Satisfying Screen 1 (Deregulation)	Share of CWS Shipments Satisfying Screen 2 (Paired Class I RR within 5 Miles of O & D)	Share of CWS Shipments Satisfying Screen 3 (Port within 5 Miles of O & D on Same Waterway)	Share of CWS Shipments Satisfying Screen 4 (<200 Miles, <5 Cars)	Share of CWS Shipments Satisfying Any Screen
ALL	ALL	25.9%	67.2%	6.9%	5.1%	80.0%
Farm Products	1	33.1%	68.2%	1.4%	5.0%	79.9%
Forest Products	8	0.0%	71.6%	0.4%	0.6%	71.6%
Fresh Fish or Other Marine Products	9	100.0%	81.5%	4.8%	0.9%	100.0%
Metallic ores	10	0.0%	28.4%	5.0%	6.4%	33.1%
Coal	11	0.0%	27.0%	1.3%	1.7%	27.8%
Petroleum (Crude)	13	0.0%	17.4%	1.3%	2.6%	18.8%
Non Metal Minerals	14	19.3%	18.6%	4.8%	6.9%	37.9%
Ordnance or Accessories	19	0.0%	27.8%	1.9%	0.0%	27.8%
Food or Kindred Products	20	28.5%	54.9%	5.5%	5.4%	66.6%
Tobacco	21	0.0%	100.0%	0.0%	0.0%	100.0%
Textile Mill Products	22	100.0%	74.4%	2.3%	4.2%	100.0%
Apparel or Other Textile Products or Knit Apparel	23	100.0%	66.7%	2.2%	1.4%	100.0%
Lumber or Wood Products Exc. Furniture	24	100.0%	28.9%	1.5%	21.1%	100.0%
Furniture or Fixtures	25	100.0%	66.2%	4.0%	0.2%	100.0%

Commodity Name	STCC Code (2-Digit)	Share of CWS Shipments Satisfying Screen 1 (Deregulation)	Share of CWS Shipments Satisfying Screen 2 (Paired Class I RR within 5 Miles of O & D)	Share of CWS Shipments Satisfying Screen 3 (Port within 5 Miles of O & D on Same Waterway)	Share of CWS Shipments Satisfying Trucking Screen 4 (<200 Miles, <5 Cars)	Share of CWS Shipments Satisfying Any Screen
Pulp, Paper or Allied Products	26	63.0%	45.9%	5.1%	6.1%	83.1%
Printed Products	27	100.0%	86.6%	1.4%	0.2%	100.0%
Chemicals or Allied Products	28	2.6%	42.4%	15.2%	15.3%	54.9%
Petroleum/Coal Products	29	2.6%	44.3%	12.4%	15.9%	53.5%
Rubber or Miscellaneous Plastics Products	30	80.3%	71.9%	4.6%	1.0%	90.5%
Leather or Leather Products	31	100.0%	57.2%	0.8%	0.2%	100.0%
Clay, Concrete, Glass or Stone Products	32	42.9%	26.2%	4.9%	12.8%	57.9%
Primary Metal Products, Including Galvanized Coating or Other Allied Processing	33	100.0%	49.1%	10.1%	17.1%	100.0%
Fabricated Metal Exc. ordnance, Machinery, or Transportation Equipment	34	94.1%	73.7%	2.9%	1.1%	98.8%
Machinery	35	76.7%	67.7%	2.8%	1.2%	90.3%
Electrical Machinery, Equipment or Supplies	36	99.0%	70.7%	4.5%	0.3%	99.6%
Transportation Equipment	37	92.8%	64.0%	6.0%	7.9%	97.5%
Instruments, Goods, Optical Goods, Watches or Clocks	38	100.0%	74.3%	0.8%	1.4%	100.0%
Miscellaneous Products	39	100.0%	70.9%	3.0%	0.2%	100.0%
Waste or Scrap Materials Not Identified by Producing Industry	40	80.0%	56.8%	5.0%	15.0%	95.1%
Miscellaneous Freight Shipments	41	16.1%	70.0%	1.9%	0.9%	75.8%
Containers, Carriers or Devices, Shipping, Returned Empty	42	0.3%	78.6%	7.8%	3.2%	79.2%
Mail, Express or Other Contract Traffic	43	0.0%	94.9%	19.6%	0.0%	94.9%
Freight Forwarder	44	0.0%	91.5%	9.9%	0.1%	91.6%

Commodity Name	STCC Code (2-Digit)	Share of CWS Shipments Satisfying Screen 1 (Deregulation)	Share of CWS Shipments Satisfying Screen 2 (Paired Class I RR within 5 Miles of O & D)	Share of CWS Shipments Satisfying Screen 3 (Port within 5 Miles of O & D on Same Waterway)	Share of CWS Shipments Satisfying Trucking Screen 4 (<200 Miles, <5 Cars)	Share of CWS Shipments Satisfying Any Screen
Shipper Association or Similar Traffic	45	0.0%	78.8%	5.1%	0.0%	78.8%
Miscellaneous Mixed Shipments	46	0.0%	82.6%	6.3%	0.2%	82.7%
Small Packaged Freight Shipments	47	0.0%	96.5%	2.3%	0.0%	96.5%
Waste Hazardous or Waste Hazardous Substances	48	0.0%	31.6%	7.1%	7.4%	41.0%

18. It bears emphasis that what ultimately matters when defining a competitive sample is (1) establishing an economically reasonable and workable set of criteria for identifying CWS shipments subject to effective competition; and (2) applying these criteria consistently. Of course, it is not practical to expect that the Board (or anyone else) could design a workable set of criteria that would flawlessly identify effectively competitive shipments in each and every instance. Any workable process would involve some error. Fortunately, such errors would not be expected to undermine the reliability of the Benchmark Model.

19. To see this, note that a classification scheme can commit two types of errors: It can mistakenly exclude a competitive shipment from the effectively competitive sample (a “Type I Error”), or it can mistakenly include a noncompetitive shipment in the effectively competitive sample (a “Type II Error”). A Type I Error would occur when a truly competitive shipment is flagged because it meets some set of criteria triggering a concern that the shipment may not be sufficiently competitive to warrant inclusion in the effectively competitive sample. But Type I Errors do not render the Benchmark Model unreliable, because the shipments that remain in the effectively competitive sample would still reflect competitive conditions—and only these shipments are used to estimate the Benchmark Model. Put differently, reliance on an under-

inclusive classification scheme would not imply that the resulting sample of competitive shipments is not effectively competitive.

20. Conversely, a Type II error would occur when a noncompetitive shipment is included in the effectively competitive sample because the selection criteria are not strict enough for that particular shipment. This over-inclusiveness would dilute the degree of competition reflected in the effectively competitive sample. This would render the Benchmark Model more conservative, in the sense of making it less likely that the Benchmark Model would indicate that a potentially noncompetitive price is significantly above the competitive level. Thus, the potential for Type II Errors can be added to the list of reasons why the Benchmark Method is inherently conservative and unlikely to adversely affect railroads' revenue adequacy.²⁸

2. Econometric Model

21. After a competitive sample has been identified, the data from the competitive sample are used to estimate an econometric model. The econometric model can be written:

$$\ln(r_{it}) = \alpha + \alpha_i + m_{it} + \sum_j \beta_j X_{ijt} + \varepsilon_{it}$$

Above, r_{it} is the revenue per ton-mile for given CWS movement i in year t . The natural log of revenue per ton-mile, $\ln(r_{it})$, is the dependent variable that the econometric model is designed to predict. The term α_i represents fixed effects; there is one fixed effect for each 5-digit STCC code.²⁹ The term m_{it} represents indicator variables designed to control for revenue masking, and

²⁸ See 2015 Consolidated Testimony Part III.B.3.

²⁹ As explained above, these fixed effects control for factors that cause rates for one commodity to be higher or lower, on average, than other commodities.

also control for fixed effects by year and railroad.³⁰ The X_{ijt} represent other characteristics of the shipment, such as distance and size. (Although the β_j are the same for all commodities, it would be conceptually straightforward to allow these parameters to vary by STCC code. This would allow, for example, the effect of shipment distance on revenue per ton-mile to be different for different commodities). Finally, ε_{ijt} is a random error term (a standard component of any econometric model). Each observation in the regression is weighted by the CWS expansion factor.³¹

22. The output of the econometric model is displayed in Table 3 below. Results are presented for nine different Benchmark Groups (BG1 – BG9). The baseline Benchmark Model uses Benchmark Group One (BG1), which is the same competitive sample detailed in Tables 2A-2B above. In the remaining Benchmark Groups, the set of shipments classified in the competitive sample is expanded in various ways. For example, in BG2, the allowable distance to Class 1 railroads is increased from 5 miles to 25 miles. Moving from BG1 to BG9, the allowable distances to rail and water competition vary between 5 miles and 50 miles.

23. The regression utilizes more than 3.5 million data points and explains approximately 57 percent of the variation in (masked) revenue per ton-mile (R -squared = 0.572).³²

³⁰ As explained above, each railroad can mask their contract revenues by multiplying revenues by a scalar value at the three-digit STCC level. Accordingly, there is a separate masking factor indicator for each unique combination of railroad, year, and 3-digit STCC. Because the masking factor indicators span all railroads and years, they also control for fixed effects by railroad and year.

³¹ The expansion factor for a movement in the CWS is equal to the number of shipments that this shipment represents in the population of shipments served by the railroad annually. It is equal to the inverse of the sampling rate.

³² By way of comparison, when the TRB used unmasked revenue data to estimate individual, commodity-level regression models, the reported R -squared statistics ranged from 65.6 percent (for Chemicals and Allied Products) to 78.5 percent (for Coal). TRB Report, Appendix B. The explanatory power of the Benchmark Model would be expected to increase when applied to unmasked revenue data. The explanatory power of the Benchmark Model could also be increased by allowing the parameters of the model to vary by STCC code (which is conceptually straightforward, as noted above). In any case, it bears emphasis that, in econometrics, a “high” R -squared is not

The coefficients on each of the shipment characteristics is highly statistically significant, and the effects of the shipment characteristics on revenue per ton-mile make economic sense. The coefficient on the natural logarithm of the shipment distance is consistently negative, at approximately -0.6. This indicates that a ten percent increase in the distance of a movement is, all else equal, associated with a decrease in revenue per ton-mile of approximately 6 percent. Therefore, longer shipments appear to be discounted relative to shorter movements, presumably because the railroad's cost per ton-mile tends to be smaller for longer movements due to scale economies. The coefficient on the natural logarithm of the shipment size, as measured by the number of carloads, is consistently negative, at approximately -0.06 to -0.07. This means that a ten percent increase in the size of a shipment is, all else equal, associated with a decrease in revenue per ton-mile of approximately 0.6 to 0.7 percent. Again, this appears to reflect scale economies.

necessarily indicative of a favorable result, nor is a "low" R -squared necessarily indicative of an unfavorable result. Even a regression with a seemingly low R -squared can generate statistically valid predictions. This is particularly true when the sample size is large, as is the case here. See, e.g., JEFFREY M. WOOLDRIDGE, *INTRODUCTORY ECONOMETRICS: A MODERN APPROACH* 199 (South-Western Cengage Learning 4th ed. 2009) [hereafter, "WOOLDRIDGE"] ("Until now, we have not focused much on the size of R^2 in evaluating our regression models, because beginning students tend to put too much weight on R -squared...choosing a set of explanatory variables based on the size of the R -squared can lead to nonsensical models... A small R -squared does imply that the error variance is large relative to the variance of y , which means we may have a hard time precisely estimating the [regression coefficients]. But remember...that *a large error variance can be offset by a large sample size*: if we have enough data, we may be able to precisely estimate the partial effects even though we have not controlled for many unobserved factors.") (emphasis added). See also DAMODAR GUJARATI, *BASIC ECONOMETRICS* 222–223 (McGraw-Hill 2008) ("[A] high r^2 is not evidence in favor of the model and a low r^2 is not evidence against it.")

TABLE 3: BENCHMARK MODEL REGRESSIONS
Dependent Variable = $\ln(\text{Revenue Per Ton-Mile})$

<i>Explanatory Variable</i>	BG1 (5mi RR, 5mi Water)	BG2 (25mi RR, 5mi Water)	BG3 (50mi RR, 5mi Water)	BG4 (5mi RR, 25mi Water)	BG5 (25mi RR, 25mi Water)	BG6 (50mi RR, 25mi Water)	BG7 (5mi RR, 50mi Water)	BG8 (25mi RR, 50mi Water)	BG9 (50mi RR, 50mi Water)
<i>Log of Total Distance (Miles)</i>	-0.635*** (0.000)	-0.623*** (0.000)	-0.619*** (0.000)	-0.635*** (0.000)	-0.623*** (0.000)	-0.618*** (0.000)	-0.634*** (0.000)	-0.622*** (0.000)	-0.618*** (0.000)
<i>Log of Carloads</i>	-0.068*** (0.000)	-0.065*** (0.000)	-0.061*** (0.000)	-0.065*** (0.000)	-0.064*** (0.000)	-0.06*** (0.000)	-0.063*** (0.000)	-0.063*** (0.000)	-0.06*** (0.000)
<i>Number of Railroads in Shipment</i>	0.2*** (0.000)	0.202*** (0.000)	0.207*** (0.000)	0.201*** (0.000)	0.203*** (0.000)	0.207*** (0.000)	0.201*** (0.000)	0.203*** (0.000)	0.208*** (0.000)
<i>Private Car Flag</i>	-0.09*** (0.000)	-0.092*** (0.000)	-0.092*** (0.000)	-0.09*** (0.000)	-0.092*** (0.000)	-0.092*** (0.000)	-0.09*** (0.000)	-0.092*** (0.000)	-0.092*** (0.000)
<i>Hazmat Flag</i>	0.141*** (0.000)	0.152*** (0.000)	0.146*** (0.000)	0.14*** (0.000)	0.152*** (0.000)	0.146*** (0.000)	0.134*** (0.000)	0.15*** (0.000)	0.145*** (0.000)
<i>Rule 11 Flag - Origin to Intermed</i>	-0.055*** (0.000)	-0.056*** (0.000)	-0.057*** (0.000)	-0.054*** (0.000)	-0.056*** (0.000)	-0.057*** (0.000)	-0.053*** (0.000)	-0.056*** (0.000)	-0.057*** (0.000)
<i>Rule 11 Flag - Intermed to Intermed</i>	-0.221*** (0.000)	-0.208*** (0.000)	-0.209*** (0.000)	-0.219*** (0.000)	-0.209*** (0.000)	-0.21*** (0.000)	-0.219*** (0.000)	-0.209*** (0.000)	-0.21*** (0.000)
<i>Rule 11 Flag - Intermed to Dest</i>	-0.09*** (0.000)	-0.079*** (0.000)	-0.08*** (0.000)	-0.089*** (0.000)	-0.079*** (0.000)	-0.08*** (0.000)	-0.087*** (0.000)	-0.079*** (0.000)	-0.08*** (0.000)
<i>Constant</i>	1.709*** (0.000)	1.608*** (0.000)	1.565*** (0.000)	1.689 (1.000)	1.603 (0.999)	1.56 (1.000)	1.683*** (0.000)	1.6*** (0.000)	1.565*** (0.000)
# of 5-digit STCC FE (α_i)	868	857	863	855	853	872	862	865	868
# Masking Factor Controls (m_{it})	9,661	10,363	10,622	9,821	10,420	10,642	9,971	10,485	10,682
Observations	3,496,978	4,123,077	4,265,047	3,542,402	4,135,900	4,273,501	3,588,840	4,154,818	4,285,131
R-Squared	57.2%	55.5%	55.5%	57.2%	55.5%	55.5%	57.2%	55.5%	55.5%

Notes: Robust p -values in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ Each observation is weighted by its expansion factor, the inverse of the waybill sampling rate. All regressions include fixed effects by 5-digit STCC, as well as separate fixed effects for each unique combination of railroad, year, and 3-digit STCC

24. On the other hand, the coefficient on the number of railroads involved in the movement is consistently positive: The more railroads involved in a shipment, the higher the rate; movements involving multiple railroads appear to have characteristics that make them more costly to perform. The coefficient on the private car indicator is consistently negative, indicating that shippers pay lower rates when the railroad does not provide the cars for the shipment. The hazardous materials coefficient is consistently positive, indicating that hazardous materials are more expensive to ship than are non-hazardous materials. The Rule 11 Flags are consistently negative, indicating that rates are lower for shipments that form part of a joint movement. For example, a movement from the origin to an intermediate station is approximately 5.5 percent less expensive than a non-Rule 11 movement, while a movement between two intermediate stations is approximately 22 percent less expensive than a non-Rule 11 movement. Finally, the regression includes fixed effects for more than 850 5-digit STCC codes,³³ and approximately 10,000 masking factor controls. Standard econometric tests confirm that both the 5-digit STCC fixed effects and the masking factor controls contribute significantly to the explanatory power of the regression model.

C. Results

25. As explained above, approximately 24 percent of CWS movements are classified as potentially noncompetitive. In this section, I use the Benchmark Model to identify movements with abnormally high rates within this potentially noncompetitive sample. For each potentially noncompetitive movement in the CWS, I used the Benchmark Model to predict what the revenue per

³³ There are more than one thousand 5-digit STCC codes in the competitive sample. However, the fixed effects for some of these 5-digit STCC codes are collinear with the masking factor controls. In these cases, the fixed effects are dropped from the regression. This does not affect the predictions of the regression model: The predictions would be the same if a fixed effect were included for every 5-digit STCC code in the competitive sample. In this case, some of the masking factor controls—those that are collinear with the 5-digit STCC code fixed effects—would be dropped instead. In either case, the regression model generates mathematically identical predictions.

ton-mile would for a shipment with comparable characteristics in the competitive sample. I then compared the actual rate paid by the shipper to the predicted competitive rate. As explained below, the actual rates for potentially noncompetitive shipments in the CWS exceed the predicted rates for comparable competitive shipments by approximately 48 percent on average.

26. For each shipment in the potentially noncompetitive sample, I used the shipment characteristics used in the econometric model to obtain the predicted rate for a comparable competitive shipment. As explained above, these characteristics include the distance of the shipment, the number of carloads, the number of railroads involved in the shipment, whether or not private cars were used, and whether or not hazardous materials were shipped. They also include the 5-digit STCC code of the shipment. Also required is the year, railroad, and 3-digit STCC of the potentially noncompetitive shipment; this information determines the masking factor correction that is applied to the shipment.

27. For the baseline competitive sample, BG1, there are approximately 1,095,000 potentially noncompetitive movements in the CWS. Of these, I was able to obtain predicted competitive rates for approximately 1,081,000, or about 99 percent. Predicted competitive rates are unavailable for approximately one percent of the potentially noncompetitive sample because it was not possible to apply a masking factor correction to these movements. Masking factor corrections could not be performed for this small percentage of movements because they involved a combination of year, railroad, and 3-digit STCC that did not appear in the competitive sample.³⁴

28. For each movement in the competitive sample, I computed the ratio of (1) the actual rate reported in the CWS; to (2) the predicted rate for a comparable competitive shipment. As seen

³⁴ Of course, masking factor corrections would not be needed if the unmasked CWS data were available. Therefore, using the unmasked sample, predicted competitive rates could have been obtained for more than 99 percent of potentially noncompetitive movements.

in Table 4 below, on average, across all potentially noncompetitive shipments, the actual rate exceeds the predicted competitive rate by approximately 48 percent on average. For approximately 26 percent of potentially noncompetitive shipments, the actual rate exceeds the predicted competitive rate by more than 50 percent (the ratio exceeds 1.5). For approximately 12 percent of potentially noncompetitive shipments, the actual rate is more than double the predicted competitive rate. For approximately four percent of potentially noncompetitive shipments, the actual rate is more than triple the predicted competitive rate. For approximately one percent of potentially noncompetitive shipments, the actual rate is more than five times the predicted competitive rate.

29. I performed comparable calculations for each two-digit STCC, the results of which are also reported in Table 4. For all but one two-digit STCC, the actual rate exceeds the predicted competitive rate on average.³⁵ For example, in the case of Chemicals or Allied Products, the actual rate exceeds the predicted competitive rate by about 33 percent on average. For approximately 25 percent of potentially noncompetitive shipments of Chemicals or Allied Products, the actual rate exceeds the predicted competitive rate by more than 50 percent. For approximately ten percent of potentially noncompetitive shipments of Chemicals or Allied Products, the actual rate is more than double the predicted competitive rate. For approximately 2.5 percent of potentially noncompetitive shipments of Chemicals or Allied Products, the actual rate is more than triple the predicted competitive rate. For approximately 0.6 percent of potentially noncompetitive shipments of Chemicals or Allied Products, the actual rate is more than five times the predicted competitive rate.

³⁵ As seen below, "Shipper Association or Similar Traffic" has a ratio of 0.99.

TABLE 4: RATIO OF ACTUAL RATE TO COMPARABLE PREDICTED COMPETITIVE RATE FOR BASELINE BENCHMARK GROUP (5MI RR, 5MI WATER)

Commodity Name	STCC Code (2-Digit)	Avg. Ratio	% with Ratio > 1.5	% with Ratio > 2	% with Ratio > 3	% with Ratio > 5
ALL	ALL	1.48	26.1%	11.6%	3.7%	0.9%
Farm Products	1	1.34	18.3%	5.8%	2.0%	0.9%
Forest Products	8	1.25	19.7%	8.8%	1.5%	0.0%
Fresh Fish or Other Marine Products	9	N/A	N/A	N/A	N/A	N/A
Metallic ores	10	1.68	16.4%	10.5%	2.9%	2.6%
Coal ³⁶	11	1.95	30.1%	11.8%	1.8%	0.5%
Petroleum (Crude)	13	1.21	8.4%	2.1%	1.1%	0.6%
Non Metal Minerals	14	2.06	14.3%	4.3%	1.8%	0.5%
Ordnance or Accessories	19	6.31	47.5%	32.1%	21.1%	12.2%
Food or Kindred Products	20	1.17	17.8%	5.7%	1.4%	0.3%
Tobacco	21	N/A	N/A	N/A	N/A	N/A
Textile Mill Products	22	N/A	N/A	N/A	N/A	N/A
Apparel or Other Textile Products or Knit Apparel	23	N/A	N/A	N/A	N/A	N/A
Lumber or Wood Products Exc. Furniture	24	N/A	N/A	N/A	N/A	N/A
Furniture or Fixtures	25	N/A	N/A	N/A	N/A	N/A
Pulp, Paper or Allied Products	26	1.24	21.1%	7.4%	1.7%	0.4%
Printed Products	27	N/A	N/A	N/A	N/A	N/A
Chemicals or Allied Products	28	1.33	24.8%	10.0%	2.5%	0.6%

³⁶ Some Coal movements contain extreme values for revenue per ton mile, on the order of 10,000 times the average. Therefore, approximately 0.8 percent of percent of Coal observations are excluded from the analysis as outliers.

Commodity Name	STCC Code (2-Digit)	Avg. Ratio	% with Ratio > 1.5	% with Ratio > 2	% with Ratio > 3	% with Ratio > 5
Petroleum/Coal Products	29	1.27	13.6%	4.4%	1.9%	0.9%
Rubber or Miscellaneous Plastics Products	30	1.15	17.6%	7.3%	1.2%	0.2%
Leather or Leather Products	31	N/A	N/A	N/A	N/A	N/A
Clay, Concrete, Glass or Stone Products	32	1.29	24.9%	8.1%	2.0%	0.4%
Primary Metal Products, Including Galvanized Coating or Other Allied Processing	33	N/A	N/A	N/A	N/A	N/A
Fabricated Metal Exc. ordnance, Machinery, or Transportation Equipment	34	1.86	46.3%	33.9%	14.1%	3.4%
Machinery	35	1.36	28.2%	15.9%	6.0%	1.9%
Electrical Machinery, Equipment or Supplies	36	1.29	21.1%	11.9%	8.3%	3.7%
Transportation Equipment	37	1.15	16.1%	7.5%	2.6%	0.6%
Instruments, Goods, Optical Goods, Watches or Clocks	38	N/A	N/A	N/A	N/A	N/A
Miscellaneous Products	39	N/A	N/A	N/A	N/A	N/A
Waste or Scrap Materials Not Identified by Producing Industry	40	1.72	48.3%	26.0%	10.9%	1.5%
Miscellaneous Freight Shipments	41	1.59	33.4%	17.7%	6.4%	2.9%
Containers, Carriers or Devices, Shipping, Returned Empty	42	1.30	31.6%	12.0%	2.4%	0.4%
Mail, Express or Other Contract Traffic	43	1.45	44.0%	18.2%	1.3%	0.0%
Freight Forwarder	44	1.34	25.6%	12.2%	5.0%	1.5%
Shipper Association or Similar Traffic	45	0.99	17.4%	8.3%	3.0%	0.0%
Miscellaneous Mixed Shipments	46	1.45	32.5%	18.4%	7.5%	1.7%
Small Packaged Freight Shipments	47	1.24	34.0%	13.2%	1.5%	0.5%
Waste Hazardous or Waste Hazardous Substances	48	1.16	15.5%	7.8%	3.3%	1.7%

30. In the next section, I demonstrate how the Benchmark Model could be applied in practice to place an upper bound on the extent to which rates in the potentially noncompetitive sample would be permitted to exceed the predicted benchmark rates.

III. APPLYING THE BENCHMARK MODEL USING THE COMPETITIVE THRESHOLD

31. In addition to identifying shipments potentially eligible for rate relief, the Benchmark Method, combined with railroad financial data, provides an economically sound basis for determining the amount of rate relief that shippers should receive while still satisfying the regulatory requirements of revenue adequacy. The STB could implement a Benchmark-based rate standard by allowing captive rates to exceed competitive rates by a predetermined Competitive Threshold. As demonstrated below, the level of CT would be selected based on an analysis of revenue adequacy: For any given value of the CT, and for any given railroad, the STB could calculate the effect of rate regulation on railroad revenue (assuming conservatively that all eligible shippers successfully petition the STB for rate relief). A higher value for CT would have less of an effect on railroad revenues than a lower value. Of course, to the extent that railroads achieve revenue adequacy from revenues earned on competitive traffic, these revenues would remain unaffected.

32. Determining the acceptable value for CT would ultimately be a policy choice. Although such a decision is likely to be controversial, the process through which the STB would assess the expected effect of CT on railroads' revenue adequacy would be transparent to all parties. Regardless of what value for CT is selected, rate relief would, by construction, prioritize the subset of captive shippers that is most likely subject to unreasonably high rates. This would allow the STB to preserve the railroad industry's ability to set differential prices to captive shippers, while granting consistent and transparent rate relief. For several reasons, implementing the CT is not equivalent to implementing rate-of-return regulation. First, the CT regulates the extent to which captive rates are

permitted to exceed their competitive counterparts, as opposed to the rate of return earned by the railroad: Railroads that earn rates of return in excess of the cost of capital are subject to rate regulation only to the extent that these excess returns are the result of charging supracompetitive prices to captive shippers. To the extent that a railroad's excess returns are attributable to procompetitive activity, such as efficient cost reductions, these returns are not penalized under the CT method. Second, surplus revenue attributable to competitive traffic, or indeed any traffic with R/VC less than 180, would obviously not be subject to regulation. Third, rate relief would, in practice, be limited to shippers that successfully brought a case before the STB, and successfully proved market dominance.

33. Below I provide an illustrative example of how the CT could be applied in practice. My calculations are limited by the fact that unmasked revenue data have not been made available to me. Nevertheless, the calculations below clarify how a CT analysis would proceed. My calculations conservatively assume that every potentially noncompetitive movement receives rate relief up to that allowed by the CT. In practice, fewer movements would be affected. Rates with R/VC below 180 (which cannot be identified without unmasked data) would not be eligible for relief. Movements for which market dominance could not be demonstrated would also be ineligible for rate relief.

34. The calculations below also conservatively assume that that, whenever rate relief is granted, the railroad's revenue would fall in proportion to the amount of rate relief granted to the shipper. For example, if rate relief causes a shipper's rates for a movement to fall by ten percent, the revenues earned by the railroad on that movement is also assumed to decline by ten percent. In reality, the quantity of ton-miles shipped on such movements is likely to increase as the shipper takes advantage of the lower rate, partially offsetting the railroad's loss in revenue. Thus, in this example,

the railroad's revenue on the movements in question would be expected to decline by less than ten percent.³⁷

35. However, it bears emphasis that the lack of unmasked revenue data makes my calculations less conservative to the extent that railroads earn a disproportionate share of their freight revenue from shipments whose rates substantially exceed their competitive benchmarks. Given unmasked revenue data, it would be possible to weight CWS movements by their respective revenues and thus to eliminate this source of bias in these illustrative CT calculations.

36. My prior testimony explained that it is reasonable to measure revenue adequacy over a period of approximately six years.³⁸ Given the CWS data currently available to me, the most recently available six-year period is 2008 – 2013. During the first three years of this time period, which include the Great Recession,³⁹ nearly all railroads were deemed revenue inadequate.⁴⁰ Barring another economic crisis of historic proportions, this time period is unlikely to be representative of the economic conditions that would be expected to prevail going forward. Therefore, for illustrative

³⁷ To obtain a more precise estimate of the likely effect on revenue, downward-sloping shipper demand could be factored into the CT calculations. This could be accomplished using estimates of shipper demand elasticities obtained from the relevant economic literature. See, e.g., US Army Corps of Engineers, "A Survey Of The Freight Transportation Demand Literature And A Comparison Of Elasticity Estimates," IWR Report 05-NETS-R-01 (January 2005), available at: <http://www.iwr.usace.army.mil/Portals/70/docs/iwrreports/05-NETS-R-01.pdf> (Independent elasticity estimates could also be obtained using standard econometric techniques). In addition, it would be necessary to take into account the increased operating costs that railroads would incur as a result of increased shipper demand. Railroads report their operating expenses for use in the STB's revenue adequacy determinations.

³⁸ Public Hearing, STB Docket No. Ex Parte 722 & STB Docket No. Ex Parte 664, *Consolidated Hearing Testimony of Jeffrey O. Moreno, Paul M. Donovan, Dr. Kevin W. Caves, Thomas D. Crowley, and Henry J. Roman On Behalf of the Concerned Shipper Associations*, Surface Transportation Board (July 23, 2015) at 5 – 8.

³⁹ The Great Recession officially spanned December 2007 – June 2009. See National Bureau of Economic Research, *US Business Cycle Expansions and Contractions*, available at: <https://www.nber.org/cycles.html>. However, it took several additional years for standard macroeconomic indicators such as output and employment to approach pre-crisis levels. See, e.g., Arne L. Kalleberg & Till M. Von Wachter, *The U.S. Labor Market During and After the Great Recession: Continuities and Transformations* 3(3) THE RUSSELL SAGE FOUNDATION JOURNAL OF THE SOCIAL SCIENCES 1-19 (2017) at 3 ("Over time, it quickly became apparent that perhaps the most unusual and unexpected feature of the Great Recession was the persistence of weak economic conditions in its aftermath.")

⁴⁰ In 2008, only Norfolk Southern was revenue adequate. In 2009, no railroad was revenue adequate. In 2010, only Union Pacific was deemed revenue adequate.

purposes, below I demonstrate how to implement the CT for both (1) the most recently available three-year period (2011 – 2013); and (2) the most recently available six-year period (2008 – 2013).

37. Table 5 below illustrates the application of the CT using the STB’s revenue adequacy determinations for 2011 – 2013. For each of the five Class I railroads, I implemented a multi-year version of the STB’s annual calculations, which compare each railroad’s annual tax-adjusted rate of return on net investment (“ROI”) to the railroad industry cost of capital estimated by the STB. My multi-year calculation is directly analogous to the STB’s annual revenue adequacy calculations. It compares each railroad’s weighted average ROI to the weighted average industry cost of capital over the three-year period. In calculating the weighted average ROI, each railroad’s ROI for a given year is weighted by that railroad’s tax adjusted net investment base for that same year.⁴¹ Similarly, in calculating the weighted average industry cost of capital, the cost of capital for a given year receives a weight equal to the aggregate tax adjusted net investment base across all railroads during that year.

38. As seen in Table 5, three railroads (BNSF, Norfolk Southern, and UP) are found to be revenue adequate for 2011 – 2013. For each of these three railroads, I calculated the minimum viable CT, defined as the lowest value of the CT that would still maintain revenue adequacy for that railroad over the same three-year period.⁴²

⁴¹ A railroad’s weighted average ROI is equal to the ratio of (a) its average annual Adjusted Net Railway Operating Income to (b) its average Tax Adjusted Net Investment Base. For example, let I_t be a railroad’s Adjusted Net Railway Operating Income in year t , and let B_t be a railroad’s Tax Adjusted Net Investment Base in year t . The railroad’s ROI in year t is equal to $R_t = I_t/B_t$. The railroad’s weighted average ROI across any two sequential years is equal to $(B_1R_1 + B_2R_2)/(B_1 + B_2) = [(I_1 + I_2)/2]/[(B_1 + B_2)/2]$, which is the ratio of the railroad’s average annual Adjusted Net Railway Operating Income to its average Adjusted Net Investment Base.

⁴² This involved determining, for each movement in the potentially non-competitive sample, and for each candidate CT value, the Revenue Reduction Factor (“RRF”) implied by the adjustment which, when multiplied against the revenue per ton-mile of a movement, brings the rate in line with the CT. For example, suppose that the CT is equal to 2.0. If the ratio of a potentially noncompetitive rate to the benchmark rate is 2.25, the RRF is equal to $2.0/2.25 = 0.889$ (implying rate relief of approximately 11 percent). On the other hand, if the ratio of a potentially noncompetitive rate to the benchmark rate is 2.0 or less, the RRF is equal to one (implying no rate relief). The RRF is also set equal to one for all movements outside of the potentially noncompetitive sample, because these movements are ineligible for rate relief.

TABLE 5: ILLUSTRATIVE COMPETITIVE THRESHOLD ANALYSIS (2011-2013)

Class I Railroad	BNSF	CSX	GT	KCS	NS	SOO	UP
Avg. Annual Freight Revenue	\$20,282,766	\$11,543,077	\$2,733,508	\$1,153,368	\$10,755,618	\$1,544,799	\$19,625,883
Avg. Annual Adj. Net Railway Op. Inc.	\$3,647,063	\$1,802,672	\$709,088	\$232,003	\$1,997,112	\$230,993	\$4,046,578
Avg. Annual Tax Adj. Net Inv. Base	\$27,362,172	\$16,734,217	\$6,893,202	\$2,422,909	\$16,471,374	\$2,829,974	\$28,057,339
Weighted Avg. Annual Tax Adj. ROI	13.33%	10.77%	10.29%	9.58%	12.12%	8.16%	14.42%
Weighted Avg. Industry Cost of Capital	11.33%						
Revenue Adequate?	Yes	No	No	No	Yes	No	Yes
Minimum Viable Competitive Threshold	1.00	N/A	N/A	N/A	1.80	N/A	1.00
Revenue Reduction Factor	0.97374	N/A	N/A	N/A	0.98845	N/A	0.95840
Avg. Annual Reduction in Freight Rev.	\$532,574	N/A	N/A	N/A	\$124,277	N/A	\$816,430
Avg. Annual Adj. Net Railway Op. Inc. [After Applying CT]	\$3,114,489	N/A	N/A	N/A	\$1,872,835	N/A	\$3,230,148
Avg. Annual Tax Adj. Net Inv. Base	\$27,362,172	N/A	N/A	N/A	\$16,471,374	N/A	\$28,057,339
Weighted Avg. Annual Tax Adj. ROI [After Applying CT]	11.38%	N/A	N/A	N/A	11.37%	N/A	11.51%

All dollar values in thousands. *Source:* Docket No. EP 552 (Sub-No. 18), Appendix B; STB Annual Report Financial Data, Table 210, "Results of Operations", available at <https://www.stb.gov/econdata.nsf>

39. For example, as seen in Table 5, BNSF's weighted average ROI for 2011- 2013 comes to 13.33 percent, well above the weighted average industry cost of capital of 11.33 percent. The minimum viable CT for BNSF is equal to 1.00. This means that, even if BNSF were constrained to charge all potentially captive shippers rates equal to their comparable competitive benchmarks (reducing BNSF's annual freight revenue by approximately \$532,574,000), BNSF would have remained revenue adequate, earning a weighted average ROI of 11.38 percent. By similar calculations, the minimum viable CT for UP is also equal to 1.00. Although this would have reduced UP's revenue by approximately \$816,430,000 annually, this still would have permitted UP to earn a weighted average ROI of 11.51 percent from 2011 – 2013.

under the Benchmark Method. For each railroad, I calculated the weighted average RRF across all of that railroad's 2011 - 2013 movements in the CWS, with each movement weighted by its expansion factor, and by the railroad's annual freight revenues. (If unmasked revenues were available, the calculation would instead be weighted by the revenue earned on each movement). The weighted average RRF provides an estimate of the extent to which each railroad's freight revenue would be reduced if all the rates for all potentially noncompetitive traffic were adjusted downward to the level given by the CT.

40. The minimum viable CT for Norfolk Southern is approximately 1.8, implying revenue reductions of approximately \$124,277,000 per year on average. The remaining railroads are not revenue adequate, so the CT is not applicable to them.

41. Calculations such as these would provide a starting point for determining the extent to which each railroad's rates should be constrained by the competitive benchmarks implied by the Benchmark Model while still preserving revenue adequacy. Beginning with the minimum viable CT, the STB could use similar calculations to determine the effect on revenue adequacy for any higher CT value deemed appropriate.

42. Finally, Table 6 performs analogous calculations, this time expanding the analysis to the full six- year period (2008 – 2013). As seen below, even when the years encompassing the Great Recession are included, the same three Class I railroads (BNSF, NS, and UP) would have remained revenue adequate for the six-year period, even if rates to captive shippers has been constrained by regulation according to the Benchmark Model. For example, the minimum viable CT for BNSF is approximately 1.7. Had BNSF been subject to this CT for the period from 2008 through 2013, its freight revenue would have been reduced by an estimated \$124,630,000 per year over the six-year period, allowing it to earn an ROI in excess of the weighted average industry cost of capital of 11.20 percent.

TABLE 5: ILLUSTRATIVE COMPETITIVE THRESHOLD ANALYSIS (2008-2013)

Class I Railroad	BNSF	CSX	GT	KCS	NS	SOO	UP
Avg. Annual Freight Revenue	\$18,162,759	\$10,442,469	\$2,408,390	\$1,036,654	\$9,891,241	\$1,239,154	\$17,573,108
Avg. Annual Adj. Net Railway Op. Inc.	\$2,995,747	\$1,627,533	\$614,464	\$193,177	\$1,802,335	\$204,271	\$3,328,338
Avg. Annual Tax Adj. Net Inv. Base	\$25,621,938	\$16,289,700	\$6,556,736	\$2,172,176	\$15,717,922	\$2,575,452	\$26,810,163
Weighted Avg. Annual Tax Adj. ROI	11.69%	9.99%	9.37%	8.89%	11.47%	7.93%	12.41%
Weighted Avg. Industry Cost of Capital	11.20%						
Revenue Adequate?	Yes	No	No	No	Yes	No	Yes
Minimum Viable Competitive Threshold	1.70	N/A	N/A	N/A	2.30	N/A	1.45
Revenue Reduction Factor	0.99314	N/A	N/A	N/A	0.99603	N/A	0.98295
Avg. Annual Reduction in Freight Rev.	\$124,630	N/A	N/A	N/A	\$39,310	N/A	\$299,634
Avg. Annual Adj. Net Railway Op. Inc. [After Applying CT]	\$2,871,117	N/A	N/A	N/A	\$1,763,026	N/A	\$3,028,704
Avg. Annual Tax Adj. Net Inv. Base	\$25,621,938	N/A	N/A	N/A	\$15,717,922	N/A	\$26,810,163
Weighted Avg. Annual Tax Adj. ROI [After Applying CT]	11.21%	N/A	N/A	N/A	11.22%	N/A	11.30%

All dollar values in thousands. Sources: Docket No. EP 552 (Sub-No. 18), Appendix B; STB Annual Report Financial Data, Table 210, "Results of Operations", available at <https://www.stb.gov/econdata.nsf>

CONCLUSION

43. For the reasons given above, I conclude that a Benchmark Model encompassing all commodities in the CWS can be implemented empirically using the CWS and publicly available data. I also conclude that the data, methods, and techniques detailed above provide an economically sound basis for determining the amount of rate relief that shippers should receive while still satisfying the regulatory requirements of revenue adequacy.

APPENDIX 1: SUMMARY OF AND INSTRUCTIONS FOR WORK PAPERS

44. The data and programs used to generate the results summarized in this report are being produced to the STB. The workpapers contain:

- 1) Masked CWS data (2006 – 2013)
- 2) Auxiliary data used to augment the CWS
- 3) STATA “.do” files with code to replicate the analysis summarized in this report
- 4) Formatted Excel tables corresponding to the tables in this report (produced by STATA).

45. To create the regression database and replicate the output in this report, use STATA to run program “00_Do_All.do” in the “do” folder, after editing the “[ROOT]” file path placeholder in each of the STATA .do files.

46. To run the model with a different CWS dataset, minor modifications to the .do files are required. First, in “04_CWS_Data_Build.do”, modify line 41 to point to the alternative CWS data. If the alternative CWS data are *unmasked*, make three additional modifications: First, comment out lines 102-104 in “04_CWS_Data_Build.do” and remove the variable “maskingFE” from line 319. Second, comment out line 55 in “05_BG_Regressions.do” and instead use the regression code in line 56. Finally, comment out lines 81-96 and uncomment lines 99-117 in “05_BG_Regressions.do”

47. Once all STATA code has been executed, raw output data can be found within the “Output” folder. If an alternative CWS dataset is used, overwrite the existing raw data tabs within the exhibits in the “Formatted Tables” folder with the new output. Doing so will automatically update the exhibits to reflect the alternative CWS data.

APPENDIX 2: CURRICULUM VITAE OF KEVIN W. CAVES



Curriculum Vitae of Kevin W. Caves

Econ One Research
805 15th St., N.W.
Suite 510
Washington, D.C. 20005
Phone: 202.312.3066
kcaves@econone.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, May 1998

Current Position

Senior Economist, Econ One Research, September 2018 to Present

Employment History

Vice President, Economists Incorporated, November 2016 to August 2018

Senior Economist, Economists Incorporated, January 2014 to November 2016

Director, Navigant Economics, March 2011 to December 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

When the Econometrician Shrugged: Identifying and Plugging Gaps in the Consumer Welfare Standard, 26:2 GEORGE MASON LAW REVIEW (Fall 2018), co-authored with Hal J. Singer.

Applied Econometrics: When Can an Omitted Variable Invalidate a Regression?, ANTITRUST SOURCE (December 2017), co-authored with Hal J. Singer.

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Analyzing High-Tech Employee: The Dos and Don'ts of Proving (and Disproving) Classwide Antitrust Impact in Wage Suppression Cases, THE ANTITRUST SOURCE (February 2015), co-authored with Hal J. Singer.

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).

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.

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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 EINER ELHAUGE, OBAMACARE ON TRIAL (August 2012).

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

Expert Testimony, Reports, and Filings

Streck v. Bristol-Myers Squibb Company (E.D. Pa.), Civil Action No. 2:13-cv-07547-TJS. Rebuttal Expert Report of Kevin W. Caves, Ph.D. (September 5, 2019).

Streck v. Bristol-Myers Squibb Company (E.D. Pa.), Civil Action No. 2:13-cv-07547-TJS. Expert Report of Kevin W. Caves, Ph.D. (August 16, 2019).

Camille Cabrera v. Bayer Healthcare LLC et al (C.D. Cal.), Case No. 2:17-cv-08525-JAK. Declaration and Expert Report of Kevin W. Caves, Ph.D. (July 16, 2019).

STB Docket No. NOR 42144, *In Re: North America Freight Car Assoc. et. al. v. Union Pacific*, Rebuttal Verified Statement of Kevin W. Caves, PhD Surface Transportation Board (May 31, 2019).

STB Ex Parte No. 711 (Sub No. 1), Reciprocal Switching, Reply Verified Statement of Kevin W. Caves, PhD On Behalf of The Shipper Coalition for Railroad Competition, Surface Transportation Board (January 9, 2017).

Payday, Vehicle Title, and Certain High-Cost Installment Loans, (Docket No. CFPB-2016-0025/RIN 3170-AA40), Expert Comments on Proposed Rule by Kevin W. Caves and Hal J. Singer, "A Consumer Welfare Analysis of the CFPB's Proposed Regulation of Payday Loans," Bureau of Consumer Financial Protection (October 2016).

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STB Ex Parte No. 722 (Railroad Revenue Adequacy), Reply Comments of Concerned Shipper Associations Verified Statement of Kevin Caves and Hal Singer, Surface Transportation Board (November 4, 2014).

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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).

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White Papers

The Empirical Link Between Fibre-to-the-Premises Deployment and Employment: A Case Study in Canada (prepared with support from Bell Canada, co-authored with Hal Singer and Anna Koyfman, October 2015).

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).

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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).

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

International Journal of the Economics of Business

Journal of Competition Law & Economics

Journal of Transportation Law, Logistics & Policy
(Editorial Advisory Board)

Research in Transportation Economics

Review of Network Economics

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.

VERIFICATION

I, Kevin W. Caves, verify under penalty of perjury that the foregoing is true and correct.

Further, I certify that I am qualified and authorized to file this statement.

Executed on November 7, 2019

Kevin Caves

Kevin W. Caves