Special Report 318

Modernizing Freight Rail Regulation

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TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

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Modernizing Freight Rail Regulation

Committee for a Study of Freight Rail Transportation and Regulation

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NOTICE: The project that is the subject of this report was approved by the Governing Board of the National Research Council, whose members are drawn from the councils of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. The members of the committee responsible for the report were chosen for their special competencies and with regard for appropriate balance.

This report has been reviewed by a group other than the authors according to the procedures approved by a Report Review Committee consisting of members of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

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Preface

In the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users of 2005, Congress called on the Secretary of Transportation to

> enter into an arrangement with the Transportation Research Board [TRB] of the National Academy of Sciences [NAS] to conduct a comprehensive study of the Nation's railroad transportation system since the enactment of the Staggers Rail Act of 1980. The study shall address and make recommendations on—(1) the performance of the Nation's major railroads regarding service levels, service quality, and rates; (2) the projected demand for freight transportation over the next two decades and the constraints limiting the railroads' ability to meet that demand; (3) the effectiveness of public policy in balancing the need for railroads to earn adequate returns with those of shippers for reasonable rates and adequate service; and (4) the future role of the Surface Transportation Board [STB] in regulating railroad rates, service levels, and the railroads' common carrier obligations, particularly as railroads may become revenue adequate.[1]

Congress appropriated funds for the study for Fiscal Year 2012,[2] and the U.S. Department of Transportation (USDOT) contracted with NAS to conduct the study beginning in September 2013. USDOT added some tasks to the study charge, which is presented in full and discussed in detail in Chapter 1.

To conduct the study, the National Research Council (NRC) of NAS convened a seven-member committee of experts in economics, regulatory policy, and freight transportation led by Richard L. Schmalensee, Dean Emeritus, Massachusetts Institute of Technology (MIT) Sloan School of Management. The contents and findings of the report represent the consensus effort of the members, who served uncompensated in the public interest. Committee members convened five times from January 2014 to January 2015 and held numerous conference calls during preparation of the report. Data-gathering sessions included briefings by carrier and labor representatives from the railroad industry, shipper groups, and government agencies, as well as academia and consulting organizations.

ACKNOWLEDGMENTS

The committee thanks the many individuals and organizations who contributed to its work.

The USDOT liaison for the study was Scott Greene, Federal Railroad Administration. Greene provided contract oversight and, along with William Huneke and Jamie Rennert of STB, arranged for the committee to have access to the confidential Carload Waybill Sample data, which were vital to the study's analyses. Greene, Huneke, and Rennert, along with Marvin Prater of the U.S. Department of Agriculture, briefed the committee.

From the railroad industry, the committee was briefed by John Gray of the Association of American Railroads (AAR) and by Michael Ogborn, who represented the American Short Line

[1] Public Law 109-59, Section 9007.

[2] H.R. 3, 109th Congress. Public Law 109-59 and Conference Report 112-284 (Fiscal Year 2012 Appropriations), November 14, 2011.

and Regional Railroad Association. Gray, along with AAR's Frank Hardesty, arranged for the committee to have complimentary access to the Centralized Station Master file, courtesy of Railinc Corporation. In addition, the committee was briefed by rail labor representatives James Stem, United Transportation Union, and John Tolman, Brotherhood of Locomotive Engineers and Trainmen.

From shipper groups, the committee heard from Bruce Carlton, National Industrial Transportation League; Thomas Schick, American Chemistry Council; Paul Gutierrez and Brian Cavey, Consumers United for Rail Equity; Daniel Jaffe, Western Coal Traffic League; Thomas Canter, National Coal Transportation Association; Mark Fisher and Randy Gordon, National Grain and Feed Association; and Terry Whiteside, Alliance for Rail Competition.

The committee invited other individuals to make presentations on matters relevant to the study: Francis P. Mulvey, former Acting Chairman of STB, on the responsibilities and functioning of the regulatory agency; Malcolm Cairns, Cairns Research and Consulting, on Canadian freight rail regulation; Stewart Myers, MIT, on revenue adequacy evaluation; Mark Meitzen and Kelly Eakin, Christensen Associates, on recent STB-sponsored studies on freight rail competition and capacity; and Russell Pittman, Antitrust Division, U.S. Department of Justice, on freight rail competition policy.

Thomas R. Menzies, Jr., and Joseph R. Morris were the principal project staff. Menzies managed the study and drafted the report with assistance from Morris and under the guidance of the committee and the supervision of Stephen R. Godwin, Director, Studies and Special Programs, TRB. Committee members Wesley W. Wilson and Frank A. Wolak authored Appendix B, which demonstrates a statistical model for identifying freight rail rates that are unusually high compared with rates for comparable traffic established under competitive conditions. Kevin Henrickson, Gonzaga University, reviewed and assisted with model programming. Rosalyn Wilson and Lindsey Carroll, Parsons Corporation, supported the committee in its analyses of the Carload Waybill Sample data. Timothy Devlin provided extensive support to the committee in arranging its many meetings and in managing documents.

The committee acknowledges Norman Solomon, who edited the report; Juanita Green, who managed the production; and Jennifer J. Weeks, who prepared the manuscript for prepublication web posting, under the supervision of Javy Awan, Director of Publications, TRB.

The report was reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise in accordance with procedures approved by NRC's Report Review Committee. The purpose of this independent review is to provide candid and critical comments that will assist the institution in making the report as sound as possible and to ensure that the report meets institutional standards for objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the deliberative process. NRC thanks the following individuals for their review of this report: Andrew Brown, Jr., Southfield, Michigan; Joseph Farrell, University of California, Berkeley; Robert E. Gallamore, Gallamore Group, LLC, Rehoboth Beach, Delaware; Darius W. Gaskins, Jr., High Street Associates, Inc., Ipswich, Massachusetts; Curtis M. Grimm, University of Maryland, College Park; Joel L. Horowitz, Northwestern University, Evanston, Illinois; William A. McCurdy, Avondale, Pennsylvania; Craig E. Philip, Vanderbilt University, Nashville, Tennessee; and Alan R. Washburn, Monterey, California. Although these reviewers provided many constructive comments and suggestions, they were not asked to endorse the committee's findings or recommendations, nor did they see the final draft of the report before its release. The review was overseen by National Academy of Sciences members Charles F.

Manski, Northwestern University, and Susan Hanson, Clark University (emerita), Worcester, Massachusetts. Appointed by NRC, they were responsible for making certain that an independent examination of this report was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of the report rests solely with the authoring committee and the institution. Karen Febey, Senior Report Review Officer, managed the report review process.

Contents

Summary

Congress called on the U.S. Department of Transportation (USDOT) to sponsor this study of the U.S. freight railroad industry's economic regulation, including its purpose and performance in ensuring that railroads can earn enough revenue to continue to operate and invest and that rail shippers can obtain adequate service at reasonable rates.[1] The study charge specifically calls for recommendations on the future role of the Surface Transportation Board (STB) in overseeing and regulating the service levels and rate offerings of railroads, particularly as they become revenue adequate.

STB was established in 1995 to succeed the Interstate Commerce Commission (ICC), which had been responsible for administering the federal railroad regulatory program when the Staggers Rail Act of 1980 substantially eased or eliminated many long-standing regulations on railroad pricing and operations. To the detriment of freight shippers, these regulations hindered the ability of the private railroads to earn enough revenues to invest, innovate, and become efficient. Implementation of the act's reforms was quickly followed by the restructuring and revitalization of the freight railroads, which shed large amounts of excess, uneconomic capacity; substantially increased their productivity; and introduced innovations that conferred large benefits on shippers in the form of improved service offerings and lower rates. By the late 1990s, the Staggers Rail Act had succeeded in spurring the development of a modern and more efficient railroad industry that was better able to compete with trucks, maintain and expand capacity, and respond flexibly to shippers' needs with less regulatory oversight and control.

Examinations of rate and service levels in the post-Staggers railroad industry since 2000 find that rates have been rising in real terms and that service disturbances have been episodic and occasionally widespread, particularly after abrupt increases in freight demand and bouts of severe weather. Rising rates have coincided with a slowdown in productivity gains—since many of the largest opportunities for improvements after deregulation had been exploited—and by volatility in input prices, particularly for fuel. Complaints about service offerings, including assertions of chronic unreliability, have been voiced by some shippers, particularly those using common carrier service, which remains subject to regulatory oversight. However, trends and patterns in common carrier service cannot be readily discerned because of a lack of sufficiently detailed data on most aspects of service quality.

The Staggers Rail Act prompted the modernization of the freight railroads to the benefit of shippers generally, but questions have been raised about the continued applicability of some of its provisions to the financially stronger railroad industry that has emerged. When the act was passed, there was much uncertainty about how successful the reforms would be in rescuing a distressed industry that had been receiving growing government subsidies but whose services remained critical to many shippers. Shippers of bulk commodities such as grain, coal, and chemicals remained especially dependent on rail. Thus, in addition to easing or ending many regulations to give the railroads more pricing and operating freedom, the act preserved some old regulatory provisions and added new ones. Some of these provisions were intended to enhance the ability of the railroads to earn the revenues needed to pay for their capital-intensive systems. Others were aimed at protecting shippers who depend on rail transportation from the loss of vital

[1] The study does not address the federal role in overseeing and regulating the safety of railroads and railroad shipments, which are the primary responsibilities of the Federal Railroad Administration and the Pipeline and Hazardous Materials Safety Administration.

service and from railroads' taking advantage of less competition in certain markets to charge unreasonably high rates.

Five of these regulatory provisions are examined closely in this study because, 35 years after the Staggers Rail Act, they remain the subject of controversy as the railroad industry's competitive structure has changed, shipper expectations for service have evolved, and the railroad industry has become modernized and financially stable. These regulatory provisions are as follows:

- **Maximum rate protections** afforded shippers who use common carrier service in markets that lack effective competition. These protections allow shippers to dispute a common carrier rate if it exceeds a statutory threshold of 180 percent of the shipment's "variable cost," as determined by STB through assignment of portions of a railroad's total expenses to individual shipments. Shippers that meet the threshold must then prove the railroad lacks effective competition and that revenues earned from the disputed rate are unreasonable because they exceed the amount required by the railroad to keep providing the service.
- **Common carrier obligation** of railroads to provide service to shippers on reasonable request, and STB's authority to regulate and supervise the posting of common carrier rates and the setting and fulfillment of other service terms.
- **Annual determinations of the revenue adequacy of each major railroad,** which STB is required by law to issue and are implemented by comparing a railroad's annual rate of return on investment with an estimate of the industrywide cost of capital.
- **Railroad merger and acquisition approvals** that are to be conducted by STB according to a broad public interest standard that emphasizes the preservation of competitive rail service in freight markets but gives weight to other interests deemed by regulators to be publicly beneficial, including the transaction's potential to affect the financial condition of other railroads.
- **Seldom-exercised authority to order a railroad to allow competitors access to its sole-served traffic,** particularly through the use of reciprocal switching arrangements whereby the railroad is required for a regulated fee to transport the traffic to and from nearby interchanges for line-haul service by another railroad.

The study committee, which was asked to advise on the future role of STB, was struck by the extent to which these regulatory provisions serve purposes that are now expired or are being implemented in ways that no longer serve their goals. The committee's findings of unsound and outdated regulations and regulatory practices, all introduced decades ago when the railroads and associated policy concerns were much different from those of today, are summarized next along with recommendations for replacing them with practices better suited to the modern freight railroad industry that the Staggers Rail Act helped bring about.

MAXIMUM RATE PROTECTIONS

The committee finds that more appropriate, reliable, and usable procedures for resolving rate disputes are needed to fulfill the regulatory interest in protecting shippers in markets that lack effective competition from unreasonably high rates. The methods used by STB to assign variable costs to shipments by allocating portions of a railroad's total expenses are economically invalid and produce unreliable results because most railroad costs are shared by traffic and cannot be

unambiguously divided and allocated to individual units of traffic. The allocations, made by STB through use of its Uniform Railroad Costing System (URCS), are inevitably arbitrary and therefore cannot have a stable or meaningful connection to a shipment's rate or to the level of market power possessed by the railroad. The fundamental problem lies with the law's requirement that variable costs be allocated to shipments when most railroad costs are shared and not traceable to individual shipments. This study documents how the URCS-derived variable costs used to implement the law's 180 percent revenue-to-variable-cost formula have led to systematic biases in the traffic qualifying for rate relief and to nonsensical outcomes such as a quarter of traffic being priced below its URCS-derived variable cost.

When the Staggers Rail Act was passed, all railroad pricing had been regulated, and hence there were no competitively determined rates that could serve as benchmarks for assessing the reasonableness of rates in markets with no effective competition. Accordingly, regulators preserved the long-standing and dubious practice of pretending to establish the variable cost of transporting individual shipments by apportioning indivisible common costs. Three decades later, ample data on market-based rates are available. They offer the potential for using statistical methods to predict what a shipment's tariff rate would be in a market having effective competition. The idea is that such predicted competitive rates can be used as benchmarks for determining whether a disputed rate is unusually high and deserves further scrutiny as potentially unreasonable. The demonstration of a benchmarking methodology in this report suggests that screening rates for relief eligibility on the basis of rates paid for comparable shipments in effectively competitive markets holds sufficient promise to warrant a concerted effort to develop, test, and refine candidate methodologies for implementation.

Successful development of a competitive rate benchmarking methodology would end the need to screen rates for relief eligibility by using a formula that applies an arbitrary 180 percent standard to an arbitrary and unreliable cost allocation, and accordingly the committee offers the following advice to Congress:

***Recommendation:* Prepare to repeal the 180 percent revenue-to-variable-cost formula by directing USDOT to develop, test, and refine competitive rate benchmarking methods that can replace URCS in screening rates for eligibility to be challenged.**

USDOT is recommended to lead the effort to develop a competitive rate benchmarking tool because it is not committed to the conceptually flawed URCS, which STB uses for multiple regulatory purposes. Replacing the URCS-based revenue-to-variable-cost formula with a more reliable and economically valid means of screening rates for eligibility to be challenged would allow regulators to dispense with the controversial follow-on procedures that are used in ruling on the reasonableness of challenged rates. The committee finds that these procedures lack a sound economic rationale and are unusable by most shippers, and thus they deserve to be replaced.

Perhaps because of the unreliability of the URCS-based screening process, STB has instituted exacting and burdensome standards for judging the reasonableness of challenged rates. The standards are intended to respect the law's interest in ensuring that railroads are not denied the opportunity to earn adequate revenues. STB's stand-alone cost test and other URCS-based procedures for judging rates are supposed to provide insight into the revenue needed by the railroad to keep supplying the service at issue. However, the use of these methods offers little insight into actual revenue needs, is inappropriate to the circumstances of many shippers, and

entails such high litigation costs that many shippers have not been able to avail themselves of the rate relief process. The result has been large and prolonged inequalities in shipper access to the law's maximum rate protections. Thus, the goal of reform should be to introduce a more rational and reliable rate screening process that will allow for less burdensome follow-on methods for ruling on the reasonableness of rates and for creation of an overall system for affording rate relief that is accessible to more shippers.

Replacing the law's revenue-to-variable-cost formula with a more reliable competitive rate benchmarking screen should not threaten revenue adequacy because regulators would be able to set the strictness of the screen—that is, the amount by which a rate can exceed its predicted competitive level before being subject to challenge. There is a trade-off regulators would need to consider in making such a decision: a stricter screen will provide less risk to railroad revenue adequacy but afford fewer shippers with legitimate rate grievances eligibility for relief. Making the screen less strict will offer greater opportunity for aggrieved shippers to challenge their rates but pose a greater risk to railroad revenue adequacy. Although decisions about the appropriate screening threshold could be controversial, they would be transparent, which is preferable to the current dependence on arbitrary and unreliable cost allocation rules used in implementing an arbitrary revenue-to-variable-cost formula instituted more than a generation ago.

With the ability to exercise more direct control over the rate screening process, regulators could discard the burdensome and inappropriate rate reasonableness standards that are in use today, and Congress could more confidently take the following action:

***Recommendation:* Replace STB rate reasonableness hearings with arbitration procedures that compel faster resolutions of disputes involving rates deemed eligible for challenge because they substantially exceed their competitive rate benchmarks.**

The standards and procedures used by ICC and STB for ruling on the reasonableness of challenged rates have proved to be slow, costly, and inappropriate to many shippers' circumstances over three decades. Thus, they prevent shippers from having equal and effective access to the law's maximum rate protections. Efforts to streamline and expedite the process through the use of simplified procedures have not overcome these deficiencies and in some respects have made matters worse. The simplified procedures make STB more dependent on the unreliable and arbitrary cost allocations of URCS. They replace the ill-suited and cumbersome stand-alone cost test with procedures that offer even less predictable decision criteria and lack even that test's weak conceptual basis.

STB's direct role in maximum rate rulings should be ended and replaced by an independent arbitration process similar to the one long used for resolving rate disputes in Canada. Unless both parties to a rate challenge agree to another format, the arbitration should be performed under a strict time limit and a final-offer rule whereby each side offers its evidence, arguments, and possibly a changed rate or other remedy in a complete and unmodifiable form after a brief hearing. The arbitrator should be instructed to keep the offers private and choose only one side's full offer without compromise. A competitive rate benchmarking method cannot control for all factors that may legitimately affect rate levels. Therefore, market dominance may not always be the cause of a challenged rate appearing high in comparison with its competitive benchmark rate. Accordingly, the arbitrator should consider evidence of market dominance, and if dominance is not found, the arbitrator should be instructed either to dismiss the challenge or to

choose the railroad's final offer. Serious consideration should be given to restricting opportunities for appealing such rulings to ensure that the arbitration process remains timely and economical.

Finally, the allowable remedies in arbitration offers should not be limited to alternative rates. The Staggers Rail Act gives regulators authority to order reciprocal switching when "necessary to provide competitive rail service." Reciprocal switching has never been prescribed by STB when a rate is found to be unreasonable, partly out of concern that such an intervention would cause rates to fall below the statutory 180 percent revenue-to-variable-cost threshold. The repeal of this arbitrary formula should make this concern moot. In addition, any reciprocal switching arrangement proposed in a final offer arbitration is likely to be reasonable in scope and severity if the party proposing it intends to prevail. Accordingly, there should be no need for regulators to set switching fee schedules or to establish applicable distance limits, since such terms should be part of any offer put before the arbitrator that included reciprocal switching. Congress could therefore take the following recommended step:

***Recommendation:* Allow reciprocal switching as a remedy for unreasonable rates.**

Permit parties in rate arbitrations to propose reciprocal switching arrangements in their offers to resolve the dispute if they so desire and allow the arbitrator to order that such arrangements be made.

ANNUAL REVENUE ADEQUACY DETERMINATIONS

The Staggers Rail Act requires STB to maintain standards and procedures to be used annually for determining which Class I railroads are earning revenues sufficient to attract capital. This annual pass/fail appraisal of revenue adequacy has become ritualistic while offering little substantive information for regulators and policy makers in monitoring the industry's economic and competitive conditions. The decades-old requirement, adopted when railroads were failing and the subject of government rescue efforts, suggests a long-term interest in regulating the profitability of individual railroads, which appears neither practical nor consistent with the deregulatory thrust of the Staggers Rail Act reforms. By sponsoring periodic assessments of economic and competitive conditions in the industry as a whole that used more varied data and analytic techniques, Congress and STB would obtain a richer set of information to support regulatory decisions and policies. The committee therefore recommends that Congress take the following step:

***Recommendation:* End annual revenue adequacy determinations and require periodic assessments of industrywide economic and competitive conditions.**

MERGER REVIEW AND PUBLIC INTEREST STANDARD

Decades ago when the railroads were heavily regulated, they were exempted from customary antitrust reviews of mergers and subjected instead to a broader public interest review by ICC. Even after economic regulation in the industry was eased, the public interest standard was

retained, in part to allow the more financially viable railroads to reduce perceived duplicative capacity by acquiring struggling competitors and thereby concentrating traffic and revenues to regain profitability. Any such rationale for keeping the public interest standard no longer exists, since STB itself has stated that excess and duplicative capacity are no longer problems and that preserving competition among the remaining railroads will be the priority for future reviews. In view of the diminished reasons for the public interest standard, its preservation can only detract from the appropriate focus on competition. STB is not as qualified to assess competitive effects as the Antitrust Division of the U.S. Department of Justice, which because of its specialized expertise on these matters is already required to advise STB on a merger's potential competitive effects. Accordingly, the committee recommends that Congress take the following step:

Recommendation: **Transfer merger review authority to the antitrust agencies and apply customary antitrust principles rather than a public interest standard.**

STRATEGIC REVIEW OF STB DATA PROGRAMS

Recommendation: **Congress should give STB the direction and resources to undertake a strategic review of all of its data programs to simplify or discontinue the reporting of little-used data as a general matter and to support the recommended changes in its regulatory practices and approaches**.

In particular, STB should be directed to review and introduce means to improve the accuracy, utility, timeliness, and availability of the Carload Waybill Sample. Its improvement will be needed to support implementation of the recommended competitive rate benchmarking system and to facilitate academic and other research on the railroad industry that can inform policy making.

The strategic review should also give priority to the data needed by STB to fulfill its role in assessing the railroad response to the common carrier obligation. STB should seek to obtain shipment-level data on service quality. Options should be explored for collecting such data, including additions and enhancements to the Carload Waybill Sample itself, because shipment-level tracking is essential for understanding trends in service levels and patterns as they shift and vary across time, regions, and traffic segments.

Finally, STB should reassess its collection of detailed railroad accounting, financial, and operations data with an eye to reducing railroad reporting burdens as appropriate given the changes in practice and responsibilities advised in this report. In particular, consideration should be given to the kinds of data that will be needed in conducting the recommended periodic economic and competitive studies of the industry.

CONCLUDING COMMENTS

There are opportunities for STB to take early steps to advance the recommendations of this report, such as by supporting USDOT in exploring competitive rate benchmarking methods and by commencing the planning of a modernized data program. Such efforts could help inform the legislative actions that are likely to be required to further the recommendations—actions that the

committee believes are overdue. The last major revision to the Staggers Rail Act terminated ICC and created STB 20 years ago. The Staggers Rail Act itself was passed 35 years ago. Since then, the railroad industry has been transformed, essentially modernized in step with the other transportation industries that were deregulated at about the same time. The railroad industry was in a fundamentally different position at the time of its deregulation. It was on the edge of bankruptcy despite its considerable potential market power and needed specialized regulatory reforms that took its financial distress into account. The industry continues to have characteristics differing from those of the other transportation modes, such as its vertical integration and the ability to obtain and exercise local market power, that demand ongoing regulatory oversight. Thus, railroad deregulation should not be complete. However, the economic regulations that remain should be suited to the financially sound, modern railroad industry of today and not to the foundering one that required rescue 35 years ago. The actions recommended in this report recognize the continued significance of the railroad regulatory program and are intended to resynchronize key elements of it that have become outdated.

The modernization proposed in this report would reduce the anachronistic regulatory burdens railroads still bear while giving more shippers real protection against unreasonable rates. It would thus continue the process begun by the Staggers Rail Act—a process that is aimed at producing a modern, efficient, and competitive railroad industry able to attract capital, maintain and expand its capacity, and serve its customers with the minimum necessary regulatory oversight.

1

Study Background, Charge, and Approach

The private freight railroad industry in the United States has been the subject of economic regulation by the federal government since the Interstate Commerce Act (ICA) of 1887. With passage of the Staggers Rail Act of 1980, Congress made sweeping changes in this regulatory program. It eliminated or eased many regulations governing rate and service offerings and allowed railroads to redress decades-long declines in traffic, stagnant productivity, and oversized networks that had become chronically undermaintained and misaligned with demand. On the eve of the Staggers Rail Act, the freight railroads were earning too little to reinvest in their networks, and some had already been rescued by government subsidies. By giving railroads more pricing and operating freedom, the act is widely credited with stimulating the industry's revival to the benefit of shippers and consumers. Significantly, regulations governing railroad–shipper commercial relationships were relaxed and in many cases rescinded. However, deregulation was not complete. The act retained, and in some cases added, regulatory requirements intended to protect rail shippers from loss of service and from excessive rates in markets lacking competitive transportation options. Regulators also retained responsibilities for general oversight of the industry's financial performance and competitive structure, especially with regard to interactions among railroads.

When Congress last amended the ICA in 1995, it retained all of the deregulatory reforms and most of the regulatory policies and provisions of the Staggers Rail Act while terminating the Interstate Commerce Commission (ICC), the long-standing railroad regulatory agency. The Surface Transportation Board (STB) was created to continue to implement and oversee the residual regulatory program. In the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users of 2005, Congress called on the U.S. Department of Transportation (USDOT) to contract with the National Academy of Sciences (NAS) to conduct "a comprehensive study of the Nation's railroad transportation system since the enactment of the Staggers Rail Act of 1980."[1] Specifically, the 2005 law asks for the NAS study to examine and make recommendations on:

1. the performance of the nation's major railroads regarding service levels, service quality, and rates;
2. the projected demand for freight transportation over the next two decades and the constraints limiting the railroads' ability to meet that demand;
3. the effectiveness of public policy in balancing the need for railroads to earn adequate returns with those of shippers for reasonable rates and adequate service; and
4. the future role of the Surface Transportation Board in regulating railroad rates, service levels, and the railroads' common carrier obligations, particularly as railroads may become revenue adequate.

This report presents the results of the congressionally requested study, which was conducted by a committee of experts in economics, regulatory policy, and freight transportation.

[1] Public Law 109-59, Section 9007.

The approach taken by the committee in conducting the study, the emphasis placed on specific elements of the study charge, and the content and organization of the report are explained in this chapter. For context, the chapter begins with an overview of conditions that preceded passage of the Staggers Rail Act and helped shape the current regulatory program. That discussion is followed by an overview of the main elements of the program and its implementation since 1980 by ICC and STB.

HISTORICAL AND POLICY CONTEXT

The Staggers Rail Act was enacted at roughly the same time as laws deregulating the interstate airline, bus, and trucking industries.[2] It was passed after a series of enactments during the 1970s had failed to resolve the railroad industry's deep financial problems.[3] Common to all the laws deregulating the transportation industries was the expectation that vigorous competition would bring about a more efficient and responsive supply of service.[4] In the airline and interstate trucking industries, most federal regulations restricting pricing, service offerings, and market entry and abandonment were revoked abruptly or phased out over a short time. Six years after passage of the Airline Deregulation Act of 1978, the Civil Aeronautics Board was disbanded and its few remaining authorities to protect consumers and police anticompetitive conduct were transferred to USDOT and the U.S. Department of Justice (USDOJ).[5]

A notable difference between the Staggers Rail Act and the legislation deregulating the other transportation industries was the former's stated purpose: to "provide for the restoration, maintenance, and improvement of the physical facilities and financial stability" of the rail transportation system.[6] Neither the trucking industry nor the airline industry was in financial distress. Instead, elements of both industries had grown less efficient under regulation, and the industries were seen as unresponsive to the interests of shippers and travelers. Accordingly, their deregulation was focused on unleashing market forces in the hope of making service offerings more innovative and less expensive for consumers rather than spurring industry financial recovery and stability.[7] In contrast, the railroad industry's financial problems were threatening its continued existence as a private enterprise.[8] Two years before the law was passed, the U.S. Secretary of Transportation had warned that "continuation of trends in the postwar period would

[2] The laws referenced are the Airline Deregulation Act of 1978, the Bus Regulatory Reform Act of 1982, and the Motor Carrier Act of 1980.
[3] The two major acts preceding the Staggers Rail Act were the Regional Rail Reorganization Act of 1973 (3-R Act) and the Railroad Revitalization and Regulatory Reform Act of 1976 (4-R Act). A review of the history of railroad deregulation is given by Keeler (1983) and by Gallamore and Meyer (2014).
[4] A comparative review of the political and economic motivations of deregulation of the transportation industries during the 1970s and early 1980s is given by Derthick and Quirk (1985).
[5] The Civil Aeronautics Board Sunset Act of 1984 temporarily transferred merger and acquisition approval to USDOT and then permanently to USDOJ in 1988. To this day, USDOT, rather than the Federal Trade Commission, monitors the airline industry for unfair methods of competition; however, the airline industry is subject to federal antitrust laws as enforced by USDOJ.
[6] Public Law 96-448, Section 3, Goals.
[7] An expressed goal of the Airline Deregulation Act of 1978 was to bring about an "air transportation system which relies on competitive market forces to determine the quality, variety, and price of airline services" [Public Law 95-504, Section 1-2(a)(9)].
[8] Intercity passenger rail service had been nationalized through the creation of the National Railroad Passenger Corporation, which operates Amtrak, in 1971.

result within the next 10 years in an industry facing enormous capital shortage, competing only for bulk shipments of low-value goods, lacking the resources necessary for safe operation and, to a very considerable degree, operating under the financial control or ownership of public agencies" (USDOT 1978, 3).

By 1976, the federal government had taken over intercity passenger rail services and consolidated the assets of several bankrupt freight railroads to create Conrail, which would require more than $7 billion in federal subsidies between 1976 and 1981 (*CQ Almanac* 1982).[9] About one-fifth of the industry's track was operated by bankrupt and bailed-out railroads (GAO 1990, 10), and an estimated 47 percent of freight rail revenues were being earned by railroads that could no longer be considered financially viable (Keeler 1983, 16–17). The bailout of more railroads was viewed as an expensive and controversial proposition in a country devoted to private enterprise. Many of the provisions of the Staggers Rail Act were thus designed to have both the near-term effect of ending the demand for government subsidies and the longer-term effect of bringing financial stability to an industry deemed essential to the economy.

The dire condition of the railroads by the third quarter of the 20th century had been decades in the making. An inflexible and anachronistic regulatory system had contributed substantially, but so too had the advent and expansion of long-haul trucking by siphoning off large amounts of once-profitable high-value freight.[10] The two factors were interconnected. Before the reforms introduced by the Staggers Rail Act are described in more detail, an overview of the circumstances preceding and prompting the law's enactment will be helpful.

Antecedents to Deregulation[11]

The regulatory regime that prevailed in the 1970s had its origins in the 19th century, when railroads and waterways were the predominant modes of long-haul transportation. When Congress passed the ICA in 1887, the 50-year-old railroad industry had been characterized by financial and service instability.[12] Often with land grants and sometimes with financial support from state and local governments, scores of private companies had been supplying rail transportation services, each building its own lines and operating trains over them in a vertically integrated manner (Scharfman 1915, 35–38). The instability arose in large part from overbuilding by competing railroads, which was exacerbated by the high capital–labor ratio inherent in railroad technology. Between 1870 and 1890, U.S. railroad track mileage increased by more than 100,000 miles (Scharfman 1915, 33; AAR 2014). Railroads faced considerable difficulty in charging rates sufficient to compensate for their large capital outlays while remaining competitive with one another and with barges and steamships. A railroad could price

[9] In addition to spending more than $7 billion to bail out Conrail, ICC had exhausted $275 million in 1979 and 1980 to keep the Rock Island Railroad operating (Gaskins 2008, 563).

[10] Gallamore (1999) notes also how railroads were adversely affected by developments such as the decline of industries that were traditional rail customers. The replacement of coal and steel by other materials including natural gas, plastics, and aluminum is an example.

[11] This section provides a brief and somewhat simplified overview of conditions in the railroad industry preceding the Staggers Rail Act's passage. More in-depth historical reviews are given by Keeler (1983), Gallamore and Meyer (2014), MacAvoy (1965), Kolko (1970), Stone (1991), Conant (1964), Stover (1997), Meyer et al. (1959), and Fogel (1964).

[12] For decades before the passage of the ICA of 1887, many states regulated tariffs and routes for both passenger and freight service.

only up to a customer's willingness to pay for the service—a willingness that depended heavily on the availability of other transportation options.[13]

To limit a shipper's pricing options and prevent destructive "rate wars," railroads tried to establish cartel pricing agreements among themselves (Scharfman 1915, 19–20, 70–71). These voluntary agreements often broke down, causing intermittent instability in service and prices to the dissatisfaction of both shippers and railroads (Keeler 1983, 22). Provisions in the ICA and its amendments over the next 60 years were designed to encourage pricing agreements and make them more stable—and in turn to make the supply of rail transportation service more reliable for shippers. To do so, the law limited the ability of railroads to enter markets; regulators had to be convinced that entry would be in the "public convenience and necessity," including the economic interest of incumbent railroads. Furthermore, the pricing agreements forged among railroads would be structured so that shippers served by multiple railroads would not obtain competing prices. Railroads were regulated as common carriers and thereby required to "serve all who apply," "provide adequate facilities," and "refrain from discriminating in rates and service" (Scharfman 1915, 16).

Rather than rates being set according to the willingness of any individual shipper to pay for a railroad's service, they would be set more uniformly among shippers moving a "like kind of traffic" so that shippers of higher-value goods—who inherently valued the rail transportation service the most—would pay the highest rates regardless of any competitive alternatives enjoyed by some of those shippers (i.e., shippers having multiple rail service options). Such "value of service" pricing was enforced by ICC's insistence that a railroad granting a rate discount to a shipper with competitive transportation alternatives must also grant the discount to all other shippers not similarly situated (Scharfman 1915, 69–70). Eventually, railroads were able to sustain higher prices through collective agreements using rate bureaus, which Congress made exempt from antitrust scrutiny (Keeler 1983, 27). In return for equalized rates for higher-value shipments, railroads were precluded from raising rates to shippers of lower-value commodities such as coal, corn, and wheat, even in markets where a lack of competitors would have otherwise enabled the exercise of monopoly power (Boyer 1981).

Railroads remained subject to the common law duty to offer "just and reasonable rates" and to respond to all reasonable requests for transportation service without "discrimination" (Scharfman 1915, 191). Rate-setting that discriminated by commodity would be allowed (i.e., value of service pricing), but so-called "local" and "personal" discrimination would not (Scharfman 1915, 119–123). The ICA had prohibited as unjust discrimination any preferential treatment of a "like or contemporaneous service in the transportation of a like kind of traffic under substantially similar circumstances and conditions" (Scharfman 1915, 117). The prohibitions against local and personal discrimination dovetailed with value of service pricing (Keeler 1983, 24). To prevent discrimination among shippers, railroads were precluded from negotiating rate and service contracts with individual shippers unless the same terms were extended to all other shippers in similar circumstances for movement of the same goods (Scharfman 1915, 80–85, 117–118). Railroads were further precluded from offering rebates or discounts to shippers of larger volumes and longer hauls. For example, a railroad could not offer a rate that declined on a per carload basis for larger-volume shipments or on a per mile basis for shipments traveling farther (Scharfman 1915, 130). Regardless of demand and supply conditions, railroads were not allowed to adjust the prices they charged for the provision of rail cars. ICC

[13] Willingness to pay has long been described in the railroad industry as "charging what the market will bear" (Scharfman 1915, 71).

made it difficult for railroads to cancel agreements to interchange traffic with competitors, which limited the ability of railroads to consolidate traffic flows for greater efficiency.

ICC was given authority to approve all railroad plans for line abandonments and service discontinuances. This power enabled regulators to prevent railroads from withdrawing service from shippers of commodities whose regulated rates were kept low and unprofitable. Given the authority to approve and condition mergers, ICC could protect existing traffic divisions among railroads (Crum and Allen 1986, 46–47). Merger approval authority was also seen as a tool that could be used by regulators to preserve the commodity-based system of ratemaking by requiring railroads having a customer base of higher-value (and thus more profitable) commodities to merge with railroads having a customer base of lower-value commodities (Keeler 1983, 24–26).[14]

This regulatory structure was upset fundamentally by the expansion of public highways and the introduction of tractor-trailer trucks during the early and middle 20th century. Railroads, which lacked the reach and service capabilities of trucks, gradually lost large amounts of their highest-value, nonbulk freight that had been charged the highest rates (Keeler 1983, 28). Concerned that individual railroads would seek to retain this traffic by discounting rates in defiance of the rate bureaus and to the detriment of the profitability of all railroads, ICC regularly stepped in to preserve the cartels and their ability to equalize rates across railroads and shippers (Keeler 1983, 28–29). To limit competition from other modes, Congress broadened ICC's authority to regulate the rates charged by long-haul trucks. Nevertheless, trucks enjoyed a substantial service advantage over railroads with their more timely and secure door-to-door transport. In view of ICC's insistence that no individual shipper receive higher service quality or a lower rate than any other shipper in a similar situation, even if such variability was necessary to retain traffic, railroads were bound to lose nearly all of their highest-value business (Gallamore and Meyer 2014, 81–99).

Because of their inability to compete with trucks for high-value freight, railroads were left with a smaller and less diverse traffic base consisting of mostly bulk commodities, whose shippers opposed increases in regulated rates. Meanwhile, railroads had been losing large amounts of their intercity passenger traffic to buses and automobiles, and eventually to airlines.[15] Rail networks had become oversized and misaligned with demand. Nevertheless, ICC rate and routing regulations remained in place. Regulators were reluctant to allow railroads to cancel legacy interchange agreements and reduce the scope of their networks (GAO 1987). They made it difficult for railroads to divest lightly used branch lines and to concentrate traffic and capital investments on a smaller number of densely traveled routes (Keeler 1983, 39). In its adherence to both the ICA and the common law doctrine of ensuring that all shippers of the same commodity received similar service at similar rates,[16] ICC was slow to grant railroads the ability to charge higher rates for their bulk traffic even in markets where they could have charged a premium because of the absence of effective competition from other railroads and barges. Double-digit inflation during the 1970s compounded these ills, as rate increases lagged growth in railroad costs (Keeler 1983, 32–33).

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[14] As Keeler notes, regulators did not use their merger review authority in this manner because of resistance from profitable railroads.

[15] As late as World War I, a majority of train miles were from passenger trains. By the 1920s, ridership was declining. The near-disappearance of passenger traffic resulting from automobility left an enormous excess of rail capacity, often in corridors not suited to heavy freight use (Gallamore and Meyer 2014, 100–129).

[16] This common law doctrine as it influenced the ICA and ICC's implementation is described in the following classic texts: Scharfman (1915), Scharfman (1931), Ripley (1912), and Hadley (1885).

By the 1970s, several railroads in the Northeast, which had traditionally depended on passenger traffic and short hauls of high-value freight, were bankrupt, including the large Penn Central. The federal government, which was unwilling to let the private railroads stop supplying service altogether, provided hundreds of millions of dollars in loan guarantees and eventually purchased the assets of the Penn Central and other Northeast railroads to create Conrail in 1976. Faced with the prospect of more bankruptcies and buyouts, Congress then turned to regulatory reform.

Nature of Regulatory Reforms in the Staggers Rail Act

Congress enacted a series of regulatory reforms during the 1970s that culminated in passage of the Staggers Rail Act of 1980. The act introduced several critical reforms aimed at giving railroads greater freedom to price and structure their service offerings and to control their production capacity. It also preserved some old and provided some new protections for shippers, as summarized next.

Freedom to Price According to Each Shipper's Willingness to Pay

The Staggers Rail Act ended collective pricing through rate bureaus by allowing two or more railroads to set rates jointly only when each is directly involved in the interline movement. The law declared that the new regulatory policy would be to allow "competition and the demand for services to establish reasonable rates for transportation by rail."[17] Regulators were instructed to be aggressive in fully exempting from any further regulatory control all traffic—truck-competitive traffic being the most obvious—for which regulation was "not needed to protect shippers from the abuse of market power."[18] ICC would have no control over the rates charged to shippers of exempt traffic or the amount and quality of service made available to them. For commodities that were not ruled exempt, such as coal, grain, chemicals, and other bulk freight, a critical reform was the law's legalization of confidential contracts between railroads and shippers. Any shipment moved under contract would be automatically excluded from any further regulation during the life of the contract; railroads would thus be free to tailor their rate and service offerings on a shipper-by-shipper basis.

The legalization of confidential contracting was a radical change in regulatory policy. Contracting had not been permitted by ICC because of the aforementioned value of service rate structure and expectations of the uniform treatment of shippers of "like traffic." The ability of a railroad to contract gave it substantial latitude to set rates differentially according to a shipper's individual circumstances and willingness to pay, since tariff (i.e., common carrier) rates were no longer generally applicable. The act thus ended ICC prohibitions against "locational" and "personal" rate discrimination as applied to most traffic. Railroads would not only be allowed to compete more aggressively for the newly exempted freight that is inherently competitive with trucks but would also be allowed to set tariff rates for the nonexempt bulk commodities at levels equivalent to the most rail-dependent shipper's willingness to pay. While shippers with more

[17] 49 USC §10101 (1).

[18] 49 USC §10502. Although the exemption provision is not explicit in identifying trucks as the competition of interest, trucks are the only ubiquitous mode, and thus a commodity's practical capability to be moved by truck became the de facto standard for deciding whether a commodity should be considered inherently competitive and granted a categorical exemption.

transportation options would be expected to refuse to pay the higher rate, a railroad could simply negotiate a discounted contract rate with terms tailored to each shipper's specific situation and willingness to pay. The price-differentiating railroad would now be able to set rates at levels that avoid pricing any profitable traffic flows out of the market.[19] If successful, the deregulated railroads could earn the revenues needed to keep supplying rail service over the long term and perhaps earn even more.

Freedom of Operations and Capacity Utilization

The Staggers Rail Act contained provisions that would help the financially distressed railroads restructure their oversized and misaligned networks. For example, the act modified ICC's long-standing authority to approve line abandonments and mergers. In the case of abandonments, the law eased the approval process by establishing a time limit for approvals and allowing railroads to present evidence on whether the line was earning the cost of capital. To facilitate mergers, the law established time limits for decisions and continued to exempt the industry from conventional antitrust review by USDOJ according to the Clayton Act's sole criterion that competition not be substantially lessened to the detriment of consumers. ICC would continue to review mergers under a broader "public interest" standard that required an evaluation of competition effects but that gave regulators more discretion to consider other factors. Among such factors were the merger's ability to reduce duplicative, uneconomic legacy capacity and its effect on the financial health of railroads that would be competing with the newly merged railroad.

To allocate their rail cars more efficiently, railroads were given the freedom to adjust rates for the delivery of cars according to fluctuations in demand—for example, by charging a premium for grain cars when demand for grain exports was high. Because they were no longer subject to rate restrictions that precluded rebates and discounts, railroads could offer pricing incentives for shippers to tender larger, consolidated shipments and to concentrate traffic on mainlines. The Staggers Rail Act had the practical effect of ending open routing. Railroads were allowed to cancel many legacy joint rate, terminal access, trackage rights, and reciprocal switching agreements affecting traffic they could otherwise transport directly (GAO 1987). On these routes they would no longer be required to offer a common carrier rate for partial moves to transfer points.[20] ICC was instructed not to interfere with the cancellation of these legacy agreements, and it was only authorized to order agreements if the intervention was deemed to be in the public interest or "necessary to provide competitive rail service."[21] However, neither criterion was well defined in the law, nor was ICC obligated to exercise the authority, and for the most part it did not.

[19] Because of the incentive to extract rents but not price traffic out of the market, the efficiency loss from railroads having pricing freedom is expected to be minimal. Indeed, limited deadweight loss was found by Grimm and Winston (2000, 65).

[20] Railroads had never been required to quote a rate for a partial move that they could otherwise serve fully. The Staggers Rail Act did not change this practice despite its other provisions giving railroads more market power. Nevertheless, over the years ICC had imposed conditions on mergers that required railroads to maintain access agreements for traffic that could otherwise be served directly. The act made cancellation of these agreements easier for railroads (GAO 1987).

[21] 49 USC §11102.

Assurance of Reasonable Rates in Markets Lacking Effective Competition

The aforementioned freedom to set rates was limited by a single requirement, applicable to common carrier service only, for "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."[22] Although railroads would have substantial leeway to set their rates, regulators were tasked with ensuring that common carrier rates remained "reasonable" in cases where a shipper could demonstrate that a railroad lacked effective competition and when the rate surpassed a specified threshold. That threshold, defined in the law as 180 percent of "variable cost," could be viewed as an attempt to provide railroads with a safe harbor for pricing their traffic at levels high enough to contribute to capital costs while providing a trigger for regulators to scrutinize unusually high rates. This regulatory backstop could also provide shippers with some downward pressure on rates and leverage in negotiating contracts in markets lacking effective competition.

Preservation of the Obligation to Provide Common Carrier Service

Before the regulatory reforms that commenced in the 1970s, all rail service was provided by common carriage, and thus all regulations concerning common carriage had general applicability. By effectively requiring that truck-competitive traffic be exempted from regulation, the Staggers Rail Act removed the common carrier obligation for a large amount of traffic. The legalization of contracting further reduced the share of traffic in common carriage and left ICC with the authority to establish and enforce the rules governing the obligation's fulfillment for a declining slice of traffic. However, the law provided no clear avenue for regulators to prescribe and enforce definitive standards of service quality. Inasmuch as common carrier rates would be allowed to change and become more heterogeneous, so too would common carrier service attributes. Regulators, who were limited in their ability to influence service except by establishing rules for the disclosure and dissemination of tariff terms, would, in essence, become a sounding board for service-related concerns expressed by shippers. Regulators would be able to respond to these concerns only indirectly by using regulatory authorities governing rail car availability, train operations, and the reporting of relevant data.

Assurance of the Opportunity for Railroads to Earn Adequate Revenues

Enacted when many railroads were not earning their cost of capital, the Staggers Rail Act emphasized that railroads should not be denied the opportunity to become revenue adequate and indeed required that regulators seek to promote this outcome. Revenue adequacy as an explicit goal of regulatory policy originated in the 4-R Act of 1976,[23] which directed ICC "to make an adequate and continuing effort to assist [railroads] in attaining such revenue levels" as needed to "provide a flow of net income plus depreciation adequate to support prudent capital outlays, assure the repayment of a reasonable level of debt, permit the raising of needed equity capital, and cover the effects of inflation."[24] In passing the Staggers Rail Act 4 years later, Congress elevated revenue adequacy to one of the chief policies of the revised regulatory program. In

[22] 49 USC §11102.
[23] Public Law 94-210.
[24] 49 USC §15(a)(4).

addition to keeping the 4-R Act's requirement that ICC assist railroads in attracting and retaining capital, the act directed ICC to "maintain, and revise as necessary, standards and procedures" to "annually determine which rail carriers are earning adequate revenues."[25]

The provision requiring annual revenue adequacy determinations resides in the section of the law governing the adjudication of rate reasonableness disputes. Therefore, its inclusion could be viewed as indicating a congressional interest in eventually using the revenue adequacy results to inform regulatory decisions about rate reasonableness when a railroad is earning revenues that substantially exceed its cost of capital. Any intentions along those lines (i.e., to use the revenue adequacy measures to define a monopoly profit constraint) remain controversial, but a clearer purpose—given the concern over the financial viability of railroads when the Staggers Rail Act was passed—was to guide affirmative measures to revive the distressed railroads while ensuring that any further regulatory interventions did not risk that revival.[26]

Implementation of Staggers Rail Act Reforms

Although implementation of a number of the reforms in the Staggers Rail Act led to legal and rulemaking challenges, many were adopted fairly quickly. Confidential contracting became legal immediately and thus automatically began to exclude growing amounts of traffic from direct regulatory control. In response to the law's stipulations to minimize regulatory controls and to grant regulatory exemptions to the "maximum extent," ICC quickly exempted entire categories of commodities and car types from regulation, including shipments moved in boxcars and intermodal containers. The agency also expedited railroad requests to sell and abandon lightly used lines. Many merger requests were approved by ICC according to the law's broad public interest standard that allowed for merging private railroads to offset any adverse competition effects with estimates of the profitability from reducing perceived duplicative capacity. A wave of mergers ensued after passage of the act, which contributed to a decline in the number of Class I railroads from 41 in 1979 to 16 by 1987, as reported by the Association of American Railroads [AAR; various years (1980, 1987)].[27]

A major implementation challenge facing ICC was the law's new requirement of maintaining reasonable rates for common carriage in markets lacking effective competition. To comply, ICC would need to develop a new system to estimate the "variable cost" of shipments. The purpose was to compare such costs with rates to determine a shipper's eligibility to challenge a rate. Furthermore, regulators would need to institute procedures for confirming that a market lacks effective competition and for assessing whether a disputed rate is unreasonable. By the end of the 1980s, ICC had instituted procedures for all three elements of the law's rate relief provision: (*a*) a revamped cost allocation system that purported to estimate a variable cost for each priced traffic movement, (*b*) evidentiary procedures for adjudicating claims of market dominance, and (*c*) an evidentiary standard for judging the reasonableness of a disputed rate. The standard required a complainant shipper (or group of shippers) to establish the minimum revenue a railroad would need to serve the traffic at issue in a "stand-alone" manner.

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[25] 49 USC §10704.

[26] For a discussion of the history of the law's requirement for revenue adequacy determination, see Macher et al. (2014).

[27] One of the causes of the reduction in Class I railroads was the periodic adjustment of Class I regulatory definitions and declassifications by ICC. Class I railroads are identified on the basis of total revenues. The threshold changes when STB updates for inflation. The revenue threshold in 2013 was $467 million.

In a series of rulings on the law's provisions giving railroads more operating and pricing freedom, ICC reaffirmed and clarified that a railroad would not be required to offer a local common carrier rate to an intermediate point for a freight movement that it could serve fully on its own.[28] A railroad could thus be the sole server of traffic originating or terminating only on its lines. It could prevent access to competing connecting service and thereby increase its market power and its exploitation of that power by pricing traffic according to each shipper's willingness to pay. Furthermore, ICC ruled that the authority to order a railroad to allow a competing railroad access to its sole-served traffic through reciprocal switching and other access arrangements would only be invoked to preclude or remedy a service abuse arising from anticompetitive conduct. The authority to order such access arrangements would not be used in a more generalized manner to inject competition into markets to reduce rates. ICC maintained that the Staggers Rail Act does not prohibit railroads from obtaining and exercising market power, as evidenced by the statutory formula that allows pricing up to 180 percent of variable cost. ICC also pointed out that the act's maximum rate provisions already gave aggrieved shippers an outlet for contesting excessive rates.

Finally, in compliance with the requirement to issue annual determinations of railroad revenue adequacy, ICC developed procedures for calculating the industrywide average cost of capital. Each Class I railroad's finances would be examined annually, and any railroad whose average return on investment equaled or surpassed the industrywide cost of capital would be ruled revenue adequate.

Rapid Turnaround and Transformation of the Railroad Industry

Passage of the Staggers Rail Act paid early dividends. If ending government subsidies had been a main impetus for the law, success was almost immediate; Conrail did not require federal funds after 1981, and no federal subsidies were granted to other railroads. Conrail was privatized in 1987, and its assets were sold to Norfolk Southern and CSX 11 years later.

With regard to the economic performance of the industry as a whole, almost every measure indicates that the law's reforms helped trigger a turnaround. Trends in some basic industry statistics reveal the scope and pace of change in productivity, efficiency, and innovation after the Staggers Rail Act was passed in 1980 (Table 1-1). A comparison of 1970 with 1995—spanning the low point of the bankruptcy of the Penn Central to the creation of STB—indicates that the major railroads shed more than 40 percent of their track mileage, two-thirds of their employees, and nearly one-third of their locomotives. As Table 1-1 shows, most of these capacity reductions occurred after 1979 during the post-Staggers years, when railroad traffic (in ton-miles) increased by 44 percent. By 1995, Class I railroads had learned to make much more intensive use of their inputs and assets: ton-miles per track mile tripled, ton-miles per carload nearly doubled, and tons per train grew by nearly 60 percent compared with 1970. Thus, the track that remained was used more intensely, and greater emphasis was placed on investing in more powerful locomotives. More efficient and cost-conscious railroads thus increased their output per employee and output per gallon of fuel consumed by 400 and 74 percent, respectively. Again, most of these productivity gains occurred after 1979.

[28] In making this ruling, known as the "bottleneck" decision, ICC referred to a long-standing history in railroad rate regulation that the reasonableness of a rate is to be assessed on a "through" basis to preclude requirements that a railroad quote tariff rates for partial routings when it was capable of providing the full routing on its own. The bottleneck issue is discussed in more detail in Chapter 4.

The Class I railroads became specialists in the long-distance movement of freight, as the average length of a haul increased by nearly two-thirds from 1970 to 1995. Many shippers located along thousands of miles of lightly used branch lines divested by the major railroads were served by hundreds of regional and short-line railroads, many of which commenced operations after passage of the Staggers Rail Act.[29] By the mid-1990s, more than 400 of these railroads, most of which connect with and feed traffic to the major railroads, operated more than 40,000 miles of divested track. Although they were still specialists in bulk transportation, the Class I railroads adapted to play a major role in the intermodal container revolution caused by the large increase in international trade. Rail deregulation did not create the demand for this container traffic, but it enabled railroads to respond more effectively through innovative service offerings such as by double-stacking containers on unit trains and by partnering with steamship lines to provide transcontinental connections ("land bridges") between the nation's container seaports and interior hubs. With their freedom to contract with shippers, railroads were able to reclaim a role in the movement of high-value goods. They eventually partnered with rival trucking companies for the line-haul segment of long-distance container and semitrailer movements (Gallamore and Meyer 2014, 285). By 1995, railroads were transporting more than three times as many containers and semitrailers as they had 25 years earlier (Table 1-1).

TABLE 1-1 Selected Statistics for Class I Freight Railroads, 1970–2013

						Percent Change		
Statistic	**1970**	**1979**	**1995**	**2005**	**2013**	**1970–1995**	**1979–1995**	**1995–2013**
Real revenue ($ millions) (2013 dollars)	51,161	62,702	44,430	51,570	70,514	–13	–29	59
Ton-miles (millions)	764,809	904,956	1,305,688	1,696,425	1,740,687	71	44	33
Miles of track owned	319,092	277,242	180,419	164,291	161,980	–43	–35	–10
Employees (approximate)	566,000	475,000	188,000	162,000	163,000	–67	–60	–13
Locomotives	27,077	28,097	18,812	22,779	25,033	–31	–33	33
Gallons of fuel used (millions)	3,545	4,080	3,480	4,192	3,682	–2	–15	6
Real revenue per ton-mile (cents) (2013 dollars)	6.7	6.9	3.4	3.0	4.1	–49	–51	19
Ton-miles per fuel gallon	216	222	375	414	473	74	69	26
Ton-miles per employee	1.4	2.0	7.0	10.5	10.7	400	250	53
Ton-miles (millions) per track mile	2.4	3.3	7.2	10.3	10.8	202	119	48
Ton-miles per carload	28,311	39,199	55,032	54,473	60,377	94	40	10
Tons per trainload	1,820	2,096	2,870	3,115	3,488	58	37	22
Average miles per ton hauled	515	616	842	894	990	63	37	18
Real capital expenditures ($ millions) (2013 dollars)	6,328	8,716	8,493	7,413	13,091	34	–3	54
Capital expenditures as a percentage of revenue	12.4	13.9	19.1	14.4	18.6	34	38	–3
Percent of freight revenue lost or damaged	1.97	1.10	0.33	0.22	0.12	–83	–70	–64
Train accidents per million train miles	NA	11.4	4.1	4.1	2.4	NA	–64	–42
Intermodal containers or trailers	2,363,200	3,278,163	7,936,172	11,693,512	12,831,692	236	142	62

NOTE: NA = not available.
SOURCE: AAR various years (1980–2014). Rate, revenue, and expenditure figures are in real terms, adjusted for inflation by using the U.S. Bureau of Economic Analysis gross domestic product chained price deflator.

[29] Regional railroads, as defined by AAR, are line-haul railroads operating at least 350 miles. Short-line railroads are line-haul railroads that operate smaller networks or that primarily perform switching. Some are jointly owned by two railroads for the purpose of transferring cars at interchanges and in shared terminal facilities.

The statistics suggest that shippers benefited substantially from the productivity improvements of the deregulated railroads. Despite the 44 percent increase in ton-miles from 1979 to 1995, inflation-adjusted (real) freight revenues fell by nearly 30 percent. Although the average revenue per ton-mile (RPTM) was clearly affected by fundamental changes in traffic composition (e.g., an increase in intermodal shipments and average length of hauls), the magnitude of the rate reductions—down about 50 percent from 1979 to 1995—suggests that most rail shippers benefited from substantially reduced prices. A number of other statistics in Table 1-1 suggest favorable developments for rail shippers, such as reductions in freight losses and damages, but their direct connection to deregulation is less certain because rail safety and security trends had been improving through the 1970s. Although railroad capital expenditures declined slightly in real terms between 1979 and 1995, expenditure levels grew in relation to freight revenue and to the leaner railroad system overall.

The early effects of the Staggers Rail Act on productivity, rates, and service quality have been studied by economists. Results from studies comparing rate levels from the prederegulation and early deregulation periods are summarized by Ellig (2002, 154) in Table 1-2. They indicate that the large cost savings and productivity gains that followed regulatory reform were passed on to shippers through lower rates. Many of the cited studies were conducted only a few years after passage of the Staggers Rail Act, but they are generally consistent in finding that even shippers who experienced rate increases at the outset were likely to experience real rate declines of 10 to 25 percent by the start of the 1990s, when the effects of the law's reforms had taken hold. For the most part (as discussed in more detail later), economic studies from the period point primarily to the industry's productivity gains, along with price competition with trucks, as the main drivers of lower rates, and secondarily to the effects of parallel and end-to-end railroad mergers in reducing uneconomic railroad capacity and improving operating efficiencies.

Measuring changes in productivity and rates is easier than measuring changes in railroad service characteristics (such as transit time, reliability, and cargo loss and damage), but evidence of the Staggers Rail Act reforms having an early, positive effect on service quality had been reported in the literature. Grimm and Smith (1987), for example, reviewed responses to an industry association survey of shippers. They found that 30 percent reported improvements in service speed, reliability, and rail car availability, whereas two-thirds reported no change and 10 percent reported service degradation. After reviewing the few early postderegulation studies (Winston 1998; Barnekov and Kleit 1990; Winston et al. 1990) that placed monetary values on changed service, such as the effects of faster delivery and greater service reliability on lowering inventory costs, Ellig (2002, 159) concluded that savings to shippers from improved service were of the same order of magnitude as the savings from reductions in rates.

PERSISTENT CONCERNS AND REGULATORY CHALLENGES

By 2005, the railroad industry had clearly turned the corner. In the 25 years since passage of the Staggers Rail Act, ton-miles had increased by nearly 90 percent; track miles and employees had declined by 41 and 63 percent, respectively; and average RPTM had fallen by 60 percent in real terms (Table 1-1). Productivity continued to improve according to a number of measures, including ton-miles per employee, fuel consumed, and mile of track. However, after 2000, railroads began adding locomotives and employees to meet growing freight demand, since fewer opportunities for concentrating traffic in existing capacity or for expanding car sizes and making

longer trains remained. The seven Class I railroads[30] left from the 41 that operated in 1979 had shed most of their legacy uneconomic capacity and become adept at operating and pricing in a deregulated environment that favored tighter levels of capacity than the regulated railroads had long been required to maintain.[31]

TABLE 1-2 Rail Rates Studies, Early Postderegulation Period

Authors and Year of Publication	Period Studied	Measure Studied	Response to Staggers Rail Act Reforms
R. L. Banks and Associates, Inc., and Fieldston Company (1998)	1981–1996	Real RPTM	21 percent lower after controlling for other factors
Wilson (1994)	1981, 1988	Rates for 34 commodities	1981: some rates higher, some lower, some unchanged 1988: all rates lower or unchanged
Burton (1993)	1973–1987	Rates for 17 major commodities	1985 rates lower by 3 to 34 percent, depending on commodity
		Average rates	10 percent higher in 1981; 30 percent lower in 1988
Barnekov and Kleit (1990)	1970–1987	Average rates	16 to 19 percent lower in 1987, saving shippers $6 billion to $8.5 billion (1998 dollars)
Winston et al. (1990)	1985	Rates and service time, all commodities[a]	Rate changes altered shipper welfare by minus $3 billion to plus $1.5 billion; shippers were $4.4 billion to $11.4 billion better off due to better service (1998 dollars)
McFarland (1989)	1969–1987	Average rates	Unchanged
MacDonald (1989)	1981–1985	Wheat rates	Fell 18.5 percent from 1981 to 1985
		Corn rates	Fell 9 percent in 1982, rose 2 percent in 1983, fell 20 percent in 1985
Lee and Baumel (1987)	1971–1984	Average rates	Accelerated rate reductions by 5 percentage points
Boyer (1987)	1970–1985	Average rates	Statistically insignificant evidence of 2 percent rate increase
Grimm and Smith (1987)	1984	Rates for all National Industrial Transportation League members	50 percent had lower rates, 12 percent had higher rates, and 38 percent were unchanged
Sorenson (1984)	1977–1983	Kansas grain rates to Gulf of Mexico for export	Fell 43 percent from 1981 to 1983
		Kansas grain rates to Kansas City	Fell 32 percent from 1981 to 1983

[a] Rates and service changes for each commodity were weighted to reflect shipper's probability of using rail for the shipment. Savings figures are the combined effect of the Staggers Rail Act and the Motor Carrier Act of 1980, which deregulated trucking.
SOURCE: Ellig 2002, 154.

[30] The seven Class I railroads in order of revenue are BNSF Railway Company, Union Pacific Railroad Company, CSX Transportation, Grand Trunk Corporation (Canadian National's U.S. operations), Kansas City Southern Railroad Company, Norfolk Southern Railway, and Soo Line Corporation (Canadian Pacific's U.S. operations). They accounted for 94 percent of railroad industry revenues in 2013.

[31] Gallamore (1999) and Gaskins (2008) give firsthand accounts of the difficulties that some railroads had in adapting to the new environment at the outset of deregulation and of how the adaptations were eventually made.

During the early 2000s, rates had begun to rise, first in nominal and then in real terms partway through the decade (rate trend data are shown in Chapter 2). Between 2002 and 2007, real rates increased by more than 15 percent. The increases were noticed by shippers, who had grown accustomed to a secular decline in rates over the previous two decades. Service disruptions had occurred after the merger of the Union Pacific and the Southern Pacific Railroads in 1996, and more episodic service disturbances had been experienced during 2004.[32] Shippers expressed concern that consolidation of the railroad industry and efforts to rationalize capacity were contributing to the rising rates and perceived increases in the frequency and duration of service disruptions.

In response to growing congressional concern about the causes of these service disturbances and the changing direction in railroad rates (GAO 2006), in 2007 STB sponsored a comprehensive study of post-Staggers economic and competitive conditions in the railroad industry. The study was completed by Laurits R. Christensen Associates in 2009 and 2010.[33] It took a longer-term view spanning the 1980s to 2008 and confirmed many of the positive findings from the postderegulation economic studies cited earlier. However, the overall performance of the railroad industry in the wake of regulatory reform was of less immediate interest to policy makers than was an understanding of the causes of the changes that had been taking place after 2000. Christensen Associates found that rail rates in general had been rising after about 2002, although largely in accordance with rising fuel prices and slowing gains in railroad productivity. The study documented the success of the railroads in reducing the industry's excess uneconomic capacity and in increasing its capabilities with regard to differential pricing (i.e., pricing to what the market would bear).

The upward trend in rates during the early 2000s accentuated concerns that had persisted since enactment of the Staggers Rail Act—that "captive" shippers (rail-dependent shippers served by only one railroad) would be adversely affected by the law's deregulatory provisions intended to allow railroads to obtain and exercise more market power. A decade earlier, when Congress had terminated ICC, implementation of the Staggers Rail Act's many deregulatory provisions (e.g., commodity exemptions, legalization of confidential contracts, abandonment approvals) had been largely complete. A primary role of the successor STB would be to administer the residual regulatory program, a key component of which was the protections afforded to captive shippers from unusually high common carrier rates and unresponsive service. However, even during the 1980s and early 1990s, shippers were not satisfied with all aspects of ICC's implementation of the Staggers Rail Act. A number of concerns that were first raised during ICC's implementation of the act became magnified for STB as rates began to rise after 2000 and railroads began to exhibit increased profitability. A synopsis of these concerns is provided next, because they are central to the study's review of STB's implementation of the current regulatory program.

[32] In 2004, during a period of rapid growth in container and other rail freight traffic, the Southern California seaports experienced severe congestion, which was attributed to lack of rail capacity for transportation of arriving containers as well as to port capacity constraints. However, rail shippers complained of degraded service in other regions during the same period (CBO 2005, 1–3; Lavigne 2014).

[33] The multivolume report can be found at http://www.stb.dot.gov/stb/elibrary/CompetitionStudy.html.

Competitive Effects of Industry Consolidation and Capacity Reductions

Some shippers expressed concerns that ICC had placed too much emphasis on helping railroads achieve financial stability by cutting capacity and too little on protecting shippers from competition losses that risked higher rates and less reliable service.[34] They maintained that regulators had been too permissive in approving mergers and acquisitions. The principal purpose was to eliminate financially weak railroads and raise the traffic and revenues of the financially stronger railroads that remained. In creating STB, Congress retained ICC's authority to approve mergers despite calls by shippers to transfer the authority to the Antitrust Division of USDOJ. In completing a review begun under ICC, STB approved the 1996 merger of the Union Pacific and Southern Pacific Railroads over the objections of some shippers and USDOJ.[35] Severe service disruptions that ensued after the merger were a factor in prompting STB to suspend further merger applications in 2000 and to revise its merger appraisal procedures. The revised procedures placed less emphasis on improving the financial health of railroads and more on preserving sufficient levels of competition, as had been advised by USDOJ. After the moratorium, merger applications involving Class I railroads ceased; nevertheless, shippers complained that many opportunities to preserve beneficial competition and levels of capacity had been lost over the previous two decades.[36]

Access to Rate Relief Procedures

Rail shippers also raised concerns about the cost and complexity of evidentiary standards intended to detect unreasonably high rates in markets that lacked effective competition.[37] The development of these standards proved particularly challenging for ICC as it sought to respect the law's interest in the attainment of revenue adequacy by railroads. Regulators had tried to provide a consistent standard for assessing the reasonableness of rates that took into account a railroad's earning requirements to attract capital. The stand-alone cost (SAC) standard was designed to determine the cost of supplying rail service in a given set of corridors in a stand-alone manner (i.e., largely outside the context of the railroad's broader network and traffic base). It proved to be time-consuming and complicated to adjudicate almost immediately and required several million dollars in litigation expenses per case (GAO 1999, 45–49). The SAC procedure was originally instituted with shippers of large and regular traffic volumes in mind, particularly shippers of coal transported in a single corridor.[38] Coal shippers raised concerns about the high cost of litigating a SAC case and results that often produced a conservatively high assessment of the revenue-adequate rate. However, resolution of a single coal case held the potential for tens of millions of dollars in overcharge penalties and future transportation savings from a lower

[34] See, for example, Western Coal Traffic League comments to the Union Pacific–Southern Pacific merger hearings, STB FD No. 32670, March 29, 1996. Also see the statement of Thomas D. Crowley on behalf of the Western Coal Traffic League before the House Committee on Transportation and Infrastructure, Hearing on the Condition of the Railroad Industry, April 22, 1998.

[35] See testimony of Steven C. Sunshine, Deputy Assistant Attorney General, Antitrust Division, statement before U.S. House of Representatives Committee on Transportation and Infrastructure, January 26, 1995. http://www.justice.gov/atr/public/testimony/0056.htm.

[36] See shipper comments to STB Ex Parte No. 582-1, Public Views on Major Rail Consolidations, and specifically comments by the National Industrial Transportation League, November 17, 2000.

[37] A summary of shipper concerns about rate relief access is given by GAO (1999).

[38] *Coal Rate Guidelines, Nationwide.* 1985 [1 ICC.2d 520, 1985 WL 56819 (ICC)].

prescribed rate (GAO 1999, 46). The ability of coal shippers to use the SAC standard at least held out the possibility that the law's rate relief protections would deter high coal rates and provide coal shippers with greater leverage when contracts were negotiated.

The SAC standard had limited applicability to shippers who shipped in small quantities or on an irregular basis. Hence, when a decade had passed and only a few shippers of commodities other than coal had filed a rate case, pressure mounted for ICC to introduce alternative evidentiary procedures that promised broader access to the law's maximum rate protections. In particular, shippers of smaller volumes and shippers who used more varied routes argued that the lack of rate cases was indicative not of a shortage of grievances but of an evidentiary standard that was inappropriate for their circumstances and that entailed minimum litigation costs that exceeded their smaller claims. When it created STB in the ICC Termination Act of 1995, Congress ordered the new agency to develop expedited procedures for resolving disputes that could be used by more shippers who were unable to use the SAC standard.[39]

In response to the congressional directive, STB retained the SAC procedure but added two new simplified procedures with lower evidentiary standards and limits on monetary awards. STB also restricted the types of evidence that railroads could introduce to refute claims that a market is dominated, which had been adding to the cost and complexity of rate cases. However, even as it sought to broaden access to the rate relief process, STB remained committed to structuring its new rate review procedures so that they remained focused on comparing rates with estimates of the revenue needs of the railroad in providing the service. Like ICC before it, STB was reluctant to introduce rate relief procedures that risked conflicting with the law's interest in ensuring railroad revenue adequacy.

Over the past decade, a number of rate relief cases have been filed by shippers of chemicals, as well as coal, under the expedited procedures for assessing market dominance and reasonable rates.[40] Railroads have expressed concern that restrictions placed on the evidence allowed in market dominance inquiries have led to exaggerated findings of market power, particularly by failing to account for a shipper's ability to discipline rates by shipping to other markets and by changing its production levels and locations.[41] Overall, however, shippers of many commodities that move predominantly by common carriage, including bulk grain and other farm products, have not used the simplified procedures. These shippers maintain that the caps on awards were too low to justify the expense of bringing a case, the standards (including a simplified version of SAC) remain inappropriate to their circumstances, and the decision criteria for an unreasonable rate ruling remain unclear.[42]

Evidence of Railroad Revenue Adequacy

Like ICC, STB is required to make annual determinations of each Class I railroad's revenue adequacy. For most of its first 10 years, STB determined that all railroads were falling short of revenue adequacy according to its industrywide average cost of capital measure.[43] Railroads viewed these findings as indicative of a continued need to limit regulatory intervention, and

[39] 49 §10701(d)101.
[40] http://www.stb.dot.gov/stb/industry/Rate_Cases.htm.
[41] STB Ex Parte No. 717.
[42] See shipper comments to STB Ex Parte No. 665-1, Rail Transportation of Grain, Rate Regulation Review. In particular, see comments by the National Grain and Feed Association, p. 14, June 26, 2014.
[43] See STB Ex Parte No. 552-1 through 10.

particularly to proceed cautiously in changing the standards used for adjudicating rate protests. Meanwhile, shippers have claimed that the method used to judge revenue adequacy does not reflect the reality of railroads having obvious access to credit markets and have identified other indicators of railroad profitability such as positive balance sheets and rising stock values.

Having long been critical of STB's annual findings of most railroads falling short of revenue adequacy, some shippers now commend the results as more railroads have been declared revenue adequate during the past 5 years.[44] In response, shipper groups have asked STB to reexamine how it uses the revenue adequacy results. They contend that the new findings of railroad profitability are relevant to the law's stated policy "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."[45] Some would like to see STB expand access to rate relief by taking a less cautious approach to safeguarding railroad revenue adequacy and profits.[46] Railroads contend that because they are capital intensive, the concern over sustaining revenue adequacy and the profit incentive that encourages capacity investments must remain at the forefront of regulatory policy. They argue that using an industrywide cost-of-capital measure to assess rate relief is tantamount to a profitability test that would be impractical to administer and contradict the law's policy of minimizing federal regulatory control.[47]

Common Carrier Service Expectations

Shipper complaints of railroads violating their common carrier duties by not complying with reasonable requests for service date back to the beginning of the U.S. railroad industry (Scharfman 1915). Since the Staggers Rail Act split the industry into common and contract carriage, shippers who rely on the former have been vocal in expressing their concerns about inferior treatment. For example, they allege that railroads are prone to making costly demands for infrastructure improvements as a condition for service, withholding tariff rates until the potential for contract negotiations is exhausted, and refusing to quote tariff rates from locations offering less profitable traffic volumes.[48] Shippers also maintain that railroads favor their contract customers to the exclusion of fulfilling their common carrier obligations. In particular, grain shippers contend that railroads give preferential treatment in the allocation of locomotives, crews, and rail cars to their contract customers to the detriment of shippers who have few options other than common carriage by rail.

In responding to such complaints, railroads maintain that the common carrier duty is not well defined and should not be interpreted to mean that capacity must be made readily available to meet all requests for transportation service, particularly when the demand for service can be

[44] See comments submitted jointly by the American Chemistry Council, the Fertilizer Institute, the Chlorine Institute, and the National Industrial Transportation League to STB Ex Parte No. 664-2, September 5, 2014, pp. 5–6.
[45] See comments submitted jointly by the American Chemistry Council, the Fertilizer Institute, the Chlorine Institute, and the National Industrial Transportation League to STB Ex Parte No. 664-2, September 5, 2014, pp. 5–6.
[46] See comments to STB Ex Parte No. 722 by the Arkansas Electric Cooperative Corporation, the Western Coal Traffic League, Consumers United for Rail Equity, the Olin Corporation, and other shippers and shipper groups.
[47] See AAR comments to STB Ex Parte No. 722, November 4, 2014.
[48] Allegations can be found in the large number of comments submitted to STB Ex Parte No. 677. The examples given here are drawn from statements by the National Grain and Feed Association, April 27, 2008, and the Western Coal Traffic League, April 17, 2008.

irregular and unpredictable.[49] They also raise concerns of their own, including the requirement of serving all kinds of traffic under the common carrier obligation, particularly the obligation to transport shipments that pose toxic inhalation hazards such as tank car loads of chlorine and anhydrous ammonia. Railroads would like to see such shipments made exempt from standard terms of common carriage to allow negotiation of compensatory rates and the addition of legal protections from potentially ruinous liability.[50]

Petitions for Competitive Access

When railroads began canceling their legacy terminal access, trackage rights, and reciprocal switching arrangements as permitted by the Staggers Rail Act, many shippers complained that their rail transportation options were being sharply curtailed (GAO 1987). Shippers petitioned ICC to stop the cancellations and to order railroads to reestablish the arrangements to prevent railroads from obtaining too much market power. Like ICC, STB has insisted that its authorities to order such access arrangements were not intended for general use as a measure to inject competition into markets but rather as a targeted tool to remedy specific instances of competitive abuse. Shippers have persisted in their objection to this policy. At the time of this study, STB was considering a petition from a shipper group to establish a new policy that would lead to mandatory reciprocal switching agreements in markets where a shipper is served by only one railroad and an interchange with another railroad is located within 30 miles.[51]

STUDY CHARGE AND APPROACH

With these concerns and regulatory challenges as a backdrop, Congress called for this study of the federal railroad regulatory program and its implementation by STB. The study's full statement of task appears in Box 1-1. The main charge consists of the four tasks requested by Congress in the 2005 law (the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users) calling for the study. The four are followed by six additional queries that were added by the study sponsors, the Federal Railroad Administration and USDOT. The committee concentrated its efforts on the charge given to it by Congress, but responses to the six additional queries are presented in Appendix A.

The fourth task asks for policy recommendations with regard to the future role of STB. The committee decided to approach the first three tasks in a manner that would help inform its recommendations about the regulatory program's future. Therefore, the committee did not conduct a historical review of railroad rate, service, and capacity changes since the 1980 Staggers Rail Act reforms. Instead, it focused on recent trends and developments that are more pertinent to the modern freight railroad industry that has emerged in the three decades since regulatory reform. Under this approach, the committee saw no reason to examine deregulatory provisions of the Staggers Rail Act that were fully implemented years ago, such as the granting of regulatory exemptions to commodities and the legalization of private contracting. The study concentrates on a limited set of regulatory provisions that STB continues to administer and that remain controversial and candidates for updating and change.

[49] See AAR filings to STB Ex Parte No. 677 and No. 677-1.
[50] See comments of AAR to STB Ex Parte Nos. 677 (March 2008) and 677-1 (July 2, 2008).
[51] STB Ex Parte No. 711, National Industrial Transportation League Petition, March 30, 2013.

Box 1-1

Study Statement of Task

The study shall address and make recommendations on the:

1. performance of the Nation's major railroads in the post–Staggers Act era regarding service levels, service quality, and rates;
2. projected demand for freight transportation over the next two decades and the constraints limiting the railroads' ability to meet that demand;
3. effectiveness of public policy in balancing the need for railroads to earn adequate returns with those of shippers for reasonable rates and adequate service; and
4. future role of the STB in regulating railroad rates, service levels, and the railroads' common carrier obligations, particularly as railroads may become revenue adequate.

As part of the analysis undertaken to address the four areas above stipulated by Congress, the committee shall, to the extent possible based upon existing data and prior analyses,

1. examine rates and service levels by type of shipper and commodity, service lane, shipper size, and shipper type;
2. estimate whether railroad exercise of market power has increased since deregulation and the impact this has had on rates and/or service;
3. describe the potential role that freight rail can serve in shifting some future growth in highway freight shipments to rail;
4. comment on the role freight rail can serve in meeting the Department of Transportation's strategic goals;
5. assess whether Class I freight railroads are earning their cost of capital; and
6. assess whether railroads continue to be a decreasing cost industry due to economies of density or whether average and marginal costs are rising and the implications the latter has for STB oversight and regulation.

Although it examines and offers advice on specific regulatory provisions in the Staggers Rail Act, the committee refrained from critiquing the act's overarching policy goals. They were taken as given. Because these policies are referenced frequently in the report, they are shown in Box 1-2. Among them are the law's interest in assuring reasonable rates and the ability of railroads to achieve revenue adequacy. The committee assumes that policy makers remain satisfied with these overarching policy goals; the focus of the study therefore was on finding ways to make the regulatory program more effective in achieving them.

In asking the committee for recommendations on the future role of STB in furthering these policies, Congress added the following phrase: "particularly as railroads may become revenue adequate." The committee interprets this phrase to indicate an interest in a study of the regulatory program in the context of a changing, postderegulation freight railroad industry. For reasons explained in this report, the committee believes that mechanistic regulatory appraisals of

Box 1-2

U.S. Freight Railroad Regulatory Policy

In regulating the railroad industry, it is the policy of the United States Government to:

1. allow, to the maximum extent possible, competition and the demand for services to establish reasonable rates for transportation by rail;
2. minimize the need for Federal regulatory control over the rail transportation system and to require fair and expeditious regulatory decisions when regulation is required;
3. promote a safe and efficient rail transportation system by allowing rail carriers to earn adequate revenues, as determined by the Board;
4. ensure the development and continuation of a sound rail transportation system with effective competition among rail carriers and with other modes, to meet the needs of the public and the national defense;
5. foster sound economic conditions in transportation and to ensure effective competition and coordination between rail carriers and other modes;
6. 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;
7. reduce regulatory barriers to entry into and exit from the industry;
8. operate transportation facilities and equipment without detriment to the public health and safety;
9. encourage honest and efficient management of railroads;
10. require rail carriers, to the maximum extent practicable, to rely on individual rate increases, and to limit the use of increases of general applicability;
11. encourage fair wages and safe and suitable working conditions in the railroad industry;
12. prohibit predatory pricing and practices, to avoid undue concentrations of market power, and to prohibit unlawful discrimination;
13. ensure the availability of accurate cost information in regulatory proceedings, while minimizing the burden on rail carriers of developing and maintaining the capability of providing such information;
14. encourage and promote energy conservation; and
15. provide for the expeditious handling and resolution of all proceedings required or permitted to be brought under this part.

SOURCE: 49 USC §10101: Rail transportation policy.

a railroad's revenue adequacy can offer little, if any, insight for policy making. Nevertheless, it is evident that financial conditions in the freight railroad industry are fundamentally improved over the dire circumstances that prevailed in the 1970s and that prompted the regulatory reforms of the Staggers Rail Act. Similarly, the transition period following deregulation, and the uncertainty that it held, has long passed. Yet 35 years after passage of the Staggers Act, many features of the program that were shaped by these earlier circumstances persist.

As they reviewed the existing regulatory program, committee members were struck by its attachment to concerns that have faded (and in some cases expired) and to the preservation of regulatory techniques that were a staple of the pre-Staggers ICC. The annual pass/fail appraisal of each railroad's revenue adequacy and reliance on traffic costing schemes known to be invalid for decades are examples of features of STB's program that are anachronistic and lack an economic foundation. Therefore, a question that arose repeatedly during the committee's discussions and that guided its review was how to bring the post-Staggers regulatory program into the modern age.

CONTENT AND ORGANIZATION OF REPORT

The remainder of this report is organized as follows.

Chapter 2 addresses the elements of the first two tasks of the study charge by examining (*a*) recent trends and patterns in railroad rates, (*b*) concerns expressed by rail shippers about freight rail service levels and quality, and (*c*) projections of demand for rail freight and associated concerns about long-range capacity constraints and possibly capacity shortages.

The analysis of railroad rates was aided by access to STB's annual Carload Waybill Sample (CWS), particularly the confidential version that contains actual rates paid by shippers using contract as well as common carriage. The traffic and revenue data in the CWS, which is designed to be a representative sample of shipment waybills, were analyzed for 2000 to 2013, a period considered to be reflective of industry circumstances today and relevant for current policy assessment.

The CWS data are used to review rate trends and patterns at an industrywide level, by commodity group, and for shipments moved in both common and contract carriage. Data on trends in railroad input costs and productivity levels help in understanding general patterns in rates observed over the past decade. A better explanation would have required more extensive evaluations and knowledge of demand and supply conditions at the commodity- and market-specific levels. Therefore, the rate analyses in the chapter are presented mainly as background and do not factor directly into the study's conclusions and recommendations pertaining to the regulatory program. Nevertheless, a particularly relevant observation from the CWS concerns the disparities among commodity groups in their use of common carriage. This observation was significant in informing the committee's assessment of the adequacies of the law's rate relief provisions, which apply only to common carrier traffic.

With regard to railroad service levels and quality, the discussion in Chapter 2 is largely descriptive. It summarizes concerns raised by shippers claiming to have experienced more frequent and lengthy service disruptions and inferior service quality generally in their use of common carriage. Whereas some quantitative data on railroad service performance are available, they are insufficient in detail and completeness to characterize the overall direction of service quality or its variability among traffic segments. Better information would have been helpful to

the committee in fulfilling the study charge to review service performance. More significantly, better information is essential for regulators in ensuring that the common carrier service obligation is being met.

The complaint data indicate that shipper concerns about common carrier rates and service performance tend to increase during periods when railroads must redeploy capacity quickly to accommodate abrupt changes in demand or adapt to other exogenous conditions such as severe winter weather. Shippers often associate service problems with insufficient allocation of or investment by railroads in rail cars and physical infrastructure, including the capacity needed to handle demand surges. Thus, Chapter 2 concludes with a general discussion of the incentives of the private railroads to deploy and invest in capacity to serve shippers. The committee was specifically asked to examine the projected demand for freight transportation over the next two decades and the constraints that may limit the railroads' ability to meet that demand. Consideration is given to recent freight forecasts and to whether the projections of long-term rail capacity shortages that are based on them are sound.

In response to the third task in the study charge, Chapters 3 and 4 examine the design and implementation of certain provisions in the Staggers Rail Act. The provisions are intended to guarantee that shippers have access to common carrier service at a reasonable price and with adequate quality. The law's other policy interests, such as ensuring that railroads have the ability to earn adequate returns, are taken into account.

Chapter 3 examines the law's maximum rate protections and their implementation by STB. The agency's Uniform Railroad Costing System, qualitative assessments of market dominance, and the SAC test and other cost-based methods for granting rate relief are key to the implementation. The chapter examines each in turn. Having found a number of methodological deficiencies, the committee then considers the feasibility of introducing an alternative approach for identifying unusually high rates that does not rely on regulatory costing methodologies. On the basis of data from actual shipment rates and characteristics from the CWS, the committee shows that prediction of the rates that would be charged for shipments in effectively competitive markets is practical. The predicted, or benchmark, competitive rates can be used by shippers of similar shipments in noncompetitive markets to determine whether their rates are unusually high. In a sense, this procedure implements the common law notion that "like" traffic under substantially similar circumstances should not have to pay substantially different rates. A specific benchmarking model is demonstrated more fully for illustrative purposes in Appendix B.

Chapter 4 examines four additional features of the railroad regulatory program: (*a*) the common carrier service obligation, (*b*) the requirement to make annual determinations of each Class I railroad's revenue adequacy, (*c*) the exemption of railroad mergers from standard antitrust reviews in favor of a public interest appraisal by STB, and (*d*) the regulatory authority to order reciprocal switching as necessary to provide competitive rail service.

As currently defined and practiced, the common carrier service obligation is a throwback to another era. The obligation is not accompanied by uniform service quality standards and is difficult to enforce in the absence of relevant information on service quality at the shipment-specific level. A review of the obligation indicates how these data deficiencies will need to be addressed if the common carrier obligation is to remain relevant. The critiques of the annual railroad revenue adequacy appraisal by STB and the long-standing application of a public interest standard for reviewing railroad mergers raise fundamental questions about the continued relevance of these regulatory practices, especially in light of the railroad industry's financial turnaround. In the case of STB's authority to order reciprocal switching, the review questions

why the agency continues to refrain from exercising this authority as a remedy for unreasonable rates.

Chapter 5 summarizes the report's background and context sections and the findings from the review of rate trends, service quality issues, and long-term capacity constraints. The findings from the review of STB regulatory provisions and practices are discussed in detail. The committee, which was asked to advise on the agency's future role, draws on these findings to make a series of recommendations intended to address deficiencies in the current regulatory program and make it reflective of circumstances in the industry today, 35 years after passage of the Staggers Rail Act.

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Abbreviations

AAR	Association of American Railroads
CBO	Congressional Budget Office
GAO	General Accounting Office *or* Government Accountability Office
USDOT	U.S. Department of Transportation

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2

Recent Rate Trends and Service and Capacity Issues

The committee was asked to review "the performance of the nation's major railroads regarding service levels, service quality, and rates" and "the projected demand for freight transportation over the next two decades and the constraints limiting the railroads' ability to meet that demand." These three issues—recent trends in rail rates, service quality issues, and concerns about future capacity constraints—are examined in this chapter. Sampled railroad waybill data are analyzed, the complaints and concerns expressed by shippers about service problems are surveyed, and railroad freight demand forecasts and projections of long-range capacity constraints are reviewed.

Shortly after the original congressional request for this study in 2005,[1] the Surface Transportation Board (STB) sponsored an independent economic study of the postderegulation freight railroad industry by Laurits R. Christensen Associates, Inc. (2009a; 2009b; 2010). The Christensen Associates' reports examine railroad rates, service levels, and capacity issues from the 1980s through 2008. In view of their relevance to the topics reviewed in this chapter, results from the Christensen Associates reports are discussed in several places.

RECENT RATE TRENDS

This section examines recent rail rate trends and patterns on an industrywide basis with regard to a selection of commodities and to shipments moved in common and contract carriage. The analysis period for the most part is 2000 to 2012 or 2013.[2] Rates are measured in average revenue per ton-mile (RPTM) on the basis of railroad revenues from both common (tariff) and contract carriage, as derived from shipment waybills sampled by STB. STB's annual Carload Waybill Sample (CWS) program is explained in Box 2-1. The analyses that follow consist mostly of simple indices and cross-tabulations and are intended for background. The results yield insights relevant to the review of regulatory policies in subsequent chapters, such as trends in commodities moved in unregulated contract and regulated common carriage.

Historical Trends in Industrywide Average Rates

Figure 2-1 shows several indices presented in inflation-adjusted (real dollar) terms. Two of the indices show rate levels for 1989 to 2007–2008. They were originally constructed by STB and Laurits R. Christensen Associates, and both use revenue and ton-mile data obtained from the

[1] Public Law 109-59 §9007. Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users.
[2] Some of the analyses end in 2012 and others end in 2013 because of the timing of the committee's receipt of 2013 Carload Waybill Sample data late in the study period.

Box 2-1

STB's CWS Program

A freight waybill is a document issued by a carrier giving details and instructions relating to the shipment. The document normally contains the names of the consignor and consignee and the shipment's commodity, origin, destination, and route. Most freight waybills are maintained in electronic form. In this study, each railroad waybill is referred to as a "shipment." A single waybill shipment can consist of one carload or an entire trainload (100 or more carloads). Because of the need for railroads to interchange traffic, the Association of American Railroads (AAR) has developed standard waybill data elements and forms, including rules for electronic data interchange.

STB requires all railroads that terminate 4,500 or more carloads to sample their waybills and report the sample on a monthly or quarterly basis, depending on traffic activity. Sampling rates vary between 2.5 and 50 percent, depending on the number of carloads in the shipment. Shipments consisting of one or two carloads are sampled at the lower rate, and shipments of 101 or more carloads are sampled at the higher rate. Other sampling rates apply to shipments with 3 to 15, 16 to 60, and 61 to 100 carloads (8.3, 25, and 33.3 percent, respectively). The sampled waybills are submitted in electronic form to a private contractor, Railinc Corporation, which processes and corrects errors in the records under contract with STB and the Federal Railroad Administration (FRA).

During processing, additional information is paired with the sampled record such as details on the rail car (e.g., capacity, dimensions, and mechanical characteristics) and location identifiers (e.g., census region, station zip code, standard production location code). The processed records, typically numbering more than 500,000 for a year, thus contain a range of information on the shipment, including routing, billed tons, miles traversed, revenue, origin, destination, interchange points, railroads traversed, car type, car ownership (e.g., railroad or private), and commodity. Commodity type is recorded by using the U.S. Department of Commerce's Standard Transportation Commodity Codes (STCCs). STTCs are two- to seven-digit codes, with the first two digits corresponding to major commodity groups and each additional digit a refinement (e.g., 01 = farm products, 011 = field crops, 0113 = grain, 01137 = wheat). For hazardous materials only, the 49 series hazmat code supplements the regular STCC.

Expansion factors are applied to each record to estimate the total population of similar shipments. The expansion factor is the inverse of the sampling rates (e.g., each shipment consisting of one or two cars is multiplied by 40). Other data added to CWS records include STB's estimate of each railroad's "variable cost" for transporting each shipment. The costing system used for these calculations, the Uniform Railroad Costing System (URCS), is discussed in more detail in Chapter 3. URCS calculates a variable cost for each shipment on the basis of railroad accounting and operating data and cost apportionment methods that take into consideration characteristics of the shipment such as commodity, number of carloads, number of railroads involved, and rail car type.

Because of the law's contract confidentiality restrictions, railroads do not submit the actual revenue data for waybills involving contract shipments. They submit encrypted data that only STB can decode. The encrypted records are marked with a flag indicating that revenue data are "calculated." When the processed waybills are delivered by Railinc to STB, the agency replaces the encrypted revenue data with the actual revenues but restricts access to the databases according to federal regulations (49 CFR 1244.9). Some nonrevenue fields are treated as confidential as well, including the origin and termination

(*continued*)

Box 2-1 (*continued*)

freight stations, junction points, and rail carrier identifications. The CWS is therefore released in versions that contain different masked and unmasked fields, with the most restricted version having masked contract revenues. STB also releases the CWS in a public version stripped of all confidential fields. In this version, and in other confidential versions that mask contract revenue, STB replaces the actual contract revenues with revenues that would have been generated by the public tariff rate.

STB uses the CWS for various purposes, including special studies and creation of the Railroad Cost Adjustment Factor (see text). Federal and state agencies use the CWS for transportation planning, as do transportation practitioners, consultants, and law firms with formal proceedings before STB. They must apply for access to the confidential versions of the CWS. All of the analyses using the CWS in this study were conducted with the confidential version containing unmasked contract revenue data.

confidential version of the CWS containing actual contract revenue.[3] Although they were constructed in slightly different ways, the two indices use a chain-weighting technique to adjust for annual variability in the mix of freight. Changes in average RPTM are measured and proportionately weighted for subgroups of traffic that share characteristics, such as commodity type, length of haul, shipment size (number of carloads), and rail car ownership.[4] The third rate index (labeled "NAS") was developed by the study committee for the more recent period 2002 to 2013. It too was based on the confidential CWS and chain-weighting according to the method used by STB.[5]

Accompanying the three rate indices is STB's productivity-adjusted Railroad Cost Adjustment Factor (RCAF-A) index,[6] which summarizes changes in the price of major railroad operating inputs, including labor, fuel, materials, equipment rents, and interest on debt. In recognition that railroads do not use inputs in fixed amounts and ratios from year to year, the RCAF-A adjusts for variations in the mix and quantity of inputs per unit of output because of productivity changes, such as reductions in fuel, materials, and labor per ton-mile.

[3] Laurits R. Christensen Associates (2010, Chapter 2, Table 2-1) provides two indices for the period 1989 to 2008, one constructed from freight revenue and another constructed from freight and miscellaneous revenues combined. For simplicity, only the former index is shown in Figure 2-1. STB's rate index (STB 2009) used 1985 as the base year, which the committee rebaselined to 1989 for comparison with the Christensen Associates index. STB's rate study and documentation on the development of its index can be found at http://www.stb.dot.gov/stb/industry/1985-2007RailroadRateStudy.pdf.

[4] The indices were developed by using a chain-weighting technique known as the Törnqvist method. An explanation of the advantages of chain-weighted indices over fixed-weighted indices is given by Diewert (1976).

[5] The updated rate trend was developed by using the same chain-weighting method that STB used. In this analysis and all others in this chapter, no CWS records were filtered or excluded, but revenue reported as "miscellaneous" during 2003–2007 was added to the freight revenue field to account for misreporting of fuel surcharge revenues.

[6] RCAF-A summarizes railroad unit-of-output costs, representing the net effect of input price changes and productivity changes. A description of the components and construction of the RCAF-A, which is developed according to STB rules, can be found at the websites of STB (http://www.stb.dot.gov/stb/industry/rcaf.html) and the Association of American Railroads (https://www.aar.org/data-center/rail-cost-indexes). The base year 1989 for the RCAF-A index shown in Figure 2-1 was constructed by Laurits R. Christensen Associates (2010), and subsequent years were updated and made consistent across periodic changes in base years.

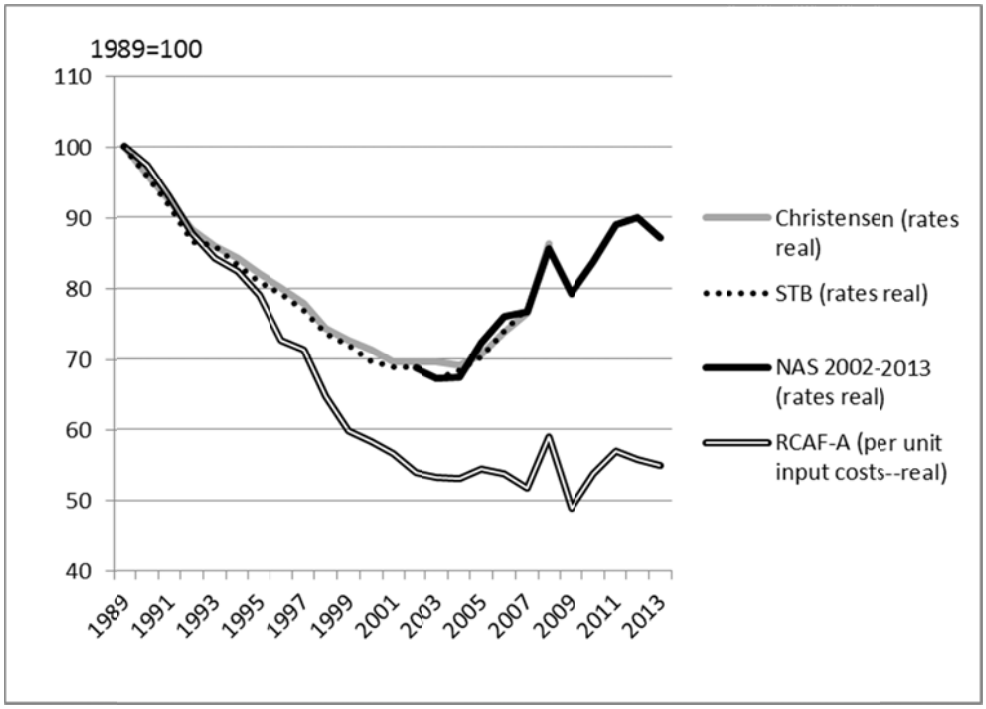

FIGURE 2-1 Historical and recent trends in industrywide real average rate and unit input costs, 1989–2013. [SOURCE: NAS rate data from CWS 2002–2013; STB rate index from STB 2009; Christensen rate index from Laurits R. Christensen Associates 2010; RCAF-A from Laurits R. Christensen Associates 2010 and AAR (various years). Adjusted for inflation by using U.S. Bureau of Economic Analysis (BEA) gross domestic product (GDP) chained price deflator (http://www.bea.gov/national/index.htm).]

Figure 2-1 shows that even when inflation is taken into account, rate levels declined during the 1990s. Real rates fell on average by 30 percent during the decade, driven by a steep decline in input costs per unit of output. This development, as indicated by the RCAF-A, was largely the result of productivity gains, such as the conversion to larger cars and consolidation of traffic in multicar shipments and unit trains of 100 or more cars. The productivity improvements after deregulation, including the shedding of low-volume branch lines and the restructuring of labor agreements, were discussed in Chapter 1.

However, as can be seen in Figure 2-1, starting in the period 2001–2003 rates began to rise 1 to 3 percent per year in nominal terms and then in real terms before jumping markedly from 2005 to 2008. During the early part of the decade, input costs, as summarized by the RCAF-A, began to stabilize after their long secular decline, only to become more volatile after 2004.

Recent Trends in Industrywide Average Rates

Because the focus of this study is on recent developments, the remainder of the section focuses on post-2000 rate trends and patterns. As noted above, from 2001 to 2003 there was a break in the downward movement in real rates that had commenced in the 1980s. Therefore, Figure 2-2 shows trends since that breakpoint through a rebaselining to 2002 and the addition of a trend line for ton-miles to indicate changes in traffic volumes.

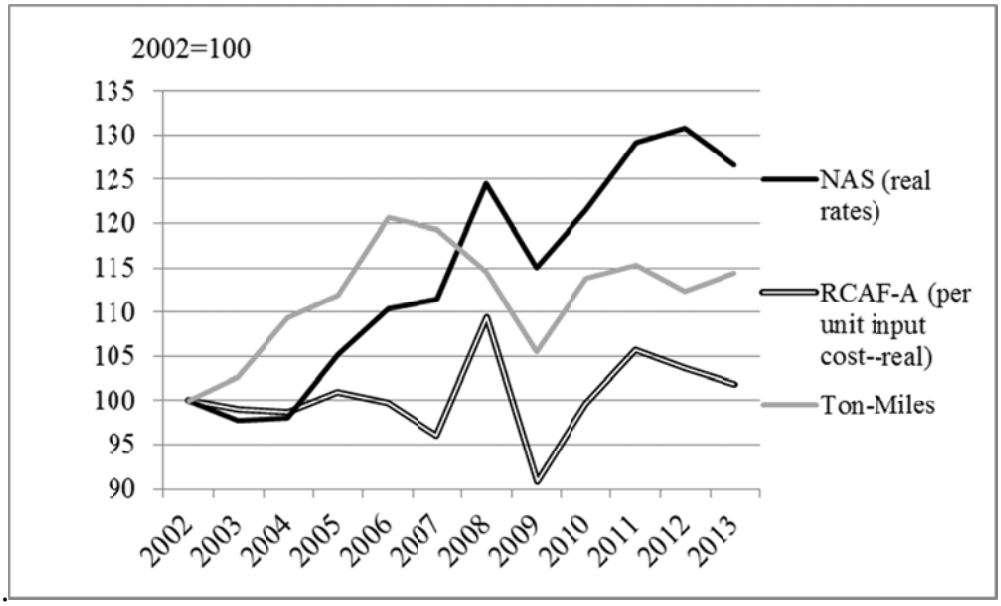

FIGURE 2-2 Recent trends in ton-miles and real industrywide average rate and unit input costs, 2002–2013. [SOURCE: NAS rate data and ton-miles are from the CWS 2002–2013; RCAF-A data are from AAR (various years). Adjusted for inflation by using BEA's GDP chained price deflator (http://www.bea.gov/national/index.htm).]

The rebaselined rate index shows that real rates rose 27 percent from 2002 to 2013, but with periods of volatility. Two of the many potential reasons for the rate increase are the growth in ton-miles in an industry that had been shedding excess capacity for years and the slight growth in input costs. The post-2006 volatility in rates, input costs, and demand complicates the assessment of secular trends. The freight railroad industry experienced a sharp decline in traffic after 2006 as the national economic recession took hold from 2007 to 2009. Sharp swings in fuel prices have also occurred since 2006; for example, the average price of a gallon of diesel fuel dropped from $3.12 in 2008 to $1.77 in 2009 and then jumped back to more than $3 by 2011 [AAR various years (2014, 63)]. Fluctuations in rates tended to parallel the fluctuations in input costs and in demand from 2006 to 2011. Since 2011, the industry has experienced relative stability in input costs and demand, which may have contributed to steady rates.

Rates by Commodity and Selected Shipment Characteristics

As shown in Table 2-1, more than three-fourths of shipments tendered in 2012 involved commodities and car types ruled exempt from common carrier regulation.[7] Examples of exempt shipments are intermodal containers, general merchandise, and fresh fruits and vegetables carried in refrigerated boxcars. These shipments are deregulated mainly because they can be transported competitively by truck. They are often made in single carloads, which explains their large

[7] The discussion refers to traffic as having been ruled exempt from common carrier regulation as distinct from traffic that is temporarily exempt by virtue of contracting. The latter traffic is not ruled exempt because it reverts to common carrier regulatory status on expiration of the relevant contract. While the law does not state explicitly that truck-competitive traffic should be ruled exempt, the ability to be moved competitively by truck is the practical reason for most exemption rulings by commodity and car type. The reasoning is that if a commodity can be moved competitively by truck, it has effective competition in all markets, because trucks are ubiquitous.

TABLE 2-1 Percentage Share of All Rail Freight by Regulatory Status, 2012

	Exempt	Nonexempt	Total
Shipments	79	21	100
Carloads	55	45	100
Ton-miles	28	72	100
Freight revenue	39	61	100

SOURCE: CWS 2012.

percentage share of railroad shipments. In comparison, coal, grain, minerals, and other bulk commodities are usually shipped in multiple carloads. The latter commodities are not often suited to long-haul movement by truck and remain subject to regulation except when they are carried by contract; thus, they are referred to in this report as "nonexempt." Shipments of nonexempt commodities, including those moved by contract, account for a much larger share of railroad traffic than shipments of exempt commodities in terms of ton-miles. In 2012, nonexempt commodities accounted for more than two-thirds of ton-miles.

Figure 2-3 shows recent trends in the average rate (RPTM) for several major commodities, including exempt intermodal containers and nonexempt coal, chemicals, grain (e.g., corn, wheat, oats), and oilseeds (e.g., soybeans, sunflower seeds). Coal, grain, and oilseed shipments have traditionally had the lowest average rates among commodity groups because of their high density, large shipment volumes, long-haul movements, and ease of loading and unloading. Nonexempt commodities moved by contract are included in the nonexempt category because they are not ruled exempt and can move in and out of common carriage over time.

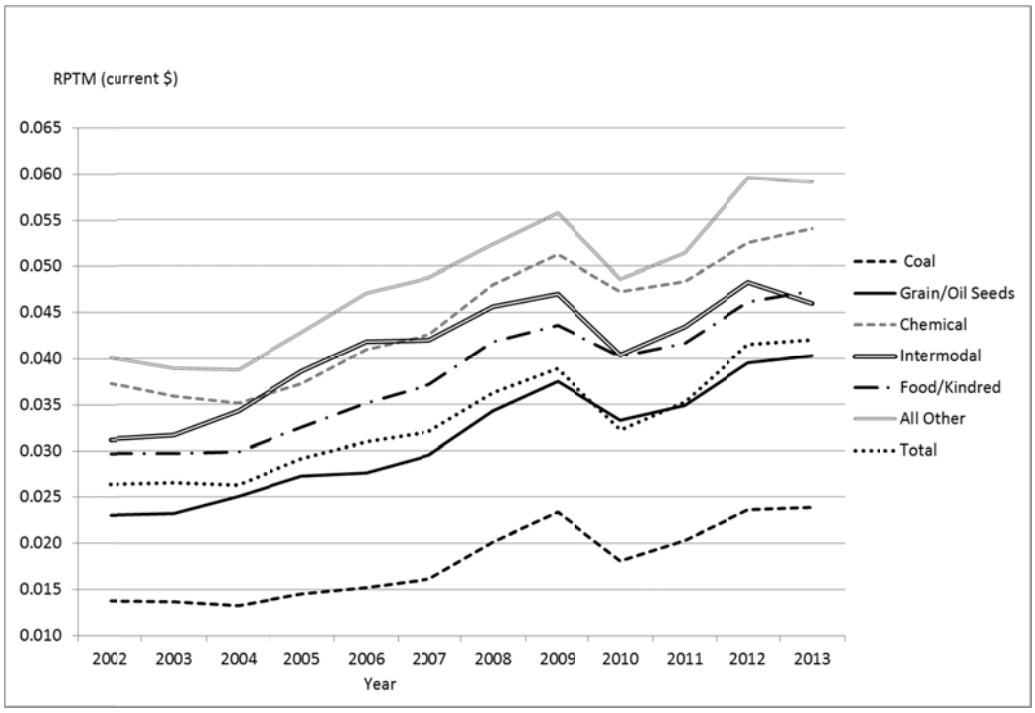

FIGURE 2-3 Trends in nominal rates by commodity, 2002–2013. (SOURCE: CWS 2002–2012.)

The average rate for all commodities, converted to an index and adjusted for inflation, is shown in Figure 2-4. As noted earlier, it rose by more than 25 percent from 2002 to 2013. Rates for coal and grain and oilseeds grew fastest, up by nearly 50 and 40 percent, respectively.

Examination of Coal

Laurits R. Christensen Associates (2010, 6-2) surmised that a contributor to the faster growth in coal rates after 2005 was the expiration of many long-term, or "legacy," contracts and their renegotiation at higher rates as volatile diesel fuel prices were pushing up rates generally. The Christensen Associates report also presented data showing that fewer opportunities existed for productivity gains to offset higher fuel prices—for example, through further consolidation of coal shipments in dedicated coal trains. By 2000, more than 95 percent of coal ton-miles were moving in shipments of 50 carloads or more. This high percentage could increase only marginally, as it did. It rose to 99 percent by 2013.[8]

Table 2-2 shows changes in coal traffic from 2000 to 2012 on the basis of shipments and carloads as well as ton-miles. The tabulations distinguish between coal shipments originating in the East and the West, because they differ substantially in character. The data show a continuing decline in coal volumes in the East, where average rates remained substantially higher than in the West, partly because of shorter average hauls, less private car use, and smaller shipment sizes.

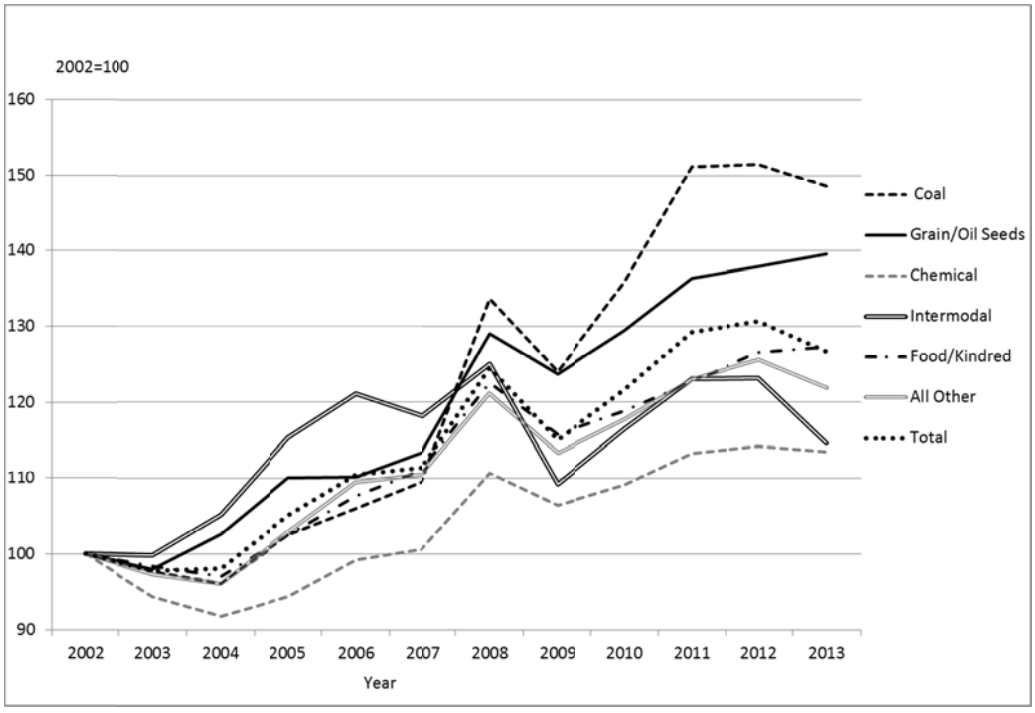

FIGURE 2-4 Index of trends in real rates by commodity, 2002–2013. [Source: CWS 2002–2012. Adjusted for inflation by using BEA's GDP chained price deflator (http://www.bea.gov/national/index.htm).]

[8] On the basis of the committee's review of the 2002 and 2013 CWS.

TABLE 2-2 Changes in Coal Traffic, 2000–2012

Origin	Shipments	Carloads	Ton-Miles (millions)	Revenue (current $) (thousands)	Average Distance (miles)	Carloads per Shipment	Tons per Carload	Percent of Carloads by Private Car	Average RPTM (current $)
2000									
East	320,331	4,091,823	152,486	3,587,453	414	13	105	46	0.024
West	59,690	3,232,878	390,833	4,051,890	1,089	54	114	78	0.010
Total	380,021	7,324,701	543,319	7,639,344	520	19	111	60	0.014
2012									
East	36,437	2,879,881	124,074	6,169,345	423	79	113	55	0.050
West	32,737	3,962,573	510,454	8,821,661	1,058	121	119	80	0.017
Total	69,174	6,842,454	634,529	14,991,006	724	99	118	69	0.024
Percent Change, 2000–2012									
East	–88.6	–29.6	–18.6	72.0	2.2	508	7.6	19.6	108.3
West	–45.2	22.6	30.6	117.7	–2.8	124	4.4	2.6	70.0
Total	–81.8	–6.6	16.8	96.2	39.2	412	6.3	15.0	71.4

NOTE: "West" includes all coal shipment origins in states west of the Mississippi River. Rates and revenues are not adjusted for inflation.
SOURCE: CWS 2000 and 2012.

Coal rates in both regions increased during the period, but more in the East. The tabulations also show how tens of thousands of smaller shipments, each averaging relatively few ton-miles, were consolidated into larger shipments after 2000. This pattern is exhibited in both regions, but most dramatically in the East, where smaller shipments had been the norm. As discussed in more detail below, the consolidation of coal traffic occurred as most coal shippers were leaving common carrier service for contract service, which likely accelerated the pace of shipment consolidation.

Examination of Grain and Oilseeds

In contrast to the situation for coal, substantial room remained for consolidation of grain and oilseeds traffic in 2002, because shipments of 50 or more carloads accounted for only half of ton-miles. This share increased to 65 percent in 2013, perhaps prompted by the growing gap in rates between smaller- and larger-carload shipments, as shown in Figure 2-5. For grain and oilseeds shipments that continued to move in smaller-carload shipments (less than 50 carloads), the average rate had become 35 percent higher than the average rate paid by larger-carload shippers (Figure 2-5 and Figure 2-6).

Consistent with the trend toward traffic consolidation, railroads tried to use their grain car fleets more efficiently and to encourage larger shipments through volume incentives, the auctioning of rail cars in large allocations (e.g., 24- or 40-car deliveries), and the promotion of 75- to 110-car train shuttle services (Wilson and Dahl 2005; Prader et al. 2013).[9] As a result of

[9] Grain train shuttle services typically involve a dedicated set of 75 to 110 cars that move as a unit from a single origin to a single destination. The shuttle operator and the railroad enter into a contract to move the train on a

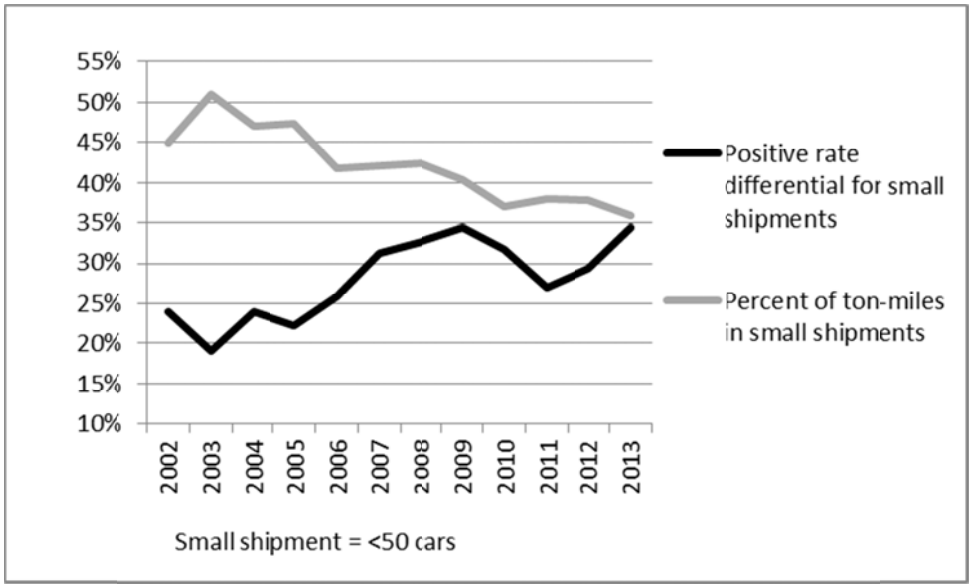

FIGURE 2-5 Trends in ton-mile shares and rate differentials for small shipments of grain and oilseeds, 2002–2013. The black line is the average RPTM for traffic moved in shipments of less than 50 cars divided by the average RPTM for shipments of 50 or more cars, expressed as a percentage less 100 percent (e.g., in 2013, shipments of less than 50 cars had an average RPTM 135 percent of that of shipments involving 50 more cars; this is shown as a 35 percent positive rate differential). (SOURCE: CWS 2002–2013.)

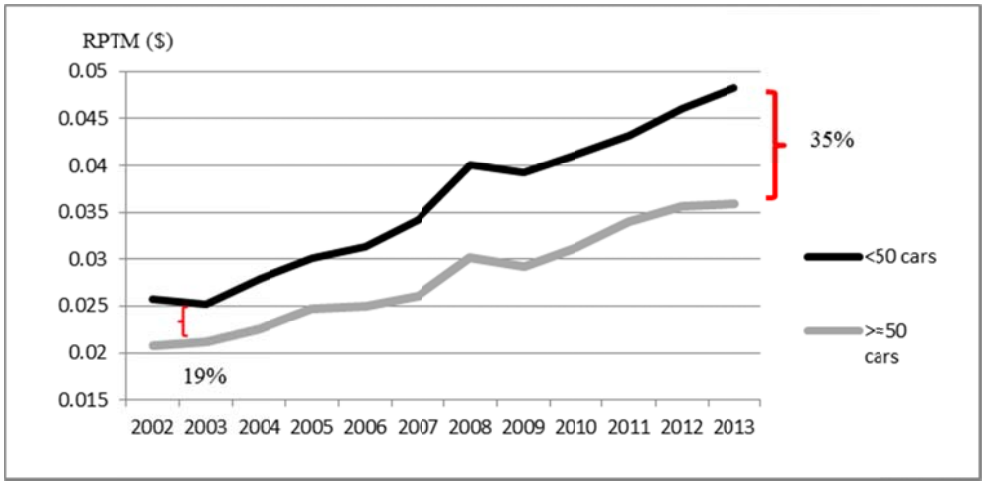

FIGURE 2-6 Average rates (nominal) paid for smaller and larger shipments of grain and oilseeds, 2002–2013. (Source: CWS 2002–2013.)

continuous basis for a specific time, generally 1 year. The shuttle operator is provided incentives for the commitment, and grain elevators are provided incentives to accommodate the trains and to have the capability for fast loading.

these efforts, railroad-owned grain cars expanded their share of ton-miles relative to private cars from 65 to 80 percent between 2002 and 2013 (Figure 2-7). Accompanying this development, and likely related to it, was the erosion of the long-standing rate premium for shipments using railroad-owned grain cars (Figure 2-7).

The declining premium for railroad-owned grain cars had been observed earlier by STB (2009).[10] In 2009, the average rate for service in railroad-owned cars actually fell below that of private cars. The reason for this change is not apparent from the aggregated data. It could be the result of many factors, such as differences in the propensity of private- and railroad-owned cars to be used in contract versus common carriage, for larger versus smaller shipments, and for longer versus shorter hauls. These other factors, more than differences in equipment costs, may have contributed to the declining gap in average rates for service in private- and railroad-owned cars.

None of the recent developments, all of which would seemingly favor lower rates (i.e., further shipment consolidation, dedicated trains), explains why rates for shipments of grain and oilseeds rose faster than rates for shipments of other commodities except coal (see Figure 2-4). For example, rates for small shipments and for larger shipments of grain and oilseeds increased by more than 80 percent and by nearly 70 percent, respectively, from 2002 to 2013. Furthermore, grain shippers—unlike coal shippers in the early 2000s—were not major users of contract carriage. Increases in grain shipping rates, therefore, are less likely to have been exacerbated by the expiration of low-rate legacy contracts, as may have occurred for shippers of coal.

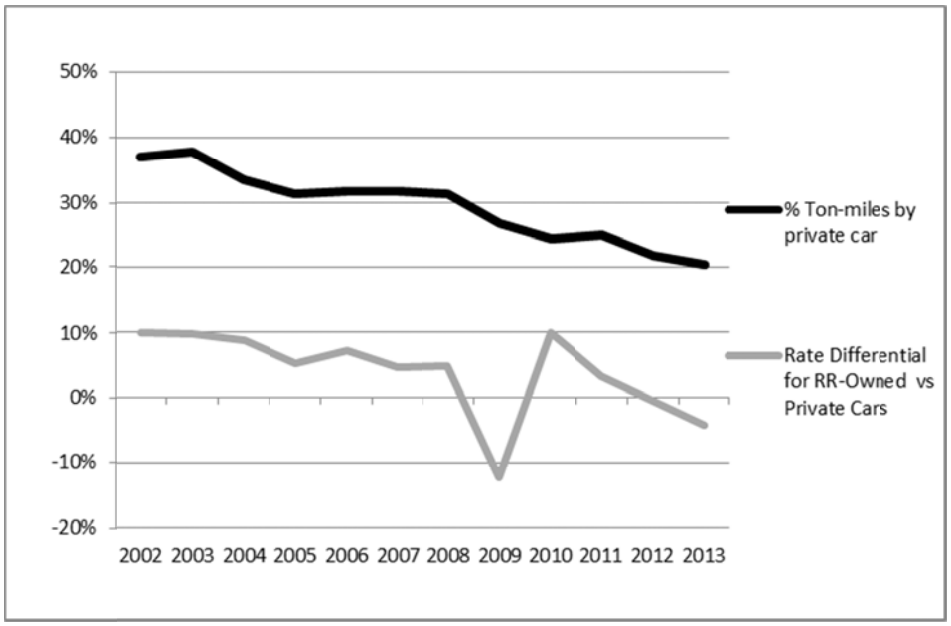

FIGURE 2-7 Share of ton-miles by private- and railroad-owned cars and their rate differentials, grain and oilseeds, 2002–2013. (SOURCE: CWS 2002–2013.)

[10] According to STB (2009), average rates for service using railroad-owned grain cars were consistently 10 to 20 percent higher than average rates for service using private grain cars during the 1990s; however, the premium had nearly disappeared by 2000.

The data in Table 2-3 show how grain and oilseeds traffic has been consolidating over the period. Total shipments went down relative to carloads. With the exception of oilseeds, the total volume shipped was lower in 2012 than in 2000, which likely reflects yearly fluctuations in harvests and grain export demand. The level of grain consolidation does not approach that of the more concentrated coal segment. Grain shippers include many elevators dispersed across a farming region, whereas coal mines deliver large and predictable volumes of coal to electric utilities and ports. Thus, most coal shippers regularly transport large volumes over fixed traffic lanes, but many grain shippers do not.

As discussed in the next section, coal shippers have converted almost exclusively to contract carriage during the past 10 to 15 years. This trend has been accompanied by even more traffic consolidation. Grain shippers have not converted to contracts in large numbers, perhaps because their shipment characteristics and volume fluctuations require more flexibility than contract commitments would allow. In addition, some new features of tariff service emulate contract features. For example, grain shippers can bid for future allotments of rail cars and locked-in tariff rates via auctions.

Contract and Common Carriage Rates

Prevalence of Contract Carriage

More than 30 years after the Staggers Rail Act permitted railroads to negotiate confidential contracts with shippers, contract carriage has become commonplace among shippers of many nonexempt commodities such as coal, ores, and chemicals.[11] In 2012, contract service accounted for more than two-thirds of nonexempt traffic, whether measured in shipments, carloads, ton-miles, or revenues (Table 2-4). Between 2000 and 2012, total ton-miles by common carriage declined by nearly 50 percent. Having started the century as the predominant means by which shippers of nonexempt commodities procured rail service, common carriage had become the minority means by 2012.

The large reduction in common carriage since 2000—part of a general industry trend that commenced years earlier—was largely the result of a rapid migration of coal to contract carriage. As shown in Table 2-5, coal ton-miles were split evenly between common and contract carriage in 2000. By 2012, only 5 percent of coal ton-miles were moved in common carriage. During this period many chemical shippers also switched to contract service. Contract carriage accounted for only 35 percent of the chemical (non–hazardous materials) ton-miles in 2000 but for 77 percent in 2012. Shippers of several other nonexempt commodities having shipment characteristics similar to those of chemicals or coal, including hazardous materials, petroleum products, ores, and stone, also became majority users of contract service by 2012.

[11] The CWS records do not state definitively whether a shipment was moved by contract or tariff. A flag in the record indicates whether the revenue data are confidential. Only contract traffic has this confidentiality privilege. However, a railroad is not required to report its contract revenues as confidential. Thus, some contract shipments could be included in the tariff shipments in these tabulations.

TABLE 2-3 Changes in Corn, Wheat, and Oilseeds Nonexempt Traffic, 2000–2012

Commodity	Shipments	Carloads	Ton-Miles (millions)	Revenue (current $) (thousands)	Average Distance (miles)	Carloads per Shipment	Tons per Carload	Percent of Carloads by Private Car	RPTM (current $)
2000									
Corn	56,295	707,756	65,253	1,194,516	702	13	103	45	0.018
Wheat	60,090	433,421	34,444	810,668	825	7	102	33	0.024
Oilseeds	13,884	198,242	16,173	286,373	567	14	98	42	0.018
2012									
Corn	47,270	635,449	61,638	1,975,155	623	13	106	26	0.032
Wheat	47,164	387,954	35,335	1,433,272	907	8	104	13	0.041
Oilseeds	13,875	254,425	29,539	930,735	627	18	107	33	0.032
Percent Change, 2000–2012									
Corn	–16.0	–10.2	–5.5	65	–11.3	0.0	2.9	–42.2	77.8
Wheat	–21.5	–10.5	2.6	77	9.9	14.3	2.0	–60.6	70.8
Oilseeds	–0.1	28.3	82.6	225	10.6	28.0	9.2	–21.4	77.8

NOTE: Small amounts of corn, wheat, and oilseeds traffic that may move in exempt rail cars are not included in the table. Rates and revenues are not adjusted for inflation.
SOURCE: CWS 2002 and 2012.

TABLE 2-4 Percentage of Nonexempt Rail Freight Traffic by Contract and Common Carriage (Tariff), 2000 and 2012

	Contract	Tariff
2000		
Shipments	40	60
Carloads	46	54
Ton-miles	44	56
Revenue	43	57
2012		
Shipments	67	33
Carloads	76	24
Ton-miles	75	25
Revenue	69	31

SOURCE: CWS 2000 and 2012.

TABLE 2-5 Contract Carriage Among Shippers of Nonexempt Commodities

	2000		2012		Percent Change, 2000–2012	
	Ton-Miles (billions)	Percent Contract Carriage	Ton-Miles (billions)	Percent Contract Carriage	In Ton-Miles	In Contract Ton-Miles
Coal	543	48	644	95	19	135
Chemicals (excluding hazardous materials)	103	35	106	77	3	126
Hazardous materials	70	49	153	72	119	221
Corn	65	20	62	23	–5	10
Food and kindred products	60	48	86	39	43	17
Lumber, wood products	44	52	36	45	–18	–29
Wheat	34	21	35	20	3	–2
Stone, clay, glass	30	49	26	63	–13	11
Petroleum and coal products	18	19	15	70	–17	207
Oilseeds	16	24	29	19	81	44
Metallic ores	15	16	16	98	7	553
Minerals	13	64	33	54	154	114
Waste, scrap	12	58	13	62	8	16

NOTE: Ton-miles are measured for movements made in nonexempt rail cars only; for example, ton-miles of hazardous materials transported in boxcars are not included in the tabulations.
SOURCE: CWS 2002 and 2012.

Despite the general shift toward contracting over the past decade, shippers of some commodities, particularly agricultural commodities, have remained users of common carriage. Contract carriage grew dramatically among coal and chemical shippers but barely changed among shippers of corn and wheat. As a consequence, grain has become the largest commodity grouping in common carrier service. It has far surpassed coal to account (along with oilseeds) for about one-third of all ton-miles by tariff (Figure 2-8).

Contract Versus Common Carrier Tariff Rates

Contract and tariff rates for the same commodities can be compared by using the revenue-unmasked version of STB's CWS. However, all contract terms, including service periods, incentives, and performance requirements, are not recorded in the CWS. Thus, the comparisons may not be valid. For example, the sampled waybills do not indicate whether a contracting railroad agreed to a lower rate in return for a traffic guarantee or whether a contracting shipper agreed to a higher rate in return for a level of service standard. Furthermore, a contract rate may reflect the demand and supply conditions that existed years before a particular shipment was tendered, while a tariff rate is more likely to reflect momentary conditions, similar to a spot rate.

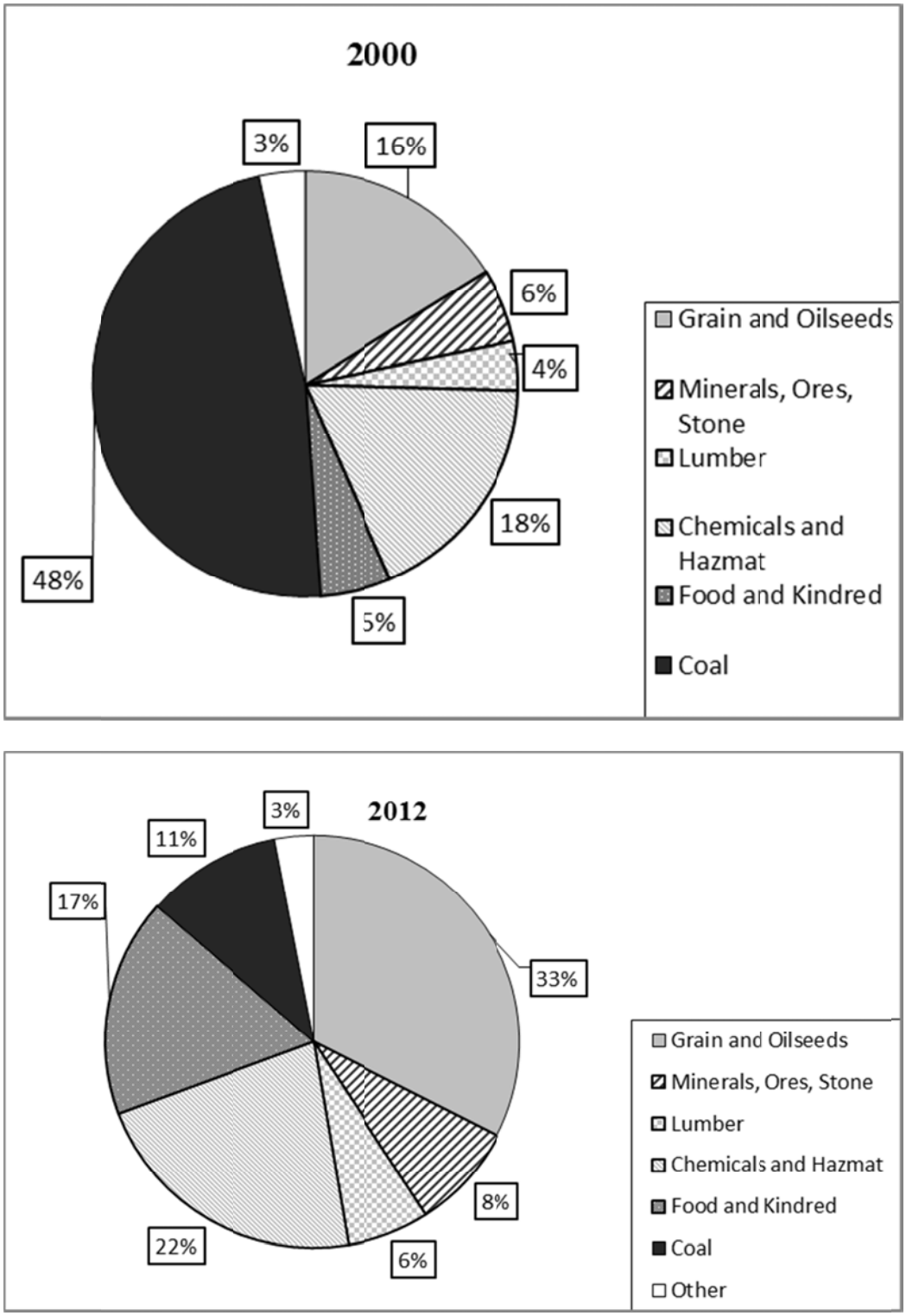

FIGURE 2-8 Tariff ton-miles by major nonexempt commodities, 2000 and 2012. (SOURCE: CWS 2000 and 2012.)

The preceding qualifications should be kept in mind in reviewing Table 2-6, in which average rates and traffic characteristics for tariff and contract shipments among the major nonexempt commodities during 2012 are compared. Except for the slightly lower contract rates for most commodities, the comparison does not indicate any consistent patterns. For example, in the case of coal, tariff shipments tend to move shorter distances than contract shipments, but the reverse is true for most other commodities. Grain is moved in larger shipments in common carriage than in contract carriage, while the opposite is true for coal. Reasons for these differences have already been discussed. Among them are the addition by railroads of features resembling those found in contracts to common carrier grain service, such as the use of multicar discounts and rate locks. The substantially higher tariff rate for coal may be an artifact of the small number of coal shippers who have remained in common carriage; many of their shipments may move intermittently or have special transportation demands that preclude contractual commitments or are more costly to provide.

Table 2-7 shows average rates for tariff and contract traffic by commodity in 2000 and 2012. With the major exceptions of coal and chemicals, contract rates for most nonexempt commodities were 5 to 20 percent lower than tariff rates in 2000. However, contract rates rose faster than tariff rates. By 2012, the gap between tariff and contract rates had closed substantially for most commodities, with the exception of coal.

TABLE 2-6 Traffic and Shipment Characteristics of Nonexempt Commodities Moved by Tariff and Contact, 2012

Commodity	Shipments	Carloads	Ton-Miles (millions)	Revenue (current $) (thousands)	Average Distance (miles)	Carloads per Shipment	Tons per Carload	Percent of Carloads by Private Car	RPTM (current $)
Tariff									
Coal	8,875	612,476	34,301	1,477,709	479	69	113	55	0.043
Corn	21,761	438,926	47,493	1,491,354	831	20	106	26	0.031
Wheat	33,204	299,263	28,179	1,165,736	975	9	104	11	0.041
Oilseeds	5,770	173,620	23,762	744,886	886	30	108	21	0.031
Chemicals (non–hazardous materials)	135,482	198,625	17,800	890,836	852	1.5	96	79	0.050
Hazardous materials	316,333	482,116	43,368	2,254,364	1,010	1.5	89	99	0.052
Contract									
Coal	60,299	6,229,978	600,227	13,513,296	760	103	118	71	0.023
Corn	25,509	196,523	14,145	483,801	445	8	103	25	0.034
Wheat	13,960	88,691	7,156	267,536	744	6	104	20	0.037
Oilseeds	8,105	80,805	5,776	185,849	443	10	104	60	0.032
Chemicals (non–hazardous materials)	906,915	1,089,801	87,826	3,953,489	828	1.2	98	93	0.045
Hazardous materials	921,609	1,296,092	109,523	5,359,741	838	1.4	89	99	0.049

NOTE: Rates and revenues are not adjusted for inflation.
SOURCE: CWS 2012.

TABLE 2-7 Average RPTM (current $) for Select Nonexempt Commodities Transported by Contract and Tariff, 2000 and 2012

Name	2000			2012			Percent Change, 2000–2012		
	Contract	Tariff	All	Contract	Tariff	All	Contract	Tariff	All
Coal	0.015	0.013	0.014	0.023	0.043	0.024	48	227	66
Grain	0.021	0.022	0.022	0.036	0.036	0.036	73	63	65
Chemicals (non–hazardous materials)	0.033	0.033	0.033	0.047	0.051	0.048	42	55	45
Hazardous materials	0.028	0.034	0.031	0.049	0.052	0.050	75	53	61
Food and kindred products	0.023	0.026	0.025	0.038	0.041	0.040	66	57	62
Lumber, wood products	0.026	0.027	0.026	0.042	0.039	0.041	61	44	55
Stone, glass, clay	0.032	0.036	0.034	0.058	0.054	0.057	81	48	65
Petroleum and coal products	0.032	0.036	0.035	0.060	0.052	0.058	87	44	63
Oilseeds	0.018	0.019	0.019	0.032	0.031	0.032	79	61	65
Metallic ores	0.018	0.038	0.034	0.040	0.071	0.041	117	89	18
Waste, scrap	0.034	0.040	0.037	0.052	0.052	0.052	53	29	42
Nonmetallic minerals	0.038	0.036	0.037	0.052	0.052	0.052	39	44	41

NOTE: Rates are not adjusted for inflation.
SOURCE: CWS 2000 and 2012.

Summary of Recent Rate Trends

During the 1990s, both railroad rates and input costs experienced a secular decline, which reflected dramatic improvements in railroad productivity. Although the railroad industry has been characterized by volatility in rates, input costs, and demand in recent years, real rates rose by more than 25 percent from 2002 (when real rates reached their low point) to 2013. Rates grew nearly twice as fast as ton-miles and far exceeded growth in input costs, which exhibited periods of volatility but rose in real terms by 2 percent. The observed volatility in input prices may have led to higher renewed contract rates to account for uncertainty, particularly in fuel prices.

Real rates increased for all commodities from 2002 to 2013, with most increases between 15 and 25 percent. Among major commodities, coal rates grew the fastest (up nearly 50 percent) followed by grain rates (up nearly 40 percent). Consolidation of both coal and grain into larger shipments has continued. In the past, consolidation had been a major contributor to growth in industry productivity and downward pressure on rates, but this effect is not evident in recent rate trends.

During the 2000s, shippers who had previously used common carriage continued to shift to contracting. In 2012, 75 percent of all nonexempt ton-miles were moved in contract carriage, compared with 44 percent in 2000. Coal shippers have turned almost exclusively to contract carriage. Shippers of grain remain the most committed to common carriage, with only 1 in 5 ton-miles being moved by contract. Characteristics of grain shipments, including irregularity in volumes and routings, may make this traffic less suited to contractual commitments than commodities with regular routings such as coal. However, railroads have added features to grain common carrier service that are characteristic of contracts, including the ability to reserve cars through auctions.

The continued reliance by grain shippers on common carriage, which is the only form of rail transportation that remains subject to direct regulation, has implications for STB rate and service oversight responsibilities that are discussed in the next two chapters.

SERVICE QUALITY ISSUES

As the preceding section makes clear, there is substantial information on railroad traffic and revenues, much of it derived from STB's CWS. However, shipment-level data for evaluating or benchmarking railroad service quality do not exist.

Apart from requiring railroads to report and publish aggregated statistics on train operations and car fleet status, STB does not sample or require the reporting of shipment-specific data pertaining to aspects of service performance such as delivery times or speeds. Hence, service trends and patterns cannot be examined with as much precision as rates, as Congress requested of this study. All that proved to be practical is a survey of shipper commentary about service quality. It was assembled mainly from past STB hearings, reports in the Christensen Associates study, and the study committee's meeting with shipper organizations (see Preface). That survey is given next and is followed by a summary of explanations offered by railroads for episodic service disturbances and a brief examination of the service-related data that are available but that were found inadequate for assessing service performance.

Because information on service quality is largely anecdotal, the record must be considered with caution. There is a consistency to shipper complaints and there are commonalities in their timing and location, which suggest some problematic service levels and particular time periods when problems have been exacerbated. However, regulatory hearings about service quality are bound to attract dissatisfied shippers, and there will always be some who are dissatisfied. STB hearings do not necessarily gauge the satisfaction levels of other shippers who may be content or who can only express their dissatisfaction with service through the enforcement of contracts in the courts.

Shipper Complaints

Shippers remark that without explicit standards for common carrier service and means of monitoring railroad performance, they can do no more than use STB as a sounding board for service complaints. A review of comments in service-related hearings by STB and Congress, trade publication survey results, and statements by shippers invited to brief the committee indicates shipper desires that regulators do more to compel railroads to improve common carrier service.[12]

In late 2013 and early 2014, STB received many complaints from shippers, especially coal, grain, and automobile shippers, who reported widespread disturbances in rail service, including an inability to obtain service, lengthy delays in transit, and unusually long rail car

[12] See STB Ex Parte No. 677 and No. 724 for many shipper comments on service. As explained in the Preface, the committee asked shipper groups who had previously submitted comments in STB service-related hearings to brief members on their concerns. The public briefings were held in conjunction with the committee's second meeting on March 14, 2014 (slides are available at http://www.trb.org/PolicyStudies/RailTransReg.aspx).

cycle times.[13] As result of these problems, shippers reported significant inventory backlogs and shortages of materials, including fertilizer for crops and coal for electricity generation. Some also expressed concerns about a lack of communications and timely information by railroads about service status.[14]

Shippers cited problems in several regions, but disturbances were particularly severe in the Upper Midwest. For example, grain shippers described their experiences to STB and to the study committee as follows:

> The sheer gravity, magnitude, and scope of rail service disruptions now being experienced are unprecedented and have rippled through all sectors of grain-based agriculture. . . . Another fallout is illustrated in the values paid in the secondary rail car freight market . . . The majority of secondary freight has traded at values of approximately $4,000 per car, equating to $1 per bushel.[15]

> The late summer/fall and winter of 2013–2014—has proven to be one of the worst rail service meltdowns in modern history—affecting all classes of traffic but especially the northern plains movements.[16]

Later in 2014, automobile manufacturers described rail service to a congressional committee:

> The greatest logistics problem faced by auto manufacturers is the carriers' failure to provide a sufficient supply of empty railcars to transport finished vehicles. Automakers have also incurred significant delays in the movement of railcars loaded with finished vehicles. In this regard, it appears that the priority of auto shipping has become less than that of other shippers. . . . These vehicles should have been transported much sooner via contracted rail services to dealerships. . . . [E]xtreme weather merely exacerbated underlying problems stemming from a lack of capacity—in cars, as well as crews and locomotive power.[17]

The Western Coal Traffic League (WCTL), an organization of coal-burning electric utilities, reported concerns to the study committee expressed by the organization's members that slow deliveries of coal will jeopardize the reliability of electricity generation.[18] In a petition to STB, it stated the following:

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[13] A rail car "cycle" is the time required for loading a rail car with product at a shipper's origin, transporting it to the consignee, unloading it, and transporting it back to the shipper for reloading.
[14] See shipper comments to STB Ex Parte No. 724.
[15] National Grain and Feed Association, Statement to STB, April 17, 2014 (http://www.ngfa.org/2014/04/21/ngfa-urges-stb-to-require-reporting-of-service-related-metrics-by-class-i-carriers-at-public-hearing-on-rail-disruptions/).
[16] T. Whiteside, Alliance for Rail Competition (Montana-based shipper organization involving many wheat shippers), presentation to the committee, March 14, 2014 (http://www.trb.org/PolicyStudies/RailTransReg.aspx).
[17] S. Karr, Statement of the Alliance of Automobile Manufacturers Before the Committee on Commerce, Science, and Transportation, September 10, 2014.
[18] D. Jaffe, WCTL, presentation to the committee, March 14, 2014 (http://onlinepubs.trb.org/onlinepubs/railtransreg/Jaffe031414.pdf).

> The limited coal deliveries and the uncertainty of adequate future deliveries have caused most of the WCTL membership to curtail coal-fired production. These curtailments have forced the utilities to seek alternative generation at significantly higher costs, which in turn has cost electric consumers and ratepayers hundreds of millions of dollars.[19]

In October 2014, WCTL petitioned STB to require one railroad (BNSF) "to submit a coal-specific service recovery plan, which the Board should then review, approve or revise, and, most importantly, enforce." The recovery plan would specify coal delivery standards to be met, and STB enforcement could include fines for failure to meet deliveries.[20] STB declared the continuation of rail service performance throughout the national system to be a priority and ordered the railroad to provide a detailed description of the contingency plans it would use to mitigate an acute coal inventory shortage at key generating stations in each region.[21]

The periodic surveys conducted by research firms and trade publications are supplemental sources of information on rail shipper satisfaction. Their industrywide representativeness is difficult to gauge, but their coverage may be broader than the record of complaints from industry groups to STB and Congress. Survey results reported in the trade press indicate a low level of shipper satisfaction with rail service during 2013 and 2014 and a general perception of deteriorating service over time.[22]

Rail service has been subject to episodic disturbances over the past two decades (TRB 2003, 63–65; TRB 2009, 57). Events preceding those of 2013–2014 include the following:

- In 1997, while the operations of the merged Union Pacific (UP) and Southern Pacific Railroads were being integrated, western rail shippers experienced extraordinary service delays as congestion at certain terminals spread into a systemwide problem. STB intervened by ordering UP to release certain shippers from contracts and to cooperate with other railroads in relieving congestion (GAO 1999, 67).
- In 1999, while Norfolk Southern and CSX were merging the operations of the disbanded Conrail, shippers experienced delays in obtaining service and in transit times (GAO 1999).
- In 2004, during a period of rapid growth in container and other rail freight traffic, the Southern California seaports experienced severe congestion that was attributed to lack of rail capacity for the transportation of arriving containers as well as to port capacity constraints. Rail shippers complained of degraded service in other regions at the same time (CBO 2005, 1–3; Lavigne 2014).

Shipper expressions of concern in 2013–2014 have precedent in the earlier periods of tight capacity. Some of the circumstances in 2004 resembled those of 2013–2014 as growth in traffic resumed after the recession. Although capacity was strained in 2004, the Congressional Budget Office (CBO), asked by Congress to examine the causes of service disturbances, concluded that "the feared 'meltdown' of service had not materialized" because the railroads

[19] WCTL, STB Ex Parte No. 724—United States Rail Service Issues. Petition of the Western Coal Traffic League for an Order Requiring BNSF Railway Company to Submit a Coal Service Recovery Plan, October 22, 2014.
[20] WCTL, STB Ex Parte No. 724.
[21] STB Ex Parte No. 724, December 3, 2014.
[22] The survey, conducted by Wolfe Research, found that 70 percent of respondent shippers had experienced what they believed were capacity-related service problems during 2013–2014 (Szakonyi 2014).

were able to take action to mitigate the effect of the surge in traffic on service (CBO 2005, 2). CBO found that the railroads were able to expand capacity by hiring new workers and adding equipment, changing routings to reduce congestion, and managing traffic demand patterns by selectively raising rates during the year. CBO noted that the large share of rail traffic moving by long-term contract rates presumably constrains the railroads' ability to adjust rates in response to sudden increases in traffic but concluded that "the BLS [freight rail industry] price index data suggest that railroads have been able to raise rates within the terms of their contracts" (CBO 2005, 12).

STB commissioned Christensen Associates, as part of its freight rail competition study, to interview shippers in various sectors of the rail freight market to solicit opinions on railroad capacity, rates, competition, and service quality. The interviews were conducted from November 2007 through August 2008 (Laurits R. Christensen Associates 2009a, 5-4–5-7). According to the authors' summary, service-related themes that emerged from the interviews included the following (Laurits R. Christensen Associates 2009a, 5-12–5-13, 18-30):

- A sense that service quality was declining but somewhat improved in 2008 compared with the 2004 congestion episode;
- A belief that the variability in delivery times had increased, leading to larger shipper inventories, the need for more rail cars, and the need for more shipper personnel to manage shipping;
- Claims that railroads having market dominance lacked motivation to provide good service and that shippers could not negotiate contracts with standards for service accountability; and
- A view that tight capacity was a primary contributor to service problems and that disturbances arising at local chokepoints were a main cause of the disruptions propagating through railroad networks lacking slack capacity.

Railroad Responses

The railroads have responded to the public complaints made by shippers concerning service quality and to STB inquiries. They have generally maintained that they cannot fully predict changing economic conditions that lead to abrupt changes in demand, nor can they predict and fully prepare for exogenous factors such as extreme weather.[23] They contend that adjustments are made to networks and operations as quickly as possible when unusual events arise. The railroads are less definitive in explaining when circumstances make it more beneficial for them to maintain some slack capacity to avoid service disruptions, but they emphasize the impracticality and high cost of maintaining extra capacity as a standard means of quickly recovering from rare events.

In comments before STB hearings about service disturbances that caused shipper complaints during late 2013 and early 2014, AAR cited

> a confluence of events that have affected rail service in particular regions of the country. These included a historically harsh winter that forced railroads to dramatically shorten train lengths and limit crew exposure to the elements; a record grain harvest and

[23] AAR Comments to STB Ex Parte No. 724, April 17, 2014.

> unexpected surge in grain exports; and higher coal volumes as utilities sought to replenish stockpiles consumed when generating additional electricity that this winter demanded.[24]

In another statement, AAR disputed reports that the traffic delays during that period were caused "by increased demand to move any one commodity or product," apparently a reference to the rapid growth in petroleum tank car movements. It emphasized instead "a surge in demand to transport a mix of more and more commodities and products, . . . something that neither railroads nor their customers anticipated."[25]

Traffic data in 2013 and 2014 are consistent with the railroad industry's description of unanticipated market conditions, especially surging demand. Railroad traffic growth, measured in originating carloads, was flat during 2013, and volumes of coal and grain experienced declines (Table 2-8). However, traffic rebounded in 2014. Grain traffic increased as a result of larger harvests and rising exports in 2014, and petroleum traffic continued its rapid growth. Both commodities account for modest shares of total U.S. rail freight traffic but are important in the Upper Midwest, where shippers described especially severe service disturbances.

In responding to complaints that railroads are slow to invest in the capacity needed to forestall service disruptions, AAR presented data to the study committee showing how trends in rail carloads, excluding coal and grain, have aligned closely with trends in output from the U.S. manufacturing sector.[26] Railroads maintain that they are like most other businesses in being required to react to broader, economywide factors influencing the level of demand. They defend the adequacy and timing of their capacity-enhancing investments. In 2014, AAR commented to STB as follows:

> It is beyond question that the railroad industry is committed to making investments in the network designed to meet the demand for rail service now and in the future. The nation's freight railroads project that they will spend approximately $26 billion this year to build, maintain, and upgrade their nationwide rail network. Railroads also expect to hire more than 12,000 people in 2014.[27]

TABLE 2-8 Total Carload Origins and Origins for Selected Commodities in 2014, with Percentage Change from 2012 and 2013, Class I Railroads

	Percent Change	
	2012 to 2013	2013 to 2014
Chemicals	0.5	1.2
Coal	–4.3	1.0
Grain	–8.0	13.5
Petroleum and products	31.1	12.7

SOURCE: AAR Weekly Railroad Traffic: Week 52, Jan. 2, 2014, and Week 52, Jan. 2, 2013.

[24] AAR. Weekly Railroad Traffic: Week 52. January 2, 2014.
[25] As the U.S. Economy Roars Back to Life, Freight Rail Provides the Ride. E. Hamberger, AAR, advertisement in the *Washington Post*, November 19, 2014, p. A15.
[26] J. Gray, AAR, presentation to the committee, March 14, 2014, Slide 5. http://onlinepubs.trb.org/onlinepubs/railtransreg/Gray031414.pdf.
[27] AAR Comments to STB Ex Parte No. 724, April 17, 2014, p. 2.

Railroads have emphasized the need to keep making such capacity investments to ensure adequate service availability and performance and have consistently claimed that regulatory interventions can make matters worse by suppressing capital spending. For example, in its comments to the April 2014 STB hearing on service quality, AAR stated:[28]

> In order for railroads to continue to invest at levels necessary to meet increasing demand for rail service, a necessary predicate is a regulatory environment that will not undercut the industry's ability to do so. The Board should carefully consider any proposals or initiatives that would upset today's balanced regulatory framework.

In briefing the committee, AAR presented 2014 data indicating that railroads had increased their expenditures on roadway, structures, and equipment by 28 percent since the low point of the 2007–2009 recession.[29]

Whether the service expectations of shippers and railroads are the same is unclear. As discussed later in this report, the development of a common set of expectations about service quality, particularly for common carrier service, must start with improvements in data for assessing service levels and monitoring performance. That information base is limited, as is evident from the review of service-related data given next.

Aggregate Data on Service Quality

Shippers and the railroads have recognized a need for better data on freight railroad service performance that can be collected and published in a timely manner. Better data could aid shippers in planning for and coping with transportation conditions, reinforce the railroads' accountability, and help regulators evaluate shipper complaints. In response to the merger-related service disturbances of 1997–1999, AAR has published a weekly series of railroad performance measures (RPM) for each Class I railroad that includes the number of cars on line by car type and by owner (the railroad on which the car is located, another railroad, or a nonrailroad), average train speeds (for five train categories: intermodal, manifest, multilevel, coal unit, and grain unit), and terminal dwell times.[30]

As an example of the potential application of the RPM data in gauging service performance, Figure 2-9 shows average BNSF train speeds from October 2013 to September 2014. BNSF data were chosen because many customer complaints about service disturbances during 2013–2014 were concentrated in the Upper Midwest, where BNSF provides much of the service. An inspection of the 2013–2014 data does not immediately suggest service disturbances as described by shippers for the period and largely acknowledged by railroads to have been

[28] AAR Comments to STB Ex Parte No. 724, April 17, 2014, p. 3.
[29] J. Gray, AAR, presentation to the committee, March 14, 2014, Slide 38. http://onlinepubs.trb.org/onlinepubs/railtransreg/Gray031414.pdf.
[30] Train speed measures the line-haul movement between terminals. The average speed is calculated by dividing train-miles by total hours operated, excluding yard and local trains, passenger trains, maintenance of way trains, and terminal time. Terminal dwell time is the average number of hours a car resides at the specified terminal location expressed in hours. The measurement begins with a customer release, received interchange, or train arrival event and ends with a customer placement (actual or constructive), delivered or offered in interchange, or train departure event. Cars that move through a terminal on a run-through train are excluded, as are stored, bad ordered, and maintenance of way cars.

problematic.[31] Average train speeds fluctuated by a few miles per hour from month to month, with a downward drift for all train types. The data are too coarse to make meaningful determinations about service quality.

Dwell time data are more indicative of service disturbances, as shown Figure 2-10. A prominent feature in the 2013–2014 series is a spike in average dwell times in the Northtown, Minnesota, terminal during late winter 2014, when dwell times averaged 60 to 75 hours compared with a system average of 30 to 35 hours during the overall period. However, for the most part the extent of aggregation of the RPM data obscures any meaningful insight into the

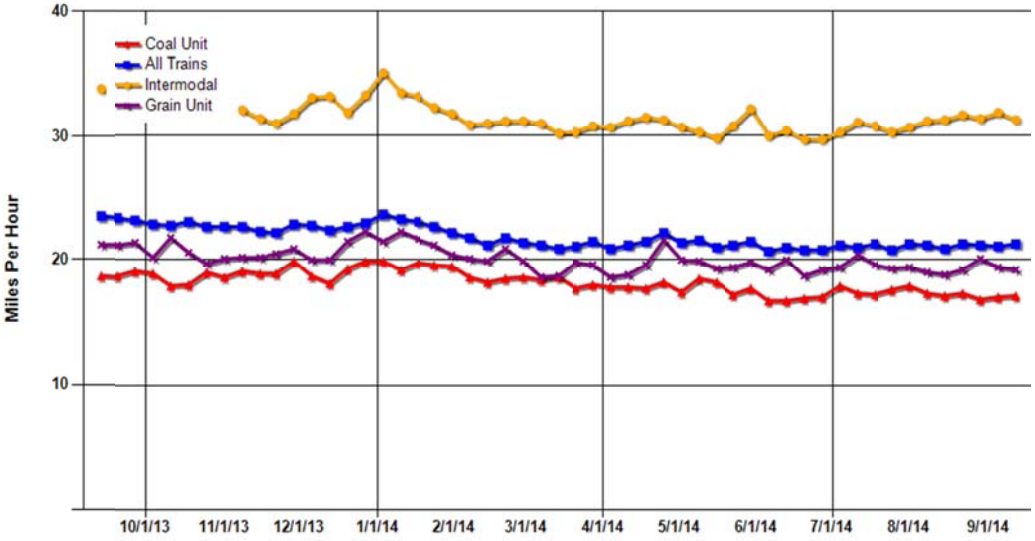

FIGURE 2-9 Average train speeds (mph), BNSF Railway, October 2013 to September 2014. (SOURCE: AAR, Railroad Performance Measures, http://www.railroadpm.org.)

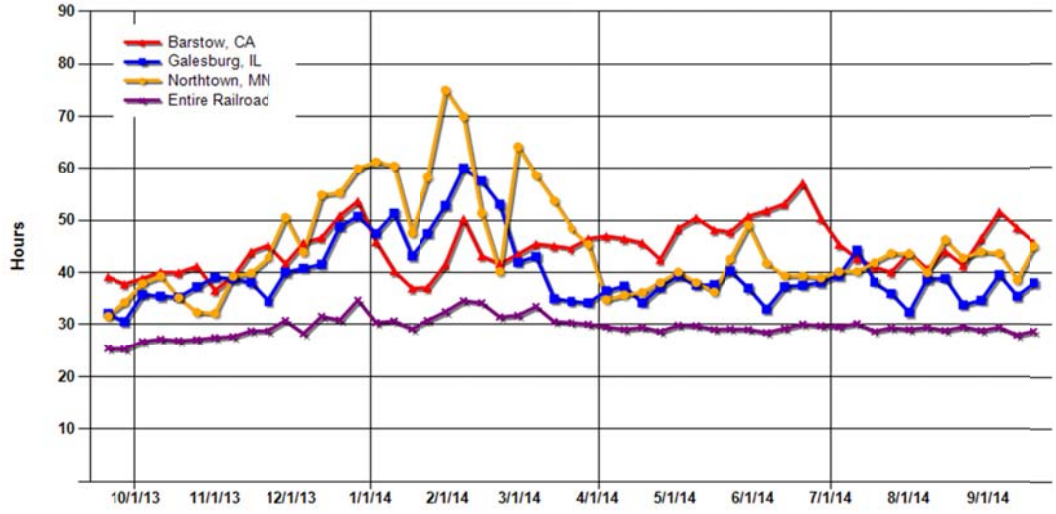

FIGURE 2-10 Average terminal dwell times for BNSF trains, October 2013 to September 2014. (SOURCE: AAR, Railroad Performance Measures, http://www.railroadpm.org.)

[31] BNSF Comments to STB Ex Parte No. 724, September 13, 2014.

types and degree of service quality problems experienced by shippers. Furthermore, an estimate of how long shipments took to move between any two particular points cannot be derived from the two data series, and neither sheds any light on how long shippers at various locations had to wait for rail cars.

In its evaluation of the RPM data, Laurits R. Christensen Associates (2009a, 17–19; 2009b, 2-31–2-34) reached the same conclusion: average train speed and dwell time data are too gross to offer more than a rough indication of service performance. For example, it calculated correlations of changes in real GDP with changes in dwell time, cars on line, and train speed by railroad during the period 2006–2008 and found that the measures did not consistently change in the expected direction. Christensen Associates also pointed out that the performance features of greatest concern to shippers, such as route-specific or corridor-specific information on on-time performance and the variability of performance, are not part of the measurement system.

Proposals to Improve Service-Related Data

In response to shipper service complaints from the winter of 2013–2014, in October 2014 STB issued a temporary order requiring all Class I railroads to report weekly performance data.[32] The required data include the standard RPM measures of train speed, terminal dwell times, and cars on line, as well as measures of the following:

- Unit train origin dwell time, by train type;
- Trains held short of destination, by train type and cause;
- Loaded and empty cars in service that have not moved in more than 48 hours, by car type;
- Grain cars loaded, by state and by commodity;
- Past due car orders;
- Grain shuttle round-trips;
- Coal unit train loadings; and
- Car counts at Chicago yards and numbers of trains held for delivery to Chicago (for railroads operating at Chicago).

The order states that the reporting "will give the agency and stakeholders access to data needed for real-time understanding of regional and national service issues" and cites shipper contentions that "performance metrics are important for rail users to plan logistics, minimize economic harm to operations and revenues, assist with business planning, and to better serve their own customers during the service recovery period."[33]

STB issued a notice of proposed rulemaking in December 2014 that would make such weekly reporting requirements permanent and that would modify the data specified in the October temporary order. The notice describes the value of the reporting as follows:[34]

> The permanent collection of performance data on a weekly basis would . . . improve the Board's ability to identify and help resolve future regional or national service disruptions

[32] STB Ex Parte No. 724-3: United States Rail Service Issues—Data Collection, October 8, 2014; STB Ex Parte 724-4.
[33] STB Ex Parte No. 724-3: United States Rail Service Issues—Data Collection, October 8.
[34] STB Ex Parte No. 724-4: United States Rail Service Issues—Performance Data Reporting, December 30, 2014.

more quickly, should they occur. Transparency would also benefit rail shippers and other stakeholders, by helping them to better plan operations and make informed decisions based on publicly available, near real-time data, and their own analysis of performance trends over time.

The committee does not know how these efforts will proceed, because the data collection proposal was introduced during the course of the study. However, the data to be collected are not specific with regard to shipment or even to origin and destination (with the exception of unit train data) in the same manner as are the on-time arrival data collected for many years by the U.S. Department of Transportation (USDOT) for airlines. Furthermore, the proposed collection effort appears to be an ad hoc response to the disturbances of the previous winter; it does not appear to have been strategically devised in the sense of there being a plan for routine use of the information in monitoring performance.

Summary of Service Quality Issues

STB maintains a waybill sampling program that allows the monitoring of railroad traffic and rates at the shipment level. However, it does not collect comparable, shipment-specific records for monitoring the performance of railroads in carrying out their common carrier duty of providing adequate service. Trends in service reliability, speed, and other aspects of performance must be identified from a largely anecdotal record of shipper complaints. The record suggests that railroad service is interrupted at intervals by disturbances that arise when traffic volumes escalate unexpectedly and outpace the railroads' deployment of capacity. Service during the winter of 2013–2014 was particularly problematic for this reason and was made worse by severe weather.

Whether service problems during such episodes are more severe or whether reliability is routinely inferior for common carrier traffic cannot be ascertained from the complaint records or by assessing the aggregated service-related data collected by STB. The complaint record is naturally skewed toward shippers of common carriage because only their service is regulated. Better service-related data at the shipment level, for both common and contract carriage, would allow more objective analysis of common carrier service quality, particularly to evaluate whether this service is chronically substandard and how it changes relative to that of contract carriage when capacity is tight.

CONCERNS ABOUT LONG-TERM CAPACITY CONSTRAINTS

The committee was asked to examine "the projected demand for freight transportation over the next two decades and the constraints limiting the railroads' ability to meet that demand." This section begins with a review of two long-range freight rail volume forecasts that are made regularly by the federal government and notes three studies undertaken in recent years to assess the potential effects of forecast freight growth on railroad capacity needs. Consideration is then given to economic factors tending to motivate railroads to supply capacity, which are typically neglected in studies that project freight volumes and predict capacity shortages. The section concludes with a brief review of federal programs intended to make investments in railroad capacity more attractive.

Forecasts of Rail Freight Traffic and Transportation Capacity Needs

Federal Freight Demand Forecasts

Commonly cited freight traffic forecasting series are USDOT's Freight Analysis Framework (FAF)[35] and the Energy Information Administration's (EIA's) National Energy Modeling System (NEMS). FAF is intended to aid transportation investment planning and policy analysis, while NEMS is used by EIA to produce the *Annual Energy Outlook* (AEO) series, which supports energy program planning and policy making (EIA 2014a). Both project traffic for all freight transportation modes on the basis of the assumption that transportation capacity does not constrain growth.

The FAF freight projections are derived from a proprietary economic model that produces regional projections of growth by industry and projections of the resulting freight traffic on the basis of a matrix of historical interregional flows by commodity and mode. The projections are made under the assumption that all of the needed transportation capacity will be available and deployed regardless of cost (i.e., no capacity constraints) (FHWA 2012, 4–8). The most recent FAF projections indicate an average annual growth rate from 2012 to 2035 of 1.3 percent for rail freight ton-miles, compared with 2.6 percent for truck ton-miles and 2.9 percent for multiple-mode shipment ton-miles, most of which are on railroads but include truck and water movements (Figure 2-11).[36] FAF also projects railroad ton-miles by commodity; for example, coal ton-miles are projected to decline at an average annual rate of 1.2 percent, whereas grain ton-miles are forecast to grow at 5.7 percent annually over the forecast period (Figure 2-11).

EIA's NEMS model projects rail freight demand by multiplying projected industrial output for the individual commodities in each Census division by a set of constant ton-mile-per-dollar coefficients (EIA 2014b, 80). EIA publishes NEMS projections in its AEO series according to high-, mid-, and low-range economic growth assumptions (Figure 2-12). The 2014 mid-range scenario, used for most purposes, shows railroad freight ton-miles in 2025 unchanged from 2012, after a recovery from depressed levels from 2013 to 2016, a short-term trend that now appears improbable (Figure 2-12). Ton-miles in 2025 are 9 percent higher in the high-range scenario than in the low-range one.

Freight ton-mile projections can vary widely from one year's AEO edition to the next. Projections are sensitive to near-term economic conditions and often result in depressed or exaggerated extrapolations, depending on when they were made in the business cycle. The 2014 edition's high-range projection is lower in all future years than the 2013 edition's mid-range projection (Figure 2-12). The 2014 AEO edition's ton-mile mid-range (reference) projection for 2025 is 23 percent below the mid-range projection for 2025 made in the 2007 AEO edition, which was published just as the economy was entering recession (Figure 2-13). In view of these discrepancies, the forecasts for future years will probably be even farther from the actual values. In Table 2-9, the 10-year (2015–2025) NEMS and FAF forecasts are contrasted with the actual ton-mile growth from 1990 to 2000 and 2000 to 2010. They suggest that forecasts are heavily influenced by recent trends in traffic growth.

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[35] Freight Analysis Framework Data Tabulation Tool. http://faf.ornl.gov/fafweb/Extraction1.aspx. Accessed February 5, 2015.

[36] USDOT states that ton-miles cannot be separated by mode for multiple-mode shipments in the historical data source it uses (the U.S. Census Bureau's Commodity Flow Survey) (FHWA 2012, 6).

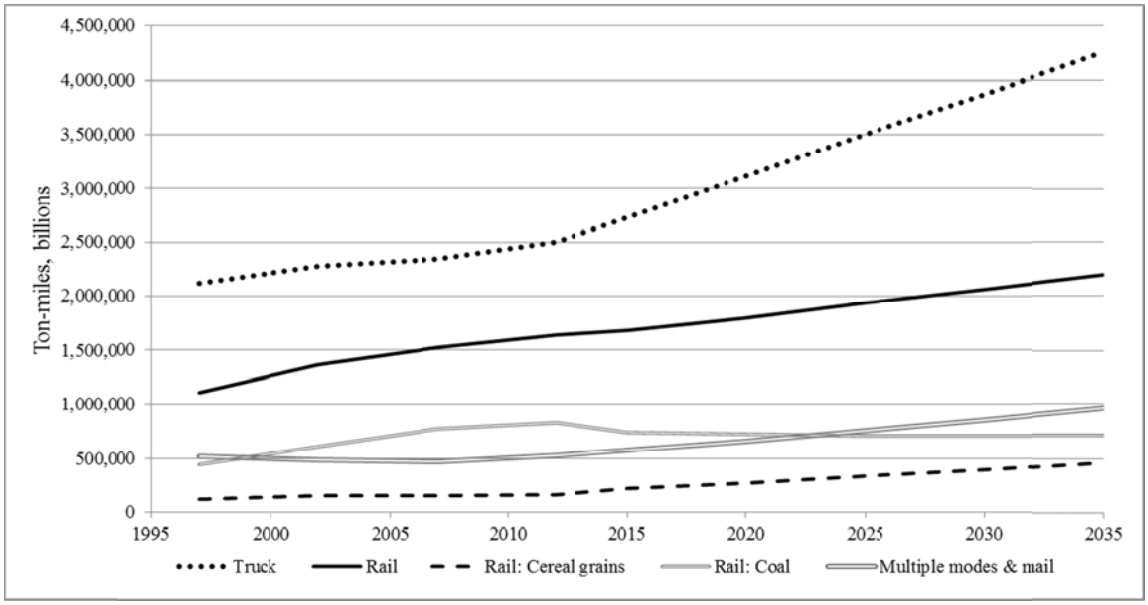

FIGURE 2-11 FAF: freight ton-miles by mode and selected rail commodities (actual for 1997–2012 and forecast for 2012–2035). Truck and railroad ton-miles do not include shipments that move by multiple modes. [SOURCE: Freight Analysis Framework Data Tabulation Tool (http://faf.ornl.gov/fafweb/Extraction1.aspx), accessed February 5, 2015.]

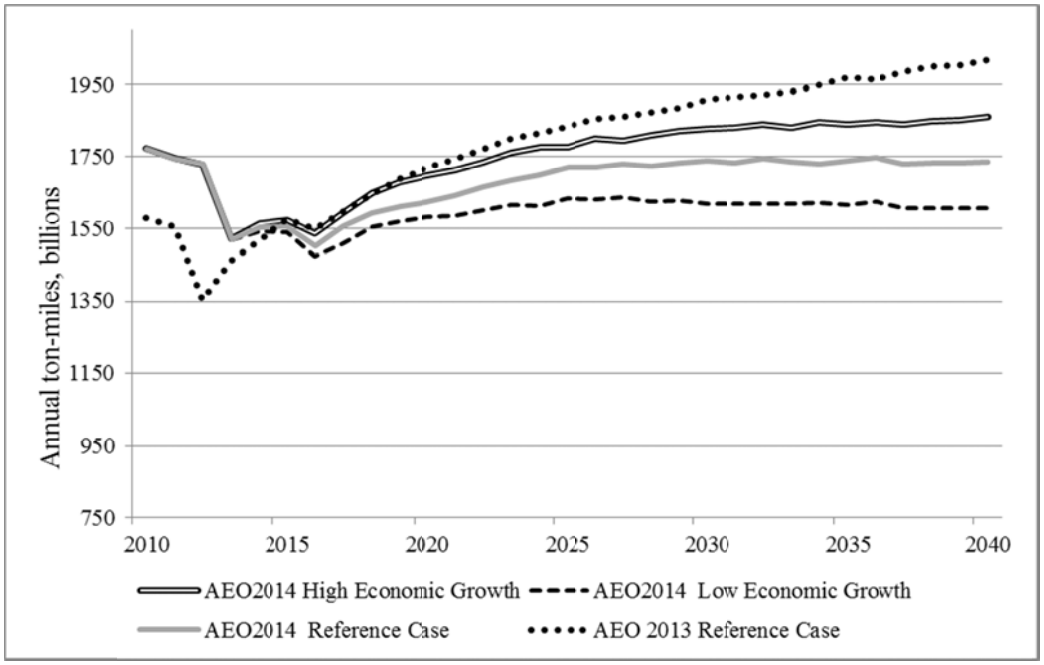

FIGURE 2-12 AEO: rail ton-miles, historical and projected. (SOURCE: EIA 2013, Table A7; EIA 2014a, Table A7.)

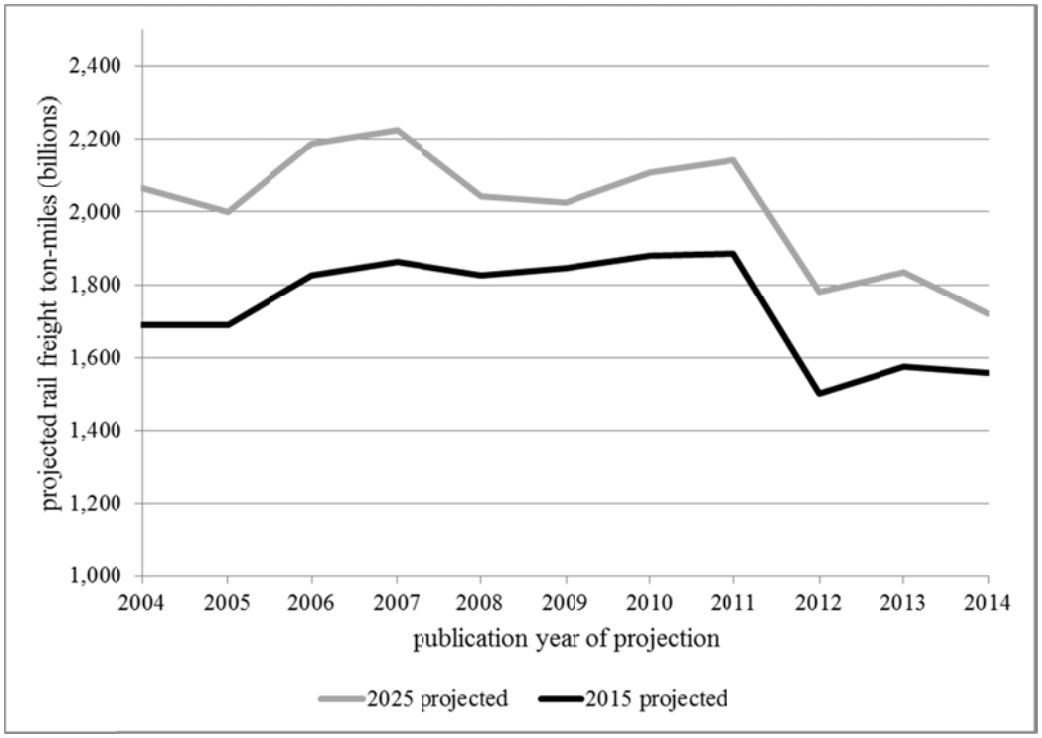

FIGURE 2-13 U.S. rail ton-miles projected for 2015 and 2025 in AEO reference cases by publication year of projection. (SOURCE: AEO, various years.)

TABLE 2-9 Comparison of 10-Year Historical and Projected Rates of Growth in Freight Rail Ton-Miles for Selected Periods

Source	Period	Actual or Forecast	Percent Change in Ton-Miles
Class I railroads[a]	1990–2000	Actual	42
Class I railroads[a]	2000–2010	Actual	15
CWS	2000–2010	Actual	15
FAF (excluding multimodal)[b]	2015–2025	Forecast	15
AEO (NEMS) reference case[c]	2015–2025	Forecast	10

[a] AAR various years (2014).
[b] Freight Analysis Framework Data Tabulation Tool (http://faf.ornl.gov/fafweb/Extraction1.aspx).
[c] EIA 2014a.

NOTE: The increases in real GDP from 1990 to 2000 and from 2000 to 2010 were 40 and 18 percent, respectively, which closely parallels the Class I railroad ton-mile increases (http://www.bea.gov/national/index.htm).

Projections of Long-Range Capacity Shortages

Freight output forecasts such as NEMS and FAF are sometimes used to inform studies of long-range transportation investment needs. Such studies are more common during business cycle peaks, when there are perceptions of tightening capacity and freight volume projections tend to produce exaggerated trend extrapolations, as noted above. The last round of prominent studies of freight capacity needs coincided with the peak in railroad ton-miles (2006), and they were released at the commencement of a recession that would quickly quiet concerns about capacity shortages (as ton-miles fell by more than 10 percent). Three prominent studies all forecast significant railroad investment and capacity gaps by 2020 to 2035:

- Cambridge Systematics (2007), whose study was sponsored by AAR, estimated a $39 billion gap between railroads' capabilities and capital spending for the infrastructure required to accommodate traffic growth and maintain service between 2007 and 2035.
- The National Surface Transportation Policy and Revenue Study Commission (NSTPRSC 2007) estimated a $1 billion to $3 billion annual gap between sustainable capital spending by the railroad industry and investment required to improve performance for 2008 to 2020 (the report utilized elements of the AAR-sponsored study cited above).
- The American Association of State Highway and Transportation Officials (AASHTO 2007) estimated an annual gap of $3 billion to $4 billion between railroads' investment capabilities and economically justified capital spending from 2007 to 2027.

These studies imply that shippers would be unwilling to pay for or railroads would be incapable of financing all the railroad capacity that would be economically and socially beneficial to provide. The source and size of the purported gaps are computed in different ways. In some cases, assumptions are made about the level of capacity needed to meet a specific quality of service target under different freight growth scenarios, and the investment shortage is calculated on the basis of projected railroad revenue and a fixed ratio of investment to earnings (NSTPRSC 2007, Vol. 1, 5–6; Vol. 2, 4–17). Candidate causes for the underinvestment are alluded to but seldom defined. Among them are the influence of regulations specific to railroads (including economic regulation and railroad labor laws), government subsidies to trucking and barge transportation (e.g., public provision of highways and waterways), and external benefits (e.g., pollution and congestion reduction) of shifting freight from highways to rail.

Such capacity needs projections have substantial weaknesses. One is the assumption that railroads invest in fixed proportion to their earnings. The studies tend naively to treat the demand for freight transportation and the supply of capacity as largely exogenous. They discount or neglect the incremental profits that railroads can generate from capacity investments and fail to explain in a convincing manner why railroads would sacrifice profits by letting large capacity gaps persist. The predictions of capacity gaps are often accompanied by policy proposals to make rail investments more attractive. However, the proposals fail to compare alternatives for correcting or compensating for the supposed causes of rail underinvestment, such as improved pricing of the public facilities used by the competing modes; pollution charges; and cost-reducing truck, rail, barge, and pipeline regulatory reforms.

Rail Capacity Supply Incentives

A common shortcoming of studies assessing future rail capacity needs, as exemplified by those cited above, is that they seldom define what constitutes capacity. The capacity of a transportation network can be difficult to define and even more difficult to measure. It cannot be characterized simply in terms of a maximum rate of throughput of some aggregate measure such as trips or ton-miles traveled. The ability of a freight network to carry any specified quantity of traffic will depend on the distribution of origins and destinations of the shipments, the temporal pattern of shipments, and shipper preferences with regard to speed and reliability. As traffic on a rail system grows, congestion is likely to begin to appear at local chokepoints, which may be in terminals or heavily used segments of mainline. As traffic continues to grow, localized congestion may spread until systemwide service problems arise. The optimum level of congestion depends on the value that each shipper places on speed and reliability and on the cost to the railroad of mitigating congestion through physical expansion, asset redeployments, and refinements in operating practices. The response may be to add more infrastructure, equipment, and workers. However, railroads may also respond by changing routings and schedules; increasing productivity through technological improvements in infrastructure, equipment, and operations; and rationing demand through pricing.

As discussed in Chapter 1, the ability of railroads to discriminate on the basis of price through contracting allows them to set rates that do not price profitable traffic out of the market and thus to avoid systematic underinvestment. Both the railroad and the shipper have an economic interest in reaching agreements ensuring that no profitable traffic goes unserved.[37] In this regard, a qualitative definition of a rail capacity shortage might be a circumstance in which a shipper or group of shippers are paying, or willing to pay, a rate that generates revenue sufficient to cover the cost to the railroad of improving speed and reliability, but improvements, for whatever reason, are not forthcoming over some protracted period.

One reason for a protracted capacity shortage might be that the railroad lacks access to credit markets. For example, a railroad that is financially weak may not be able to raise investment capital generally and thus not be able to add capacity even in individual markets where additions would be profitable. Another possibility is that some shippers may not be able to commit to a contract, perhaps because they lack a sufficiently regular service need. Normally, a railroad that posts a high tariff rate would negotiate contracts with shippers having a lower willingness to pay and thus ensure that all profitable traffic is served. If a shipper is unable to contract in these cases it may not be served; however, both the railroad and the shipper will have a strong incentive to bargain, so that the scenario of an unmet demand ought to be relatively rare.

In light of these profit incentives, protracted capacity shortages would not be expected. However, capacity provision may not be smooth or well targeted in the short term. The observed pattern of increasing shipper complaints at the start of economic expansions suggests that there can be lags in capacity deployment and investment during upticks in demand, especially if the new demand is viewed as short-lived or simply outpaces the physical ability of a railroad to respond. Investments involving the addition of fixed infrastructure can be “lumpy” and difficult to target precisely and quickly. Railroads must also make choices that minimize opportunity costs when temporary constraints arise. Accordingly, a railroad may price some traffic that is

[37] The incentive to add capacity to accommodate all profitable traffic is apparent as railroads respond to the increasing demand for transportation of crude oil in the Upper Midwest. This demand did not exist less than a decade ago.

normally profitable out of the market; however, service for that traffic should resume over the longer run when capacity adjustments can be made. In addition, there is no guarantee that a shipper will have its traffic transported from its preferred location. The reason is that railroads make pricing and investment decisions in a network environment, where interdependent demands affect where railroads add capacity. Shippers with a high willingness to pay may be compelled to ship from alternative locations where traffic is concentrated; the trend toward consolidation of grain-loading facilities to serve shuttle trains (as noted earlier) is one example.

Thus, the price-discriminating capabilities of railroads should preclude prolonged and significant underinvestments in capacity. However, the profit-maximizing calculus of railroads and shippers will not necessarily lead to resource allocations that are desirable from a societal perspective when externalities are factored in. Studies of future capacity needs are often accompanied by policy recommendations that would make investments in rail capacity more attractive to reduce externalities such as highway congestion and emissions from freight moved by truck. As discussed next, such externalities are a common justification for government programs to attract more capital to the railroad industry.

Public Policy and Railroad Capacity

Congress has authorized a number of government programs that can be used by the freight railroads and that are intended to increase the attractiveness of investing in rail capacity. They include two credit assistance programs (the Railroad Rehabilitation and Improvement Financing and Transportation Infrastructure Finance and Innovation Act programs) and a discretionary grant program (the Transportation Investment Generating Economic Recovery program) administered by FRA and USDOT. In addition, Congress funds occasional projects specifically to aid railroads with capacity investments. An example is the Heartland Corridor project, which was administered by the Federal Highway Administration. That project increased tunnel clearances for trains moving double-stacked intermodal containers between Chicago and Norfolk, Virginia. Its purpose was to reduce the number of containers moved by truck on the public highways. While all of these programs play a minor role in overall rail freight capital funding, they are examples of public-sector efforts intended to guide rail freight investments toward perceived public interests.[38]

FRA, whose primary responsibility is to regulate railroad safety, also regards itself as responsible for promoting socially beneficial investments in rail freight transportation. For example, the FRA website states the following: "To meet the needs of the current and future freight rail industry and to maximize the benefits of public investments, FRA is committed to supporting current freight rail market share and growth and developing strategies to attract 50 percent of all shipments 500 miles or greater to intermodal rail."[39] FRA's 2010 National Rail Plan Progress Report identifies two goals related to freight capacity: "support the current freight rail market share and growth" and "develop strategies to attract 50 percent of all shipments 500 miles or greater to intermodal rail" (FRA 2010, 14). As a rationale for its pursuit of these goals, FRA states that greater use of rail freight will bring about lower casualty rates, shipper cost

[38] For example, the Obama administration's Fiscal Year 2015 federal surface transportation program reauthorization proposal called for $10 billion in spending over 4 years on road, rail, and port projects to relieve freight bottlenecks (http://www.whitehouse.gov/sites/default/files/omb/budget/fy2015/assets/transportation.pdf).

[39] Rail Freight Overview. https://www.fra.dot.gov/Page/P0528. Accessed February 28, 2015.

savings, reductions in energy consumption and pollutant emissions, and reduced highway congestion and infrastructure costs.[40]

Summary of Long-Run Capacity Issues

Railroads maintain that service disturbances do not indicate chronic underinvestment in capacity. Instead, they are a temporary phenomenon arising from a short-run inability to adjust supply, which can cause traffic to move slowly and some normally profitable traffic to go unserved. Nevertheless, concerns about railroads falling short of the investments required to handle future growth in freight traffic were prevalent before the recent recession. At that time, the railroad industry's networks had been made lean, traffic had been steadily growing, and forecasts of rapid traffic growth had become exaggerated by the postderegulation volume peak. Predictions of capacity gaps were often dire but were seldom accompanied by explanations of why the profit motive of railroads would allow such a suboptimal outcome to persist over time periods in which adjustments can be made. A profit-maximizing railroad that can access credit markets (i.e., that is revenue adequate) and can price according to its customers' willingness to pay should generally have the ability and incentive to deploy and invest in the capacity required to move all profit-generating traffic. The profit incentive should oppose any large and protracted capacity shortfalls.

However, the profit motive by itself may not produce an equilibrium rail output that maximizes public welfare when externalities are considered. Forecasts of long-run capacity shortages seldom distinguish between valid concerns about railroads underinvesting in the capacity needed to handle socially optimal traffic and more questionable concerns about railroads underinvesting in the capacity required to handle all profitable traffic. Shifting freight from truck to rail may create positive externalities, such as reductions in air pollution or highway congestion, that neither carriers nor shippers will take into account. In this sense, railroads may fall short in supplying welfare-maximizing levels of rail capacity, and policy interventions may be warranted to fill the gap. However, that possibility was not examined in this study. It concerns issues and requires analyses that are outside the study charge and that are better suited to a multimodal study of national freight policy.

CHAPTER SUMMARY

The main points from this chapter that are discussed in the summary assessment of the final chapter are given in the following paragraphs.

Freight rail rates declined for more than two decades after the railroad industry was largely deregulated, but real rates increased over the past decade and gains in productivity slowed. Since 2007, the railroad industry has been characterized by volatility in rates, input costs, and demand. During the past decade, average rates for coal and grain have grown the fastest, for reasons that could not be established in this chapter. Contract carriage is now predominant for many bulk commodities, including coal and chemicals. Grain shippers continue to rely mostly on common carriage and represent the largest user group of this service.

[40] S. Greene, FRA, presentation to the study committee, May 29, 2014 (http://www.trb.org/PolicyStudies/RailTransReg.aspx).

Shippers have repeatedly raised concerns about the reliability and general quality of freight rail service, particularly common carrier service. Complaint levels tend to be highest during periods of sharply rising demand and have been exacerbated by bouts of severe weather. Because STB only regulates common carrier service, it largely receives complaints only from this segment of traffic. Thus, whether common carrier service is chronically inferior to contract service or whether it suffers more when capacity is tight is difficult to ascertain. Data pertaining to service quality that are collected by STB are anecdotal and do not allow objective evaluation of service quality trends and the responsiveness of railroads to their common carrier service obligations.

Long-range forecasting of freight rail capacity levels tends to be unreliable. It is affected by the near-term business cycle and focuses more on general factors influencing freight demand and less on those influencing service supply. While short-term capacity shortages can be expected, the reasoning offered for anticipated long-term shortages is often vague. Profit-maximizing railroads should be expected to supply all the capacity needed to transport profitable traffic over the longer term. Whether the resulting rail freight volumes are welfare-maximizing when the external costs of freight transportation are considered is another matter. Government programs exist to help make more freight profitable for railroads to move and thus to shift traffic away from trucks out of concern over highway congestion, safety, and emissions. Whether these programs are effective and justified was deemed to be outside this study's scope.

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Abbreviations

AAR	Association of American Railroads
AASHTO	American Association of State Highway and Transportation Officials
CBO	Congressional Budget Office
EIA	Energy Information Administration
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
GAO	General Accounting Office
NSTPRSC	National Surface Transportation Policy and Revenue Study Commission
STB	Surface Transportation Board
TRB	Transportation Research Board

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3

Review of the Rate Relief Process

The Staggers Rail Act gave railroads substantial freedom to set rates but restricted this freedom for common carrier rates when the service is supplied in markets lacking "effective competition."[1] These rates are not regulated directly, but they can be challenged by a shipper after the fact. The law states that in markets where a railroad has "market dominance," its common carrier rates must be "reasonable."[2] Market dominance is defined as the absence of effective competition from other railroads or modes of transportation.[3] A rate is automatically considered reasonable if it does not exceed 180 percent of its "variable cost," as determined by the Surface Transportation Board (STB).[4] If a disputed rate exceeds this percentage and is found to be in a market lacking effective competition, STB can rule on whether the rate is reasonable.[5] If STB finds the rate to be unreasonable, it must order the railroad to compensate the shipper for overpayments, and it may prescribe the maximum rate the railroad can charge for future movements.[6]

In ruling on the reasonableness of a rate, STB is directed to be respectful of the law's overarching policies (see Box 1-2),[7] including the policy that railroads must be able to earn "adequate revenues." Adequate revenues are defined as those "sufficient—under honest, economical, and efficient management—to cover operating expenses, support prudent capital outlays, repay a reasonable debt level, raise needed equity capital, and otherwise attract and retain capital in amounts adequate to provide a sound rail transportation system."[8]

In 1995, when Congress last amended the Interstate Commerce Act (ICA) to terminate the Interstate Commerce Commission (ICC) and create STB, it added a new policy calling for the "expeditious handling and resolution of all proceedings."[9] It further instructed STB to ensure the prompt handling of rate challenges in particular by adopting appropriate measures for "avoiding delay in the discovery and evidentiary phases" of proceedings and by establishing "a simplified and expedited method for determining the reasonableness of challenged rail rates in those cases in which a full stand-alone cost [SAC] presentation is too costly, given the value of the case."[10]

Thus, STB's implementation of the law's rate relief provision involves the following three steps:

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[1] 49 USC §10101(4).
[2] 49 USC §10701(d)(1), §10702.
[3] 49 USC §10707(a).
[4] 49 USC §10707(d)(1)(A).
[5] When a complaint is filed, STB may investigate the reasonableness of the challenged rate or dismiss the complaint if the complaint does not contain reasonable grounds for investigation and action [49 USC §10704(b), §11701(a), 11701(b)].
[6] 49 USC §11704(b), §10704(a)(1).
[7] 49 USC §10101.
[8] 49 USC §10701(d)(2), §10704(a)(2).
[9] 49 USC §10101(15).
[10] 49 USC §10704(d), §10701(d)(3).

1. Estimate the variable cost of a priced unit of traffic to determine whether its rate exceeds the 180 percent statutory threshold.
2. Determine whether a market subject to a rate challenge lacks effective competition and qualifies as being dominated.
3. Establish standards for determining whether a disputed rate that passes these eligibility screens is unreasonable and the shipper is entitled to relief.

The methods used by STB in implementing each of the three steps are assessed in this chapter. Most originated with ICC and have been modified and added to by STB over the past 20 years. Before the methods are assessed, a brief review of their origins and the historical concerns that shaped them is provided. In addition, how the steps interrelate is explained. For example, the law's "revenue-to-variable-cost" (R/VC) formula determines initial eligibility to challenge a rate. Because this is a highly imperfect screen, regulators have come to depend on market dominance inquiries and elaborate cost calculations to ensure that rate relief is granted in a measured way that does not conflict with the law's interest in protecting revenue adequacy.

After the STB methods for granting rate relief are reviewed, consideration is given to alternative approaches for implementing the law's maximum rate protections. The rate dispute resolution process used in Canada is examined, and an alternative method for identifying unusually high rates is described.

HISTORICAL CONTEXT AND LINKS TO REVENUE ADEQUACY

Rate Reasonableness: Efficiency, Fairness, and Revenue Adequacy

As discussed in Chapter 1, the policy interest in "reasonable" rates dates back to the ICA of 1887 and even further to the common law principles that shaped the legal doctrine of common carriage. Railroads were subject to the long-standing common law duty to offer "just and reasonable rates" and to respond to all reasonable requests for transportation service without "discrimination" (Scharfman 1915, 191). The ICA specifically prohibited as unjust discrimination any preferential treatment of a "like or contemporaneous service in the transportation of a like kind of traffic under substantially similar circumstances and conditions" (Scharfman 1915, 117). Efforts to bring about a "just and reasonable" railroad pricing system led to requirements, including the posting of generally applicable tariff rates, and to rate structures that limited the ability of railroads to charge shippers of the same commodity rates that differed according to competitive circumstances.

Over time, regulatory prohibitions on varying rates in response to demand contributed substantially to railroads falling short of the revenues needed to maintain their capital-intensive systems and to the loss of large amounts of traffic to trucks. Hence, Congress made it clear to ICC that the Staggers Rail Act's protections from unreasonable rates should not be interpreted as an opportunity to reregulate rates and hinder the ability of railroads to earn adequate revenues. Congress was explicit in advising ICC that the granting of relief should not conflict with revenue adequacy by stipulating the following:

> This [rate reasonableness] provision sets forth for the first time a standard for the Commission to use in determining if a rate is reasonable, and that standard goes to

> ensuring that railroads can continue to operate as private enterprises. Previous admonitions by the Congress that the Commission assist carriers in earning adequate revenue levels have not achieved their goals. As a result, the Committee is establishing a more straightforward mandate. This is a clear directive to ensure financially sound railroads, and the Commission is not to misuse the term "reasonable" to circumvent this directive.[11]

Before the Staggers Rail Act, rail rates had been kept too high in many markets where shippers had nonrail competitive options, which caused potentially profitable traffic to be priced out of the rail market. By allowing railroads to adjust rates according to demand, the act ended this inefficiency of the previous regulatory system.[12] In making an exception to these pricing freedoms, the act's maximum rate provisions required regulators to determine what constitutes an "unreasonable" rate in markets where a railroad lacked effective competition and could exercise significant market power. However, even in noncompetitive rail markets, concern over high rates causing efficiency losses should be minimal, for reasons that are explained next.

A traditional rationale for regulating prices in markets where firms have substantial market power is the prevention of inefficiencies caused by supracompetitive pricing. Typically, a monopolist that is unable to price discriminate will raise prices generally to levels that maximize profits from customers with high willingness to pay. In the process it will price some other customers with a lower willingness to pay out of the market even though they could have been served profitably with a lower price. The priced-out traffic represents an efficiency loss. However, as discussed in Chapters 1 and 2, the Staggers Rail Act gave railroads the freedom to contract with shippers for service and ended the requirement that railroads post tariff rates that apply to all shippers. In markets where it had substantial market power, a railroad could therefore raise tariff rates for shippers with the fewest options and the highest willingness to pay without concern for losing price-sensitive customers, who could be retained by negotiating discounted contract rates. Because little traffic would be priced out of the market, efficiency losses would be minimal.

Price discrimination, if applied perfectly, leads to no efficiency losses. While contracting may not provide railroads with the opportunity to engage in perfect price discrimination, the ability to negotiate rates with individual shippers should be sufficient to ensure that almost all profitable traffic is served.[13] Accordingly, there can be little or no efficiency rationale for the law's requirement that tariff rates be kept reasonable. Other purposes for the maximum rate protections in the Staggers Rail Act might therefore be surmised. The most obvious would be conformance to the common law principle, discussed above, that seeks to promote fairness by protecting shippers who lack competitive options from paying tariff rates that are unusually high compared with those of similar shippers who have more options.[14]

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[11] H.R. 1035, 96th Congress, Second Session, 54 (1980), as cited by ICC 1985, 10–11.

[12] By keeping rates artificially high and thus pricing some traffic out of the market, the regulatory system created inefficiencies as the affected shippers turned to second-best transportation options, reduced their output, or took other action more costly than would have occurred if railroads had been allowed to adjust their rates to lower but still profitable levels.

[13] As noted in Chapter 1, Grimm and Winston (2000) have quantified minimal deadweight losses from rates charged to captive shippers.

[14] Concern over fairness is predominant in the field of rate regulation. Schmalensee (1979) has observed that to the extent that utility regulators in the United States have been concerned with rate structures, they have tended to be motivated and informed by considerations of equity or fairness rather than efficiency.

As a practical matter, ICC was thus charged with developing a standard for rate reasonableness that was concerned with fairness, not efficiency. In fulfilling this charge, the agency had to respect the law's interest in revenue adequacy by ensuring that rate relief was not granted so liberally that railroads would once again fall short of their revenue needs. Thus, in introducing its first set of guidelines for ruling on rate reasonableness, the 1985 *Coal Rate Guidelines*,[15] ICC set a precedent whereby all evidentiary standards for judging the fairness of a rate would need to be linked, at least ostensibly, to the statutory goal of ensuring revenue adequacy. This link was stated explicitly in the guidelines: "The maximum rate guidelines we are adopting here culminate several years of research and effort to develop an economically efficient and equitable methodology for determining the reasonableness of rates. . . . We believe [the guidelines] will provide the necessary protection for captive shippers, while providing railroads the opportunity to earn adequate revenues" (ICC 1985, 2).

Thirty years have passed since the *Coal Rate Guidelines* were introduced, and STB has remained committed to linking rate fairness and revenue adequacy. Many shippers have been critical of the evidentiary standards used to make this linkage. They believe that the standards have unnecessarily precluded access to the law's maximum rate protections. Railroads generally defend the linkage as crucial in safeguarding their ability to continue producing and reinvesting.

Exacting Standards for Rate Reasonableness and the R/VC Formula

Shipper criticisms of STB's granting of rate relief have tended to center on the procedures used in making qualitative assessments of market dominance and in ruling on the reasonableness of rates by using evidentiary standards characterized as being excessively costly and burdensome. However, any critical assessment of these procedures must begin by examining their respective roles in the overall process for granting rate relief. Market dominance and rate reasonableness inquiries are the second and third steps in a system that begins with a shipper having to show that its rate exceeds the statutory threshold of 180 percent of the shipment's variable cost. Because of the congressional directive that regulators not grant rate relief so permissively that it threatens railroad revenue adequacy, the confidence that regulators have in this statutory formula as a screen for limiting rate relief cases is critical. In the absence of such confidence, the introduction of exacting and imposing standards for assessing market dominance and rate reasonableness might be expected. Indeed, the 180 percent formula is an unreliable screening tool for reasons explained and documented next. That unreliability, in turn, may have prompted regulators to institute complex evidentiary procedures, such as a SAC test, that function as the primary safeguard for railroad revenue adequacy.

Over the past two decades, STB has tried with limited success to address shipper concerns about the accessibility of the rate relief process by making piecemeal changes in the procedures used during the latter stages of the process. System-level reforms that place greater emphasis on the role of the R/VC standard have been largely neglected, although its significance suggests that reforms centered on it are an essential first step.

[15] ICC 2d 520, 1985 WL 56819 (ICC), August 8, 1985.

VARIABLE COST FORMULA

When the Staggers Rail Act introduced the R/VC formula for screening rates for relief eligibility, ICC had long been using accounting-based cost allocation systems for costing railroad services and activities.[16] The law directed the agency to develop an updated method to determine "economically accurate railroad costs directly and indirectly associated with particular movements of goods, including the variable costs associated with particular movements."[17] To comply, ICC developed the Uniform Railroad Costing System (URCS), which shares a methodological approach with earlier cost accounting schemes and remains in use today.[18] For reasons explained next, estimation of variable cost with the URCS or any other cost allocation scheme is inherently problematic. No cost allocation scheme can yield economically valid relationships for assessing a railroad's rate levels or market power.

Insoluble Problem of Allocating Variable Costs

The Staggers Rail Act did not provide regulators with clear guidance on how a "variable cost" should be defined or computed. The law refers to the need to establish variable costs for "particular movements." That requirement may seem straightforward, but railroads produce many kinds of freight service. The services, or products, vary in many dimensions that are relevant to their individual pricing, such as volume, location, commodity, and time of travel. A coal unit train priced at one time of year for one routing in a railroad's network is a product different from a coal unit train priced at another time of year for another routing. Inasmuch as the R/VC formula was meant to inform decision making, regulators need to know how product-specific and precise a variable cost estimate must be to achieve its purpose. For example, they need to know whether systemwide averages would suffice or whether a variable cost must be fully traceable to the specific unit of traffic to which the rate applied.

Furthermore, whether the term "variable cost" was meant to be the incremental cost of a priced shipment (e.g., the added fuel use or wear and tear that one additional shipment creates) or something else is not clear. Regulators collect large amounts of expense data from railroads. However, they do not collect expense data at the shipment-specific level. Regulators have traditionally used the expense reports to assign costs to segments of rail traffic, essentially by dividing total reported expenses (or some subset of these expenses) among portions of a railroad's output. Of course, railroads incur many costs that are unreported in expense ledgers, both at the firm- and the movement-specific level, such as system congestion and delays that are added by the operation of another train or the switching of another car. It is often argued that the omission of such unreported costs from expense-based cost allocation schemes can be misleading because railroads must take all costs into account. While that is true, minimizing such reporting omissions would not make the cost allocations substantially more valid or relevant, for reasons that become evident when the cost allocation process itself is reviewed.

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[16] The Staggers Rail Act, §10705a(m)(1), required ICC to determine variable costs by using its Rail Form A costing method or to adopt an alternative method.

[17] Cost accounting principles in Title III, Section 301, §11162 of the Staggers Rail Act of 1980.

[18] ICC decided that Rail Form A's data structure and statistical techniques did not reflect the operation of the modern railroad industry (STB 2010, 2).

The cost allocation process begins by characterizing a railroad's total expenses as being more or less variable with levels of traffic output.[19] These characterizations are made by observing how a railroad's total expenses change as a function of total traffic. For example, 95 percent of fuel expenses and 50 percent of road maintenance costs may be characterized as variable with traffic output. In performing this exercise, the time period selected is critical. A decline in traffic output of 10 percent in a month, for example, would likely lead to the finding that a railroad's expenses changed less than if traffic had declined by 10 percent from one year to the next. That is because individual railroad cost items can be adjusted differently over time. For example, labor costs may be fixed from week to week but variable from year to year. Thus, the time period used for the "variable-fixed" allocation will have a significant impact on the items defined as variable and thus on the total amount of variable costs to be allocated across traffic. Because the time period is likely to be based solely on when expense data are collected, there will be an inherent arbitrariness in the distinction between fixed and variable costs.

The cost allocator thus has to establish rules for dividing the subset of a railroad's reported expenses characterized as "variable" for an arbitrarily determined time period. These divisions must then be assigned to units of traffic that are inevitably going to be crude versions of the actual priced units of traffic. In the process, many relevant costs could be omitted because they are not recorded on expense ledgers. The vagaries, omissions, and arbitrariness of these steps alone are intimidating. The process of dividing costs, however, is even more problematic and adds another large degree of arbitrariness to the process. The reason is that relatively few costs that a railroad incurs can be directly attributed to specific units of traffic. With good data, the cost allocator may be able to attribute a few costs to a specific movement—for example, the movement's incremental contribution to the fuel used by a train or wear and tear on specific equipment. However, there will be few opportunities for such unambiguous attributions because most railroad costs are shared by all traffic or multiple groupings of traffic, such as those associated with operating and maintaining track, locomotives, terminals, and yards. Division of these cost items in any economically meaningful way among individual units or narrow segments of traffic is simply not possible.

The common cost problem arises even in allocating costs associated with the movement of an individual train. Consider a train containing a 10-carload shipment of wheat and a 10-carload shipment of coal. The *total variable cost* of the train may be readily defined as all of the costs such as crew wages and fuel that can be avoided by not operating it.[20] The *incremental cost* of each set of cars is also readily defined. It is the difference between the cost of operating the train with and without each set—for example, the fuel saved by not having to move as much weight. However, the locomotive must be used even if only one set of cars is moved. Some of its operating costs, such as crew wages, are included in the train's total variable cost but not in the incremental cost of each set of cars. Any allocation of the total variable cost of the train among individual shipments must divide all the operating costs of the locomotive among the shipments, a division that has no basis in fact and is inherently arbitrary.

In summary, regulators face insurmountable challenges in estimating a variable cost to compare with the rate charged for a unit of traffic. Nevertheless, their fundamentally arbitrary

[19] The common use of cost allocation methods for rail regulatory purposes has been well documented. An early study of the processes was conducted by Meyer (1958).

[20] There may be variable costs of activities that support both this train and other trains; allocating them between this and other trains would be inherently arbitrary. This complication is ignored, and the train's total variable cost is assumed to be well defined.

cost allocation results have meaning because they are used in making regulatory decisions, most significantly in calculating the R/VC percentages for assessing eligibility for rate relief. The problems arising from use of the URCS for this purpose are described next.

Fundamental Flaws of URCS

ICC introduced URCS with the idea of defining a railroad's fixed and variable costs more precisely by dividing expenses into more discrete categories and defining units of traffic more narrowly, such as by car type, shipment size, and length of haul.[21] Regressions were run to determine whether certain cost items were more or less fixed with respect to traffic volume changes (e.g., by showing that annual fuel used to run locomotives was 96 percent variable with traffic). Expert judgments were made about certain other cost relationships (e.g., that 50 percent of a railroad's annual expenditures on capital and road property should be treated as variable with respect to traffic levels) (STB 2010, 5). Engineering studies conducted over the past 50 years were consulted to help allocate certain costs more precisely, such as the fuel used in switching a car (STB 2010, 4). URCS would even allow regulators for the first time to assign lower costs to shipments moved in unit trains and multicar allotments because of their added efficiencies. URCS would simply spread the cost savings, through a so-called "make-whole adjustment," over all other traffic because it would be essential for all of the railroad's costs that have been declared "variable" to be fully assigned.

URCS suffers from all of the methodological problems cited above. It is a cost allocation scheme that has no economic foundation, as amply illustrated by the "make-whole" contrivance to redistribute unallocated costs. Its refinements relative to earlier cost allocation schemes have done nothing to make the results any more reliable or less arbitrary because the large majority of cost items characterized by URCS as "variable" are clearly not variable (e.g., road property) with respect to priced units of traffic. Indeed, STB characterizes results from URCS as being "systemwide averages," acknowledging that they do not reflect the actual cost of providing any specific service. The results from URCS cannot be represented as meeting the law's requirement for economic accuracy, and they cannot be portrayed as having any relevance to the price charged for a given unit of traffic as implied by their use in the law's R/VC formula. STB's own Railroad–Shipper Transportation Advisory Council has referred to URCS as "an outdated and inadequate costing system."[22]

Nevertheless, STB has stated that the results of URCS are sufficient for regulatory purposes: "Though imperfect, URCS has served as the agency's costing tool for more than two decades and has produced costs sufficiently reliable for the Board to make regulatory determinations" (STB 2010, 1). The source of this confidence is unclear. In responding to a congressional inquiry about URCS, the agency pointed out that "there is no accounting process that can precisely attribute costs to particular movements" (STB 2010, 1) and that the "URCS system-wide average could be higher or lower than the actual cost of any particular movement" (STB 2010, 4). As STB further explained, "a railroad uses its physical assets (e.g., rail lines, locomotives, rail cars, yard equipment) to transport hundreds of different commodities between many different locations. Thus, there are many common costs (akin to overhead) that the railroad

[21] The expense groups and methods used to allocate portions to traffic are described more fully by Wilson and Bitzan (2003).

[22] http://www.stb.dot.gov/stb/docs/RSTAC /RSTAC%20URCS%20White%20Paper%20on%20URCS%20November%2022.pdf.

will seek to recover from all of its customers. By necessity, the methodology must incorporate assumptions and generalizations about railroad operations, some of which may not reflect individual situations" (STB 2010, 1). Yet in conceding these deficiencies, STB overlooks their significance by acknowledging that "the role of URCS is to estimate that portion of the variable costs of providing rail service that can be attributed to *any given* [emphasis added] rail movement" (STB 2010, 1).

Evident Problems with Using URCS in the R/VC Formula

The arbitrary results produced by URCS are treated by regulators as if they were economically valid and are used for many regulatory purposes. In addition to being used in screening traffic for rate relief eligibility according to the R/VC formula, URCS is used in subsequent procedures to determine market dominance, to make assessments of whether a challenged rate is reasonable (by estimating the profitability of "crossover" traffic in SAC tests, as described later), and, if necessary, to prescribe the maximum tariff rate a railroad may charge. URCS is also used in measuring avoidable costs when a railroad applies to abandon a line and in calculating compensation fees for mandated access (STB 2010, 6–8).

The results of URCS are often used misguidedly by others. For example, in 2006 the U.S. Government Accountability Office (GAO) examined trends in shipments having rates with various R/VC percentages to determine whether railroads were obtaining and exercising more market power over time (GAO 2006). In finding that the share of traffic having R/VCs above 180 percent had dropped from 1985 to 2004, GAO surmised that the market power of railroads had been declining. Coincidental with these findings, however, GAO found that the amount of traffic having R/VCs exceeding 300 percent had increased from 4 to 6 percent, which caused the agency to question whether railroads were becoming more effective in exploiting market power when they possessed it (GAO 2006, 43). Fundamentally dependent on URCS-derived costs, such expanded uses of the R/VC formula have no basis in fact.

The reasons Congress had for introducing the R/VC formula or choosing 180 percent as the threshold below which rates would be immune from challenge are debatable.[23] Such a formula is logically coherent only if the variable cost term has a connection to a railroad's incremental cost of transporting a shipment and thus bears some resemblance to the rate that would be charged in a competitive market. A rate with a high R/VC percentage might be viewed as a sign that a railroad is exercising significant market power. However, estimates of variable cost that are derived in a highly arbitrary manner—in ways described above—cannot be expected to have a tenable or stable relationship to these incremental costs, and thus they can offer no meaningful insight into market power when they are compared with a shipment's rate. Box 3-1 indicates how a number of cost allocation rules that might be viewed as reasonable can yield substantially different R/VC percentages, which would cause shipments to fall below or exceed the 180 percent threshold.

[23] The Staggers Rail Act actually phased in the 180 percent standard over 5 years, beginning with a standard of 160 percent and rising by 5 percentage points annually until October 1984.

Box 3-1

Example of the Arbitrariness of Cost Allocation Rules

STB compares a disputed rate with 180 percent of the URCS estimate of the average variable cost of the movement to determine whether the rate is presumptively excessive. Because there are substantial common costs involved in the production of rail services, URCS uses administrative rules to allocate them to derive the average variable cost estimate that is applied to a specific movement. The following examples show how choosing among various common cost allocation rules can result in different rates violating the 180 percent R/VC threshold and therefore becoming candidates for scrutiny by STB.

First, suppose a railroad can provide three types of service (1, 2, and 3) with the following demand curves: $q_1 = 100 - 5p_1$, $q_2 = 100 - p_2$, and $q_3 = 75 - p_3$, where each p is the price of the corresponding service and each q is the number of units of the service produced. Further, suppose the railroad's variable cost function takes the form $C(q_1, q_2, q_3) = 500 + 5q_1 + 10q_2 + 3q_3$. This function supposes that common variable costs are \$500 and the average incremental, or marginal, cost of shipping Products 1, 2, and 3 is \$5, \$10, and \$3, respectively. Suppose the railroad sets $p_1 = \$15$, $p_2 = \$13$, and $p_3 = \$10$. On the basis of the above demand curves, these prices imply that $q_1 = 25$, $q_2 = 87$, and $q_3 = 65$. This set of outputs implies a total variable cost equal to \$1,690 = \$500 + \$5 * 25 + \$10 * 87 + \$3 * 65. Total revenue is equal to \$2,156 = \$15 * 25 + \$13 * 87 + \$10 * 65, so the railroad just breaks even if its fixed costs are (\$2,156 – \$1,690) = \$466, the difference between its total revenue and total variable costs.

There is no unambiguous way to allocate the common variable costs of \$500 to the individual products to obtain product-specific variable costs. Consider four possible rules for allocating the common costs to the three products. The first rule allocates on the basis of quantity: the \$500 of common costs is allocated to each product according to its share of total output. In this example, Product 1 is allocated 25/(25 + 87 + 65) of the common costs, Product 2 is allocated 87/(25 + 87 + 65) of the common costs, and Product 3 is allocated 65/(25 + 87 + 65) of the common costs. To compute the average variable cost of Product 1 requires adding the marginal cost of Product 1 to Product 1's share of the \$500 of common costs divided by the number of units sold of Product 1. This yields \$7.82. Multiplying this fully allocated average variable cost of Product 1 by 1.8 yields \$14.08, which is less than the price set for Product 1 of \$15. The first row of the embedded table contains the 180 percent of the average variable cost thresholds for each product on the basis of the quantity-based common cost allocation rule. For this rule, only the price charged for Product 1 violates the 180 percent threshold.

The second rule uses revenue shares to allocate the \$500 of common costs to each product. Product 1's total revenue is \$15 * 25 = \$375, Product 2's is \$13 * 87 = \$1,131, and Product 3's is \$10 * 65 = \$650. To compute Product 1's average fully allocated cost requires taking the marginal cost of Product 1 and adding its revenue share of the \$500 common cost divided by the amount sold of Product 1. This yields \$8.48. Multiplying this fully allocated average variable cost figure for Product 1 by 1.8 yields \$15.26, which is greater than the price charged for Product 1. Consequently, this cost allocation rule would not result in the price of Product 1 being deemed presumptively excessive. The second row contains the 180 percent of the average fully allocated cost thresholds for each product for the revenue-based allocation rule. For this allocation rule, only Product 3 violates the 180 percent threshold.

The third cost allocation rule uses the incremental cost shares of each product to allocate the \$500 of common costs. Product 1's incremental cost is \$5 * 25 = \$125, Product 2's is \$10 * 87 = \$870, and Product 3's is \$3 * 65 = 195. Use of the same procedure as described above for Product 1's marginal cost share to allocate the common variable costs to each product yields an average fully allocated variable cost

(*continued*)

Box 3-1 (*continued*)

for Product 1 of $7.10. Multiplying this result by 1.8 yields $12.78. The third row contains the 180 percent of the average fully allocated cost thresholds for each product under this common cost allocation rule. Both Product 1 and Product 3 violate the 180 percent threshold.

The fourth cost allocation rule simply assigns one-third of the $500 of common variable costs to each product. For Product 1, this yields an average fully allocated cost of $11.67, which implies a 180 percent threshold of $21.00. From the table below, only the price of Product 2 violates the 180 percent threshold under this cost allocation rule.

This numerical example demonstrates that which of the prices of the three products would violate the 180 percent threshold and be deemed presumptively excessive depends on the ad hoc cost allocation rule used. The example points out the arbitrary nature of using a fully allocated cost approach to determine whether a price charged should be deemed excessive and therefore be a candidate for regulation.

Examples of Alternative Rules for Computing a Rate's Fully Allocated Cost Threshold (180 percent R/VC value)

Method Used to Compute Fully Allocated Cost	Product 1	Product 2	Product 3
Quantity-based cost allocation	**$14.08**	$23.08	$10.48
Revenue-based cost allocation	$15.26	$23.43	**$9.57**
Variable cost–based cost allocation	**$12.78**	$25.56	**$7.67**
Equal cost allocation by product	$21.00	**$12.45**	$13.62
Actual rates for shipments	$15.00	$13.00	$10.00

In its STB-sponsored study, Laurits R. Christensen Associates (2009) examined the relevance of the URCS-based R/VC formula in assessing market power and competition. On the basis of rate and variable cost data recorded in STB's Carload Waybill Sample (CWS) from 2001 to 2008, Christensen Associates reported that the share of ton-miles exceeding the 180 percent threshold had been stable during the period, ranging from about 15 to 20 percent, while the share exceeding 300 percent fluctuated between 2 and 5 percent (Table 3-1). Most significantly, however, Christensen Associates (2009, 11-25) reported that one-fifth to one-third of all traffic had an R/VC below 100 percent. The comparisons were updated in this study for 2012. Table 3-1 shows that in 2012, 20 percent of all rail traffic was purported to have moved at rates below variable cost. A large share of traffic earning revenues below what is represented as an approximation of the incremental cost of a service means that large portions of rail traffic are being priced at an economic loss. This outcome is nonsensical, or at least very difficult to reconcile with the railroad industry's profit motive.

Christensen Associates concluded that URCS was flawed by failing to take into account "latent cost-causing factors or other shipment features."[24] STB has defended URCS from such findings by stating that ratios below 100 percent are possible for some traffic for short periods. The reason given is that URCS is not a measure of short-run variable costs but rather a measure

[24] Laurits R. Christensen Associates 2009, 11-24. Christensen Associates findings about URCS were acknowledged by STB in its 2010 URCS critique (STB 2010).

of "intermediate" variable costs made on a system average basis that includes cost items such as rails and ties "that are fixed in the short term."[25] That defense illustrates the inherent problem with cost allocation (i.e., how does URCS decide where to allocate rail and tie costs?), but it is also an implausible defense when 20 to 30 percent of traffic is assumed to be operating at below cost for many years and railroads remain financially solvent.

Even though URCS allocation rules and procedures are arbitrary, analyses of R/VCs suggest that they do not produce random results. They can produce systematic biases in the traffic identified as falling below or above the 180 percent threshold. For example, analyses of R/VCs for nonexempt (tariff and contract) traffic grouped by market distance show that shorter-haul shipments have much higher shares of ton-miles exceeding the 180 percent threshold than do longer-haul shipments (Figure 3-1). As discussed in the previous chapters, railroads have expressed concern that STB does not properly cost hazardous materials shipments because URCS omits a large number of costs associated with their transportation risk and its mitigation.[26] They maintain that because of these costs, the rates charged for hazardous materials shipments may appear excessive when they are not. Indeed, a review of the R/VCs for hazardous materials shipments indicates that a large percentage of this traffic moves at rates above 180 percent, suggesting the potential for systematic bias (Figure 3-2).

TABLE 3-1 Percent of Ton-Miles by R/VC Category, Selected Years, 2001–2012

	R/VC < 100%	100% ≤ R/VC < 180%	180% ≤ R/VC < 300%	R/VC ≥ 300%
Study Committee Review, 2012				
Nonexempt	16	56	24	4
Tariff	4	60	31	5
Contract	19	55	21	4
Exempt	30	57	11	1
Total	20	57	20	3
Christensen Associates, 2001–2008				
2001–2002	22	56	19	2
2003–2004	21	57	17	5
2005–2006	29	52	16	4
2007	33	50	15	2
2008	34	49	14	3

SOURCE: 2012 CWS; Laurits R. Christensen Associates 2009, 11-25; M. Meitzen and K. Eakin, Christensen Associates, presentation to the committee, January 10, 2014 (http://www.trb.org/PolicyStudies/RailTransReg.aspx).

[25] STB Ex Parte No. NOR-42088, Western Fuels Association, Inc., and Basin Electric Power Cooperative v. BNSF Railway Company, June 15, 2012, p. 7.
[26] See comments by the Association of American Railroads to STB Ex Parte No. 677-1, July 10, 2008, p. 26.

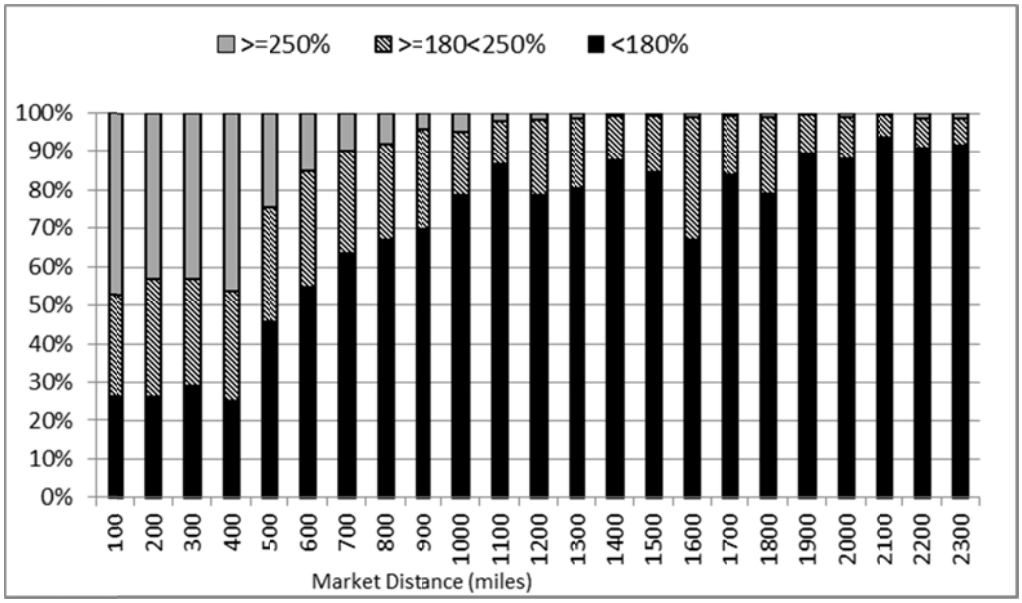

FIGURE 3-1 Share of nonexempt traffic (ton-miles) by selected R/VC ratios, 2012. (SOURCE: 2012 CWS.)

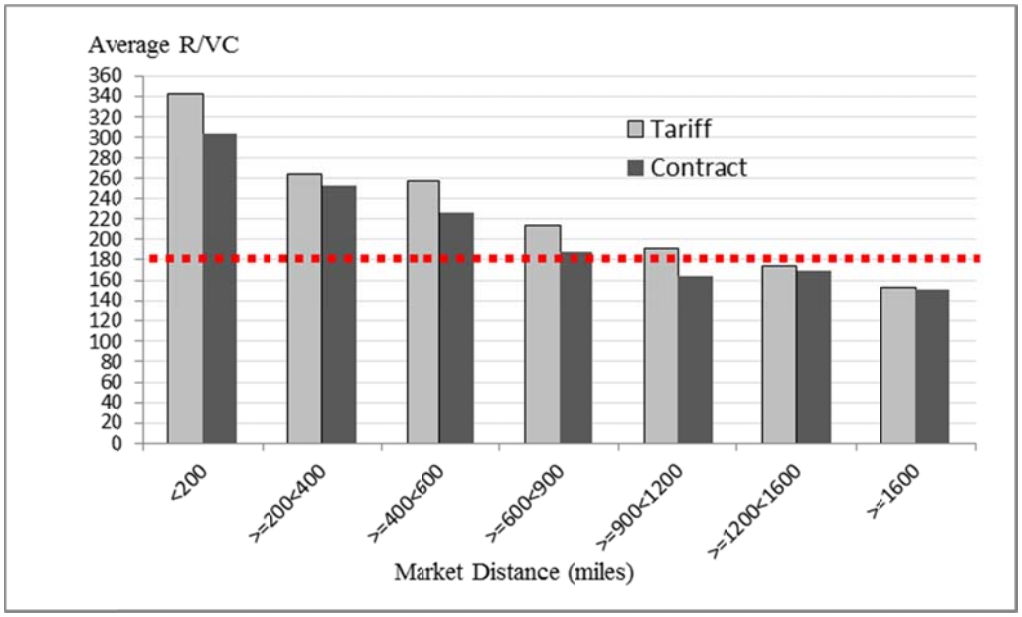

FIGURE 3-2 Average R/VC for hazardous materials shipments by market distance, 2012. (SOURCE: 2012 CWS.)

Criticisms of URCS because of its omission of relevant costs such as those directly attributable to the movement of hazardous materials are valid. However, the addition of those costs to URCS allocations, if that is possible, would not make the results any more economically meaningful. Replacing or reforming URCS with more "refined" methods of cost allocation would be substituting one contrivance for another. The more appropriate solution is to replace

reliance on URCS in rate regulation with a system for identifying unusually high rates that is economically sound and that does not apply arbitrary cost allocation rules. At the conclusion of this chapter, such a methodology is demonstrated.

MARKET DOMINANCE INQUIRIES

When a tariff rate exceeds the 180 percent R/VC threshold and a shipper paying that rate complains, the law requires a direct review of the competitive structure of the market in question, often referred to as a qualitative assessment of market dominance. Market dominance is defined in the law as the "absence of effective competition from other rail carriers or modes of transportation for the transportation to which the rate applies."[27]

These assessments are made on a case-by-case basis, and the complainant shipper and the railroad present evidence. In some cases, the railroad concedes a shipper's characterization of dominance. In others, the railroad may submit evidence to counter the shipper's evidence, and STB must decide. Because of the limited suitability of long-haul trucking for the bulk commodities normally moved under common carriage, market dominance inquiries tend to focus on the shipper's proximity to other bulk transportation modes, including other railroads, barges, pipelines, and trans-loading operations (short truck hauls between rail stations).

In inquiries during ICC's tenure, railroads had additional latitude in characterizing a shipper's rail substitution possibilities, including nontransportation options. A railroad could, for example, show that a shipper or its customers could readily substitute another product for the one transported by rail (i.e., product competition) or ship to and from alternative locations (geographic competition).[28] However, since 1998 STB has prohibited such showings on the basis that they "significantly impede the efficient processing" of the proceedings and present "undue burdens and obstacles" for shippers challenging rates.[29] This decision was in direct response to the demand by Congress for the timely handling of rate challenges, "avoiding delay in the discovery and evidentiary phases" of proceedings.[30]

STB reported that rate cases proceeded more quickly after the exclusion of geographic and product competition from market dominance inquiries. However, a number of cases in the past several years have caused STB to express concern that assessments of market dominance will once again slow down and potentially deter rate challenges. It has stated that "new cases involving challenges to dozens, if not hundreds, of transportation rates raise complex market dominance issues. Without some more objective means of resolving these issues quickly, the market dominance inquiry will soon dwarf the rate reasonableness inquiry."[31]

In view of the requirement to expedite market dominance inquiries, STB has increasingly turned to URCS. It has reasoned that its use is valid because "Congress regarded R/VC ratios as an appropriate measure for allocating joint and common costs among rail shippers, as reflected in the 180 percent R/VC jurisdictional floor for rate relief."[32] A case in 2012, for example, was

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[27] 49 USC §10707.

[28] For example, an electric utility that burns coal may be able to convert to natural gas supplied by a pipeline or obtain power on the wholesale market (creating product competition), or a water treatment plant may obtain chemicals from suppliers in regions served by other carriers (creating geographic competition).

[29] STB Ex Parte No. 627, December 10, 1998.

[30] 49 USC §10704(d), §10701(d)(3).

[31] STB NOR No. 42123, M&G Polymers USA, LLC, v. CSX Transportation, Inc.

[32] STB Ex Parte No. 657-1, Major Issues in Rail Rates Cases.

brought by a producer of plastic pellets contending that the defendant railroads had market dominance affecting rates in 42 markets.[33] The central issue was whether trucks, which are sometimes used to transport the pellets, function as a practical constraint on railroad pricing. To assess this potential, STB has resorted to using URCS and its R/VC values to estimate the highest price that the railroad could charge the pellet shipper without causing substantial traffic to be diverted to trucks.[34]

In 2013, the Association of American Railroads petitioned STB to restore product and geographic competition. It cited the changing nature of rate relief complaints and the growing complexities of making market dominance decisions. STB ruled against the restoration. It found that railroads did not offer a practical framework that could be used in proceedings to establish the existence and practical effect of these nontransportation forms of competition.[35]

Antitrust agencies routinely consider product and geographic competition when they define the relevant market in merger reviews. STB itself has continued to permit evidence of product and geographic competition in deciding rate cases involving pipelines.[36] Such forms of competition can affect the willingness to pay for rail transportation on a route, perhaps significantly (USDOJ and FTC 2010, Chapter 4). Many other factors can affect willingness to pay, including wages, the price of other inputs, and the productive capacity at a plant. Accordingly, thorough assessments of the competitive and demand conditions in a market will be inherently site-specific and fact-intensive. Under such circumstances, market dominance proceedings that are undisciplined could be prone to lengthy delays that deter rate complaints.

An alternative to the categorical prohibition of certain kinds of evidence as a way of preventing delay is to discipline the process itself by using deadlines to compel parties to prioritize their arguments and evidentiary presentations. When they conduct merger reviews, the antitrust agencies follow a process with legislated timelines that allow 30 days for initial assessments about the relevant market and other substantive issues.[37] In railroad market dominance inquiries, statutory deadlines might bring about faster and more efficient competition evaluations without the need for excluding types of evidence. Their introduction is considered later in this report.

RATE REASONABLENESS STANDARDS

If a shipper is charged a tariff rate that exceeds 180 percent of variable cost and can prove it ships in a dominated market, it is eligible to challenge the rate by using one of three main

[33] STB NOR No. 42123, M&G Polymers USA, LLC, v. CSX Transportation, Inc.

[34] STB reasoned that truck prices close to 180 percent of R/VC would be a clear indicator of the competitive viability of trucks; however, the agency needed to establish how high the R/VC percentage could go before attracting truck competition. To do this, STB consulted URCS to calculate an R/VC that the railroad would need to average for all of its potentially high (>180 percent) R/VC traffic in order to earn a return on investment equal to the cost of capital. (The idea was that the traffic above 180 percent R/VC is primarily responsible for the railroad's revenue adequacy.) STB then compared this average R/VC with the R/VC that would trigger truck competition. STB ruled that the latter exceeding the former would indicate that trucks do not provide an effective means of competition. Because the URCS variable cost numbers are essentially arbitrary, so is this procedure.

[35] STB Ex Parte No. 717.

[36] See STB Docket No. 41685, CF Industries, Inc., v. Koch Pipeline Company, LP, May 3, 2000.

[37] The U.S. Department of Justice (USDOJ) and the Federal Trade Commission (FTC) review most mergers under the timelines set by the Hart–Scott–Rodino Act of 1976. Once information compliance is met, USDOJ and FTC can request a second 30-day period to seek additional information if concerns arise.

methods for judging rate reasonableness. The traditional method for large claims is a SAC proceeding. In response to congressional demands for faster handling of rate cases,[38] STB has instituted two additional streamlined methods to be used mostly for smaller claims.

SAC Test

Origins

One stated priority of ICC in first implementing the maximum rate provisions in the Staggers Rail Act was to develop a method for assessing rate reasonableness that could be used in cases brought by coal shippers. The concern was that they were "caught in the transition to a less regulated environment. . . . and may be subject to monopoly abuse because they had made investments or locational decisions, or entered into long-term supply contracts, during the pre–Staggers Act period of greater rate scrutiny" (ICC 1985, 3). The agency's other stated priority was to ensure that the assessment method introduced did not conflict with the law's requirement that railroads be allowed to earn adequate revenues.[39]

The 1985 *Coal Rate Guidelines* introduced the regulatory concept of "constrained market pricing." The guidelines state that a railroad's rates for the transportation of market-dominated traffic would be subject to several constraining factors. The primary constraint is revenue adequacy. The guidelines declare that "captive shippers could 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" (ICC 1985, 11). However, ICC did not explain how it would implement the constraint and whether the application of a firmwide revenue adequacy constraint implied an intention to scrutinize, or even cap, a railroad's overall profitability.

Absent further guidance on the application of a firmwide revenue adequacy constraint—or any near-term prospects for its use given the still tenuous financial condition of railroads in 1985—the *Coal Rate Guidelines'* two other constraints for judging rate reasonableness took precedence. First, the shipper would not be required to bear the cost of any demonstrated management inefficiencies; that is, ICC would not accept management inefficiencies as a defense for a high rate. Second, the shipper would not be required to bear the cost of facilities or services from which it derives no benefits. ICC declared that such "[c]ross-subsidization of other shippers is effectively precluded" (ICC 1985, 4).

To implement these two constraints, ICC declared that a shipper could not be charged more than the "stand-alone" cost of providing service, defined as a cost that "approximates the full economic costs, including a normal profit, that need to be met for an efficient producer to provide service to the shipper(s) identified" (ICC 1985, 7). Because a railroad's network and other production facilities are used to provide a range of services to many shippers, the SAC is the theoretical cost the railroad would incur if it only provided the single service in question, without supplying the additional services sharing the production facilities. Of course, this cost cannot be directly observed. Hence, ICC introduced the SAC test, the stated purpose of which was to estimate a competitive rate level "to determine the least cost at which an efficient competitor could provide the [stand-alone] service" (ICC 1985, 15). That estimated rate level

[38] 49 USC §10704(d), §10701(d)(3).
[39] H.R. 1035, 96th Congress, Second Session, 54 (1980), as cited by ICC 1985, 10–11.

would thus "represent the theoretical maximum rate that a railroad could levy on shippers without substantial diversion of traffic to a hypothetical competing service" (ICC 1985, 6).

SAC's Questionable Applicability to Railroad Regulation

The SAC test was not invented by railroad regulators but imported from the economics literature on utility regulation during the 1970s, particularly as applied to the regulated telecommunications sector of that time.[40] As Pittman (2010) points out, the idea of calculating the SAC of a service was conceived to aid regulators in setting rates charged by firms whose economies of scale and declining average costs made setting regulated rates equal to marginal cost problematic for cost recovery. When they were regulated as monopolies, these firms were generally required to provide service at long-run breakeven—that is, they were restricted to earning a rate of return that is just competitive (i.e., not supracompetitive or earning residual "economic profits"). The SAC test was conceived to provide regulators with an approximation of the rates that groups of customers (whose services are supplied through use of the same production facilities) should be expected to pay to cover fully the stand-alone cost of providing their service without subsidizing the services provided to other customers.

Consider a regulated monopolist that is subject to a constraint of zero economic profits (i.e., breakeven). Any rate that it charges to one group of customers that is above the SAC of supplying service to them necessarily means that the other customers are paying less than the incremental cost of providing them service (i.e., the difference between the firm's total cost and the SAC of providing service to the first group). In this sense, the second group is being subsidized.[41] If the monopolist has economies of scale and scope, it also follows that the second group is paying less than the SAC of serving them. A ratemaking structure that is designed to avoid such cross-subsidies may be desirable to regulators to avoid imposing an unfair a burden on one set of customers. It may also be desirable on efficiency grounds to keep the rate structure of the regulated firm from inadvertently inviting entry by less efficient, higher-cost suppliers seeking to attract the business of the customers paying the subsidy. Of course, any concern over inefficient entry is inapplicable to railroads, inasmuch as the prospect of high rates inviting railroad entry, with its large fixed and sunk costs, is negligible.[42]

As noted above, the *Coal Rate Guidelines* are explicit in referring to the subsidy-free goal as a rationale for the SAC test, which implies an interest in the fairness aspect of cross-subsidization—that is, to ensure that shippers are not forced to pay higher rates that benefit other shippers. However, as Pittman (2010) explains, railroads are not utilities with rates that are fully regulated or that are precluded from earning positive economic profits. Railroads are free to set their own rates and to earn profits. A private railroad not facing a risk of competitive entry is highly unlikely to reduce its total profit by passing along revenues earned from one group of shippers to supply subsidized service to others.

Thus, the absence of any legitimate risk of shipper cross-subsidies or of concern over efficiency or fairness effects arising from such cross-subsidies makes the conceptual basis for

[40] Credit for formalizing the concept of subsidy-free pricing to define the concept of cross-subsidization is generally given to Faulhaber (1975).

[41] The profit constraint implies that the firm is not allowed to "pocket" the difference between the SAC and the revenues earned from the higher rate but must pass it along to other customers through lower rates.

[42] Of course, the complainant shipper should welcome entry and would obviously not dispute a rate on grounds that it would spur inefficient entry.

applying a SAC test for railroad rate regulation highly questionable. The test might still be useful in ensuring that a railroad does not try to defend a disputed rate by pointing to costs that actually arise from management inefficiencies. The simulated, stand-alone railroad should be designed to be efficient and thus to reveal any such inefficiencies to preclude such a defense. While the *Coal Rate Guidelines* make clear that part of SAC's purpose is to identify such management inefficiencies,[43] that purpose appears highly questionable today in light of the railroads' own profit incentives, which should motivate management efficiency.

Thus, as Pittman explains in his critique, the decision by regulators to apply the SAC test must hinge on purposes other than those arising from cross-subsidies or an intention to protect efficiency. One obvious advantage of SAC is that it links directly, even if only ostensibly, to the law's interest in ensuring railroad revenue adequacy. Viewed in this way, SAC is potentially defensible from a legal and administrative standpoint if it can be applied in a consistent way. However, its disadvantages, as explained next, are substantial. SAC proceedings are costly to bring, and shippers with characteristics fundamentally different from those of the coal shippers for whom the process was designed find the test especially difficult to apply.

SAC's Complexity

Designing an efficient stand-alone railroad and estimating its costs for adjudicatory purposes are complicated endeavors. The SAC procedure requires the complainant shippers and the railroad to design a hypothetical railroad that offers stand-alone service. As detailed in Box 3-2, this requires extensive documentation with regard to its configuration and investment and operating expense items such as locomotives, car leasing, personnel, materials, and administration. Complex computer programs are required to model the hypothetical railroad and to test its operating plan and configuration against the forecast demand of the traffic groups it is supposed to serve. According to the *Coal Rate Guidelines*, the simulations and their assumptions must be able to "show that the alternative [railroad] is feasible and could satisfy the shipper's needs. All of its data on construction and operating costs must be verifiable" (ICC 1985, 15).

A SAC presentation is inevitably complex. The minimal evidence that litigants must provide is substantial, and litigation costs are constrained only by the amount of revenues at stake for the shippers and railroads involved in the dispute. As Pittman (2010) and Johnstone (2009) have documented, the higher the monetary sums at stake, the more elaborate, and in some respects fanciful, the SAC scenarios tend to become. A review of past cases is punctuated with estimates of landscaping costs, minutiae about station dwell times, debates over operating plan details, and speculation about maintenance needs as the hypothetical railroad ages. They contain details and determinations with regard to matters whose relevance cannot in practice be evaluated by outsiders and presumably can be evaluated by STB only with much dedicated expertise and effort.[44] Whether the complex hypothetical scenarios that emerge have any connection to the genuine revenue needs of the defendant railroad, which operates a broader network shared by many shippers with many fixed and sunk costs, cannot be readily discerned.

[43] Indeed, the second constraint of the *Coal Rate Guidelines* specifies that "a captive coal shipper would not be required to bear the cost of demonstrated management inefficiencies in the carrier's operations and pricing structure" (ICC 1985, 2).

[44] After reviewing the evidence submitted in many cases, Pittman (2010, 4) points out that the "process is plagued with both problems of asymmetric information and the resulting incentives and ability to pick and choose among such information in order to further one's own agenda."

Box 3-2

Steps in a SAC Presentation

To make a SAC presentation, a shipper designs a stand-alone railroad (SARR) tailored to serve an identified traffic group. It is based on the optimum physical plant or rail system needed for that traffic. By using information on the types and amounts of traffic moving over the railroad's system, the complainant selects a subset of that traffic (including its own traffic, to which the challenged rate applies) that the SARR would serve.

On the basis of the traffic group to be served, the level of services to be provided, and the terrain to be traversed, a detailed operating plan must be developed for the SARR. Once an operating plan is developed that would accommodate the traffic group selected by the complainant, the SARR's investment and operating expense requirements (including such expenses as locomotive and car leasing, personnel, materials and supplies, and administrative and overhead costs) must be estimated. The parties must provide documentation to support their estimates.

It is assumed that investments normally would be made before the start of service, that the SARR would continue to operate into the indefinite future, and that recovery of the investment costs would occur over the economic life of the assets. However, STB's SAC analysis only examines a set period of time, commonly 10 years. In that analysis, the revenue requirements for the SARR are estimated on the basis of the operating expenses that would be incurred and the portion of capital costs that would need to be recovered during that period. A computerized discounted cash flow model simulates how the SARR would likely recover its capital investments. It takes into account inflation, federal and state tax liabilities, and the need for a reasonable rate of return. The annual revenues required to recover the SARR's capital costs (and taxes) are combined with the annual operating costs to calculate the SARR's total annual revenue requirements.

The revenue requirements of the SARR are then compared with the revenues that the railroad is expected to earn from the traffic group. There is a presumption that the revenue contributions from non–issue traffic (that is, the traffic of noncomplaining shippers) should be based on the revenues produced by the current rates. Traffic and rate level trends for the traffic group are forecast to determine the future revenue contributions from that traffic.

STB then compares the revenue requirements of the SARR with the total revenues to be generated by the traffic group over the SAC analysis period. URCS is used to calculate the variable costs to allocate revenues from shared, or crossover, traffic. Because the analysis period covers multiple years, a present value analysis is used that takes into account the time value of money; the annual over- and underrecovery are netted as of a single point in time. If the present value of the revenues that would be generated by the traffic group is less than the present value of the SARR's revenue requirements, the complainant has failed to demonstrate that the challenged rate levels violate the SAC constraint. On the other hand, if the present value of the revenues from the traffic group exceeds the present value of the revenue requirements of the SARR, STB must decide what relief to provide to the complainant by allocating the revenue requirements of the SARR among the traffic groups and over time.

SOURCE: STB Ex Parte No. 646-1, September 4, 2007.

The SAC evidentiary rules were originally intended for use by coal shippers, who ship large volumes on a regular basis over fixed traffic corridors. They have been modified to allow their use by other shippers whose flows do not dominate a corridor. Shippers can propose the inclusion of traffic that crosses over the corridor (or set of corridors) and contributes net revenues (i.e., profits) that would effectively lower the amount of revenue that the stand-alone railroad would need to earn from the complainant shipper to maintain the service. Railroads can argue that some or all of this proposed crossover traffic should be excluded. For shippers of relatively small quantities, the significance of the railroad's profits earned from the crossover traffic is crucial. The profit contribution from crossover traffic is estimated by using the R/VC markups derived from URCS.

If STB finds that the revenue earned by the defendant railroad from the complainant shipper exceeds the revenue needed by the stand-alone railroad to serve this traffic, after profits from any crossover traffic are factored in, it will find the rate to be unreasonable. The revenue-adequate rate that the stand-alone railroad would need to charge the shipper would become the maximum rate judged reasonable by STB. If the revenue-adequate rate, as determined by SAC, is lower than the defendant railroad's rate, it becomes the basis for the assessment of overcharge penalties and a prescribed rate for future traffic. The prescribed rate can be no lower than 180 percent of the traffic's R/VC ratio as derived from URCS.

SAC's High Cost and Inappropriateness

STB estimated in 2013 that a SAC case costs about $5.8 million for a shipper to litigate.[45] The portion of these costs pertaining to the minimal evidentiary requirements of a SAC case is difficult to determine because of the parties' incentive to keep adding evidence and details in proportion to the size of the claim. As noted, SAC was introduced by ICC with coal shippers in mind. Thirty-seven of the 44 SAC cases brought before STB through 2014 involved coal shippers, who won seven and settled in 21 others (Table 3-2). Coal shippers maintain that the SAC process is burdensome and leads to rates being judged reasonable at conservatively high levels out of deference to revenue adequacy, when the true revenue needs of the railroad are lower because of network economies. However, even with these concerns, coal shippers have demonstrated the ability to bring SAC cases and prevail in them.

TABLE 3-2 Rate Disputes Adjudicated by STB on the Basis of SAC, 1996–2014

Disposition	Coal	Grain	Minerals	Chemical
Rate reasonable	7[a]	1	0	2
Rate unreasonable	7	0	1	0
Settlement	21[a]	0	0	3
Withdrawn	2	0	0	0
Total	37[a]	1	1	5

[a] One SAC case was originally ruled as rate reasonable, but the case was readjudicated after a court remand and subsequently settled.
SOURCE: STB (http://www.stb.dot.gov/stb/industry/Rate_Cases.htm).

[45] STB Ex Parte No. 715, Rate Regulation Reforms, July 8, 2013, pp. 10–11.

For coal shippers who transport large volumes over fixed routes, the multimillion-dollar litigation costs involved in bringing a SAC case may be recouped by the large reparations and lower rates prescribed on winning a case. The demonstrated ability of coal shippers to bring and win SAC cases may have played a role in the large shift of coal traffic from common to contract carriage during the past decade, as documented in Chapter 2. Accordingly, the law's rate relief provisions may give coal shippers leverage in negotiating more favorable contract rates and service. Whether SAC has contributed to "fairer" rate outcomes for coal shippers cannot be judged in the absence of legislated evaluation criteria on what constitutes a fair rate.

In comparison, shippers who transport smaller volumes of traffic over more varied routes have not shown an ability to use SAC, much less to win a case. Since SAC's inception 30 years ago, only one case has been filed by shippers of grain or other agricultural products. McCarty Farms lost the case in 1997.[46] Grain shippers in particular have argued that the design of a stand-alone railroad entails large litigation expenses that cannot be justified when a grievance involves a relatively small claim. In addition, these shippers, whose traffic may not be the dominant flow (or remotely close to it) in a corridor or set of corridors, must depend heavily on the profits generated by any crossover traffic to cover common costs and lower the revenue-adequate rate as determined by SAC. These profit contributions in turn are computed from R/VC markups derived from the unreliable URCS. Complainant shippers can therefore face substantial uncertainty about a fundamental aspect of their SAC case. Such uncertainties, coupled with the high litigation costs of SAC, have discouraged most shippers of commodities other than coal from making use of the process.

Within a short period after adopting the *Coal Rate Guidelines*, ICC recognized that shippers of lower volumes over more varied routes would not be strong candidates for disputing a rate with the SAC test. However, ICC took many years to develop a set of alternative procedures. When Congress created STB in 1995, it required the introduction of alternatives to SAC.[47]

Simplified Procedures

Congress recognized that the SAC process was not being used by many shippers. When it created STB in 1995, it instructed the agency 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." This directive led STB to create several alternative procedures intended to be less expensive and faster to litigate and administer but accompanied in some cases by limits on the potential award to shippers. The two expedited options, which were introduced in 1997 and revised in 2007, are the simplified SAC and the three-benchmark methodologies.[48] Both procedures restrict the evidence parties can submit and set a time limit on decisions.[49] STB is required to decide on the case within 120 days of the close of arguments, and parties are required to participate in a 20-day nonbinding mediation process at the outset of the case.

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[46] See Johnstone (2009) for a history of the McCarty Farms rate relief case. Johnstone points out that McCarty Farms itself, which was one of the largest grain shippers in the case named for it, shipped only 3,000 tons of grain per year, which is less than the total tonnage in a single unit train carrying coal.

[47] See STB Ex Parte No. 347-2, Rate Guidelines—Non-Coal Proceedings, December 27, 1996.

[48] STB Ex Parte No. 646-1, September 5, 2007.

[49] STB Ex Parte No. 646-1, September 5, 2007.

Simplified SAC

The simplified SAC procedure is conceptually the same as a full SAC procedure. It is streamlined by replacing the design of a hypothetical stand-alone railroad and postulation of its customer base with the apparently less demanding requirement of estimating the SAC of providing the current service with its current traffic on the actual railroad involved. The core analysis is thus an assessment of the existing railroad facility rather than the design of an efficient railroad optimized for the traffic at issue. The litigants are required to estimate the return on investment that would be needed to replicate the existing facility by using estimates of replacement costs, while URCS is used to estimate the railroad's operating costs. In 2012, STB removed restrictions on the total rate relief that could be awarded. The removal was justified on the grounds that any award from a simplified SAC (i.e., lower prescribed rate in conformance with the stand-alone revenue needs) would likely be smaller than that from a full SAC case because of the assumption that the rail service replicated in the simplified SAC is already efficient. This assumption could reduce any differential between the disputed rate and simulated stand-alone rate and thereby lower the potential reward to the shipper.[50]

In 2013, STB estimated that a simplified SAC would cost a shipper about $4 million to litigate.[51] From 1999 through 2014, five rate cases have been adjudicated before STB on the basis of the simplified SAC procedure. All involved chemical shippers and all led to a settlement.[52]

Three-Benchmark Process

The three-benchmark process is even more streamlined than the simplified SAC. The procedure's simplicity derives largely from its heavy reliance on URCS. STB compares the R/VC of the disputed rate with the average R/VC of the portion of the defendant railroad's other "potentially captive" traffic that has an R/VC higher than 180 percent; this is one benchmark. For a second benchmark, STB compares the disputed rate's R/VC with the average R/VC of the railroad's traffic that most resembles that of the traffic at issue with regard to such characteristics as commodity type, carload size, and travel distance. Finally, STB compares the disputed rate's R/VC with calculations of the average markup that the railroad is presumed to need on all of its potentially captive traffic to make the railroad revenue adequate. The purpose of the three benchmarks is "to ensure that the complaining shipper's traffic is not bearing a disproportionate share of the carrier's revenue requirements vis-à-vis other relatively demand-inelastic traffic without good cause."[53] STB applies the three benchmarks to a formula for ascertaining when a disputed rate is reasonable.[54]

The three-benchmark method was estimated by STB in 2007 to cost a shipper about $250,000 to litigate. It is now subject to a $4 million cap on rate relief over 5 years.[55] Through 2014, five cases have been brought, all by chemical shippers. One led to a ruling of a rate being unreasonable, and four led to settlements. In 2014 comments to STB, a number of shipper

[50] STB Ex Parte No. 715, Rate Regulation Reforms, July 25, 2012.
[51] STB Ex Parte No. 715, Rate Regulation Reforms, July 8, 2013, p. 22.
[52] STB (http://www.stb.dot.gov/stb/industry/Rate_Cases.htm).
[53] See STB Ex Parte No. 347-2, Rate Guidelines—Non-Coal Proceedings, December 27,1996.
[54] For a description of the calculations, see STB Ex Parte No. 646-1, September 5, 2007.
[55] STB Ex Parte No. 715, July 18, 2013.

groups, including the National Grain and Feed Association, complained that the caps on awards were too low to justify the expense of bringing a case and that the evidentiary burdens, decision-making uncertainties, and procedural delays remained too great.[56]

SUMMARY ASSESSMENT OF RATE RELIEF PROCEDURES

STB's rate relief procedures involve three steps that appear to be distinct and independent but that are integrated in an important sense because of the need of regulators to ensure that the amount of rate relief resulting from them does not impair railroad revenue adequacy. Perhaps most significantly, the identification of rates that are candidates for further scrutiny with respect to market dominance and reasonableness is determined by a statutorily defined R/VC screen. The screen itself is arbitrary and cannot be implemented in a reliable and economically valid way because of its reliance on cost allocations as implemented by URCS. This unreliability appears to have prompted regulators to institute exacting and often costly procedures for assessing market dominance and rate reasonableness. The cost and complexity of the process have contributed to shippers who have relatively small claims not taking advantage of the law's maximum rate protections.

In stipulating that the variable cost of a priced unit of traffic be calculated as a means of screening it for eligibility for rate relief, the Staggers Rail Act created an insoluble problem for regulators. Most railroad costs are shared by traffic and cannot be unambiguously allocated to individually priced units of traffic. URCS, like all similar schemes for allocating variable costs, is incapable of producing results with any stable relationship to an individual movement's price. Previous studies have not found any connection between the R/VC relationships that emerge from URCS and a railroad's market power. However, those studies, as well as this study, have revealed that URCS produces inexplicable results. Among them are the pricing of about 25 percent of all railroad shipments below their presumed variable cost and most short-haul and hazardous materials traffic exceeding the 180 percent R/VC threshold.

Perhaps to compensate for an unreliable URCS-based rate screening process, STB has instituted exacting and complex procedures for assessing market dominance and rate reasonableness. Railroad revenue adequacy is safeguarded as a practical matter because of these imposing procedures, but shipper access to rate relief is restricted in a biased manner. The once-burdensome market dominance assessment, which was designed to ensure that any rate that passes the unreliable URCS-based R/VC screen is from a market lacking competition, was streamlined by STB by limiting the evidence that could be introduced by railroads rather than simply by adopting review timelines. The processing speed gained from this action has only marginally expanded access to rate relief, in part because the main evidentiary method used for ruling on the reasonableness of a rate requires a complex SAC presentation. Such presentations entail large minimum litigation expenses that cannot be justified by shippers with relatively small claims, and they are inapplicable to shippers whose traffic is not close to being the dominant flow along the corridor it uses. The high fixed cost and inappropriateness of this standard have led to few shippers of commodities other than coal bringing a SAC case.

[56] See shipper comments to STB Ex Parte No. 665-1, Rail Transportation of Grain, Rate Regulation Review. In particular, see comments by the National Grain and Feed Association, June 26, 2014, p. 14. In revising the simplified procedures in 2007, STB concluded that shippers were reluctant to use the simplified procedures because of vagueness in the requirements and uncertainty about eligibility.

After more than a decade of complaints about SAC from shippers of grain, chemicals, and other commodities that regularly use common carriage, STB introduced two expedited evidentiary methods for assessing rate reasonableness. One is a somewhat simplified version of SAC, and one assesses the profitability of traffic as determined by R/VC ratios derived from URCS. With each effort to streamline the rate relief process, STB has increased its dependence on the arbitrary cost allocations derived from URCS. STB is thus moving toward replacing the inappropriate SAC test with URCS-based procedures that offer even less predictable decision criteria and lack even that test's weak conceptual basis. Meanwhile, shippers of some commodities that are heavy users of common carriage, including grain, have not used the expedited methods after more than 15 years. They contend that the procedures continue to be irrelevant and to impose a substantial cost burden and uncertainties about decision criteria.

RATE ARBITRATION IN CANADA

To simplify and expand access to rate relief, STB has periodically considered the use of arbitration as a method for rate dispute resolution, as have members of Congress in various legislative proposals.[57] Arbitration is normally viewed as an alternative method for resolving disputes. It involves proceedings that are less formal and therefore faster and more economical than formal discovery and adjudication proceedings. The arbitrator reviews the evidence, listens to the parties, and then makes a decision. STB now uses arbitration to resolve certain nonrate disputes between shippers and railroads, and a voluntary arbitration and mediation program is used by BNSF Railway and grain shippers to settle rate and service disputes in Montana.[58] The National Grain and Feed Association has operated an arbitration system for railroad–shipper disputes since the early 20th century, which it expanded in 1998 to include involvement by major railroads.[59]

In conducting hearings during 2001 on the potential to use arbitration for small rate cases, STB also examined the potential for using the binding, final-offer form that is practiced in Canada.[60] The agency concluded that because the law states that STB itself must adjudicate all challenged rail rates, such an alternative process would need to be legislatively authorized.[61]

Canada's arbitration process merits consideration because of the similarities and interconnectivity of the U.S. and Canadian railroad industries. As in the United States, the Canadian freight railroad industry has been substantially deregulated for about 30 years, and the easing of regulation has been accompanied by improved productivity and lower freight rates.[62] Canada requires railroads to offer common carrier service and exempts traffic moved under

[57] A recent legislative proposal for rate arbitration was introduced on September 8, 2014, in S. 777, 113th Congress, second session.
[58] BNSF, the Montana Farm Bureau, and the Montana Grain Growers have informally mediated grain farmers' rail issues since 2004, but they agreed to establish a formal process in 2008.
[59] See National Grain and Feed Association Trade Rules, Arbitration Rules, Rail Arbitration Rules and Rail Mediation Rules, 2014 (http://www.ngfa.org/wp-content/uploads/2014_TradeRules.pdf).
[60] STB Ex Parte No. 586, Arbitration—Various Matters Relating to Its Use as an Effective Means of Resolving Disputes That Are Subject to the Board's Jurisdiction, September 18, 2001.
[61] STB Ex Parte No. 586, September 20, 2001, Footnote 7.
[62] In comparison, freight rail systems in Europe and Australia are vertically separated or hybrids of vertical separation and integration. In the United Kingdom and Sweden, for example, independent train operators compete over a single rail network owned by a separate entity, whereas in Germany and Australia a single vertically integrated railroad is required to provide access to independent train operators (Cairns 2013).

confidential contract from regulations governing rate and service offerings, as does the United States. The two major Canadian railroads are closely integrated with the U.S. rail system and share the characteristics of vertical integration and private ownership (Cairns 2013). Both the Canadian Pacific (CP) and Canadian National (CN) railroads are part of larger companies that include two U.S. Class I railroads, the Soo Line (CP) and Grand Trunk (CN). About 30 percent of the revenues of CN and CP are earned from cross-border movements (Cairns 2014). Although each concentrates its operations in different parts of Canada—CP in the West and CN in the East—the two railroads are competitors for substantial amounts of traffic, since both operate transcontinental systems.[63]

Despite these similarities and the integration of the two countries' railroad systems, Canada's regulatory regime differs from that of the United States, particularly with respect to provisions granting rate relief. Canadian law requires that rate disputes be decided by arbitration according to the final-offer decision-making rule. Any shipper dissatisfied with a tariff rate or service offered by CP or CN may apply to the Canadian Transportation Agency (CTA) for arbitration to resolve the dispute. No market dominance assessment is required, nor does Canada have a rate screening process such as the R/VC formula used in the United States.

CTA manages the application, but an independent arbitrator is selected to decide on the dispute. Both parties to the arbitration are required to present their arguments, evidence, and offers for resolution of the dispute in their final form (that is, with no additional opportunity for amendments). The arbitrator is bound to choose one of the two offers without modification. The law limits the decision's applicability to a duration of 1 year. It also limits the duration of the arbitration process itself—60 days is allowed for most disputes, and 30 days is allowed for disputes involving monetary sums of less than $750,000 (Cairns 2013). The details of the arbitrator's decision, as well as the specific offers proposed by the parties, are kept confidential.

The requirement of confidentiality is intended to reduce the formality of the proceedings and to avoid introducing precedents that could discourage parties from negotiating a settlement or from making other concessions that help resolve the dispute more quickly. The imposition of time limits is intended to bring economy to the process and to ensure that shippers are not precluded from access to rate relief as a consequence of slow processing and high litigation costs. In addition, the time limit in conjunction with the final-offer rule injects uncertainty into the process, which limits the likelihood that any one party will take an extreme position and encourages the settlement of disputes. Box 3-3 provides an overview of the key features of final-offer arbitration and the procedures used in Canada.

Canada does not mandate that arbitrators have any special knowledge or training in the railroad industry, and arbitration decisions are confidential and do not create precedent. For these reasons, the process can be even more unpredictable and compel compromise, and only on rare occasions do parties avail themselves of the process in successive years (Cairns 2014). Because the decisions of arbitrators are kept confidential, the number of decisions favoring shippers versus railroads is unknown. Cairns estimates that about 30 decisions in total have been rendered

[63] According to Cairns (2013, 33), the two railroads compete directly for about 40 percent of Canadian rail freight traffic, and another 20 percent could be trans-loaded (i.e., short-haul movements could be made by truck to gain access to the second railroad).

Box 3-3

Final-Offer Rate Arbitration in Canada

Arbitration is intended to be a faster, more flexible, and more economical means of dispute resolution than litigation. In conventional arbitration, the arbitrator is free to impose any award that he or she believes is appropriate. The tendency of arbitrators to split the difference between each side's offer can reduce the prospects for a negotiated settlement, since both sides are motivated to make extreme offers under the assumption that the arbitrator will select a compromise position (Kochan and Katz 1988, 279–284).

Final-offer arbitration (FOA), with its "either-or" format, is designed to have the opposite effect by prompting a convergence of offers, since each party believes that making a more reasonable offer will increase the odds of its being selected. By introducing uncertainty into the process, FOA is designed to prompt the parties toward their most reasonable offer and therefore to induce settlements. Kochan and Katz (1988, 284) report that only 10 to 15 percent of FOA cases lead to an arbitrator decision, compared with 25 to 30 percent of conventional arbitrations. FOAs are often preceded by mediation to start the settlement discussion.

In Canada, individual shippers or groups of shippers can apply for arbitration to challenge an existing tariff rate or a tariff rate being offered by a railroad in anticipation of an expiring contract rate.[64] The railroad must receive written notice of the shipper's intention to pursue arbitration at least 5 days before the shipper applies with CTA. CTA appoints the arbitrator, and the shipper and railroad share the costs of the process. Within 10 days of the application being filed, the shipper and railroad must submit their final offers to CTA, including the proposed rates. Within 5 days of receiving the final offers, CTA must refer the matter to the arbitrator.

The arbitrator must consider whether the shipper could use any other competitive means of transportation. This requirement is intended to make it more difficult for shippers who have access to viable transportation alternatives to succeed and thus to make them less inclined to bring a case. Otherwise, CTA does not specify the criteria that an arbitrator must consider in reaching a decision or the kinds of evidence that parties must submit. Because the process and its results are kept confidential, the decisions do not establish precedents concerning the evidence submitted or how it is evaluated and weighed.

The arbitrator in a Canadian rate case is required to render a decision within 60 days of the shipper's original submission to CTA, and the decision is made retroactive to the date on which the shipper filed its application. The duration of the decision is limited to 1 year.

since the process was instituted in 1988. This estimate is consistent with that in a 2001 report by a panel appointed by the Canadian government to review the regulatory process. The panel reported 23 decisions during the process's first 13 years and estimated that half of the arbitration cases were settled before a decision (Minister of Public Works and Government Services Canada 2001, 35).

[64] For a detailed review of the process, see http://www.pulsecanada.com/transportation/resources/final-offer-arbitration-general-information.

Canadian disputes can involve service issues, but Cairns (2014) estimates that most involve rate grievances. Because there is no eligibility requirement for a shipper to dispute a rate, any shipper can file a dispute or, as Cairns points out, threaten to do so to gain leverage in negotiations with railroads. According to the 2001 panel report, railroads have expressed concern about the ability of shippers to seek rate relief without good cause. However, the panel pointed out that arbitrators are instructed by CTA to assess whether the shipper has competitive means of transporting goods. The panel concluded that as a consequence of this requirement, a shipper in a competitive market would be unlikely to endure the complexity and expense of a case in view of the low likelihood of prevailing once its competitive status was exposed (Minister of Public Works and Government Services Canada 2001, 71).

COMPETITIVE RATE BENCHMARKING TO IDENTIFY UNUSUALLY HIGH RATES

When the R/VC formula was introduced in the Staggers Rail Act more than 30 years ago, rates had long been set by cartels under regulatory oversight. Hence, there was little practical value in trying to compare rates in dominated versus more competitive markets. The regulatory practice of assigning portions of a railroad's total costs to individual units of traffic was therefore retained as a way of identifying potentially excessive rates. For reasons that have been explained in this chapter, STB's URCS-derived R/VC formula does not indicate whether a rate is unusually high relative to rates of comparable shipments in competitive markets. In short, comparing the arbitrarily defined URCS variable cost with an actual rate is not a sound basis for screening shippers for eligibility for relief. It cannot be justified on economic grounds and has led to the development of a rate relief system that is characterized by large inequalities in shipper access to relief.

Nevertheless, STB must identify traffic eligible to pursue rate relief. Its method of doing so must ensure that shippers in markets lacking effective competition do not pay unreasonably high rates and that railroads are not denied the ability to attain revenue adequacy. The challenge for regulators is to replace an unreliable and arbitrary cost allocation scheme with an economically sound approach for identifying rates that may be unreasonable. Such an approach will, in turn, allow for the development of procedures for assessing the reasonableness of rates that are not so burdensome and costly that they effectively deny eligibility for relief to shippers for reasons unrelated to the legitimacy of their claims.

A wealth of information on unregulated, market-based rail prices now exists in STB's annual CWS, along with detailed information on important characteristics of individual shipments. These data, supplemented with information on the competitive structure of individual markets, can be used to develop models of rates determined under effectively competitive conditions. A shipper in a market lacking effective competition can compare its tariff rate with the rate predicted by the model if the shipment were made in a competitive market. The predicted rate, or some designated percentage above it, would become the benchmark for deciding whether the shipper's rate is unusually high and a candidate for a closer rate reasonableness examination.

An illustrative methodology that uses statistical models and readily available data to implement this benchmarking approach is demonstrated in Appendix B. Data on shipment characteristics and rates in effectively competitive markets are used to construct a predicted, or benchmark, rate for any given rail shipment in a presumptively noncompetitive market on the

basis of key observable characteristics of the shipment. The benchmark rate is computed by estimating the distribution of average rates (i.e., revenue per ton-mile) for the shipment conditional on observable characteristics of the shipment mainly derived from CWS data. The characteristics include the distance traveled, the number of carloads in the shipment, the number of railroads involved, and competitive circumstances at the origin and destination (i.e., number of competing railroads and proximity to other modes), as well as controls such as calendar year and railroad. The demonstration shows how models can be constructed for broad commodity groups such as farm products, coal, and chemicals. Models could similarly be developed for narrower product groups (e.g., grain, hazardous materials) as long as there are enough observations for reasonably precise estimation of the conditional distribution.

Once a model of this sort is developed and made public, a shipper could enter a defined set of shipment characteristics, such as travel distance, commodity, car type, and railroad (or railroads) used, into a website or spreadsheet that would predict the competitive benchmark rate. Most of the characteristics to be entered into the model would be readily identifiable by the shipper or could be integrated into the program. For example, the number of railroads serving the market and distance to a waterway can be preprogrammed. The demonstration in Appendix B suggests that such models would be no more complicated to construct and run, and would probably be less so, than the annual derivation of variable costs from URCS. The complexity of the latter (and the potential to upset existing patterns of results) has prevented its basic structure from being changed for decades despite fundamental methodological flaws. Once the statistical models of the type demonstrated in Appendix B are constructed, they could be used from year to year but updated regularly with new data on shipment rates and characteristics as obtained from the annual CWS.

Designation of the percentage above the benchmark rate that would qualify a shipper's tested rate for further scrutiny for reasonableness would be key to the implementation of the models. A shipper's tested rate is unlikely to match the predicted rate perfectly because of the impracticality of having a complete set of information on all of a shipment's economically meaningful characteristics for precise matching with characteristics of shipments in the benchmark group. However, the more the tested rate deviates upwardly from its predicted value, the less likely is its high level due only to the omission of economically meaningful characteristics. Regulators would need to decide the percentage by which a tested rate must exceed its predicted benchmark competitive level before a shipper would be entitled to have its rate scrutinized as potentially unreasonable. Examinations of each model's predictive capability may be undertaken to inform such decisions. Such examinations might cause regulators to apply different qualifying thresholds for different commodities.

Regulators would need to consider an obvious trade-off in making such decisions. On the one hand, a stricter screen (i.e., large percentage threshold) will provide less of a threat to railroad revenue adequacy but would make fewer shippers with legitimate rate grievances eligible for relief. On the other hand, a less strict screen would offer greater opportunity for aggrieved shippers to challenge their rates but would pose a greater threat to railroad revenue adequacy. Although decisions about the appropriate threshold could be controversial, they would be transparent. That is preferable to the current system, which relies on arbitrary cost allocation rules that are used in implementing an arbitrary R/VC threshold.

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Abbreviations

FTC	Federal Trade Commission
GAO	Government Accountability Office
ICC	Interstate Commerce Commission
STB	Surface Transportation Board
USDOJ	U.S. Department of Justice

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4

Review of Other Regulatory Provisions

The preceding chapter focused on the rate reasonableness provisions of the railroad regulatory program. Those provisions deal directly with balancing the interest of railroads in earning adequate revenues against that of shippers in obtaining reasonable rates and service levels. However, they are not the only regulatory requirements or practices that can affect railroad rates, service levels, and revenue adequacy. Because of the impracticality of critiquing all relevant elements of the regulatory program, the committee concentrated its assessment on four provisions that have remained controversial or unsettled in their implementation and that are candidates for change.

The four provisions examined are (*a*) the common carrier obligation and its implications for service quality in a partially deregulated railroad industry, (*b*) the requirement that regulators annually determine the revenue adequacy of Class I railroads and whether this requirement retains a useful purpose, (*c*) the exemption of railroad mergers from standard antitrust reviews focused only on competition and whether a rationale remains for reviews conducted by regulators according to a broader "public interest" appraisal, and (*d*) the authority of regulators to use reciprocal switching orders to forestall or remedy unreasonable rates. The requirements associated with each provision and the history of its implementation are discussed. The committee's assessment of its continued relevance and of the need for changes follows.

COMMON CARRIER SERVICE OBLIGATION

Requirements and History

The obligation of railroads to provide service under terms of common carriage can be traced to English common law and requirements in charters granted by states that gave railroads land rights through eminent domain (Keeler 1983, 19–22). As discussed in Chapter 1, railroads providing common carriage were expected to serve all shippers equally, without "discrimination," and at just and reasonable prices. Later codified in the Interstate Commerce Act, the common carrier obligation, and its emphasis on nondiscrimination as interpreted by courts, was the foundation for many regulatory requirements such as prohibitions on private contracting and the discounting of rates.

Before the commencement of regulatory reforms during the 1970s, all railroad traffic was moved in common carriage. Thus, rates and other terms of service were publicly posted and fairly uniform across shippers. The Staggers Rail Act retained the common carrier duty but transformed both its applicability and its enforceability in a number of ways. First, by requiring regulatory exemptions for all truck-competitive traffic and by legalizing the use of confidential contracts, the law ended the general applicability of common carriage; railroads would become common and contract carriers, held to both regulatory and contractual obligations. Second, by reducing the standardization of rates, the law increased the likelihood of a less homogeneous rail service generally, since service attributes could be expected to vary along with rates. Third, even as regulators were required to establish rules governing the mechanics of a common carrier

service offering, such as tariff disclosure and dissemination practices, they were not given well-defined authorities to prescribe and enforce the substance of these offerings, such as minimally acceptable levels of service speed and reliability.

More than 30 years after the Staggers Rail Act, the common carrier service obligation remains poorly defined. In 2008, the Surface Transportation Board (STB) held a hearing to obtain public input on the extent of the common carrier obligation and to whom it applies.[1] The law simply states that a railroad must "provide the transportation or service on reasonable request."[2] STB's hearing revealed how railroads and shippers differ in their interpretation of the demands and expectations embodied in this requirement. As described in Chapter 2, shippers have expressed concern that railroad service for common carriage is substandard—unpredictable in its quality and unreliable in its provision. Absent clear service standards, shippers contend that a railroad has no reason to maintain a consistent common carrier service and that consequently it will unilaterally revise service terms and conditions.[3]

Railroads maintain that the common carrier service obligation is not absolute. Requests for service can be unreasonable if they do not take into account capacity shortages resulting from exogenous factors such as severe weather and surges in a commodity's demand. This viewpoint was discussed in Chapter 2.[4] The railroads also contend that shipper demands for rail transportation service are not reasonable when such service imposes large uncompensated costs and risks. In particular, railroads have raised concern about potentially ruinous liability from transporting tank car loads of chemicals that present a toxic inhalation hazard (TIH), such as anhydrous ammonia and chlorine (AAR 2011).[5] Although railroads have substantial freedom to set the rates for this common carrier service, STB establishes the rules governing tariff terms such as the allowance of indemnity clauses that can shift liability risks.[6] In situations where TIH shipments are moved in markets lacking effective competition, railroads complain that the threat of rate regulation restricts their ability to raise rates to compensatory levels. They contend that STB's regulatory costing methodology [the Uniform Railroad Costing System (URCS)] omits many of the risk-related costs associated with a TIH shipment and thus exposes the railroad to the law's maximum rate provisions if prices are set in a manner that reflects directly attributable costs.

Shippers maintain that rail transportation is generally safer than truck transportation and that any changes in practice will risk creating a less safe system for transporting many shipments.[7] In their view, the traditional arrangements for allocating liability to the railroad and shipper based on fault have not resulted in ruinous liabilities for railroads, and railroads

[1] STB Ex Parte No. 677, Common Carrier Obligation of Railroads.
[2] In its section governing common carrier transportation (49 USC §11101).
[3] Shipper concerns can be found in the large number of comments submitted to STB Ex Parte No. 677. The examples given here are drawn from statements by the National Grain and Feed Association (NGFA), April 27, 2008, and the Western Coal Traffic League, April 17, 2008.
[4] See comments of the Association of American Railroads (AAR) to STB Ex Parte Nos. 677 (March 2008) and 677-1 (July 2, 2008).
[5] For more detailed discussions of the common carrier obligation and hazardous materials service, see Branscomb et al. 2010 and Abel 2011.
[6] In 2011, Union Pacific Railroad Company (UP) filed a petition requesting that STB allow general tariff provisions that would require TIH shippers to indemnify UP against all liabilities except those caused solely by the railroad. STB denied the petition. It argued that the impact of allowing such a generalized provision would be overly broad and cited agency precedent avoiding broad allowances and relying instead on narrow adjudications of specific tariffs (STB Docket No. FD 35504, April 30, 2013).
[7] See shipper comments to STB Ex Parte No. 677, Common Carrier Obligation of Railroads: Hazardous Materials.

exaggerate their concerns to increase contract bargaining power. They favor interpreting the law's reference to shippers making "reasonable" requests for service as meaning that the request must be "specific as to the volume, commodity, and time of shipment."[8]

Assessment

The common carrier service obligation rests on a long history of legal and regulatory interpretations. Its relevance has been complicated by the industry's partial deregulation and the advent of modern logistics systems. Developments such as just-in-time inventorying, computerized tracking of shipments, and an increasingly globalized and multimodal supply chain have diversified service capabilities and expectations (Lasserre 2004; Hale 1999). The willingness of shippers to pay for service attributes such as speed and reliability is likely higher and more varied today than it once was, and perhaps much higher than during the 1970s, when all traffic was moved in a more homogeneous manner under regulated common carriage.

Historically, regulators focused more on controlling rates than on ensuring service quality. Rates were more quantifiable and possibly more pertinent to shippers when service was supplied according to more uniform tariff terms. As common carrier rates were deregulated, so too was service quality, since a product's price and quality will be interlinked. The common carrier obligation was thus retained without a regulatory framework that could be used to ensure a minimal service response by railroads. Such a framework may have been impractical in any case, in view of the growing variability in shipper service expectations and demands.

Retention of the common carrier service requirement implies that regulators must have a way to monitor the service response by railroads. Like the Interstate Commerce Commission (ICC) before it, STB lacks such a monitoring capability. Thus, it has functioned instead much like a sounding board for shippers to express their service grievances.[9] For the most part, the complaints are conveyed to STB by shippers who depend on common carriage. This does not mean that exempt or contract shippers lack similar concerns; however, contractual remedies are available to them and are enforced through the courts. The complaint record must be considered with caution, because service complaints associated with common carriage dominate STB hearings and there will always be common carrier shippers with service complaints.

Some aggregate statistics on railroad service performance are available, such as railroad train speeds and dwell times as discussed in Chapter 2, but they are not specific to common carriage service. In its review of railroad service performance, Laurits R. Christensen Associates (2009, ES-43) observed that "to evaluate many of the shippers' service quality concerns at more than aggregate or anecdotal levels, data that capture service performance metrics at a disaggregate level are necessary." Since that observation was made, STB has taken steps to increase service-related data, as noted in Chapter 2. However, these efforts do not extend to collecting data on service performance at the shipment-specific level, which would permit direct comparisons of the service provided in common and contract carriage both regularly and when capacity is tight.

A central concern of railroads is their obligation to transport TIH shipments without assurances of adequate rate compensation and protections from risk. In the previous chapter, STB's URCS was reviewed. The question of whether railroads are being allowed to charge compensatory rates for TIH shipments is interconnected with the use of URCS because URCS

[8] STB Ex Parte No. 346-25b, July 27, 2005.
[9] See STB Ex Parte No. 677 for an example of a service-related hearing.

determines whether a TIH tariff rate is too high and eligible for rate relief. As documented in Chapter 3, the cost allocations made by URCS are essentially arbitrary but produce nonrandom biases, such as uniformly high revenue-to-variable-cost (R/VC) percentages for some shipments, including hazardous materials.

The shortcomings of the current rate relief implementation as they pertain to TIH shipments in particular appear in Table 4-1, which examines two commonly transported TIH materials, anhydrous ammonia and chlorine. More than three-quarters of chlorine and anhydrous ammonia shipments in 2012, both tariff and contract, had rate levels that would have qualified for rate challenges according to the law's 180 percent R/VC ratio. In view of these uniformly high ratios, a reason for railroads seeking to modify the common carrier obligation for TIH traffic may be to counter biases in URCS. Regulators face many complexities in resolving the scope of the common carrier obligation; however, this aspect of the problem, an artifact of a flawed regulatory process, should not be difficult to fix.

ANNUAL REVENUE ADEQUACY DETERMINATION

Requirements and History

Revenue adequacy as an explicit goal of railroad regulatory policy dates to the Railroad Revitalization and Regulatory Reform (4-R) Act of 1976.[10] The act directed ICC "to make an adequate and continuing effort to assist [railroads] in attaining such revenue levels" as needed to "provide a flow of net income plus depreciation adequate to support prudent capital outlays, assure the repayment of a reasonable level of debt, permit the raising of needed equity capital,

TABLE 4-1 Average Revenue per Ton-Mile, Anhydrous Ammonia and Chlorine, 2012

TIH Commodity	Percent of Total Ton-Miles	Average Revenue per Ton-Mile ($)	Average Shipment Distance (miles)	Percent of Ton-Miles	
				>180% R/VC	>250% R/VC
Anhydrous ammonia (STCC 2819815)					
Contract	84	0.12	833	76	56
Tariff	16	0.18	859	98	98
Total	100	0.13	837	80	63
Chlorine (STCC 2812815)					
Contract	87	0.13	580	91	81
Tariff	13	0.14	514	99	97
Total	100	0.13	570	92	83

NOTE: STCC = Standard Transportation Commodity Code.
SOURCE: 2012 Carload Waybill Sample.

[10] Public Law 94-210.

and cover the effects of inflation."[11] Four years later, the Staggers Rail Act added the requirement that regulators "maintain and revise as necessary standards and procedures for establishing revenue levels for all carriers . . . that are adequate, under honest, economical, and efficient management, to cover total operating expenses, including depreciation and obsolescence, plus a reasonable and economic profit or return (or both) on capital employed in the business. . . ."[12] Regulators are directed to use these standards and procedures to "annually determine which rail carriers are earning adequate revenues" and to make "an adequate and continuing effort to assist those carriers in attaining [adequate] revenue levels."[13]

In response to the provisions in these two laws, ICC developed procedures for making the annual determinations, which STB inherited and has periodically modified in rulemakings over the past two decades.[14] STB describes the assessment process as "essentially mechanical."[15] Each year, it calculates an average return on investment (ROI) for all Class I railroads and then compares each railroad's ROI with an estimate of the industrywide cost of capital.[16] The ROIs are computed from annual financial information reported to STB by comparing tax-adjusted income with investments made in assets normally used for rail transportation services. To calculate the industrywide cost of capital, STB determines the interest paid by railroads on borrowed funds and estimates the returns that shareholders demand as compensation for their investment risk. Because these latter returns to equity cannot be observed directly, they are estimated by using financial models that involve the discounting of estimated future cash flows. STB then weights the two components of the cost of attracting capital to compute an industrywide cost of capital figure. If a railroad's calculated ROI equals or exceeds the industrywide cost of capital, the railroad is declared to be revenue adequate.

Any choice of models and methods for computing the industrywide cost of capital is bound to be controversial because STB uses the results in a number of regulatory proceedings. The cost of capital estimate, for example, is used in determining the capital costs associated with building a stand-alone railroad in a stand-alone cost proceeding, in determining the compensation to be awarded to shippers when a rate is found to be unreasonable, and in reviewing line abandonment applications.[17] However, the annual revenue adequacy determination itself, which uses the cost of capital figure as its denominator, does not play a meaningful role in any regulatory decisions.[18]

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[11] 49 USC §15(a)(4).
[12] 49 USC §10704.
[13] 49 USC §10704.
[14] ICC defined adequate revenues as those achieving the level necessary for a railroad to compete equally with other firms for available financing to maintain, replace, modernize, and, where appropriate, expand its facilities and services. ICC Ex Parte No. 393, Standards for Railroad Revenue Adequacy.
[15] STB Ex Parte No. 552-18, Railroad Revenue Adequacy 2013, September 2, 2014.
[16] See STB Ex Parte No. 552-18 and all previous years.
[17] The cost of capital methodology has been modified periodically in response to complaints from shippers and railroads. Last modified in 2009, the model is the subject of an ongoing STB proceeding in response to shipper complaints that the railroad capital costs calculated are too high and vary inexplicably. See STB Ex Parte No. 664-2: Petition of the Western Coal Traffic League to Institute a Rulemaking Proceeding to Abolish the Use of the Multi-Stage Discounted Cash Flow Model of the Railroad Industry's Cost of Equity Capital, December 23, 2013.
[18] The revenue adequacy results have been used at times for more general purposes, such as justification for regulatory priorities. For example, in announcing new merger review procedures in 2001, STB noted that the changes were being made to improve protection of competition but expressed concern that "rail carriers continue to generate very modest returns that are typically below those of the industries they serve." STB Ex Parte No. 582-1, June 11, 2001.

Whether STB intends to use the results of its annual determinations for more substantive regulatory purposes remains unclear. As discussed in Chapter 3, the *Coal Rate Guidelines* imply that a railroad's revenue adequacy status "*over time*"[19] may be used in making rate reasonableness determinations (ICC 1985, 11). The guidelines declare that the "first logical constraint on a carrier's pricing is that its rates not be designed to earn greater revenues than needed to achieve and maintain this revenue adequacy level," that "rate increases would generally only be permitted to the extent needed for the carrier to reach and maintain revenue adequacy," and that a shipper 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" (ICC 1985, 11). This language implies that firmwide revenue adequacy, as indicated by each railroad's annual determinations, could at some point be used much like a profitability test for deciding on maximum rate levels. Indeed, the guidelines state that the "revenue adequacy standard represents a reasonable level of profitability for a healthy carrier. . . . Carriers do not need any greater revenues than this standard permits, and we believe that, in a regulated setting, they are not entitled to any higher revenues" (ICC 1985, 11).

The provision calling for the development of revenue adequacy standards resides in the section of the Staggers Rail Act that prescribes the adjudication of rate disputes.[20] This positioning may explain ICC's original interest in linking the results of the annual determination to its decisions about reasonable rates. That linkage has never been used to adjudicate a railroad rate challenge.[21] Nevertheless, STB's annual release of its revenue adequacy findings attracts attention. For most of the agency's first 20 years, the findings have shown railroads falling short of revenue adequacy. This supports railroad claims that revenue adequacy should remain a policy priority and tempers demands for changes in regulatory policy, such as expansion of access to rate relief. Shippers have claimed that the results provide an overly conservative depiction of railroad financial performance inconsistent with other evidence of financial health, such as positive balance sheets and rising stock values.[22] As more railroads have been judged revenue adequate in recent years, railroads have expressed more skepticism about the process. They indicate shortcomings in the methods used to value assets.[23] Conversely, some shippers have begun to argue more forcefully that STB should clarify how it intends to use the results in making regulatory decisions, including decisions about reasonable rate levels.[24]

[19] Italics are in the quoted text.
[20] 49 USC §10704.
[21] STB regulates interstate pipelines that carry products other than petroleum, natural gas, and water. In 2000, shippers of anhydrous ammonia successfully challenged the rates charged by a pipeline operator by using the revenue adequacy standard from the *Coal Rate Guidelines*. See STB Docket No. 41685, CF Industries, Inc., v. Koch Pipeline Company, LP, May 3, 2000.
[22] See, for example, Appendix A in Comments of Arkansas Electric Cooperative Corporation, STB Ex Parte No. 722, September 5, 2014.
[23] See Opening Comments of the Association of American Railroads (AAR), STB Ex Parte No. 722, September 5, 2014. AAR identifies various problems with ROI measurements, including the use of historical asset values rather than replacement costs.
[24] See comments to STB Ex Parte No. 722 by Arkansas Electric Cooperative Corporation, Western Coal Traffic League, Consumers United for Rail Equity, the Olin Corporation, and other shippers and shipper groups.

Assessment

While the law does not define how the results from revenue adequacy determinations should be used, several possible purposes can be surmised. First, Congress likely intended that the annual determinations inform affirmative steps to help railroads regain financial viability. That purpose is consistent with the requirement for revenue adequacy standards that first appeared in the 4-R Act, when rescuing the industry from its financial distress was a priority.[25] A related possibility is that the annual determination was meant to gauge the reformed regulatory program's impact on the ability of railroads to keep investing and perhaps to monitor the industry for sustained supracompetitive rates of return that might indicate an excess of market power. A third possibility, in light of the position of the requirement in the law's section on rate relief procedures, is that the annual determinations would be used in a more direct manner as a profitability test for making rate reasonableness assessments that are more favorable to shippers.

With regard to the first purpose, Congress would have wanted frequent monitoring of each railroad's financial condition in light of the large amount of railroad service being supplied with the assistance of government subsidies during the 1970s. The ability of distressed and failing railroads to earn adequate revenues was a pressing concern. Thus, there is little doubt that the annual revenue adequacy determination was intended to support measures to rescue the railroad industry when it was introduced. That purpose can no longer be considered relevant. Railroads long ago attained financial viability and independence from government subsidies.

The second possible purpose—to monitor the effects of the regulatory program on the ability of railroads to keep investing and for signs of railroads exploiting market power—remains a policy interest. Some level of tracking of railroad industry profitability and financial performance may be important in ensuring that regulations and other government policies not reduce railroads' incentives or capabilities with regard to investment over time. Similarly, monitoring the industry for signs of monopoly behavior, such as by periodic assessment of competition, general levels of profitability, and rate and service trends, is consistent with the policy objective of curbing anticonsumer behavior. In essence, policy makers need to know whether a railroad's profits are consistently outside a reasonable band of profitability that characterizes many other industries over a business cycle. However, such information is not provided by a regulatory agency annually making what are largely perfunctory comparisons of each railroad's rate of return with an estimate of the industrywide cost of capital.

Continuation of the determinations of revenue adequacy might be considered innocuous if they did not prolong the misguided view that a single annual pass/fail measure of railroad profitability can be used to regulate rates. Such an application could result in the evolution of STB's industrywide cost of capital figure into something resembling public utility rate-of-return regulation in which the firm is constrained to pricing levels yielding a return on capital that is no higher than a prescribed level. Rate-of-return regulation has had a mixed record in the industries where it is used because it can incentivize excessive capital-to-labor ratios and lessen the motivation for asset replacement and the pursuit of innovation.[26] Rate-of-return regulation

[25] This argument is made by Macher et al. (2014). The authors elaborate on the various interpretations of Congress's intentions in requiring annual revenue adequacy determinations.

[26] The classic discussion of the effect of rate-of-return regulation on labor–capital ratios that are not cost minimizing is given by Averch and Johnson (1962). A review of the economics literature on adverse effects of rate-of-return regulation, including effects on asset replacement and innovation, is provided by Biglaiser and Riordan (2000).

connotes an interest in restricting railroad profitability that would be at odds with the deregulatory thrust of the Staggers Rail Act reforms.

MERGER REVIEW ACCORDING TO A PUBLIC INTEREST STANDARD

A railroad or other party controlling one or more railroads must obtain approval from STB to merge with or purchase another railroad. STB inherited this review authority from ICC, which under the Staggers Rail Act retained its exclusive power to approve all railroad mergers and acquisitions.[27] The railroad industry therefore remains exempt from Section 7 of the Clayton Act, which requires economically significant mergers in most industries to be reviewed by the Antitrust Division of the U.S. Department of Justice (USDOJ) or the Federal Trade Commission (FTC) before they are consummated.[28] The antitrust reviews consider only whether the transaction will "substantially lessen competition." In contrast, STB is required to consider many other potential merger-related effects that are characterized in the law as being in the public interest. Among them are impacts on rail workers, safety, community development, and the ability of the merging railroads and other competing railroads to earn adequate revenues. The specific wording of the law with regard to matters that must be considered is given in the following subsection.

When Congress created STB in 1995, USDOJ recommended ending the railroad industry's exemption from the exclusively competition-based appraisal standard used for airlines, which were deregulated at about the same time as railroads.[29] The reasoning was that eliminating the broader public interest standard and transferring merger reviews to USDOJ's Antitrust Division would clarify and expedite the review process, which was ill defined and slowed by special interests (including competing railroads) seeking concessions. Congress retained the standard but added certain features associated with conventional antitrust reviews, including use of divestiture as a remedial condition to counter potentially adverse competitive effects. In addition, STB was required to give substantial weight to any competition-related recommendations by USDOJ.[30]

Public Interest Standard in Historical Context

Public interest standards giving regulators independent responsibility to review mergers are used in some regulated industries that are otherwise exempt from merger review by the antitrust enforcement agencies. Regulatory commissions for specific industries such as the Federal Energy Regulatory Commission and the Federal Communications Commission (FCC) are charged not only with evaluating the competitive implications of a transaction but also with ensuring that legislatively articulated policy goals are maintained or furthered. For example, FCC

[27] 49 USC §11321 and §11326.

[28] The Clayton Act (15 USC §18) was amended substantially in 1976 by the Hart–Scott–Rodino Antitrust Improvements Act (Public Law 94-435), which established the federal premerger notification program that provides USDOJ and FTC with information about large mergers and acquisitions before they occur.

[29] USDOJ, rather than FTC, reviews most transportation industry mergers. See testimony of Steven C. Sunshine, Deputy Assistant Attorney General, Antitrust Division, Statement before the U.S. House of Representatives Committee on Transportation and Infrastructure, January 26, 1995 (http://www.justice.gov/atr/public/testimony/0056.htm).

[30] 49 USC §11324(d).

must review mergers to ensure that they do not reduce universal service, harm broadband deployment, or exceed foreign ownership restrictions (Koutsky and Spiwak 2010).

The law states that STB must review and approve planned mergers involving at least two Class I railroads. The review must consider "at least (1) the effect of the proposed transaction on the adequacy of transportation to the public; (2) the effect on the public interest of including, or failing to include, other rail carriers in the area involved in the proposed transaction; (3) the total fixed charges that result from the proposed transaction; (4) the interest of rail carrier employees affected by the proposed transaction; and (5) whether the proposed transaction would have an adverse effect on competition among rail carriers in the affected region or in the national rail system."[31]

The Staggers Rail Act added the competition criterion for merger reviews, but the remaining public interest criteria originated in the Transportation Act of 1940 (Phillips 1962, 9). Few railroad mergers occurred between World Wars I and II, but the public interest standard was applied by ICC during the 1950s and 1960s in a number of cases (Gallamore and Meyer 2014, 132–133). According to Gallamore and Meyer (2014, 132–133), many of the merger review decisions during the period focused on enhancing or protecting railroad finances rather than protecting competition. First, mergers of regionally competing railroads were approved so that traffic could be concentrated by reducing parallel capacity. Second, end-to-end mergers whose consummation risked extending financially stronger railroads with single-line service into new territories and upsetting existing railroad divisions of traffic and revenues were denied.[32] Traffic protection conditions were often required when mergers were approved both to lessen anticompetitive effects and to minimize adverse effects on other railroads (Crum and Allen 1986, 47). The era's mergers of rival railroads were deemed necessary to promote financial stability, which was viewed as a more pressing goal than achieving the single-line efficiencies from end-to-end mergers.

With this perspective and the worsening financial condition of the railroads during the 1970s in mind, the retention of the public interest standard by the Staggers Rail Act is understandable, despite its deregulatory tenor. Coupled with the act's imposition of decision deadlines, the public interest standard was viewed as more flexible in allowing the railroad industry to shed uneconomic capacity and achieve financial stability.

A wave of mergers followed soon after passage of the Staggers Rail Act. In late 1980, the Chessie System and the Family Lines System combined to form CSX Corporation. Two years later, the Norfolk and Western Railroad and the Southern Railway merged to form Norfolk Southern Corporation (NSF). At about the same time, the Frisco Railroad merged with Burlington Northern (BN), and Union Pacific (UP) Railroad acquired the Missouri Pacific and Western Pacific Railroads. During the 1990s, the four largest Class I railroads took their current shape. CSX and NSF split Conrail's assets, BN merged with the Santa Fe Railroad, and UP merged with the Southern Pacific Railroad (SP). Through mergers, reclassifications, and bankruptcies, the number of Class I railroads was reduced from 40 in 1980 to seven, its current level, by the end of the decade.[33]

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[31] 49 USC §11324.

[32] Gallamore and Meyer (2014, 137) note that from the mid-1950s through the 1960s, ICC approved 16 major mergers, only two or three of which had mostly end-to-end characteristics. They report that ICC turned down only four major mergers during the 1950s and 1960s, and two were end-to-end.

[33] AAR (2014) recommends caution in comparing the number of Class I railroads in 1980 with the number in 2014. For example, of the 40 railroads that were classified as Class I in 1980, 14 would not have qualified according to today's Class I revenue requirements, even after adjustment for inflation. AAR also points out that one of the other

Most of these mergers took place before STB's creation, but the Conrail acquisitions and the UP-SP merger were approved by STB. The latter transaction was particularly controversial and revealed the difference between the approval standards and practices used by rail regulators and antitrust enforcers. In opposing the 1996 merger, USDOJ argued that a reduction in rail competitors in the West from three to two could cause "overwhelming competitive harm" in a large number of markets as the unified railroad exercised market power unilaterally and through coordinated behavior with the single remaining competitor (BN).[34] In granting approval, STB placed greater emphasis on the financial benefits of the merger. The financially weak SP would become part of a stronger system that would be in a better position to compete aggressively with the newly merged and more efficient BN, to the benefit of shippers in western markets (Kwoka and White 2004; Nottingham 2007; Conant 2004).

STB accepted UP's proposals to counter competition losses by extending trackage rights agreements with BN.[35] USDOJ raised concern about the long-term viability and enforceability of such agreements. In addition, USDOJ was less inclined to accept the public interest benefits claimed by the railroads. It viewed them as overstated, not recognizable as public benefits, or achievable through other means (Kwoka and White 2004; Nottingham 2007; Massa 1997). In general, USDOJ's concerns were similar to past criticisms of ICC as being too accepting of industry estimates of efficiencies, cost savings, and other claimed benefits from proposed mergers (Massa 1997).

The economic effects of the mergers approved by ICC and STB during the first two decades after the Staggers Rail Act's passage have been extensively studied (e.g., Wilson 1997; Berndt et al. 1993; Pittman 1990; Chapin and Schmidt 1999; Winston et al. 2011; Wilson and Bitzan 2003; Grimm and Plaistow 1999). The studies generally found that consolidation activity contributed significantly to the industry's shedding of uneconomic legacy capacity and resultant cost savings. The extent varied from merger to merger, depending on the degree to which a merger had vertical (involving end-to-end connections) and horizontal (involving parallel capacity) features. Efficiency gains were largely passed on to shippers through lower rates and enhanced service. The magnitude of the benefits was small compared with those ensuing from other developments after deregulation, such as the move to larger cars and longer and more frequent trains.

Revised Merger Policy and Recent Issues

In 1999, BN and the Canadian National (CN) applied to merge, 3 years after the UP-SP merger and shortly after CSX and NSF had divided Conrail to create two major railroads in the East. By this time, STB had come to believe that the industry's excess capacity had been largely eliminated through line abandonments and the earlier mergers; hence, the potential for additional efficiencies from further consolidations had been exhausted for the most part.[36] The agency raised concern that another merger would prompt a final round of mergers involving the few

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26 Class I railroads in 1980 provided mostly passenger service, two were bankrupt before deregulation, and five were legally distinct entities but had unified operations, marketing, and administration even before 1980. A more reasonable estimate, according to AAR, is that 18 Class I rail systems existed in 1980 and ultimately merged to form the seven that remain. Even AAR's numbers indicate substantial consolidation activity.

[34] STB NOR No. 32760, August 6, 1996, p. 89.

[35] STB granted BN and other railroads trackage rights over about 4,000 miles of track, mainly between California and Colorado and in Texas and other areas on the Gulf Coast.

[36] STB Ex Parte No. 582, April 7, 2000.

Class I railroads that remained.[37] Furthermore, the BN-CN merger was proposed in the wake of prolonged service disturbances after UP's integration of SP. STB declared a 15-month moratorium on further reviews until a reassessment of its merger evaluation criteria was complete.[38]

During the moratorium, BN and CN withdrew their application to merge. In June 2001 STB introduced its *Major Rail Consolidation Procedures*.[39] In that document, it reaffirmed its obligation to use a public interest standard but declared that applicants would face a higher burden of proof to demonstrate that anticipated public benefits would be "substantial and demonstrable" and thus outweigh any anticompetitive effects. The agency explained:

> While we have always used a balancing test, we are changing how we will weigh these [public interest] goals and are adding new elements to the mix. We are updating the importance of competition and recognizing that redundancy is no longer a central issue. Claims of improved carrier efficiency will be scrutinized carefully, and we will give greater weight to the potential for transitional service developments.[40]

STB also indicated that it would no longer review the effects of each merger in isolation. Instead, it would consider the cumulative effects of consolidation activity on the level of competitiveness in the railroad industry as a whole. It stated that

> while further consolidation of the few remaining Class I carriers could result in efficiency gains and improved service, the Board believes additional consolidation in the industry is also likely to result in a number of anticompetitive effects, such as loss of geographic competition, that are increasingly difficult to remedy directly or proportionately.[41]

After the new merger procedures were announced, some railroads expressed concern that STB's emphasis on "enhanced" competition imposed a more restrictive standard than the traditional antitrust policy of preventing the substantial lessening of competition.[42]

Because no Class I railroads have applied to merge since 1999, there is no precedent to show how STB would apply its new burden-of-proof standards. During the past decade, nearly all STB actions pertaining to its merger and acquisition authorities have involved regional and short-line railroads leasing or buying branch lines from larger carriers. These transactions are normally viewed as minor and as qualifying for exemption from full-scale merger and acquisition reviews. The Staggers Rail Act requires that STB promptly approve proposed transactions not involving two or more Class I railroads unless it finds a likelihood of lessened competition or the creation of a monopoly and it determines that the anticompetitive effects from these outcomes outweigh the public interest in meeting transportation needs.[43] Nevertheless, STB has faced criticism over certain approved transactions, particularly those involving

[37] STB Ex Parte No. 582, April 7, 2000.
[38] STB Ex Parte No. 582, April 7, 2000.
[39] STB Ex Parte No. 582-1, June 7, 2001.
[40] STB Ex Parte No. 582-1, June 7, 2001.
[41] STB Ex Parte No. 582-1, June 7, 2001.
[42] Comments of BN to STB Ex Parte No. 582-1, May 16, 2001, pp. 11–12.
[43] Contractual terms between Class I and short-line railroads that are part of a sale or lease of trackage or a transfer of operating rights that involve interchange commitments are subject to STB approval under its authority to approve mergers and acquisitions.

interchange commitments that limit the ability of the regional or short-line railroad to interchange traffic with major railroads other than the seller or lessor.[44] Such interchange commitments can be viewed as anticompetitive because they prevent the short-line railroad from offering shippers more competitive routing alternatives.[45]

Shippers have referred to interchange commitments as "paper barriers" to competition and have petitioned STB to prohibit commitments lasting longer than 5 years.[46] In response, STB has mentioned the important role that these contractual commitments can play in preserving rail service on low-volume lines. They enable smaller railroads to finance the lines by guaranteeing traffic to the major railroad that sells or leases them.[47] However, in acknowledging that such commitments can lead to abuse, STB concluded that decisions about their propriety should be made on a case-by-case basis. Rather than issuing general prohibitions, STB has required that a purchaser or lessee disclose more information on the duration and other terms of the commitments.[48]

Overview of STB's Merger Review Procedures for Major Railroads

Comparison of STB's railroad merger review process with that of USDOJ in applying the competition appraisal standard for mergers in most other industries is helpful. Briefly, the latter process begins with the merger parties notifying USDOJ of their plan. USDOJ may request more information. If the plan raises no competition-related concerns, USDOJ may allow the transaction to proceed after 30 days have elapsed (or sooner with USDOJ approval). If it has concerns, USDOJ may request additional information from the merger parties; from other interested parties (e.g., customers); and from relevant federal agencies, such as the U.S. Department of Transportation in the case of the airline industry. If USDOJ concludes that the transaction could lessen competition in violation of the Clayton Act, it will seek to stop the transaction by filing a complaint in federal court. This step is often unnecessary, since the threat of action alone often persuades the parties to address the concerns or abandon the merger.[49]

The *Horizontal Merger Guidelines*, which USDOJ develops jointly with FTC, are central to its review process. That document describes the main analytical techniques and types of evidence used by the two antitrust agencies in assessing whether a merger could substantially lessen competition. For example, the guidelines outline the methods to be used for defining markets and measuring market concentration; they explain how competitive behavior is examined, including both unilateral and coordinated behavior; and they give hypothetical examples to make the economic concepts more understandable. They were introduced in their modern form in 1982 and are updated every 5 to 10 years on the basis of new economic learning

[44] A typical interchange commitment, for example, is a lease credit for rail cars interchanged with the seller or lessor carrier.
[45] For example, see Review of Rail Access and Competition Issues—Renewed Petition of the Western Coal Traffic League, STB Ex Parte No. 575-1, October 30, 2007.
[46] Review of Rail Access and Competition Issues—Renewed Petition of the Western Coal Traffic League, STB Ex Parte No. 575-1, October 30, 2007.
[47] STB Ex Parte No. 714, Information Required in Notices and Petitions Containing Interchange Commitments, October 29, 2012.
[48] STB Ex Parte No. 575-1, May 29, 2008.
[49] See testimony of Steven C. Sunshine, Deputy Assistant Attorney General, Antitrust Division, Statement Before the U.S. House of Representatives Committee on Transportation and Infrastructure, January 26, 1995 (http://www.justice.gov/atr/public/testimony/0056.htm).

and case law. In addition to informing USDOJ's review procedures, the guidelines are intended to provide potential merger parties, courts, and others with an understanding of the rationale and analytical processes underlying enforcement and thus to deter mergers that would likely be challenged.

STB's *Major Rail Consolidation Procedures* differ from the *Horizontal Merger Guidelines* in a number of ways. Rather than providing an analytical framework for predicting competitive effects, the procedures delineate a series of principles in statements explaining STB's views on the ways in which a railroad merger can serve the public interest. STB does not bear the burden of proof to deny a merger; railroad applicants bear the burden of making a convincing case for why the merger should be approved in light of STB's stated principles about what constitutes the public interest. Applicants are thus required to explain "the purpose sought to be accomplished by the proposed transaction, such as improving service, enhancing competition, strengthening the nation's transportation infrastructure, creating operating economies, and ensuring financial viability."[50]

The procedures emphasize that other claimed benefits of a merger should not be pursued at the expense of competition. The merger applicants are responsible for demonstrating that such a trade-off will not occur, not STB. The applicants must propose competition "enhancements" if they cannot avoid competition losses in certain markets. Examples are the establishment of shared terminal areas, the granting of trackage rights, and the termination of existing interchange commitments with short-line railroads. In addition, the procedures require applicants to propose backup remedies if their competition enhancements are not effective.

The procedures were issued 5 years after the UP-SP merger and reflect a concern about the potential for mergers to cause large transitory service disruptions. Applicants are required to provide a detailed service assurance plan and to explain how they would cooperate with other railroads in overcoming service disruptions. The procedures also reflect a concern that a merger would prompt a round of industry consolidation. Accordingly, applicants are required to speculate on the "cumulative impacts" of their merger and how it could affect the competitive structure of the industry in the years ahead. They must explain how any competitive changes would affect the claimed benefits of their merger and how any conditions attached to the merger (e.g., trackage rights, terminal access agreements) would need to be amended as a result.

Assessment

Because no Class I railroads have applied to merge since STB introduced its new merger review procedures in 2001, there is no precedent for how the decision-making process would unfold. Nevertheless, merger review guidelines that have well-defined purposes, evidentiary requirements, and evaluation rules and criteria should make the process comprehensible and transparent. Firms considering a merger should have a clear understanding of expectations and be able to structure the transaction accordingly or be dissuaded from pursuing it in the first place. A main purpose of the *Horizontal Merger Guidelines* is to offer guidance that the business community can use in assessing the antitrust enforcement risks of a proposed transaction.[51] Similar transparency of purpose and articulation of procedure are not offered in STB's *Major Rail Consolidation Procedures*. Apparently, STB's statutory obligation to balance the law's

[50] STB Ex Parte No. 582-1, June 7, 2001.
[51] See "Commentary on Horizontal Merger Guidelines," USDOJ and FTC, March 2006, p. v.

public interest considerations complicates the development of a straightforward review framework comparable with that of the antitrust standard.

The procedures do not offer a methodology for reviewing merger plans. As noted, the procedures make merger applicants responsible for the analysis of their merger plans, but the procedures themselves lack clear guidance on the evidence and analytical methods that are to be used for such analyses. The procedures offer little guidance on how regulators would evaluate the results of the analysis or how they would assess the various actions to be proposed by applicants to protect or further the public interest. Indeed, the merger outcomes that would be construed as desirable and that merger applicants should be expected to prove cannot be known in advance on the basis of the guidance offered in the procedures.

STB's own statements about the importance of preserving competition suggests that this clouded approval process is not a consequence of regulators having other priorities in mind. Instead, it is a legacy obligation to scrutinize mergers in the context of a broader public interest standard. STB itself has stated that the significance of perceived public interests that guided its merger reviews in the past, particularly the interest in helping the industry shed uneconomic and duplicative capacity, has been greatly diminished. In its overview of the procedures, STB explains that the revised merger review rules were necessitated in light of the "declining number of number of Class I railroads, the elimination of the industry's excess capacity, and the serious transitional problems that have accompanied recent major rail consolidations."[52] It states that "our shift in policy places greater emphasis in the public interest assessment on enhancing competition while ensuring a stable and balanced rail transportation system."[53]

STB itself believes that the preservation of competition should be central to merger reviews and that other public interest concerns have expired or been diminished. Thus, questioning the purpose of STB continuing to be responsible for merger reviews is reasonable. If preservation of competition is the primary concern, USDOJ's Antitrust Division is far more qualified to lead the reviews, in view of its staff of competition analysts and the well-established evidentiary and evaluation framework in the *Horizontal Merger Guidelines*. The law already requires USDOJ to advise STB on the competition impacts of major railroad mergers. The continued subordination of USDOJ's role is now justified, as a practical matter, mainly on the grounds that STB is better positioned to redress service disruptions that can arise during the integration of merged railroads. However, STB can invoke other authorities to minimize such effects from mergers that pass the competition scrutiny of USDOJ.[54]

AUTHORITY TO ORDER RECIPROCAL SWITCHING

Before the Staggers Rail Act, when regulated rates were largely equalized, shippers had limited incentive to seek alternative railroad routings for the purpose of obtaining a more competitive

[52] *Major Rail Consolidation Procedures*, p. 8.
[53] *Major Rail Consolidation Procedures*, p. 8.
[54] For example, in response to service problems following the UP-SP merger, STB adopted rules to address localized service inadequacies by establishing expedited procedures for shippers to obtain temporary alternative rail service from another carrier when the incumbent carrier cannot properly serve shippers. These rules were promulgated in accordance with the agency's authority to order alternative through routes in the public interest [(49 USC §10705(a)] and to direct the handling of traffic and the use of rail facilities for a limited time when there is an emergency situation (49 USC §11123). See Expedited Relief for Service Inadequacies, STB Ex Parte No. 628, December 21, 1998.

rate. However, once rates were allowed to vary, that incentive would change, especially on routes that involved a "bottleneck" segment whereby only one railroad could serve the route fully.

A bottleneck segment is illustrated in Figure 4-1. In the example, the rail segment between Points A and B is the bottleneck, since it can be served only by Railroad 1. If Railroad 1 does not quote a rate to the interchange of Railroad 2, Railroad 1 has effective control over the service supplied to all shippers on its larger network who originate or terminate shipments on the bottleneck segment (on the assumption that there are no nonrail transportation alternatives). Provisions in the Staggers Rail Act had the practical effect of allowing a railroad to cancel many interline and terminal access agreements for traffic that it could serve on its own, which reinforced the ability of railroads to control bottleneck traffic (GAO 1987).

However, the Staggers Rail Act left several authorities with regulators that they could use to order a railroad to allow competitor access to bottleneck traffic if such an order was deemed "practicable and in the public interest."[55] First, regulators could simply mandate that the railroads interchange traffic, and if necessary they could regulate the division of revenues, including the switching fee (i.e., mandate that railroads establish "through routes").[56] Second, regulators could require that a railroad allow other railroads (again for a regulated fee) to operate on the tracks within terminal areas that were bottlenecks. In essence, this allows other railroads to market the host railroad's terminal as if it were their own.[57] Third, regulators could order a railroad to accept shipper requests to haul traffic short distances over the bottleneck segment to and from a nearby interchange with a second railroad that would perform the line-haul move. As explained in Figure 4-1, this practice is referred to as mandated "reciprocal switching."

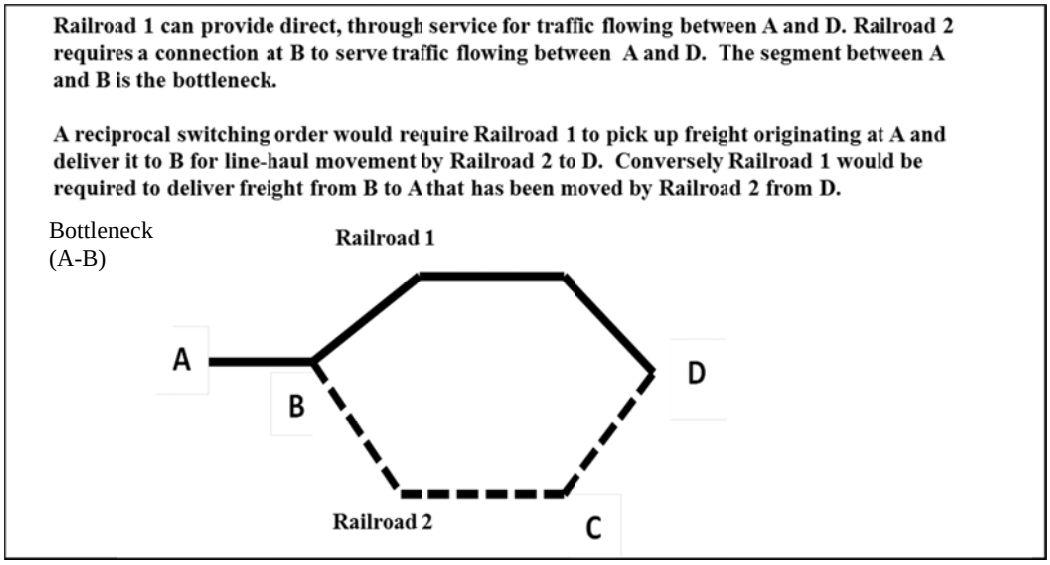

FIGURE 4-1 Rail bottleneck scenario.

[55] "Practicable and in the public interest" was historically interpreted by ICC as requiring the demonstration of "some actual necessity or compelling reason" why such an arrangement should be ordered. Such a showing would need to entail "more than a mere desire on the part of shippers or other interested parties for something that would be convenient or desirable to them" [Jamestown Chamber of Commerce v. Jamestown, W. & N.R. Co., 195 ICC 289, 291 (1933)].

[56] 49 USC §10705(a)(1).

[57] 49 USC §111103(c)(1).

A key distinction between reciprocal switching and the other access authorities is the stipulation in the Staggers Rail Act that regulators can order such arrangements not only if practical and in the public interest but also if deemed "necessary to provide competitive rail service."[58] The specific reference to competition in the act represents a new regulatory power (rather than a holdover authority as applicable to the designation of through routes and terminal access). It has led to debate about STB's ability to use reciprocal switching as a means of curbing railroad market power by stimulating or introducing the threat of competition for bottleneck traffic.

Limited Practical Use of Reciprocal Switching Orders

In implementing the Staggers Rail Act, ICC took the view that its authorities to order competitive access to bottleneck traffic were not meant to be used freely to inject more competition into rail markets but instead to address specific anticompetitive behaviors. In its *Intramodal Competition Rules*,[59] the agency declared that through-route, terminal access, and reciprocal switching arrangements affecting bottleneck traffic may be prescribed only if "necessary to remedy or prevent an act that is contrary to the competition policies" of the law.[60] The rules went on to define anticompetitive behavior as a railroad using its market power to extract unreasonable terms or to disregard the needs of a shipper by rendering inadequate service. A complainant would need to demonstrate, for example, that the single-line service offered by the bottleneck railroad, in lieu of an interline service, is inadequate because the routing is so circuitous, slow, and inefficient that it essentially disregards a shipper's needs for rail transportation.

In promulgating the *Intramodal Competition Rules*, which were challenged by shippers but subsequently upheld in court,[61] ICC reasoned that the law merely authorizes, but does not require, it to order bottleneck access arrangements. It maintained that a narrow interpretation of the authorities focused on anticompetitive conduct that leads to unreasonable service offerings (as opposed to unreasonable rates) was consistent with the law's policy. The agency contended that actions to "initiate an open-ended restructuring of service to and within terminal areas solely to introduce additional carrier service" would run counter to the law's directive to minimize regulatory control.[62]

ICC further maintained that any interventions for the express purpose of enhancing competition in sole-served markets must respect the law's rate reasonableness criteria. The Staggers Rail Act, for example, is explicit in stating that railroads have a safe harbor in pricing traffic up to 180 percent of its "variable cost." If a rate in a market lacking effective competition exceeds this threshold, aggrieved shippers are eligible to file a rate case. If the shippers prevail,

[58] 49 USC §111103(c). Specifically, the law states that STB "may require rail carriers to enter into reciprocal switching agreements, where it finds such agreements to be practicable and in the public interest, or where such agreements are necessary to provide competitive rail service."
[59] ICC Ex Parte 445, Intramodal Rail Competition, codified at 49 CFR 1144.
[60] 49 CFR 1144.2(a)(1).
[61] See Baltimore Gas and Elec. v. United States, 817 F.2d 108 (D.C. Cir. 1987) and Midtec Paper Corp. v. U.S., U.S. Court of Appeals, District of Columbia, September 16, 1988.
[62] ICC reasoned that "rail carriers have been given a great deal of flexibility to adjust their rates under the Staggers Act. We are convinced that Congress's aim in creating section 11103(c) was to provide a competitive counterbalance to this broadened rate freedom." See Delaware & H. Ry. Co. v. Consolidated R. Co., 367 I.C.C. 718, 720-21 (1983).

regulators can prescribe a rate that is closer to the 180 percent threshold, but they cannot prescribe one that is lower. Inasmuch as mandated reciprocal switching (in lieu of a rate prescription) could cause the shipper's rate to fall below the 180 percent level, regulators concluded that such an intervention would violate the law's safe harbor provision.[63]

The counterargument put forth by shippers was that Congress had given ICC a new regulatory power to order reciprocal switching when necessary to provide competitive rail service. In doing so, Congress meant to increase the options available to STB in addressing the concerns of aggrieved shippers and in providing a mechanism for controlling railroad market power through competitive access rather than only by prescribing maximum rates after disputes. According to this view, reciprocal switching orders should be not be treated as subordinate to the law's rate relief provisions, and STB has the authority to order their use as it sees fit to provide for competitive service.[64]

Reciprocal Switching in Canada and Proposals for the United States

Canadian Interswitching

Canada has long allowed a shipper to demand that a railroad offer reciprocal switching (referred to as "interswitching") over its bottleneck segments. By law, a shipper with access to only one railroad at the origin or destination of a haul can have the shipment transferred to another railroad according to a government-prescribed switching rate if the origin or destination is within a radius of 30 kilometers (about 19 miles) of an interchange point. The Canadian Transportation Agency establishes the switching fees according to a distance-based table applicable to all regions of the country. The fees are charged per car and vary in amount according to the bottleneck distance (grouped in four zones) and the total number of cars involved. The cars are supplied by the line-haul carrier. The current fees (in Canadian dollars) average about $250 per car and $3.38 per kilometer when fewer than 60 cars are interswitched and about $65 per car and $1.20 per kilometer when shipments exceed 59 cars.[65] All shippers can take advantage of the regulated switching rates regardless of their competitive options (i.e., there is no market dominance test).[66]

According to a 2001 Canadian government review panel, the interswitching requirements that are now used to provide competitive access were instituted early in the 20th century to prevent overbuilding of multiple rail terminals in urban areas and to ensure that a joint switching rate could be calculated quickly (Minister of Public Works and Government Services Canada 2001, 63). The review panel recommended keeping the requirement to serve its current purpose of providing competitive access but recommended against proposals to expand the distance beyond 30 kilometers, expressing satisfaction with the status quo (Minister of Public Works and Government Services Canada 2001, 63). That status quo, according to Cairns (2014), leads to 3 to 5 percent of the total traffic carried by the CN and Canadian Pacific (CP) railroads being interswitched at the regulated switching rates. Cairns observed that further use of the

[63] Midtec Paper Corp. v. U.S., U.S. Court of Appeals, District of Columbia, September 16, 1988.
[64] The argument is recounted in Midtec Paper Corp. v. U.S., U.S. Court of Appeals, District of Columbia, September 16, 1988.
[65] https://www.otc-cta.gc.ca/eng/interswitchingrates.
[66] Under certain circumstances, when a shipper contends that it is subject to "substantial commercial harm," the law permits interswitching at distances greater than 30 kilometers. According to Cairns (2013), the requirement to prove commercial harm has limited shipper use of this provision.

interswitching provision may be limited, as a practical matter, because CN-CP network layouts do not offer many alternative routings that would make interswitched traffic competitive (i.e., the interswitched traffic would move over uneconomical, circuitous routes).

Proposals for Mandated Reciprocal Switching in the United States

Since the *Intramodal Competition Rules* were adopted by ICC in 1986, shipper groups have periodically petitioned or pursued legislation to have them changed to allow for more expansive use of the regulatory authority to order reciprocal switching.[67] During the course of this study, STB was considering a petition by the National Industrial Transportation League (NITL), an organization of rail shippers, to repeal the *Intramodal Competition Rules* and to reinterpret the law so that a railroad would be required to engage in reciprocal switching under certain defined conditions.[68] In its petition, NITL asserts that the current authority has been rendered meaningless: no shipper has attempted to obtain a reciprocal switching order for more than 15 years because of the burden of proving abusive service under the rules.

In short, NITL has proposed that if a shipper's facility is served by only one Class I railroad or if the shipper is paying a tariff rate that exceeds 240 percent of R/VC, the railroad serving the shipper would be required to switch traffic, according to a regulated fee schedule, with any competing railroad that wants to do so and that operates from an interchange within a reasonable distance of the shipper's facility. NITL proposes, as one criterion, that the relevant distance be set at 30 miles.[69] The organization proposes that STB promulgate rules requiring a railroad to accept a request for reciprocal switching if these criteria are met.[70]

Assessment

The desirability and legality of NITL's proposal could not be assessed by the committee. Any proposal that relies on an R/VC formula to determine shipper eligibility, as the NITL proposal does, is problematic because of the unreliability of variable cost estimates derived by STB, as discussed in Chapter 3. Nevertheless, a few generic issues pertaining to reciprocal switching orders deserve attention, all of them empirical in nature.

First, in proposing reciprocal switching in addition to (rather than as a replacement for) the current rate relief process, NITL recognizes that an access mileage limit (i.e., 30 miles) would have differing effects on shippers simply by virtue of where they are located on a railroad's network and where that network has interchanges with competing railroads. Whether some types of shippers are more likely than others to be located near eligible interchanges can be determined by examining the layout of railroads and the distribution of shippers, as well as the mileage limits delineated in the reciprocal switching proposal. In particular, any reciprocal switching proposal with a short mileage limit would lead to variability in shipper access to relief

[67] One recent example of a legislative proposal to mandate reciprocal switching to enhance competition is the Railroad Competition and Service Improvement Act of 2007 (S. 953 and H.R. 2125). The bill would have defined "areas of inadequate competition" if shippers pay rates above 180 percent of R/VC and are served by a single railroad. In such defined areas, the bill would authorize STB to order reciprocal switching and terminal trackage rights.

[68] STB Ex Parte No. 711, NITL, March 30, 2013.

[69] The proposal contains other eligibility criteria that are not explained here but that can found in the NITL petition.

[70] B. J. Carlton, NITL Presentation to Study Committee on Railroad Transportation and Regulation, March 14, 2014. http://www.trb.org/PolicyStudies/RailTransReg.aspx.

by commodity type, since some commodities may be produced at locations farther from interchange points than others (e.g., wheat versus chemicals).[71]

Other empirical questions concern the practical effect that a reciprocal switching order would have on competition and thus on the rate and service levels in individual markets. Whether shippers would benefit from vigorous competition would depend on various factors such as the traffic density economies and routing circuities of each railroad and the willingness of railroads to bid for one another's sole-served traffic.[72] The Canadian experience with setting switching fees on the basis of an uncomplicated but variable schedule suggests that setting such fees would be administratively feasible, but the size and structure of the fees would affect the amount of competitive activity at the margin.

Any assessment of a reciprocal switching measure will depend on its specific design features and on assumptions about the circumstances in which it would be applied. Thus, the committee cannot offer conclusions about the effect of proposals like the one made by NITL without a thorough empirical analysis. Findings concerning the desirability of a targeted or broad (i.e., Canadian-style) application of reciprocal switching would be based on the outcome of such empirical assessments. A possible starting point for STB in assessing the impact of reciprocal switching is to allow its use in a more limited setting. For example, it could be used as an optional remedy for rates that have already been ruled unreasonable and thereby offer an alternative to a prescribed rate. This would be consistent with STB's policy of exercising its authority to order reciprocal switching only when it determines that an anticompetitive abuse has occurred.

CHAPTER SUMMARY

Common Carrier Service Obligation

Until passage of the Staggers Rail Act, all railroad traffic was moved in common carriage, and thus all rates were publicly posted, with service terms and conditions that were to a large extent homogeneous. By allowing common carrier rates to vary widely, the law increased the likelihood that service attributes would also become more heterogeneous. Thirty-five years after the act's passage, not only have the railroads been transformed but so too has the broader logistics system in which they and their shipper customers operate. Consequently, a common carriage framework that omits service quality no longer appears tenable. Yet a fixed or well-defined service standard appears impractical in view of the wide diversity of shipper demands and expectations. Nevertheless, regulators must be able to monitor the response of railroads to the common carrier obligation. They need regularly collected data on service quality to evaluate service performance, particularly shipment-specific data to ascertain whether the service provided in common carriage is substantially different from that provided in contract carriage and whether differentials change markedly when capacity is tight.

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[71] NGFA expressed concern to the study committee that most grain shippers would not qualify for mandated switching because of their generally longer distances from interchanges [R. Gordon, NGFA, NGFA statement to the study committee, March 14, 2014 (http://www.trb.org/PolicyStudies/RailTransReg.aspx)].

[72] A primary concern expressed by railroads is that mandated switching could cause serious service inefficiencies by intruding on the ability of carriers to structure their networks, control their operations, and plan capacity utilization (see AAR comments to STB Ex Parte 711).

Annual Revenue Adequacy Determination

Every year, STB must compare each Class I railroad's ROI with an estimate of the industrywide cost of capital. Railroads with an ROI that exceeds the cost of capital are declared revenue adequate. The requirement was first instituted when many railroads were on the edge of bankruptcy and some were receiving substantial government subsidies—a state of affairs that no longer exists.

Nevertheless, there is a continuing public interest in ensuring the ability of railroads to keep producing and reinvesting. This must be balanced with the interest in preventing them from exercising market power to an excessive degree. In essence, policy makers need to be able to determine whether a railroad's profits consistently fall outside a reasonable band of profitability for a prolonged period. This need is not met by a regulatory agency issuing an annual pass/fail assessment of each railroad's earnings performance.

Merger Review

Two Class I railroads seeking to merge must apply and obtain approval from STB, which inherited this review authority from ICC. By law, STB must consider a range of potential effects from a merger, including impacts on the competitive structure of markets, rail workers, the environment, safety, and the ability of the merger applicants and other railroads to earn adequate revenues. In contrast, merger reviews conducted by the antitrust agencies focus exclusively on whether the transaction is likely to "substantially lessen competition." The railroad merger review process lacks the same transparency and clarity of purpose because of the statutory requirement for a public interest appraisal. The practical purpose of the appraisal after deregulation was to reduce the uneconomic capacity of struggling railroads and concentrate traffic and revenues for the healthier railroads that remained. Financial stability in the industry has been achieved, and any further merger reviews are likely to hinge on efficiency and competition issues that USDOJ is most qualified to assess. Thus, the rationale for retaining STB's role in reviewing mergers according to a public interest standard is not compelling.

Authority to Order Reciprocal Switching

The Staggers Rail Act gave regulators authority to order reciprocal switching arrangements when "necessary to provide competitive rail service." Reciprocal switching has been ordered on rare occasion in the United States to address competitive abuses that led to inadequate service. ICC's rationale for making minimal use of the authority, to which STB adheres, is that the law's maximum rate provision is available to captive shippers to obtain reasonable rates. Furthermore, reciprocal switching has not been imposed as a remedy for rates found to be unreasonable because the law expressly allows railroads to price up to 180 percent of variable cost, and a reciprocal switching remedy could depress rates below that level. The experience in Canada, where reciprocal switching is required regardless of rate levels, provides an opportunity for assessing its effects, particularly if the interest is in broader application. One possible starting point for assessing reciprocal switching on a more limited basis is to allow its use as an optional remedy for rates that have been ruled unreasonable and thus perhaps as an alternative to a prescribed rate.

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ICC	Interstate Commerce Commission

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5

Summary Assessment and Recommendations

This chapter provides a synopsis of the report's background and context discussion, an overview of recent trends in freight rail rates and issues pertaining to rail service quality and capacity, and critiques of several major elements of the federal railroad regulatory program. Together, they respond to the request by Congress for an independent examination of the

- Performance of the nation's major railroads with regard to service levels, service quality, and rates;
- Projected demand for freight transportation over the next two decades and the constraints limiting the railroads' ability to meet that demand; and
- Effectiveness of public policy in balancing the need for railroads to earn adequate returns with those of shippers for reasonable rates and adequate service.

The committee was asked to make recommendations on the "the future role of the Surface Transportation Board [STB] in regulating railroad rates, service levels, and the railroads' common carrier obligations, particularly as railroads may become revenue adequate." Therefore, at the conclusion of the chapter a number of actions to end or modify long-standing regulatory requirements and practices are recommended. In many cases the actions are accompanied by proposals to replace the requirements with alternative approaches consistent with the policy goals of the Staggers Rail Act.

The theme that unifies the recommendations is modernization. The Staggers Rail Act was successful in enabling the development of an efficient, innovative, and financially strong freight railroad industry, to the benefit of shippers and consumers. The law allowed the industry to modernize. However, many elements of the 35-year-old law's regulatory program are not appropriate for today's railroad industry. It is time to bring the regulatory program into the modern age.

STUDY CONTEXT

Regulatory Reforms of the Staggers Rail Act

The Staggers Rail Act of 1980 made fundamental changes in the federal railroad regulatory program. When the act was passed, the country's private freight railroad industry was in financial and physical decline. It had been overregulated and had lost large amounts of traffic to trucks. Some railroads were receiving government subsidies, and the industry's nationalization was a possibility. Just a few years earlier the federal government had nationalized passenger rail service. The railroads, which had once dominated the transportation of freight and passengers, were left with an asset base that had become oversized and misaligned with demand. They were generating too little revenue to pay for basic upkeep, much less reinvestment. Reducing expansive networks and other legacy capacity that had become uneconomic and making more intensive use of the capacity that remained were critical to the industry's survival as a private

enterprise. The Staggers Rail Act sought to enable such changes, which had been hindered for decades by the federal regulatory regime.

The Staggers Rail Act ended restrictions on rate-setting that had made price competition among railroads nearly nonexistent and that had detracted from the ability of railroads to compete with barges and trucks. The act allowed railroads to shed excess capacity and to concentrate traffic on fewer lines using fewer locomotives and workers. Regulators were required to be more accommodating of railroad requests to discontinue unprofitable service and to sell or abandon lightly used lines. Provisions in the law were intended to hasten what had become a slow and uncertain merger review process. Regulators were instructed to conduct the reviews according to a "public interest" standard that balanced the competitive effects of the merger against other potential outcomes. One outcome to be appraised was whether the proposed merger would enlarge the traffic base and earnings potential of the merged railroad and thus make it more financially viable (and thus less likely to need public subsidies).

The law allowed railroads to cancel many legacy trackage rights, terminal access, and reciprocal switching agreements—some imposed years before as merger conditions—that had hindered their ability in a deregulated setting to provide efficient direct service and to obtain pricing leverage over traffic that originated and terminated exclusively on their networks. Railroads would thus have an enhanced ability to concentrate traffic in more efficient movements and to charge "captive" shippers rates corresponding to their willingness to pay. Although the law permitted regulators to order access agreements if they were deemed "necessary to provide competitive rail service," such interventions were not required, and regulators ordered them only on rare occasions out of respect for the law's interest in revenue adequacy.

Congress's new regulatory policy was to allow "competition and the demand for services to establish reasonable rates for transportation by rail." In addition to ending most regulatory mechanisms that restricted pricing, the Staggers Rail Act legalized confidential contracting. With more operating and pricing freedom, railroads had more opportunity to innovate and compete for traffic that had been shifting to trucks. The new freedoms fit in with the act's provisions that made it easier for railroads to cancel interchange agreements and retain control over sole-served traffic. A railroad could thus obtain more market power over captive shippers and exercise that power more effectively by charging them up to their maximum willingness to pay. To retain the business of other shippers having more options, the railroad was free to negotiate individual contract rates commensurate with each shipper's willingness to pay. With private contracting made legal, the tariff rate no longer applied to all traffic. The railroads could maximize profits and prioritize profitable traffic flows without leaving any profit-generating traffic unserved.

The Staggers Rail Act reforms were thus oriented toward inducing efficiency, providing incentives for innovation and capital formation, and creating a renewed railroad alternative to trucks. The revenue-enhancing aims of the reforms were also clear. The private railroads were earning too little to keep producing and reinvesting in their capital-intensive systems, and the law was designed to alleviate that situation. The prolonged failure of railroads to cover their cost of capital promised service losses to shippers generally, with the greatest harm to those having the most dependence on rail. The general loss of freight rail service was not a policy option, however. Billions of dollars had been spent by the federal government on subsidies to failing private railroads, with the prospect of billions more. That course was not considered desirable, so Congress structured the Staggers Rail Act to emphasize railroad revenue adequacy.

The Staggers Rail Act was explicit that railroads should be allowed to earn their cost of capital and required regulators to make annual assessments of each railroad's progress in doing so. The assessments were to aid policy makers in monitoring the industry's financial condition and in determining whether additional actions were needed to turn the industry around. Revitalization was the immediate goal, followed by ensuring the long-term viability of a privately owned and operated freight railroad system. Whether the required annual revenue adequacy assessments were meant for other purposes, perhaps even to monitor the deregulated industry for signs of excessive profits, is unclear. Any purpose other than monitoring the rescue effort appears to have been secondary when the Staggers Rail Act was passed.

Unlike the comprehensive deregulation laws that were enacted contemporaneously for other transportation industries, the Staggers Rail Act preserved a number of economic regulations and added requirements intended to protect the interests of shippers who might be harmed by the regulatory reforms. A tenet of railroad regulation arising from common law is that railroads are "common carriers," obligated to provide service to all shippers on reasonable request and "without discrimination." This obligation was preserved for all traffic that could not be moved competitively by truck. In addition, Congress appears to have recognized that features of the law would enable railroads to obtain more market power and exploit it by raising rates, particularly for shippers who would lose transportation options when railroads elected to cancel their legacy interchange agreements with competitors. The law therefore did not end rate regulation entirely but included provisions allowing shippers using common carriage in markets lacking effective competition to challenge a rate as being unreasonably high.

While the Staggers Rail Act preserved the duty to provide common carrier service, it did not define either the minimum level of service that should be supplied or the maximum rates that could be charged. Minimum service requirements had never been defined for common carriage by rail, whereas rates had long been subject to regulation. With rates deregulated and allowed to change, service terms and levels could be expected to change as well. The Staggers Rail Act simply required that all common carrier rates be "reasonable." The reasonableness standard in railroad regulation had evolved from common law notions of fairness implying that similarly situated shippers should pay generally similar rates. The Staggers Rail Act did not prescribe a new or specific fairness standard. It declared that all common carrier rates should be presumed reasonable and that only shippers in markets where the railroad qualifies as being "dominant" could challenge a tariff rate on grounds that it is unreasonable. This exception to the law's pricing freedoms could be viewed as a counterbalance to the law's allowing railroads to obtain and exercise more market power as a means of covering capital costs, regaining financial viability, and ending the demand for public subsidies.

Aftermath of the Staggers Rail Act Reforms

Many of the reforms in the Staggers Rail Act could be adopted fairly quickly. Confidential contracting became legal immediately, and large amounts of traffic in markets where it became heavily used were effectively deregulated. The Interstate Commerce Commission (ICC), the industry's regulatory body, exempted entire categories of truck-competitive commodities and car types from regulation, including shipments moved in boxcars and intermodal containers. The agency expedited railroad requests to sell and abandon lightly used lines and approved applications for mergers involving railroads having overlapping networks on the basis of the public interest standard.

The reforms had an immediate impact on the subsidy debate—no federal operating subsidies were granted after 1981. Other changes occurred quickly as well. By 1995, the major railroads had shed more than 40 percent of their track mileage, two-thirds of their employees, and about one-third of their locomotives compared with 1970, when the wave of railroad bankruptcies had commenced. During the period, railroads had learned to make much more intensive use of their remaining capacity; ton-miles per track mile tripled, ton-miles per carload nearly doubled, and tons per train grew by nearly 60 percent. Hundreds of new regional and short-line railroads provided connecting service to shippers located along thousands of miles of lightly used branch lines abandoned or sold by the major railroads. The major railroads had become specialists in long-haul freight. Despite large reductions in road mileage and rolling stock, their operational capacity had increased, and ton-mileage grew by more than 40 percent from 1980 to 1995. Free to control their operations, reshape their physical plant, and innovate, the railroads even reclaimed a role in the transportation of high-value freight, as they tailored their services to accommodate the long-distance movement of intermodal containers.

The statistics suggest that shippers in general benefited significantly from the more innovative and efficient postderegulation railroads that had become competitive with trucks for more traffic. Productivity gains were largely passed along to shippers through lower rates and improved service. Revenue per ton-mile had declined in real terms by more than 10 percent by the end of the 1980s, and during the next decade shippers grew accustomed to steadily declining rates as railroads continued to consolidate traffic on mainlines by using larger cars and longer trains. During the 1990s, a 45 percent decrease in railroads' real input costs was accompanied by a 30 percent drop in real rates. The few postderegulation studies that tracked and placed monetary values on changed service, such as reductions in shipper inventory costs through faster and more reliable movements, concluded that the benefits to shippers from improved rail offerings were comparable with those from the reductions in rates.

Shipper Concerns and Issues Post-2000

During the early 2000s, signs appeared that the postderegulation efficiency gains of the railroad industry were largely complete. Rail rates had begun to rise, first in nominal and then in real terms partway through the decade. Between 2002 and 2007, real rates increased by more than 15 percent. Railroads were no longer fully offsetting increases in the price of fuel and other inputs through productivity gains. The industry's legacy capacity excesses had been shed. Traffic volumes had nevertheless been growing through 2006, and prerecession projections of continued fast growth were causing some policy makers and shippers to express concern that capacity had become too lean. With the service disruptions that followed the merger activity during the 1990s and other service disturbances in 2004 in mind, some shippers maintained that industry consolidation and rationalization of capacity had gone too far. They expressed concern that these developments had contributed to the secular rise in rates and to a potential for future demands for rail service to go unmet.

The upward trend in rates and episodic service disruptions renewed concerns that had been expressed by some shippers since ICC's initial implementation of the Staggers Rail Act:

- *Shippers maintained that regulators interested in improving the financial position of the railroads by curtailing excess capacity had placed too little emphasis on protecting shippers from unreasonable rates and unreliable service.* The claim was that because of mergers, which

helped reduce the number of Class I railroads from 41 in 1979 to seven by 1999, fewer markets had effective railroad competitors. In terminating ICC in 1995 and creating STB to replace it, Congress left the new agency with the authority to approve mergers by using the public interest standard, despite suggestions by shippers that review authority be transferred to the U.S. Department of Justice (USDOJ). STB had agreed to the merger of the Union Pacific and Southern Pacific Railroads over the objections of USDOJ, which had raised concerns about losses in competition that could harm shippers and consumers. By 2000, STB had declared that an excess of uneconomic capacity was no longer a problem and that further railroad consolidation could risk competition losses. In 2001 STB issued new merger review rules that emphasized the preservation of competition. However, this interest could only be assessed as a component of a legacy public interest appraisal requiring consideration of many other factors, such as the perceived interest of the public in protecting or enlarging a railroad's earning capabilities.

- *Shippers claimed that railroads, in their dual capacity as common and contract carriers, were giving preference to the latter form of service and neglecting the former*. By 2000, nearly half of all ton-miles were transported in contract carriage, and some commodities had migrated almost entirely out of common carriage. Other large segments of traditional rail traffic, including most grain and farm products, still relied on common carrier service. Shippers of these commodities maintained that during periods of temporary shortages in capacity they were more likely than contract shippers to endure significant delays and interruptions in service. They also complained that railroads were discouraging common carriage requests by providing inferior service, preconditioning service on costly upgrades in sidings and other infrastructure, and failing to deploy and make investments in the levels of capacity needed to ensure reliable service. Shippers wanted STB to introduce and enforce minimum service standards for common carriage.
- *Shippers expressed concern that access to rate relief for common carrier service had been substantially restricted because of the procedures used by regulators in assessing the reasonableness of disputed rates.* Rate cases applying the evidentiary standard introduced by ICC in 1985 for coal shippers could take years to adjudicate and had large minimum litigation costs that deterred rate challenges by shippers of smaller volumes over more varied routes. These shippers often had claims that were too small to justify the standard's minimum litigation costs, and a standard designed for traffic flowing regularly in defined corridors was often inappropriate and unworkable for them. By the early 2000s, nearly all rate cases had involved shippers of coal, whose large volumes and fixed traffic lanes made the risk–reward trade-off in bringing a case more favorable. Simplified procedures introduced in the mid-1990s for lower-volume shippers of commodities such as chemicals and grain had not attracted much interest. The procedures were still viewed by these shippers as inappropriate to their circumstances, with decision criteria that were too uncertain to justify the litigation expense. Shippers in markets lacking effective competition argued that regulators had not provided a balanced implementation of the law. Railroad revenue adequacy was being safeguarded, but mainly by making rate relief practically unavailable to most rail shippers.
- *Shippers claimed that railroads had become increasingly adept at obtaining and exploiting market power. They claimed that railroads set rates according to each shipper's maximum willingness to pay at levels that were collectively yielding profits beyond those needed to achieve a revenue adequate system with normal rates of return*. By 2006, three of the seven Class I railroads were declared revenue adequate by STB. The finding caused some shippers to

call for a reevaluation of the regulatory program's emphasis on promoting revenue adequacy and for the restructuring of rate reasonableness procedures to offer expanded opportunities for relief. Some shippers urged STB to make greater use of its authority to order interchange agreements and to mandate short-distance reciprocal switching to inject more competition in captive markets and reduce railroads' market power.

Railroads disputed all of these claims, but shipper complaints gained force as railroad rates continued to rise during the early 2000s and traffic volumes strained railroad capacity. Congress originally requested this study in 2005 against this backdrop. During the following two years, industrywide average rates reached their peak, but ton-miles began to decline. The deep economic recession that began in late 2007 quieted many concerns about high rates, low service levels, and capacity shortages. They resurfaced as freight demand and real rates increased after 2010.

REVIEW OF RATES, SERVICE, AND CAPACITY ISSUES

When the U.S. Department of Transportation (USDOT) initiated this study in late 2013, the railroad industry had been experiencing renewed growth in demand, and rates had been rising along with input costs. An especially severe winter was about to create major service disturbances, particularly for coal, grain, and fertilizer shippers in the Upper Midwest. Concerns about long-range shortages in railroad capacity had abated since their prerecession peak. However, the growth of trainload movements of crude oil after 2011, much of it originating in the Upper Midwest, intensified the controversy over whether railroads would devote substantial capacity to this new segment of contract traffic to the detriment of shippers who traditionally used common carriage.

Recent Trends in Rates (Chapter 2)

Since 2007, the railroad industry has been characterized by fluctuating rates, input costs, and demand. After real average rates per ton-mile reached their postderegulation low during 2001–2003, they increased by about 25 percent through 2013. Growth in rates was nearly twice as fast as that of ton-miles and far surpassed growth in input costs, which exhibited substantial volatility because of unstable fuel prices. The volatility may have led to higher contract rates, especially for long-term contracts renegotiated during periods of high fuel prices. Among major commodities, coal rates grew the fastest (up nearly 50 percent), followed by grain (up nearly 40 percent). The rate increases occurred even as railroads continued to consolidate traffic into larger shipments, a process that in the past had largely offset upward pressure on rates.

During the 2000s, more contract rates were negotiated as more bulk shippers shifted out of common carriage. By 2012, about three-quarters of nonexempt ton-miles moved under contract rates, compared with less than half a decade earlier. During the decade, coal shippers had turned almost exclusively to contract carriage. Shippers of grain remained the most committed to common carriage and to posted tariff rates, which still accounted for more than three-quarters of grain ton-miles in 2012.

Recent Service Quality Issues (Chapter 2)

STB maintains a waybill sampling program that allows the monitoring of railroad traffic and rates at the shipment level. It does not collect comparable shipment-specific records for monitoring the quality of common carrier service. Trends in service reliability, speed, and other aspects of performance must be inferred from a largely anecdotal record of shipper complaints. The record suggests that railroad service continues to experience disturbances when traffic volumes escalate unexpectedly and surpass the railroads' deployment of capacity. Service during the winter of 2013–2014 was particularly problematic for this reason and was made worse by unusually cold conditions that slowed and reduced the size of trains.

Whether service problems during such episodes are more severe for common carrier traffic or reliability is routinely inferior for that traffic cannot be ascertained from the complaint records or by assessing the aggregated service-related data collected by STB. The STB complaint record is naturally skewed toward shippers using common carriage because only their service is overseen by STB. An objective assessment of service quality might have been possible if shipment-specific data on service quality were available. In particular, whether the service provided in common carriage is substantially inferior to that of contract carriage and whether any service differentials tend to change when capacity is tight might have been ascertained.

Long-Run Supply of Capacity (Chapter 2)

Railroads maintain that service disturbances are not indicative of chronic underinvestment in capacity. Instead, they claim that disturbances are a temporary phenomenon arising from a short-run inability to adjust supply that can cause traffic to move slowly and some normally profitable traffic to go unserved. Nevertheless, concerns about railroads falling substantially short of the investments required to handle growth in freight traffic were prevalent before the recent recession. At that time, the railroad industry's networks had been made lean, traffic had been steadily growing, and forecasts of rapid rail freight growth for the 2020–2035 time frame had become exaggerated by the 2006 ton-mile peak. The predictions of capacity gaps were often dire but were seldom accompanied by explanations of how the profit motive of railroads would allow such a suboptimal outcome to persist over periods in which adjustments could be made. A profit-maximizing railroad with access to credit markets (i.e., one that is revenue adequate) and that can price according to each customer's willingness to pay should, in general, have the ability and incentive to invest in the capacity required to accommodate all profit-generating traffic. The profit incentive should be sufficient to motivate railroads to avoid large and protracted capacity shortfalls.

The profit motive by itself may not produce an equilibrium rail output that maximizes public welfare when externalities are considered. Forecasts of long-run capacity shortages seldom distinguish between valid concerns about railroads underinvesting in the capacity needed to handle socially optimal traffic and less credible concerns about railroads underinvesting in the capacity required to handle all profitable traffic. Shifting more freight from truck to rail may create positive externalities such as reductions in air pollution or highway congestion that neither carriers nor shippers take into account. In this sense, railroads may fall short of supplying welfare-maximizing levels of rail capacity, and this might warrant policy interventions to fill the gap. That possibility was not examined in this study because it involves issues outside the study charge and better suited to a multimodal study of national freight policy.

FINDINGS FROM A REVIEW OF RAIL REGULATION

The committee was asked to examine the effectiveness of the railroad regulatory program in balancing the interests of railroads in earning adequate returns and shippers in obtaining reasonable rate and service levels. Many aspects of the railroad regulatory program affect this balance. In view of the impracticality of reviewing them all, the study concentrated on five major regulatory provisions that remain controversial because of the substantial transformation of the railroad industry in the wake of the Staggers Rail Act.

The five provisions examined are (*a*) the criteria that qualify a shipper to dispute the reasonableness of a common carrier rate and the procedures used by regulators to resolve disputes, (*b*) the common carrier obligation and its implications for service quality, (*c*) the annual practice of determining the revenue adequacy of individual railroads, (*d*) the exemption of railroad mergers from standard antitrust reviews that focus on competition in favor of a broader public interest standard, and (*e*) the authority of regulators to order reciprocal switching to forestall or remedy unreasonable rates.

The results of the examination are summarized below. The chapters where the assessments were made are identified. Key assessment findings are summarized in Box 5-1. The findings have the following in common: many regulatory provisions and practices have outlived or no longer fulfill their original purpose and are candidates for discontinuation or replacement with practices better suited to today's railroad industry.

Rate Relief: More Appropriate, Reliable, and Usable Procedures Are Needed (Chapter 3)

The Staggers Rail Act gave railroads substantial freedom to set prices but restricted this freedom for common carriage rates when a railroad has market dominance. Market dominance is defined in the law as the absence of effective competition from other railroads or modes of transportation. A shipper is eligible to challenge a rate if the railroad involved has market dominance and the revenue earned from the disputed rate is more than 180 percent of the railroad's "variable cost" of providing the service, as computed by STB. If a disputed rate qualifies for adjudication according to these criteria, STB can rule on whether the challenged rate is reasonable. If the agency finds that the rate is unreasonable, it must order the reimbursement of overcharges and may prescribe a maximum rate that can be charged.

The three main steps in STB's granting of rate relief are (*a*) estimating the variable cost of a disputed movement, (*b*) determining whether effective competition exists in a market subject to a rate dispute, and (*c*) ruling on whether a qualifying rate is reasonable. The following are the committee's findings concerning the procedures used for each step.

Variable Cost Allocations Are Invalid and Unreliable

In stipulating that the variable cost of a priced unit of traffic be calculated as a means of screening it for eligibility for rate relief, the Staggers Rail Act created an insoluble problem for regulators. Railroads produce numerous kinds of freight service that differ in many dimensions, each of which can affect pricing to a significant degree, such as volume, location, and time of travel. Characterizing the relevant product, or "unit level," at which a shipment was actually

Box 5-1

Summary of Findings from Regulatory Review

Rate relief: more appropriate, reliable, and usable procedures are needed
Variable cost allocations are invalid and unreliable; empirically derived alternatives to the Uniform Railroad Costing System (URCS) and the revenue-to-variable-cost formula exist: URCS is neither an economically meaningful nor a reliable tool for making regulatory determinations about eligibility to pursue rate relief. These deficiencies cannot be overcome by revising URCS because no allocation of common costs can produce an economically valid and reliable measure of the variable cost of a shipment. Replacement of traditional cost allocation methods such as URCS with more credible, empirically based tools for identifying unusually high rates is now practical.

Time limits on market dominance inquiries are essential: Strict timelines for reviews are fundamental in preventing delays in market dominance inquiries. With time limits, categorical limits on evidence are unnecessary.

Methods for assessing rate reasonableness lack a sound economic rationale and are unusable by most shippers; sounder and more economical methods are needed: The commitment to the stand-alone cost test and other URCS-dependent methods for assessing disputed rates has produced inequalities in shipper access to the law's maximum rate protections. Faster, sounder, more transparent, and more economical methods are available for resolving rate disputes and could give more shippers the opportunity to pursue rate relief.

Common carrier obligation: service quality data are crucial in assuring responsive performance
Regularly collected, usable shipment-specific data on service quality are needed for evaluation of service performance to ascertain whether service provided in common carriage is substantially inferior to that of contract carriage and whether service differentials tend to change markedly when capacity is tight. A model for shipment-level data exists in the waybill sampling program that STB uses for monitoring railroad traffic and rates, and examples can be found in other transportation industries, such as the on-time performance data that are collected for each airline flight.

Annual revenue adequacy determination serves no constructive purpose
The annual revenue adequacy determination no longer provides meaningful information for policy making. Its persistence prolongs the misguided view that a single yes/no indicator of railroad profitability should be used to regulate rates.

Merger review: the legacy public interest standard is no longer justified
There is no longer an economically sound argument for retaining the ambiguous public interest standard applied by regulators for merger reviews in lieu of a well-defined, competition-based appraisal by antitrust enforcers.

Reciprocal switching orders: a potential remedy for unreasonable rates
Reciprocal switching deserves further consideration as a remedy for rates found to be unreasonable.

priced can require descriptive information at a fairly precise product level. That product-specific information may be available, but cost information at the same level will not be available. This information imbalance alone is a serious problem when generalized variable cost estimates are assigned to individual shipments and are supposed to have a meaningful relationship to their prices, which are in turn product-specific.

If regulators were only interested in the incremental costs of moving a given priced unit of traffic—such as the contribution to a train's fuel use—the lack of product-specific information would be problematic in itself. However, if the interest is in trying to assign many other railroad costs to the shipment, no level of precision will suffice. Most of a railroad's costs are shared by multiple units of traffic, not only at the aggregate level of the railroad and the network but also at the level of individual train service. For example, the sum of the incremental costs of each shipment in a multishipment train will be less than the incremental cost of operating the train itself. The former will not include the labor costs associated with operating the train's locomotive, which would not be reduced if any single shipment were removed. Any allocation of that common cost to the individual shipments would be arbitrary and lack an economic foundation.

In view of the futility of allocating common costs incurred at the microlevel of the train to individual shipments, making such allocations on the basis of macrolevel expense information for an entire railroad appears even less justifiable. Yet that is exactly what regulators try to do. Each category of a railroad's annual expenses is characterized as more or less variable with respect to traffic output, as measured for a given time interval. Depending on the time interval selected—which tends to be a function of the data collection intervals—the subtotal of expenses that are considered variable with respect to traffic will differ, because some cost items can be adjusted differently over the measured period of time. For example, regulators may decide that 95 percent of fuel use is variable with respect to annual traffic output and that 50 percent of interest expenses on capital are variable. The subtotal of expenses characterized as "variable" will thus have been determined to a large degree on the basis of when and what kinds of expense data are collected. Some cost items, such as the cost of congestion and delays and the cost of risk-bearing, will be omitted. Nevertheless, regulators will divide this subtotal, including expense items as varied as fuel, locomotives, and road maintenance, and assign portions of it to segments of a railroad's traffic. The units of traffic that will be the subject of the allocations will be fairly generic to create systemwide average variable costs for types of traffic that vaguely resemble the priced units.

After passage of the Staggers Rail Act, ICC introduced the Uniform Railroad Costing System (URCS) to fulfill the law's requirement to estimate "the variable cost for particular movements." URCS is a cost allocation scheme that proceeds in a manner similar to that described above. STB characterizes the results from URCS as "systemwide averages" and acknowledges that they do not reflect the actual cost of providing any specific service. Nevertheless, these averages—despite the numerous deficiencies just described—are in fact compared with the price of a specific shipment in the expectation that there will be a meaningful relationship between the two. In view of the vagaries and inherent arbitrariness of the process, any possibility of a stable and meaningful connection appears to be low. Such a comparison is insufficient for making decisions about whether the shipment's price is unreasonable or indicative of a railroad exercising excessive market power. Of course, URCS was developed for the primary purpose of making such decisions.

Previous studies have not found any connection between the revenue-to-variable-cost relationships that emerge from URCS and a railroad's market power. However, they indicate that URCS produces inexplicable results that should be cause for concern. For example, 20 to 30 percent of all railroad shipments have URCS-assigned variable costs that are higher than their rates. This outcome, which has persisted in the data for at least 15 years, implies that railroads lose money on about one-quarter of their traffic. STB has defended such findings by stating that ratios below 100 percent are possible for some traffic for short time periods. The reason given is that URCS is not a measure of short-run variable costs but instead is a measure of "intermediate-run variable costs" and includes costs associated with items such as rails and ties that are fixed in the short term. That defense illustrates the inherent problem of cost allocation—how, for example, can URCS decide on the allocation of rail and tie costs to specific units of traffic? It is also an implausible defense when 20 to 30 percent of traffic is assumed to be priced below cost from year to year and railroads nevertheless remain financially solvent. URCS produces many other results that appear unreasonable on their face and that suggest systematic biases in its allocation rules. Most short-haul traffic, for example, exceeds the 180 percent revenue-to-variable-cost threshold, as do most shipments of hazardous materials. Hence, not only does URCS make arbitrary distinctions about which traffic qualifies for rate relief, it does so in a nonrandom manner that is untenable.

Accordingly, **the committee finds that URCS is neither an economically meaningful nor a reliable tool for making regulatory determinations about eligibility to pursue rate relief. Furthermore, the deficiencies of URCS cannot be overcome by revising it. No allocation of common costs can produce an economically valid measure of the variable cost of a shipment.** When the Staggers Rail Act introduced the variable cost formula in 1980, railroad rates had long been regulated, and data on market-based rates were not available. That void in market-based rate data no longer exists. An alternative approach to the statutory formula and to URCS-like cost allocations is to compare disputed rates with those rates paid for comparable shipments in markets that are not dominated by a single carrier. Comparison and categorization of shipments are complicated because of the aforementioned problem of identifying the appropriate product offering (that is, the "priced unit" of traffic). Traffic and rate data reported to STB cannot be used to account for all shipment characteristics that can influence pricing. However, a comparison of rates that controls for a reasonable number of observable shipment characteristics eliminates the need to assign relevant costs to the traffic, which has proved to be a futile exercise with many side effects.

As demonstrated in Appendix B, such a competitive rate benchmarking method can be implemented today because STB already maintains a detailed database of shipments whose rates are determined in the marketplace. While those data could be refined, **replacement of cost allocation methods such as URCS with more credible, empirically based tools for identifying unusually high rates is now more practical.**

Time Limits on Market Dominance Inquiries Are Essential

When a tariff rate exceeds the 180 percent revenue-to-variable-cost threshold and a shipper paying that rate complains, the law requires a review of the competitive structure of the market in question, often referred to as a qualitative assessment of market dominance. Such assessments are site-specific and can be fact-intensive. During ICC's tenure, railroads defending a rate challenge were given wide latitude during market dominance inquiries to characterize a shipper's

rail substitution possibilities, including nontransportation options. A railroad could, for example, show that a shipper or its customers could substitute another product for the one transported by the railroad (product competition) or ship to and from other locations (geographic competition). However, to expedite rate cases, in 1998 STB prohibited evidence of product and geographic competition. Railroads have subsequently petitioned for the restoration of ICC's approach. They claim that current market dominance inquiries have become narrowly focused and overstate a railroad's market power. STB has denied the requests. It reports that rate cases have proceeded at a faster pace since the 1998 ruling and subsequently eased the burden on shippers of filing and processing a rate complaint.

Nontransportation forms of competition can affect a shipper's willingness to pay for rail transportation, perhaps significantly. But the number of factors considered in rendering a definitive assessment of a shipper's willingness to pay could become extensive and almost open-ended. The timely processing of cases would be unlikely and the fixed cost of challenging a rate would be raised beyond the reward potential of shippers with smaller claims. Nevertheless, antitrust agencies routinely consider product and geographic competition in defining the relevant market during merger reviews. Rather than categorically prohibiting certain evidence, they follow legislated timelines for the conduct of the reviews. Their focus is on disciplining the process directly through deadlines rather than indirectly through limits on evidentiary content.

In the same way, timelines could expedite market dominance inquiries. In so doing they would allow for an end to the categorical exclusion of types of evidence that the railroads believe is important. Indeed, **strict timelines for reviews are fundamental in preventing delays in market dominance inquiries. With time limits, categorical limits on evidence are unnecessary.**

Methods for Assessing Rate Reasonableness Lack a Sound Economic Rationale and Are Unusable by Most Shippers

If a shipper can prove it ships in a dominated market and its rate exceeds 180 percent of the URCS-determined variable cost, it is eligible to challenge its rate on the basis of one of three methods for judging rate reasonableness. The original method adopted by ICC in 1985 is a stand-alone cost (SAC) proceeding. In response to congressional demands for faster handling of rate cases, in 1997 STB instituted two additional methods intended for use mostly for smaller claims. All three are predicated on the idea that shippers should be required to demonstrate that the challenged rate produces revenues higher than those needed by the railroad to cover its common costs. Regulators have sought to link the decision about what constitutes a reasonable rate to the law's interest in ensuring that railroads are not denied the ability to achieve revenue adequacy through the imposition of such evidentiary requirements.

The SAC procedure remains STB's main evidentiary method. It requires complainant shippers to design a hypothetical railroad that offers stand-alone service. Detailed assumptions and documentation about its configuration and investment and operating expense items such as locomotives, car leasing, personnel, materials, and administration must be provided. Rates based on stand-alone costs were initially proposed for use in the telecommunications industry, where sunk costs are relatively low. The argument was that in telecommunication a rate that exceeds the SAC of providing the service in question could invite inefficient entry and should thus be lowered. Use of the SAC test in today's railroad industry, where sunk costs are massive and new railroad entry is almost inconceivable, lacks a similar rationale.

In a SAC proceeding, shippers can propose the inclusion of traffic that crosses over the corridor (or set of corridors) and contributes net revenues (profits) that effectively lower the amount of revenue the stand-alone railroad would need to earn from the complainant shipper to maintain the service. Railroads can argue that some or all of this proposed crossover traffic should be excluded. For shippers of relatively small quantities, whose traffic is not the dominant flow in the corridor, the significance of the railroad's profits earned from crossover traffic is crucial. The profit contribution from crossover traffic is estimated by using revenue-over-variable-cost markups derived from URCS. If STB finds that the revenue earned by the defendant railroad from the complainant shipper exceeds the revenue needed by the stand-alone railroad to serve this traffic, after profits from crossover traffic are factored in, STB will find the rate to be unreasonable. The revenue-adequate rate the stand-alone railroad would need to charge the shipper would become the maximum rate that can be judged reasonable according to STB. If that rate is lower than the defendant railroad's rate, it becomes the basis for the imposition of overcharge penalties and a prescribed rate that is no lower than 180 percent of the traffic's revenue-to-variable-cost ratio as derived from URCS.

The SAC process was originally introduced to resolve rate disputes brought by coal shippers, who ship large, regular volumes in fixed corridors. According to coal shippers, the SAC process is burdensome and leads to rates being judged reasonable at conservatively high levels out of deference to revenue adequacy; the true revenue needs of the railroad are lower because of network economies. Coal shippers have long demonstrated the ability to bring and prevail in a SAC case. In contrast, shippers who transport smaller volumes on more varied routes have not. The design of a stand-alone railroad entails large litigation expenses that cannot be justified by shippers with relatively small claims. These shippers, whose traffic is not the dominant flow (or remotely close to it), must depend heavily on the profits generated by any crossover traffic that STB rules can be included in the SAC analysis. These profit contributions are computed from revenue-over-variable-cost markups as contrived by URCS. Complainant shippers can therefore face substantial uncertainty about a fundamental aspect of their SAC case. Such uncertainties, coupled with the high litigation costs of SAC, have discouraged most shippers of commodities other than coal from making use of the process.

After more than a decade of complaints about SAC from shippers of grain, chemicals, and other commodities, STB introduced the two expedited evidentiary methods for assessing rate reasonableness. One is a somewhat simplified version of SAC; the other, known as the three-benchmark method, assesses the profitability of traffic as determined by the revenue-to-variable-cost ratios established from URCS. In so doing, the agency indicated its continued commitment to a cost-based approach for assessing rate reasonableness and to linking the assessment process to the interest of ensuring railroad revenue adequacy. Shippers of some commodities that are heavy users of common carriage, including grain, have not demonstrated the ability to use the expedited methods after more than 15 years. They contend that the procedures continue to be irrelevant, to impose a substantial cost burden, and to be prone to uncertainties about decision criteria.

STB has been using the conceptually flawed URCS and the inappropriate SAC test for 30 years. The agency's rate relief procedures are still not usable by many of the primary users of common carriage. **The committee finds that the commitment to the SAC test and other URCS-dependent methods for assessing disputed rates has produced large and prolonged inequalities in shipper access to the law's maximum rate protections.** The commitment to costing methods stems from congressional directives to ensure that maximum rate decisions not

impair the ability of railroads to become revenue adequate. However, the revenue-to-variable-cost formula for screening rates for eligibility for regulatory review is both arbitrary and biased because of the inherent problems associated with defining and allocating variable costs. In view of these problems, it is reasonable to surmise that the SAC process was instituted as a safeguard for revenue adequacy out of concern that unjustified rate cases could put railroad financial viability at risk. The committee has found that URCS produces revenue-to-variable-cost percentages implying that one-quarter of all railroad traffic is priced below variable cost and that most hazardous materials and short-haul traffic exceeds the 180 percent threshold. These findings suggest that concerns over the reliability of the screening process are well founded. The serious deficiencies in the current screening process need to be rectified before more usable procedures for rate dispute resolution that respect the law's interest in revenue adequacy can be implemented.

If a more reliable screening process is implemented, **faster, sounder, more transparent, and more economical methods are available for resolving rate disputes that would give more shippers the opportunity to pursue rate relief.** The experience in Canada has shown that time-limited arbitration, particularly if applied with a final-offer decision rule, can produce reasonably fast resolutions to rate disputes, in part by inducing settlements. STB has considered final-offer arbitration as a potentially faster and more economical means of resolving rate disputes but has concluded that such an approach would need to be legislatively authorized. The findings of this study suggest that such an authorization would be ill-advised unless it is accompanied by complementary changes in other elements of the rate relief process, especially the revenue-to-variable-cost screen.

Common Carrier Obligation: Service Quality Data Are Essential in Assuring Responsive Performance (Chapter 4)

Rail regulators historically focused their attention on rates, whose levels were often more pertinent to shippers because of the uniformity of other attributes of regulated rail service. Until the Staggers Rail Act, all railroad traffic was moved in common carriage, and all rates and other terms of service were publicly posted and to a large degree similar. The act retained the common carrier duty but transformed both its applicability and its enforceability. The law not only ended the general applicability of common carriage but also increased the likelihood that its service attributes would become more heterogeneous. Thus, even as regulators retained the authority to establish certain common practices for aspects of common carriage such as tariff disclosure methods, rates and other attributes of the service content became more varied.

Thirty-five years after passage of the Staggers Rail Act, the broader logistics system as well as the railroads has been transformed. A requirement for common carriage that neglects service quality no longer seems tenable. At the same time, a well-defined set of service standards appears to be impractical in an environment characterized by diverse service offerings and changing logistics needs. The dilemma for regulators is that for the common carrier obligation to persist—as it must, if only to give effect to the law's protections for shippers from unreasonable rates—the capability of monitoring service levels is essential in ensuring that the obligation is being met.

The tracking of complaint reports is not adequate for this purpose, nor are highly aggregated data that do not even distinguish between the service that is being provided for common and contract carriage. STB recognizes the need for better service-related data.

However, its proposed enhancements appear to be an ad hoc reaction to the latest episode of service disturbances and complaints. **The committee finds that regularly collected, usable data on service quality are needed to evaluate service performance. In particular, shipment-specific data could help ascertain whether service provided in common carriage is substantially inferior to that provided in contract carriage and whether any service differentials change markedly when capacity is tight. The waybill sampling program that STB uses for monitoring railroad traffic and rates is one model for shipment-level data, and examples can be found in other transportation industries, such as the on-time performance data that are collected for each airline flight.**

Annual Revenue Adequacy Determination Serves No Constructive Purpose (Chapter 4)

On an annual basis, STB compares each Class I railroad's rate of return on investment with an estimate of the industrywide cost of capital. Railroads with a rate of return exceeding the cost of capital are declared revenue adequate. The requirement was introduced during the 1970s, when many railroads were on the edge of bankruptcy and some were receiving substantial government subsidies. Policy makers needed to gauge the effectiveness of the regulatory reforms in rescuing the industry from its financial distress. That concern no longer exists.

There is a continuing public interest in ensuring the ability of railroads to keep investing, but balanced with an interest in preventing the excessive exercise of market power. In essence, policy makers need to determine whether a railroad's profits are consistently outside a reasonable band of profitability that characterizes many other industries over a business cycle. This need is not met by a regulatory agency annually issuing a single assessment of each railroad's earnings performance. Like all businesses, railroads have good and bad financial periods. A process that boils down financial and economic performance into a single pass/fail judgment is misleading and incapable of providing the detail needed for informed policy making. Furthermore, by continuing to compare each railroad's rate of return with an industrywide average cost of capital, regulators leave the impression that the practice might eventually be used to impose rate-of-return regulation. Such public utility–type regulation has never been used to regulate railroads and would be at odds with the Staggers Rail Act, a central policy of which is to minimize the need for federal regulatory control.

The committee finds that the annual revenue adequacy determination no longer provides meaningful information for policy making. Its persistence prolongs the misguided view that a single yes/no indicator of railroad profitability can be used to regulate rates. Periodic, but not annual, reviews of the economic and financial condition of the railroad industry as a whole, including rate, service, and competition levels, would provide a richer set of information for the improvement of railroad policies and regulation.

Merger Review: The Legacy Public Interest Standard Is No Longer Justified (Chapter 4)

Two Class I railroads seeking to merge must apply and obtain approval from STB, which inherited this review authority from ICC. By law, STB must consider a range of potential effects from a merger, including impacts on the competitive structure of markets, rail workers, safety, and the ability of the applicants and other railroads to earn adequate revenues. In contrast, merger reviews conducted by the antitrust agencies focus exclusively on whether the transaction is likely to "substantially lessen competition." In most transportation industries, merger reviews

are conducted by the Antitrust Division of USDOJ on the basis of well-defined and transparent analytic methods, evidentiary procedures, and review timelines.

After the number of Class I railroads had declined to seven by the end of the 1990s, STB expressed concern that further consolidation would harm competition to the detriment of consumers. In 2001 STB introduced new procedures for reviewing mergers that placed greater emphasis on preserving competition. Because the law itself was not changed, the agency remained obligated to appraise mergers in the context of the broader, statutorily required public interest standard. That standard allows ill-defined and ambiguous interests to be introduced into the review. It also allows consideration of potential outcomes that are no longer clearly in the public interest, such as the ability of the transaction to raise the revenues of the merged railroad and to protect the earnings capability of other railroads competing with the merged railroad. When most railroads were financially troubled, giving positive consideration to such effects may have been in the public interest, if only to reduce the need for public subsidy. However, such conditions no longer exist.

In antitrust merger reviews, the enforcement agency must prove that the transaction is illegal because it is likely to lessen competition substantially. Under STB merger review procedures, the railroad applicants must demonstrate that losses in competition will be minimal or that such losses will be more than offset by other beneficial outcomes in the public interest. The committee's assessment of STB's merger review procedures could find no definitive guidance on what constitutes a merger outcome that would or would not be in the public interest, nor any clear directives about the evidentiary and analytic procedures that applicants must follow to inform the agency's decision. This clouded review process appears to have arisen from a statutory requirement to review mergers in the context of a broader standard. The standard has been applied in the past to reduce the uneconomic capacity of struggling railroads and to concentrate traffic and revenues for the financially healthier railroads that remained. Railroad financial stability has been achieved, and any further merger reviews are likely to hinge on efficiency and competition issues that USDOJ is most qualified to assess. Thus, the rationale for retaining STB's role in reviewing mergers according to a public interest standard is no longer compelling.

The committee finds that there is no longer an economically sound argument for retaining the ambiguous public interest standard applied by regulators for merger reviews in lieu of a well-defined competition-based appraisal by antitrust enforcers. The law already requires USDOJ to advise STB on the competition impacts of major railroad mergers. USDOJ's Antitrust Division is more qualified to assess competitive impacts than is STB, and the rationale for relegating the antitrust agency to a subordinate role no longer exists.

Reciprocal Switching Orders: A Potential Remedy for Unreasonable Rates (Chapter 4)

The Staggers Rail Act made it easier for a railroad to cancel terminal access, trackage rights, and reciprocal switching agreements with competitors for traffic that it could serve by itself. The law nevertheless gave regulators a new authority for ordering reciprocal switching arrangements when that was "necessary to provide competitive rail service." A railroad ordered to engage in reciprocal switching must agree, for a regulated fee, to transport shipments originating or terminating on its line to or from a nearby interchange with another railroad willing to perform the line-haul movement. In this way, a reciprocal switching order can increase a captive shipper's competitive options. Canada's two major railroads have long been required to switch

traffic according to government-prescribed switching rates if requested for an interchange located within 30 kilometers (about 19 miles) of the shipment's origin or destination.

Reciprocal switching has been ordered on rare occasions in the United States to address competitive abuses that led to inadequate service. ICC's rationale for making minimal use of the authority, to which STB adheres, is that the law's maximum rate provision is available to captive shippers to obtain reasonable rates. In addition, reciprocal switching has not been imposed as a remedy for rates ruled unreasonable because the law expressly allows railroads to price up to 180 percent of variable cost, and a reciprocal switching order could depress rates below that level. The experience in Canada, where reciprocal switching is required regardless of rate levels, provides an opportunity for assessing its effects, particularly if the interest is in broader application. One possible starting point for assessing reciprocal switching on a more limited basis is to allow its use as an optional remedy for rates that have been ruled unreasonable and thereby to provide an alternative to a prescribed rate.

RECOMMENDATIONS FOR REGULATORY CHANGE

A presumption of this study has been that policy makers are satisfied with the overarching policies of the Staggers Rail Act, such as allowing railroads to achieve revenue adequacy and shippers to obtain reasonable rates. The study findings suggest that certain regulatory provisions and practices no longer serve these policy goals or could serve them more effectively if they were designed and implemented differently. Hence, most of the recommendations that follow do not simply advise ending a regulatory provision or practice; they are accompanied by proposals for alternative regulatory designs or procedures better suited to today's railroad industry. Because the study was called for in legislation, the intended main recipient of the recommendations is Congress. Most of the recommended steps summarized in Box 5-2 would require legislative action.

Prepare to repeal the 180 percent revenue-to-variable-cost formula by directing USDOT to develop, test, and refine competitive rate benchmarking methods that can replace URCS in screening rates for eligibility to be challenged.

Recommendation: End the economically unsound regulatory requirement of estimating the variable cost of railroad movements to allow STB to dispense with all cost allocation schemes such as URCS. Move closer to common law notions of rate fairness by introducing a rate screening process that allows shippers to seek relief if they are paying tariff rates that are unusually high in comparison with rates paid for similar shipments in markets having more competition options. Require USDOT to make a concerted effort to develop a benchmarking system to replace URCS and the revenue-to-variable-cost formula, and make the necessary resources for this task available.

Rationale: When the revenue-to-variable-cost formula was introduced in the Staggers Rail Act more than 30 years ago, rates had long been set by cartels under regulatory oversight. There was little practical value in comparing rates in dominated versus more competitive markets. The regulatory practice of assigning portions of a railroad's total costs to individual units of traffic was therefore retained as a way of identifying potentially excessive rates. However, most of a

railroad's costs are shared by multiple units of traffic and cannot be unambiguously divided and assigned to individually priced units. The variable cost estimations of URCS are arbitrary and bear no stable relationship to the cost of individual shipments, railroad pricing decisions, or railroad revenue needs. Even though the variable cost allocations are inherently arbitrary, they play a significant role in deciding which rates qualify for relief. Comparisons with actual shipment prices are bound to produce distorted depictions of market dominance and other illogical outcomes, such as consistently showing large amounts of traffic moving at an economic loss. URCS has been shown to produce such distortions.

Box 5-2

Recommendations

Prepare to repeal the 180 percent revenue-to-variable-cost formula by directing USDOT to develop, test, and refine competitive rate benchmarking methods that can replace URCS in screening rates for eligibility to be challenged.
End the economically unsound regulatory requirement of estimating the variable cost of railroad movements to allow STB to dispense with all cost allocation schemes such as URCS. Move closer to common law notions of rate fairness by introducing a rate screening process that allows shippers to seek relief if they are paying tariff rates that are unusually high in comparison with rates paid for similar shipments in markets having more competition options. Require USDOT to make a concerted effort to develop a competitive rate benchmarking system to replace URCS and the revenue-to-variable-cost formula, and make the necessary resources for this task available.

Make entitlement to rate relief contingent on a satisfactory finding of market dominance in the procedure for ruling on the reasonableness of a rate and do not limit the types of evidence that can be used to assess dominance.
Make a shipper's entitlement to rate relief dependent on a satisfactory finding of market dominance in the procedure used for determining the reasonableness of the rate to avoid delays in the processing of cases. There should be no restrictions on the types of evidence—such as that pertaining to product and geographic competition—that can be introduced to assess market dominance.

Replace STB rate reasonableness hearings with an arbitration procedure that compels faster rulings on disputes involving rates found eligible to be challenged because they substantially exceed their competitive benchmarks.
End STB's direct role in adjudicating rate disputes and prescribing penalties and remedies. Require that disputes involving rates that pass the benchmarking screen be resolved through an independent arbitration process similar to the one long used for resolving rate disputes in Canada. Unless both sides agree to another format, the arbitration should be performed under a strict time limit and a final-offer rule,

(*continued*)

Box 5-2 (*continued*)

whereby each side offers its evidence, arguments, and possibly a changed rate or other remedy in a complete and unmodifiable form after a brief hearing. The arbitrator should be instructed to keep the offers private and choose only one side's full offer without compromise. However, if market dominance is not found to the satisfaction of the arbitrator, he or she should be guided by STB instructions either to dismiss the challenge or to accept the railroad's offer. STB should identify candidate arbitrators and require professional qualifications that are not so restrictive with regard to specialized railroad industry expertise that the processing of challenges may be slowed. Serious consideration should be given to restricting opportunities to appeal arbitration rulings to ensure that the process remains timely and economical.

Allow reciprocal switching as a remedy for unreasonable rates.
End the practical prohibition on reciprocal switching as a remedy for an unreasonable rate. Allow the parties in rate arbitrations to propose reciprocal switching arrangements in their offers to resolve the dispute if they so desire and allow the arbitrator to order that such arrangements be made.

End annual revenue adequacy determinations; require periodic assessments of industrywide economic and competitive conditions.
End the requirement for annual determinations of each railroad's revenue adequacy status. Replace this formulaic process with a requirement for periodic (e.g., 5-year) monitoring and assessment of the railroad industry's economic performance, competitive conditions, and rate and service levels to inform railroad regulatory decisions and policies.

Transfer merger review authority to the antitrust agencies, which would apply customary antitrust principles rather than a public interest standard.
End the requirement that railroad mergers be reviewed and approved by STB according to a broad public interest standard. Turn over responsibility for merger reviews to USDOJ, which would enforce the competition standard of the antitrust laws as it is applied to other transportation industries. Just as it consults with USDOT on airline mergers, USDOJ would be expected to solicit the views of STB on proposed railroad mergers, but it would not be bound by those views.

Require a strategic review of STB data programs to identify opportunities to simplify or discontinue the reporting of little-used data as a general matter and for the following specific purposes:

1. To improve the accuracy, utility, timeliness, and availability of the Carload Waybill Sample to implement the competitive rate benchmarking tool and enable more independent analyses and beneficial uses;
2. To obtain shipment-level data on service quality to monitor the railroads' responsiveness to the common carrier obligation; and
3. To reassess the collection of detailed railroad accounting, financial, and operations data, with consideration of opportunities to reduce railroad reporting burdens as regulatory approaches change and to obtain the kinds of data that will be required to conduct periodic economic and competition studies of the industry.

A wealth of information on unregulated, market-based rail prices now exists in STB's annual Carload Waybill Sample (CWS), along with detailed information on characteristics of individual shipments. The information can be used to develop models of rates determined under effectively competitive conditions. The resulting models can be used by a shipper to compare its rate with the model's benchmark prediction of the rate it would have been charged under effective competition. Even if a railroad's rates were uninfluenced by levels of competition, about half the time shippers who compared their rates with the median predicted benchmark would find their rates to be higher, at least to some degree. No model based on real data ever fits perfectly, and prediction errors will cause many tested rates to exceed their predicted competitive benchmark levels. Sometimes the excess will be large in percentage terms. The reason is that the data cannot include all of the economically meaningful characteristics of a shipment that may affect its rate. However, the larger the excess, the greater the likelihood that unobserved characteristics and prediction error alone are not the cause and that the exercise of market power is a contributing factor.

Regulators would need to decide the percentage by which a tested rate must exceed its predicted benchmark competitive level before a shipper could have its rate scrutinized as potentially unreasonable. Examinations of each model's predictive capability may be undertaken to inform such decisions, and regulators may apply different qualifying thresholds for different commodities. Regulators would need to consider an obvious trade-off in making such decisions: a stricter screen (i.e., large percentage threshold) will provide less of a threat to railroad revenue adequacy, but fewer shippers with legitimate rate grievances will be eligible for relief. Making the screen less strict will offer greater opportunity for shippers to challenge their rates but pose a greater threat to railroad revenue adequacy. Decisions about the appropriate threshold could be controversial. However, the transparency of the competitive rate benchmarking tool makes it preferable to the current system, which relies on arbitrary cost allocation rules that are used to implement an arbitrary revenue-to-variable-cost formula contrived more than a generation ago.

The recommended competitive rate benchmarking model approach would be no more complicated to construct and run, and would probably be less so, than the annual derivation of variable costs from URCS. The complexity of the latter has prevented its basic structure from being changed for decades despite fundamental methodological flaws. The proof-of-concept analysis in Appendix B demonstrates how the CWS, supplemented with readily available information on the physical layout of the railroad networks and proximity to competing transportation modes, can be used to develop the benchmark models. Once they were constructed, models of this general type could be used from year to year. They would be updated regularly with new data on shipment rates and characteristics as obtained from the annual CWS. Refraining from making significant changes in the models except on a periodic basis (e.g., every 5 to 10 years) would have the advantage of ensuring stability and predictability by users.

Make entitlement to rate relief contingent on a satisfactory finding of market dominance in the procedure for ruling on the reasonableness of a rate and do not limit the types of evidence that can be used to assess dominance.

Recommendation: Make a shipper's entitlement to rate relief dependent on a satisfactory finding of market dominance in the procedure used for determining the reasonableness of the rate to avoid delays in the processing of cases. There should be no restrictions on the types of

evidence—such as that pertaining to product and geographic competition—that can be introduced to assess market dominance.

Rationale: The law does not clearly define what constitutes an unreasonable rate, but it does stipulate that relief should apply where there is a lack of effective competition. A competitive rate benchmarking model cannot control for all factors that can temper a railroad's market power, including product and geographic competition. Thus, further assurance is warranted that a railroad's market dominance has been directly reviewed before a shipper is entitled to relief. The structure and elements of that dominance review need not be formally defined and can be folded into the overall process for ruling on the reasonableness of a rate as long as the design of the overall process prompts timely rulings.

STB's current detailed assessment of market dominance deters shipper claims by delaying processing and increasing litigation costs. The process restricts the evidence a railroad can submit to dispute market dominance as a way of expediting this step. The emphasis on expedited processing should remain, but timeliness should be achieved by integrating the assessment of market dominance into the procedure used for ruling on the reasonableness of the rate. The antitrust agencies now consider evidence on market structure under a strict timeline during complex merger reviews, and there is no obvious reason why the assessment of market dominance for a less complicated rail rate dispute should require a separate, time-consuming proceeding.

Replace STB rate reasonableness hearings with an arbitration procedure that compels faster rulings on disputes involving rates found eligible to be challenged because they substantially exceed their competitive benchmarks.

Recommendation: End STB's direct role in adjudicating rate disputes and prescribing penalties and remedies. Require that disputes involving rates that pass the benchmarking screen be resolved through an independent arbitration process similar to the one long used for resolving rate disputes in Canada. Unless both sides agree to another format, the arbitration should be performed under a strict time limit through a final-offer rule whereby each side offers its evidence, arguments, and possibly a changed rate or other remedy in a complete and unmodifiable form after a brief hearing. The arbitrator should be instructed to keep the offers private and choose only one side's full offer without compromise. However, if market dominance is not found to the satisfaction of the arbitrator, he or she should be guided by STB instructions either to dismiss the challenge or to accept the railroad's offer. STB should identify candidate arbitrators and require professional qualifications that are not so restrictive with regard to specialized railroad industry expertise that the processing of challenges may be slowed. Serious consideration should be given to restricting opportunities to appeal arbitration rulings to ensure that the process remains timely and economical.

Rationale: The evidentiary standards and procedures used by ICC and STB for adjudicating rate disputes are slow, costly, and inappropriate to many shippers' circumstances. They prevent shippers from having equal and effective access to the law's maximum rate protections. Efforts to streamline and expedite the procedures have not overcome these deficiencies. In some respects they have made matters worse by causing STB to become more dependent on the arbitrary cost allocations made by URCS. Thus, STB has moved toward replacing the inappropriate and

cumbersome SAC test with procedures that offer even less predictable decision criteria and lack even that test's weak conceptual basis.

The recommended replacement of formal STB hearings with a private, final-offer arbitration process would motivate the sides to pursue constructive resolutions without concern over establishing unfavorable precedents. Arbitration accompanied by deadlines should make the processing of rate disputes faster and induce settlements. The stipulation that the briefs, final offers, and explanations for the decision are to be kept confidential (and thus would not be precedent-setting) should increase the chances of a settlement. The ruling must be consistent with the law's interest in controlling rates only when there is market dominance, so the arbitrator must be convinced of dominance either as a condition for proceeding to the final-offer stage or for choosing the shipper's final offer. The first approach, requiring a finding of market dominance as a prerequisite for reviewing final offers, may be viewed as disadvantageous by a shipper with a smaller claim; the prerequisite could introduce a time-consuming step before a final ruling can be made in the shipper's favor. The latter approach, which implies a single-stage process, may be viewed as disadvantageous by a railroad. It could be put in the position of having to choose how far to go in disputing market dominance versus defending the reasonableness of its rate or proposing alternatives in its final offer. The timing of the introduction of the market dominance decision into the arbitration proceeding would need to take such views into account. Presumably, other arbitration formats and dispute resolution methods could be used if they were agreed to by all parties. Among them might be a separate arbitration to decide first on the reasonableness of the rate and, if it is found to be unreasonable, a second stage to decide the remedy.

In the committee's view, access to rate relief on the basis of the competitive rate benchmarking system would end the necessity for elaborate evidentiary procedures such as SAC presentations. The URCS-based revenue-to-variable-cost formula is an unreliable indicator of the exercise of market power. It offers no assurance that rates above its threshold are unreasonable or that rates below are not. STB has imposed burdensome evidentiary standards for rate adjudication, perhaps to protect revenue adequacy. In addition to being inappropriate for many types of traffic, these standards have such high fixed litigation costs or uncertain decision criteria that they have substantially restricted the pool of shippers eligible to pursue rate relief. Under the proposed competitive rate benchmarking approach, revenue adequacy could be protected at the outset of the process on the basis of transparent choices made by regulators about the strictness of the benchmarking screens.

Use of the proposed competitive rate benchmarking tool would allow all subsequent phases of the rate relief process to be made more economical and usable, since they would no longer serve as the main safeguards for revenue adequacy. The committee believes that if a competitive rate benchmarking process is instituted, STB's current adjudication processes can be replaced by the expedited form of rate arbitration long used in Canada without threatening revenue adequacy. The strict timeline for preparing arguments and evidence should make the process more economical and thus more accessible to shippers who pass the competitive rate and market dominance screens. It should also prompt more shippers and railroads to resolve disputes on their own.

Allow reciprocal switching as a remedy for unreasonable rates.

Recommendation: End the practical prohibition on reciprocal switching as a remedy for an unreasonable rate. Allow the parties in rate arbitrations to propose reciprocal switching arrangements in their offers to resolve the dispute if they so desire, and allow the arbitrator to order that such arrangements be made.

Rationale: Allowing a reciprocal switching arrangement to be proposed as a remedy in a final-offer arbitration proceeding appears to be prudent. Any proposal under this format, if the proposer intends to prevail, is likely to be reasonable in scope. Accordingly, there should be no need for regulators to set switching fee schedules or to establish applicable distance limits as in Canada. Such terms should be part of the offer to be put before the arbitrator. Reciprocal switching has never been prescribed by STB when a rate is found to be unreasonable, partly out of concern that such an intervention would cause rates to go below the statutory 180 percent revenue-to-variable-cost threshold. The recommended repeal of this arbitrary formula should make this concern moot.

End annual revenue adequacy determinations; require periodic assessments of industrywide economic and competitive conditions.

Recommendation: End the requirement for annual determinations of each railroad's revenue adequacy status. Replace it with a requirement for periodic (e.g., 5-year) monitoring and assessment of the railroad industry's economic performance, competitive conditions, and rate and service levels to inform railroad regulatory decisions and policies.

Rationale: The annual pass/fail revenue adequacy appraisal of Class I railroads has become ritualistic. It offers little substantive information for regulators and policy makers in monitoring economic and competitive conditions in the industry. The requirement was adopted when railroads were failing and the subject of government rescue efforts. It suggests a long-term interest in regulating the profitability of individual railroads, which appears neither practical nor consistent with the deregulatory thrust of the Staggers Rail Act reforms. By sponsoring periodic assessments of economic and competitive conditions in the industry as a whole on the basis of more varied data and analytic techniques, Congress and STB would obtain a richer set of information to support regulatory decisions and policies.

Transfer merger review authority to the antitrust agencies, which would apply customary antitrust principles rather than a public interest standard.

Recommendation: End the requirement that railroad mergers be reviewed and approved by STB according to a broad public interest standard. Turn over responsibility for merger reviews to USDOJ, which would enforce the competition standard of the antitrust laws as it is applied to other transportation industries. Just as USDOJ consults with USDOT on airline mergers, it would be expected to solicit the views of STB on proposed railroad mergers, but it would not be bound by those views.

Rationale: Decades ago, when the railroads were heavily regulated, they were exempted from antitrust reviews of proposed mergers and subjected instead to a broader public interest review by ICC. Even after economic regulations in the industry were eased, the public interest standard was retained. Part of the purpose was to allow the more financially viable railroads to reduce perceived duplicative capacity by acquiring struggling competitors. In that way, they could concentrate traffic and revenues and regain profitability. Any such rationale for keeping the public interest standard no longer exists. STB itself has stated that excess and duplicative capacity are no longer problems and that preserving competition among the remaining railroads will be the priority for future reviews. In view of the diminished reasons for the public interest standard, its preservation can only detract from the desired focus on competition. STB is not as qualified to assess competitive effects as the Antitrust Division of USDOJ, which is already required to advise STB on a merger's potential competition effects. Ending the public interest standard and turning over responsibility to the Antitrust Division, with an obligation to hear STB's views, would be timely and is warranted.

Require a strategic review of STB data programs to identify opportunities to simplify or discontinue the reporting of little-used data as a general matter and for the following specific purposes:

1. To improve the accuracy, utility, timeliness, and availability of the CWS to implement the competitive rate benchmarking tool and enable more independent analyses and beneficial uses.

Recommendation: STB should be given the direction and resources to undertake a strategic review of all of its data programs. The review should begin with the role of the CWS in enabling implementation of the recommended competitive rate benchmarking system and in facilitating academic and other research on the railroad industry that can inform policy making. The CWS is STB's main empirically derived tool for monitoring industry traffic and revenues to support regulatory decisions, and it should be recognized as the linchpin of the agency's data program. An effort should be made to improve its accuracy, utility, timeliness, and availability. The strategic review should recommend modifications and enhancements of the CWS that will be needed in implementing the competitive rate benchmarking tool and should identify elements of the database that can be eliminated because they are no longer used.

The review should also make recommendations on how to expand access to the CWS. They should be based on examinations not only of how confidentiality restrictions can be modified to protect business interests but also of how beneficial use of the data can be promoted by making public- and government-use versions more accurate. The latter can be particularly important in informing public investment decisions, such as whether and where to improve the nation's system of waterways as determined by the U.S. Army Corps of Engineers. The Bureau of the Census has long made confidential data available to researchers in electronic form with safeguards that protect confidentiality. The strategic review should examine such safeguards and those used by other federal agencies and should recommend modified versions of them suitable for the CWS.

2. To obtain shipment-level data on service quality to monitor the railroads' responsiveness to the common carrier obligation.

Recommendation: As part of a strategic review of its data programs, STB should appraise the data needed to fulfill its role in supervising the supply of common carrier service. For example, consideration should be given to collecting information that permits the tracking of the time elapsed from a shipper request for service to rail car placement, removal, and arrival at the destination, perhaps in conjunction with information on the scheduled delivery time. The appropriate platform for such data collection may be the CWS, because shipment-level tracking of service is essential for understanding trends in service levels and patterns across time, regions, and traffic segments. STB should explore options for collecting shipment-level data, including additions to and enhancements of the CWS itself. STB should examine all data elements in the standard railroad freight waybill that could be useful for monitoring service performance and consider adding such elements to the CWS. STB should also examine opportunities for collecting new data, which would either be added to the waybill reporting or subsequently linked to CWS records.

3. To reassess the collection of detailed railroad accounting, financial, and operations data, with consideration of opportunities to reduce railroad reporting burdens as regulatory approaches change and to obtain the kinds of data that will be required to conduct periodic economic and competition studies of the industry.

Recommendation: A strategic review of STB's data programs would not be complete without an examination of the purpose of the agency in requiring the use of its own railroad accounting system and the reporting of railroad financial and operations information, often in copious detail. The changes in the regulatory program recommended in this report would enable STB to review these data reporting requirements and to assess how changes in them would affect its ability to discharge its remaining regulatory and oversight responsibilities. Adoption of the recommended actions, such as discontinuation of URCS, SAC assessments, public interest appraisals of mergers, and formulaic annual revenue adequacy determinations, should have far-reaching implications for the agency's needs for railroad financial and operations data. The resources saved from any streamlining or simplification of these data programs could be used to enhance the agency's other data programs on rates and service quality. STB could focus on the collection of the kinds of financial and economic data needed in supporting the recommended periodic economic and competition studies.

CONCLUDING COMMENTS

STB could take early steps to advance the recommendations of this report, such as by supporting USDOT in exploring competitive rate benchmarking methods and by commencing planning for a modernized data program. Such efforts could help inform the legislative actions that will likely be required to further the recommendations—actions the committee believes are overdue. The last major revision to the Staggers Rail Act terminated ICC and created STB 20 years ago. The Staggers Rail Act itself was passed 35 years ago. In the interval, the railroad industry has been

transformed, essentially modernized in step with the other transportation industries that were deregulated at about the same time. The railroad industry was in a fundamentally different position at the time of its deregulation—on the edge of bankruptcy, despite its considerable potential market power, and in need of specialized regulatory reforms that took its financial distress into account. The industry continues to have characteristics differing from those of the other transportation modes, such as its vertical integration and the ability to obtain and exercise local market power, that require ongoing regulatory oversight. Therefore, railroad deregulation should not be complete. The economic regulations that remain should be suited to the financially sound railroad industry of today, not to the foundering one that required rescue 35 years ago. The actions recommended in this report recognize the continued significance of the railroad regulatory program and are intended to resynchronize key elements of it that have become outdated.

The modernization proposed in this report would reduce the anachronistic regulatory burdens railroads still bear while giving more shippers real protection against unreasonable rates. It would continue the process begun by the Staggers Rail Act—a process aimed at producing a modern, efficient, and competitive railroad industry able to attract capital, maintain and expand its capacity, and serve its customers with a minimum of regulatory oversight.

Appendix A

Responses to Topics (*a*)–(*f*) in Statement of Task

The statement of task directs the committee to address six queries in addition to the four task items stipulated by Congress for this study. This appendix offers a brief response to each query and cites sections of the report where more supporting information can be found.

(*a*) Examine rates and service levels by type of shipper and commodity, service lane, shipper size, and shipper type.

Chapter 2 presents trends and patterns in real rates for 2000 to 2013 derived from the Surface Transportation Board's (STB's) confidential Carload Waybill Sample (CWS). Rate trends are examined industrywide, for several major commodity categories, and for common and contract carriage. CWS records are not specific to individual shippers, and hence examination of rates by shipper size was not possible. In addition, rates were not examined at the level of specific shipping lanes because regulations prohibit releasing confidential CWS revenue data for specific routings or origin–destination points. The industrywide and commodity-specific rate trends are compared with trends in the productivity-adjusted Railroad Cost Adjustment Factor, an index of input costs per unit of railroad output. Findings on rate trends as they relate to trends in input costs are summarized in Chapters 2 and 5. In Appendix B, a methodology for identifying unusually high common carrier (tariff) rates on the basis of comparisons with rates for similar shipments in more competitive markets, including shipments moved in contract carriage, is developed and demonstrated. The report recommends that such empirically based methods be used to identify rates that can be challenged according to the maximum rate protections and that such methods replace current methods relying on arbitrary cost allocations.

Freight rail service performance cannot be examined in the same quantitative manner as rates. The review of service quality in Chapter 2 was largely limited to a survey of recent shipper complaints. Most concerned the inadequacies of railroads in meeting their common carrier service obligation, particularly during periods of tight capacity caused by high demand and episodes of severe weather. Data at the shipment-specific level are not available for assessing whether shippers using common carriage regularly receive service inferior to that of shippers using contract carriage or whether common carrier service levels are more likely to suffer when capacity is tight. The recommendation that STB begin collecting shipment-specific data to monitor rail service performance on a more regular, detailed, and systematic basis appears in Chapter 5.

(*b*) Estimate whether railroad exercise of market power has increased since deregulation and the impact this has had on rates and/or service.

As explained in the report at various points, including Chapter 1, the Staggers Rail Act's legalization of private contracting, pricing freedoms, and effective elimination of open routing have all contributed to the ability of railroads to obtain and exercise market power. Railroads must be able to charge rates that exceed marginal costs, and thus to exercise market power, for at least some portions of their traffic if they are to recoup their large overhead, or common, costs.

Whether the scope and intensity of local market power exercised by railroads has been growing in recent years, or whether it has grown beyond the point needed for railroads to pay for their common costs (i.e., to continue to attract capital), cannot be established from examinations of the revenue-to-variable-cost formula that is used by STB for such purposes. As explained in Chapter 3, the revenue-to-variable-cost formula is based on a faulty premise. A railroad's common costs cannot be divided and allocated to individual segments of traffic in an economically valid way, as is assumed by the formula, or with results that offer insight into the pricing of traffic and a railroad's exercise of market power. For reasons given in Chapter 4, STB's annual pass/fail determinations of railroad's revenue adequacy on a firmwide basis provide little insight into whether railroads have been earning above-normal profits that suggest an ability to exploit market power.

The examination of rate trends in Chapter 2 shows that rates have grown faster than input costs since the early 2000s. This divergence could partly be the result of increased exercise of market power. However, the committee is unaware of any structural change in the industry that would have produced a significant increase in market power after 2000. For example, there were no major mergers, nor was there any apparent diminution of competition from trucks or barges. The divergence may also result from the use of congestion pricing by the railroads to manage traffic under capacity constraints. As explained in Chapter 2, congestion may continue in some locations even if a railroad makes all economically justified capacity investments. The cost of capacity expansion to relieve the congestion may exceed the marginal revenue that the railroad derives from congestion reduction. Alternatively, the divergence in rates and input costs may simply reflect a change in the mix of traffic, including more high-margin traffic. The committee did not attempt to distinguish between alternative explanations of recent rate trends relative to trends in input costs.

(*c*) Describe the potential role that freight rail can serve in shifting some future growth in highway freight shipments to rail.

Chapter 2 references studies of future freight capacity needs by the American Association of State Highway and Transportation Officials, the National Surface Transportation Policy and Revenue Study Commission, and the Association of American Railroads. Each study concluded that increasing the railroads' share of freight transportation could confer public benefits, including reductions in highway congestion and emissions, through the diversion of freight from trucks. Existing government programs designed to make freight rail more attractive to shippers who would otherwise use highways and to make such freight more profitable for railroads to move are cited in the chapter. Some of the programs have lowered the cost of capital for investment by railroads in the capacity to handle more truck-competitive freight. However, the existence of alternatives for achieving these outcomes, including higher road use pricing and pollution charges, is noted in the chapter. This study did not examine the alternatives or whether the current approach is justified. Such an examination would have required a review of the comparative costs and externalities created by both modes as well as competing modes such as barge, which would have been beyond this study's scope.

(*d*) Comment on the role freight rail can serve in meeting the Department of Transportation's strategic goals.

According to the strategic plan of the U.S. Department of Transportation (2014, 13), the department's strategic goals are safety (reduce transportation-related casualties), state of good repair (ensure maintenance of infrastructure in good repair), economic competitiveness (promote policies and investments that bring economic benefits), quality of life in communities (coordinate transportation policy with housing and development policy), and environmental sustainability (reduce harmful emissions and oil dependence). This study could not possibly examine the rail freight sector with such broad goals in mind. The report examines the economic regulation of freight railroads. It offers recommendations for federal actions that, if implemented, will maintain the economic efficiency and financial health of the freight rail system while providing more effectively for fair treatment of shippers. Such outcomes would be consistent with strategic goals such as economic competitiveness and maintenance of good repair. The committee did not evaluate the safety, environmental, or other community impacts of its recommendations. It believes that maintaining an efficient and financially sound rail system would be consistent with these strategic goals.

(*e*) Assess whether Class I freight railroads are earning their cost of capital.

As the report describes in Chapters 1 and 2, the freight railroads have access to credit markets, as is demonstrated by their substantial investments in capacity. This observation alone strongly suggests that railroads are earning their cost of capital. As noted above (and for reasons explained in Chapter 4), the committee finds that STB's annual appraisal of the revenue adequacy of each Class I railroad does not provide meaningful information about the industry's earnings or profitability levels. Consideration of the railroad industry's profitability levels over the extended period of a business cycle and comparisons with the ranges of profitability observed in other industries would be more relevant. Therefore, the report recommends that the statutory requirement for an annual revenue adequacy determination be repealed and replaced with a requirement for periodic (e.g., 5- to 10-year) assessments of industrywide economic performance, competitive conditions, and rate and service levels. The committee is also mindful of the fact that revenue adequacy calculations in other regulated industries have often been made within the context of rate-of-return regulation. This form of regulation has never been used in the U.S. railroad industry and has had a mixed record where it has been used, as noted in Chapter 3.

(*f*) Assess whether railroads continue to be a decreasing cost industry due to economies of density or whether average and marginal costs are rising and the implications the latter has for STB oversight and regulation.

This report does not examine whether the railroads have exhausted or nearly exhausted all economies of density, and by implication whether railroads should continue to be allowed to engage in differential pricing. Given the complexity of network economics and the dominance of common costs in railroad operations, the committee recognized the difficulty of undertaking such assessments and did not attempt to do so. A characteristic of operating near capacity is that the marginal cost (including congestion elements) will rise with traffic levels. While the assumption that marginal costs are rising with traffic levels for well-defined movements is

logical, the committee is unaware of any studies that have attempted to answer this question more generally. The fundamental economics of railroad networks have not changed. Even if marginal costs are now rising, they can be expected to decline again with increases in output when capacity is expanded.

REFERENCE

U.S. Department of Transportation. 2014. *Transportation for a New Generation: Strategic Plan, Fiscal Years 2014–2018*. Washington, D.C.

Appendix B

Demonstration of Competitive Rate Benchmarking to Identify Unusually High Rates

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This appendix presents and implements the basic features of a methodology for identifying unusually high common carrier rail rates for eligibility to pursue regulatory relief. The approach uses the rates and other observable characteristics of a large random sample of "benchmark" shipments from what are believed to be effectively competitive markets to predict the rate that would be charged for any given "nonbenchmark" shipment if it too had been in an effectively competitive market. If the shipment's rate is higher than its predicted competitive rate by some margin designated by regulators, the rate may be a candidate for further scrutiny for reasonableness.

Once a methodology of this sort is developed and an interface made public on a website or spreadsheet, a shipper who uses common carriage and believes it lacks effective competition could enter certain characteristics of its shipment, such as commodity type, origin and destination, car type, and railroad. The shipment's competitive benchmark rate would be predicted on the basis of this information. Because of the impracticality of having complete information on all of a shipment's economically meaningful characteristics, perfect correspondence between the tested rate and the rate predicted from the benchmark group is unlikely. Nevertheless, the higher the tested rate is relative to its predicted rate, the less likely it is that the difference was caused only by the omission of economically meaningful shipment characteristics, and the more likely it is that a lack of competition was a determining factor. The decision about what constitutes a differential that is so large that a lack of competition is likely to be a determining factor requires judgment on the part of the regulator in deciding which shippers are eligible to challenge a rate.

The appendix demonstrates that most of the data required for the development of the competitive rate benchmarking models are available in the Surface Transportation Board's (STB's) Carload Waybill Sample (CWS). The CWS contains considerable information on shipment characteristics in addition to rates, such as distance moved, origin and destination points, railroad used, car type, commodity, and shipment size. However, additional databases would need to be consulted to characterize markets as being effectively competitive. In particular, data are required for determining the proximity of shipment origin and destination points to ports and other railroads. Such data can be compiled, as demonstrated in this appendix. Nevertheless, further refinement of the competitive rate benchmarking approach may reveal other data needs, including details on shipment characteristics that currently are not in CWS records or readily available through other databases. Once aware of these data needs, STB could presumably take the necessary steps to begin filling them.

Competitive rate benchmark models are implemented in this appendix for four broad commodity groups: farm products, coal, chemicals, and petroleum (crude oil and refined products). The purpose of this implementation is to demonstrate a "proof of concept" of the competitive rate benchmarking approach by constructing and applying streamlined models that

emphasize and illustrate the approach's key features. Models developed for practical implementation would require more thorough review and testing of their design and output.

The example benchmark models are developed by using all deregulated (i.e., exempt) shipments[1] and other nonexempt shipments moved under contract that are characterized as being in effectively competitive markets because of the availability of competing rail or water services. CWS records from 2000 through 2013 are used to construct the benchmark group. Here again, the specific criteria to be used in determining which shipments to include in the benchmark group would require careful consideration, but those criteria should be indicative of a shipment facing effective competition. To illustrate the models' application with 2013 shipments, all common carrier tariff shipments and all contract shipments that do not have effective competition (based on proximity to competing rail and water services) are used. All tariff shipments were included for this purpose because only common carrier shippers are eligible to pursue rate relief. Although contract shipments are not eligible, shipments lacking effective competition were included because they may be eligible for rate relief on contract expiration.

In the application of all four models, more than 80 percent of the 2013 shipments had rates less than 150 percent of their predicted benchmark rates and more than 90 percent had rates less than 180 percent. The shipments from the more homogeneous commodity groups, coal and farm products, were more likely to have rates closer to their predicted benchmarks than the shipments from the more heterogeneous commodity groups, chemicals and petroleum. In the latter case, consideration may need to be given to constructing narrower, product-specific models (provided the data contain sufficient observations) or to increasing the allowable deviation from the competitive benchmark before a rate is deemed unusually high and deserving of further scrutiny. Regulators would need to establish such thresholds on the basis of policy objectives.

The construction of the benchmark models and the data used to develop them are discussed in more detail in the following sections. Results from applying the models by using 2013 tariff rates for shipments from the test sample are then presented. Conclusions are drawn about the feasibility of implementing a benchmarking approach on the basis of the experience in constructing and applying the models. First, however, the reason for considering the development and introduction of a competitive rate benchmarking tool is recapped on the basis of the discussion in Chapter 3.

RATIONALE FOR COMPETITIVE RATE BENCHMARKING

The Staggers Rail Act of 1980 charged regulators with protecting shippers from unusually high common carrier rates when they have few competitive options. For reasons explained in Chapter 3, STB's current method for identifying common carrier rates has no basis in economic theory and often produces nonsensical results. In summary, STB is required to identify traffic eligible to pursue rate relief by estimating the variable cost of each shipment and then comparing it with the shipment's rate. The act does not define "variable cost," so STB estimates it by using traditional regulatory methods that allocate portions of a railroad's total expenses (e.g., reported wages paid to train crews, road maintenance, and fuel use) to priced units of traffic output. As discussed in Chapter 3, most of the costs allocated in this manner are shared by traffic and therefore cannot be traced in an economically meaningful way to individual shipments. Consequently, the variable costs generated by STB are arbitrary and can have no stable relationship to a shipment's rate.

[1] By virtue of being ruled exempt, these shipments have already been found by STB to have effective competitive options.

The implementation of the act's revenue-to-variable-cost formula is therefore unsound and does not offer a reliable means for identifying rates that are candidates for regulatory scrutiny.

The challenge for regulators is to develop alternatives to arbitrary cost allocation schemes that are economically sound, can be readily implemented and updated, and can be used by shippers trying to determine whether the tariff rates they face can be disputed. When the Staggers Rail Act introduced the revenue-to-variable-cost formula in 1980, railroad rates had long been regulated, and data on market-based rates were not available. That void in rate data no longer exists. Thus, an alternative approach to assessing rates on the basis of arbitrary cost allocation is to compare rates in markets lacking effective competition with those paid for comparable shipments in markets that have more competitive options. The benchmarking models developed and demonstrated next illustrate the types of statistical models that can serve this purpose.

OVERVIEW OF A COMPETITIVE RATE BENCHMARKING MODEL

Data on shipment characteristics and rates in effectively competitive markets are used to construct a predicted, or competitive benchmark, rate for any given rail shipment in a potentially noncompetitive market on the basis of key observable characteristics of the shipment. The statistical model used to compute competitive benchmark rates is a conditional quantile function for the distribution of average rates (revenue per ton-mile) for the shipment conditional on observable characteristics of the shipment derived mainly from CWS data for 2000 to 2013. These characteristics include the distance traveled, the number of carloads in the shipment, the number of railroads involved, and competitive circumstances at the origin and destination (i.e., number of competing railroads and availability of other transport modes), as well as controls such as calendar year and railroad and commodity fixed effects. The CWS is described in Box B-1.

Separate models and benchmark rates are developed for four broad commodity groups: food products, coal, chemicals, and petroleum. Models could readily be developed for more commodities and for narrower product groups (e.g., grain, hazardous materials) as long as there are enough observations for precise estimation of the parameters of the conditional quantile functions.

Once the effectively competitive benchmark model has been constructed for each commodity, a shipper could determine how close its common carrier rate is to the competitive benchmark rate for shipments having the same set of observable characteristics but in markets with effective competition. When such tests are performed, a significant fraction of rates tested will exceed the competitive benchmark rate even if pricing is not affected by the level of competition. All the conditional quantile models have a prediction error. None can include all relevant rate-determining variables because some are not currently available. Therefore, each tested rate that exceeds its benchmark value should not be presumed unusually high. Nevertheless, some of the tested rates will be much higher than their predicted values. The larger the margin is in percentage terms (i.e., the higher the ratio of the tested rate to the benchmark rate), the higher is the likelihood that this ratio was caused by something other than the prediction error in the model and can plausibly be attributed to the railroad exploiting the lack of competition.

All else equal, the larger the ratio of an actual rate in a potentially noncompetitive market to the rate predicted for the observed shipment characteristics from the benchmark group, the

Box B-1

STB's CWS Program

STB requires all railroads that terminate 4,500 or more carloads to compile a stratified random sample of their waybills and report this sample on a monthly or quarterly basis, depending on traffic activity. Sampling rates vary between 2.5 and 50 percent, depending on the number of carloads in the shipment. Shipments consisting of one or two carloads are sampled at the lower rate, and shipments of 101 or more carloads are sampled at the higher rate. Other sampling rates apply to shipments with 3 to 15, 16 to 60, and 61 to 100 carloads (8.3, 25, and 33.3 percent, respectively). The sampled waybills are submitted in electronic form to a private contractor, Railinc Corporation, which processes and corrects errors in the records under contract with STB and the Federal Railroad Administration.

During processing, additional information is paired with the sampled record such as details on the rail car (e.g., capacity, dimensions, and mechanical characteristics) and location identifiers (e.g., census region, station zip code, standard production location code). The processed records, typically numbering more than 500,000 for a year, thus contain a range of information on the shipment, including routing, billed tons, miles traversed, revenue, origin, destination, interchange points, railroads traversed, car type, car ownership (e.g., railroad or private), and commodity. Commodity type is recorded by using the U.S. Department of Commerce's Standard Transportation Commodity Codes (STCCs). STTCs are two- to seven-digit codes, with the first two digits corresponding to major commodity groups and each additional digit a refinement (e.g., 01 = farm products, 011 = field crops, 0113 = grain, 01137 = wheat). For hazardous materials only, the 49 series hazmat code supplements the regular STCC.

Expansion factors are applied to each record to estimate the annual number of similar shipments. The expansion factor is the inverse of the sampling rates. If the CWS is used as the primary mechanism for gathering the data for estimating competitive benchmark price models of the type described in this appendix, quality controls must be in place to ensure that the sampling scheme for compiling shipment rates and characteristics is in fact random and stratified in a way that allows a valid estimate of the annual population joint distribution of rates and shipment characteristics to be computed.

more likely the actual rate will be found unreasonable after further scrutiny. Determining the minimum ratio that should entitle a shipper to such scrutiny is not a technical problem but rather a policy choice. A lower ratio would allow more shippers who are paying reasonable rates to seek rate relief, whereas a higher ratio would deny relief to more shippers whose rates might otherwise have been found unreasonable. A low ratio could threaten the ability of a railroad to earn sufficient revenues to cover its overhead costs.

Regulators could set this threshold in many ways. For example, they could select the conditional median as the appropriate benchmark rate and rule that any rates 1.5, 2, 3, or some other multiple higher than the median are unusually high. Alternatively, the conditional 85th, 90th, 95th, or some other percentile of the distribution of predicted values could be set as the appropriate upper bound on the benchmark rate, meaning that all rates above this threshold are presumed to be unusually high. Consequently, there is a trade-off between the size of multiplier

that is selected and how the benchmark rate is identified (i.e., the percentile of the conditional distribution that is designated, such as the median or the 90th percentile).

The data used in the models that are developed in this appendix could be updated annually or more often, as new CWS data become available. STB could create a website or spreadsheet into which shippers, railroads, and regulators enter the characteristics of a shipment needed by the model for computation of the competitive benchmark price. That price would be compared with the rate charged for the shipment. Most of the characteristics needed for estimating the competitive benchmark price are known to the shipper or can be integrated into the program. For example, market-related variables such as the number of railroads serving the market and distance to a waterway can be preprogrammed. The user may need to enter only the shipment size, the railroads used, the commodity, and certain other shipment-specific variables to find the benchmark price for its shipment.

DETAILS OF THE MODELS DEMONSTRATED

Benchmark and Nonbenchmark Samples

To establish the pool of effectively competitive shipments to estimate the conditional quantile functions and the pool of shipments lacking effective competition to apply the models, CWS records from 2000 through 2013 are divided into two groups, as described below.

The *effectively competitive benchmark group* consists of shipments of all commodities and car types that have been deregulated (i.e., ruled exempt by STB) and shipments of the subset of nonexempt commodities that were moved in contract carriage and have effective rail or water competition. The presence of effective competition is defined as one alternative rail option within 10 miles of the origin and the destination, water ports on the same waterway within 50 miles of the both the origin and the destination, or both circumstances.[2]

The *potentially noncompetitive group* consists of all shipments that were moved by common carriage and the subset of shipments of nonexempt commodities that were moved by contract and have no effective rail or water competition.

Data Sources

As noted, the primary source of data for developing and testing the benchmark models was the CWS from 2000 through 2013. The random sampling scheme used for the CWS is described in Box B-1. Each year's CWS consists of more than 500,000 sampled shipments with information on revenue, distance, shipment size, and the railroads that provided the service. The CWS records also contain codes that can be linked with the Association of American Railroads' Centralized Station Master[3] (CSM) to allow shipper and receiver locations to be identified. Specifically, CSM rail station records are uniquely identified by a Standard Point Location Code, which is also contained in the CWS. The identifiers permitted the mapping of stations into the CWS and the assignment of latitude and longitude values to each shipment origin and

[2] Preliminary robustness checks on the distance used to designated effective rail and water competition did not indicate qualitative differences when distance was increased from 10 to 50 miles for railroads. However, a strong rationale for the distances selected would be important for the development of models used in practice.

[3] https://www.railinc.com/rportal/centralized-station-master.

destination. These data, along with railroad network geographic information system data,[4] were combined to identify locations of stations and shipment origins and destinations and to develop measures of railroad competition. The data were also used in conjunction with the Port Series[5] data produced by the U.S. Army Corps of Engineers to measure the presence of water competition. The Port Series data indicate the location of ports on U.S. waterways along with the commodities handled by each port.

Finally, all rates from the CWS were adjusted to constant 2009 dollar values by using the gross domestic product price deflator available from Federal Reserve Economic Data through the Federal Reserve Bank of Saint Louis.[6]

Estimation Model and Variables

In the approach illustrated here, shipment rates (rate) are modeled as a function of shipment distance (X_1), shipment size (number of cars) (X_2), the number of railroads involved in the movement (X_3), the number of Class I railroads within 10 miles of the origin (X_4) and destination (X_5), a dummy to indicate whether the shipper owns the cars (X_6), and a dummy to indicate that there is no water port within 50 miles of the origin (X_7) or destination (X_8); if water is present, the distances of the origin (X_9) and destination (X_{10}) from the nearest port are included. Additional variables can be added to the vector of shipment characteristics, X, on the basis of further review and assessment. The elements of X selected for this implementation were based on two factors: (*a*) previous empirical research on the determinants of shipment rates and (*b*) the availability of the variables in the CWS and other publicly available data sets.[7] All of the continuous variables—distance, size, number of railroads, and proximity to the nearest water ports—are measured in natural logarithms.[8] Finally, fixed effects are included: β_t for the year (t), β_r for the primary railroad in the movement (r), and β_c for the five-digit STCC categories (c). The parametric form of the model is given by the following:

$$\ln(\text{rate}_{rtc}) = \beta_r + \beta_t + \beta_c + \sum_{k=1}^{10} \beta_k X_{k,rtc} + \varepsilon_{rtc}$$

The error term, ε_{rtc}, is included to account for the fact that unobserved factors explain differences in rates across shipments that are not captured in the observed shipment characteristics and fixed effects included on the right-hand side of the equation. The presence of this unobserved random variable is the major reason why all rates in excess of the predicted competitive rate for a particular shipment's characteristics should not be deemed unreasonably high. Certain factors that are unobserved by the analyst and that may be either observed or unobserved by the parties may influence the price set for this route.

[4] http://www-cta.ornl.gov/transnet/RailRoads.html.
[5] http://www.navigationdatacenter.us/ports/ports.htm.
[6] http://research.stlouisfed.org/fred2/.
[7] See, for example, MacDonald (1987 and 1989) and Wilson (1994).
[8] A variety of functional forms were explored before the linear conditional quantile model was selected. Its transformation of the continuous variables performed best across the four commodities.

This parametric model is estimated by quantile regression methods, as explained in Box B-2. There are many possible ways to compute the benchmark price. The results reported below are based on the conditional median function, $Q(0.5|X)$, which is the 0.5 quantile function of the conditional distribution of the shipment price given the vector of shipment characteristics, X. The first step is to compute the ratio of the actual price for each shipment in the noncompetitive (nonbenchmark or test group) sample to the value of $Q(0.5|X)$ for the set of characteristics, X, of that route. This is followed by a presentation of the distribution of the ratio of the actual price to $Q(0.5|X)$ for each observation in the noncompetitive sample. These plots are useful for determining the appropriate value of the multiplier to apply to $Q(0.5|X)$ to compute the maximum price for a shipment with characteristics X that would not be subject to mitigation.

Imposition of a linear functional form restriction on the conditional quantile function is unnecessary. This restriction is imposed for the current application as a means of simplifying the presentation. Nonparametric methods could be used to estimate the conditional distribution of y given the vector of observable shipment characteristics, $F(y|X)$. For example, kernel density estimation methods could be used to compute an estimate of $F(y|X)$ for the effectively competitive sample of shipments.[9] Such an estimate of $F(y|X)$ could then be used to compute the conditional median function $Q(0.5|X)$ or a conditional quantile function for any other quantile of $F(y|X)$ that does not rely on a parametric functional form assumption. Such a nonparametric procedure for computing $F(y|X)$ would counter the possibility that small changes in functional form might unduly benefit some railroads or shippers when parametric-based approaches to the computation of conditional quantile functions are used.

A nonparametric procedure could be applied to any set of variables that regulators believe should be included in the vector of shipment characteristics, X. A process could be envisioned under which the elements of X and the set of competitive shipments are first determined by regulators in an open process that involves feedback from railroads, shippers, and other interested parties. The conditional distribution function $F(y|X)$ would then be estimated for that choice of X and a sample of shipments. An open development process of this type should help limit the opportunities for shippers and railroads to exploit the model specification to their advantage. Of course, the more successful that regulators are in including economically meaningful variables in X, the more confident they can be that a tariff rate substantially above its benchmark level deserves closer scrutiny. Such scrutiny—for example, by an arbitration process—would provide an opportunity for the shipper and railroad to bring forward additional quantitative evidence.

The value of y, the dependent variable, in all quantile regression models is the average revenue per ton-mile deflated by the gross domestic product price deflator. This variable is simply the revenue received from a shipment divided by the product of the number of tons in the shipment and the distance traveled. Revenues are the sum of freight revenues (transportation-related revenues), miscellaneous charges, and fuel surcharges. Fuel surcharges were introduced by railroads in 2003 but were reported in different CWS fields by different railroads. Some railroads included surcharges in the freight revenue field and others included them in the miscellaneous revenue field. From 2009 forward, CWS has had a separate field for fuel surcharges. In the calculation for ton-miles, the variable "billed weight" was used for tons, and distance was calculated as the "total miles traveled for the shipment."

[9] Silverman (1986) provides an accessible introduction to these estimation methods.

Box B-2

Details on Statistical Methods

Let $y(t)$ equal the price of movement t (the average revenue per ton-mile) and let $X(t)$ equal the observable characteristics of movement t described above. From the subsample of "effectively competitive" movements in the CWS, it is possible to estimate quantiles of $F(y|X)$, the conditional distribution of the price of a competitive movement, y, given the observable characteristics of that movement, X. The function $F(y|X)$ gives the probability that a shipment with characteristics X has a price for the movement less than y. The function $F(y|X)$ takes on values between 0 and 1. Finding the value of y that satisfies the equation $0.5 = F(y|X)$ yields the conditional median of y given X, $y(\text{median})|X$; 50 percent of effectively competitive shipments with these route characteristics are estimated to have a price below this value. Solving for the value of y satisfying the equation $0.9 = F(y|X)$ yields the conditional 90th percentile, $y(90\text{th})|X$; 90 percent of the shipments with route characteristics X have a price (average revenue per ton-mile) below this value. Clearly, $y(90\text{th})|X > y(\text{median})|X$. Because $F(y|X)$ is an increasing function of y, for each value of X, this function can be inverted to solve for what is called the conditional αth quantile of y given X for $0 < \alpha < 1$. This function can be written as $Q(\alpha|X) \equiv F^{-1}(\alpha|X)$, which implies that $Q(\alpha|X)$ solves the equation $F(Q(\alpha|X)|X) = \alpha$. The elements of the X-vector described above and all of the conditional quantile functions estimated are assumed to have the following parametric form:

$$Q(\alpha|X) = \beta_r^\alpha + \beta_t^\alpha + \beta_c^\alpha + \sum_{k=1}^{10} \beta_k^\alpha X_{k,rtc} + \varepsilon_{rtc}^\alpha$$

where the coefficient estimates and model disturbances are indexed by α to indicate that they are likely to differ across quantiles of the conditional distribution. For each set of products described below, the conditional quantile function, $Q(\alpha|X)$, is computed by using quantile regression methods for several values of α: 0.25, 0.50, 0.75, and 0.90. Each function $Q(\alpha|X)$ is specified as a linear combination of functions of the elements of X.

The explanatory variables used in the model are based on past econometric studies, many of them cited in Chapter 1, that examine how rail rates relate to shipment characteristics such as distance, shipment size, and number of railroads involved in the shipment, as well as various measures of intramodal and intermodal competition (Boyer 1987; Barnekov and Kleit 1990; McFarland 1989; Burton 1993; Wilson 1994; Dennis 2000; Schmidt 2001; MacDonald 1987; MacDonald 1989; Grimm et al. 1992; Burton and Wilson 2006).[10] The specific explanatory variables used in the models estimated include distance, shipment size (in carloads), the number

[10] Shipment size is measured by carloads in the shipment. It is common practice for railroads to offer lower rates for multiple-car shipments as well as unit train shipments. Unfortunately, there is no unambiguous identifier for unit train shipments in the data. Various conventions for defining unit train shipments were explored; the results on reported coefficients were nearly identical across the specifications.

of Class I carriers within a specified distance from the origin and destination, whether the cars are owned privately or by a railroad, the presence of waterway competition, and distance to the nearest waterway locations. Shipment distance, shipment size, the number of railroads involved in the movement, and the private cars dummy variable are directly observed in the CWS or are easily constructed from the data.

Railroad competition is measured as the number of Class I railroads within 10 miles of the origin and of the destination. Other options considered, such as the number of competing railroads within 20, 30, and so on up to 200 miles, produced similar results. They had relatively stable measures of fit and coefficient estimates. The measure of waterway competition was computed in a similar but more involved manner. It required that both the shipment origin and the destination be within a specified distance of ports on the same waterway system.[11] This reflects the fact that an origin near the Mississippi River System and a destination near the Columbia River System are unlikely to constrain railroad pricing. As with railroad options, multiple distances to waterways were considered. The distances ranged from 20 to 200 miles. In the models reported here, waterway competition is captured by two variables. First, a dummy (Nowater) was given a value of 1 if there are no water ports within 50 miles of the origin and destination. Second, for locations within 50 miles, distances to water were included for both the origin and the destination.

The remaining variables are fixed-effect controls for the year of the movement, STCC category, and railroad. STTCs are two- to seven-digit codes; see Box B-1 for a brief explanation of the coding. As discussed below, estimation proceeds for different STCCs at the two-digit level, but five-digit commodity fixed effects are used to control for differences between more narrowly defined commodities (e.g., wheat versus corn). Finally, a railroad dummy variable is introduced to control for differences across railroads. For single-line hauls, it is simply the railroad that provided the service. For multiple-railroad movements, the dummy was assigned to the railroad that hauled the movement the longest distance.

To recap, a number of decisions would need to be made before a competitive rate benchmarking methodology could be put into practice. They would need to address at least the following: (*a*) the validity and integrity of the random sampling scheme used by the CWS; (*b*) the criteria to be used in identifying the set of shipments to be included in the effectively competitive sample used to estimate the competitive benchmark rate function; (*c*) the set of economically relevant shipment characteristics, X; (*d*) the statistical methodology to be used in estimating the conditional quantile function; and (*e*) the procedure to be used in computing the maximum price for a tested shipment that would qualify it for further scrutiny as being unreasonable.

DEMONSTRATION OF METHODOLOGY: SUMMARY OF RESULTS

Summary statistics are presented in the subsections that follow for the models developed and applied for each of the four commodity groupings: farm products (STCC = 01), coal (STCC = 11), chemicals (STCC = 28), and petroleum (STCC = 13 and the portion of 29 corresponding to petroleum products).

[11] Waterway systems were defined as the Mississippi River (including tributaries and the Great Lakes), the Columbia River, the East and Gulf Coasts, and the West Coast.

The first table shown for each commodity model contains descriptive statistics of the shipments that make up the benchmark and nonbenchmark samples. The statistics for both samples are for 2000 through 2013. Only the 2013 observations from the nonbenchmark sample are subsequently used to illustrate the model, and they are referred to as the test group.[12] Because the statistics presented are averages (i.e., average distance shipped, average rate, average number of railroads at origin), each observation is weighted on the basis of its sampling rate (i.e., expanded to the full population).[13]

A second table summarizes the nonintercept effects for each model as estimated by quantile regression for quantiles 0.25, 0.5, 0.75, and 0.9 (i.e., the intercept effects, railroad dummies, annual dummies, and STCC dummies are suppressed), each weighted by the expansion factor. The application of the benchmarking methodology required the designation of a specific quantile of the estimated conditional distribution for construction of the competitive benchmark rate. The median (quantile = 0.5) was designated for this purpose. Ordinary least squares (OLS) estimates are also reported in the tables as an informal specification test of the functional form for the linear conditional quantile functions.[14]

As noted, the models are applied with only the 2013 test group observations. Two graphs are provided showing the distribution of the actual-to-predicted rates for the 2013 test group. The first graph shows the entire distribution. The more heterogeneous commodity groups (chemicals and petroleum) produce long tails, perhaps because of the wide range of products in these commodity groups. A second graph shows a truncated distribution that removes the upper and lower 1 percentiles of observations. The truncated versions make the density of observations exceeding the median rate by a factor of 2 to 3 easier to see.

A table follows the second graph showing the number of observations with actual-to-predicted rate ratios at various intervals above 1. The observations are disaggregated further into tariff and contract shipments. The tables provide a general sense of the relative shares of shipments that would be candidates for scrutiny if different intervals (i.e., bins) above the median were selected as benchmark cutoff points. The columns labeled "expanded" in this table report the expansion-factor frequency of a given ratio in each bin. This calculation is reported to determine whether high-ratio shipments are over- or undersampled relative to their frequency of occurrence in the population of total shipments.

The results from the application of the four illustrative models indicate that regulators may need to establish commodity-specific thresholds for identifying a tested rate that qualifies as being unusually high and deserving of further scrutiny as a candidate for relief. Important factors to consider in making such determinations are the number of likely excluded shipment

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[12] Of course, all the 2000–2013 nonbenchmark records could have been used in applying the model. Only the 2013 records were used for illustrative purposes and to make the applications manageable.

[13] The STB expansion factor for a shipment is equal to the number of shipments that this shipment represents in the population of shipments served by the railroad annually (as described in Box B-1). For example, each shipment that consists of one or two carloads is sampled at a rate of 1:40, and therefore these observations are expanded by 40, whereas each shipment consisting of 100 or more carloads is sampled at a rate of 1:2, and therefore these observations are expanded by 2. The averages shown in the descriptive statistics tables, such as those for rates and distances, should not be compared with those elsewhere in the report, which are weighted by ton-miles rather than shipments.

[14] Koenker and Bassett (1982) show that under the joint hypothesis that the functional form for the conditional quantile function is correctly specified and the error terms, ε_{rtc}, are independent and identically distributed, the slope coefficients in the OLS model and all conditional quantile functions should have the same probability limit. Although a formal statistical test of this joint null hypothesis was not performed, the slope coefficients are very similar across the columns of the tables for all four commodity groups.

characteristics that have economic meaning and the precision with which the conditional quantile function is estimated. However, the competitive rate benchmarking process is intended only to identify rates that are unusually high and deserving of further scrutiny; it is not intended as the final arbiter of rate reasonableness.

Farm Products

The descriptive statistics for the observations used in the construction and application of the farm products model are provided in Table B-1. There are a total of 169,872 observations, with 53,778 in the benchmark sample and 116,094 in the nonbenchmark sample. The large number of shipments in the nonbenchmark sample reflects the substantial use of common carriage (tariff) service by shippers of farm products, especially grain and oilseeds shipments. In 2009 dollars, the average rate for the combined sample is 4.7 cents per ton-mile. The average distance traveled is 896 miles, and the average shipment size is 9.4 cars. Most shipments involve only one railroad in the move. On average, shippers have 1.8 railroads within 10 miles of the origin and 2.4 railroads within 10 miles of the destination. In view of the large amount of Midwestern corn and wheat in the sample, the lack of water options within 50 miles for nearly 90 percent of shipments is interesting. Finally, about 40 percent of movements are made in private cars. There is little difference across the two sample groups in most variables. However, the nonbenchmark observations tend to ship in greater quantities, and by construction they tend to have less competition (both rail and water).

TABLE B-1 Farm Products Summary Statistics, 2000–2013

Variable	Combined Samples	Benchmark Sample	Nonbenchmark Sample
Observations	169,872	53,778	116,094
Revenue per ton-mile (2009 dollars)	0.047	0.049	0.045
Distance (miles)	896	950	854
Shipment size (number of cars)	9.4	5.5	12.3
Number of railroads in shipment	1.17	1.20	1.15
Number of Class I railroads within 10 miles of origin	1.84	2.32	1.47
Number of Class I railroads within 10 miles of destination	2.42	2.75	2.17
No water ports within 50 miles (binary)	0.89	0.87	0.91
Distance to water from origin (miles)	158.5	146.4	167.9
Distance to water from destination (miles)	109.1	96.3	119.0
Private car (binary)	0.40	0.41	0.40

NOTE: All values are means weighted by the expansion factor associated with each sampled shipment.

The benchmark sample was used to develop the farm products model, as was the case for all models. The model nonintercept effects are summarized in Table B-2 for the regression quantiles 0.25, 0.5, 0.75, and 0.9. OLS estimates are also reported. The coefficient estimates for the same variable have the same sign across columns of the table. The magnitudes are also stable across the columns. Increases in shipment distance and shipment size tend to predict lower rates (revenue per ton-mile), while increases in the number of railroads involved in the shipment tend to predict higher rates. The competition variables, rail and water, are statistically important and have signs consistent with intuition and the literature cited above.

The 2013 test group consists of 6,319 observations. The median regression model in Table B-2 is used to predict their competitive benchmark rates. The ratios of actual rate to predicted rate for the 6,319 shipments are summarized in Figures B-1 and B-2 and in Table B-3. Figure B-1 provides the entire distribution, while Figure B-2 provides the distribution with the largest ratios (i.e., rates that are more than 3 times their predicted rate) excluded. As shown in Figure B-1, most of the ratios are near 1, but the distribution is positively skewed, with some very large values. As indicated in Table B-3, 75 percent of the observations have ratios of less than 1.2. The maximum ratio is 9.35. Most of the ratios are between 0 and 2, as portrayed in the truncated distribution in Figure B-2 and by the cumulative percentages in Table B-3.

TABLE B-2 Benchmark Models—Farm Products (Based on Competitive Benchmark Data)

		Quantile			
Variable	OLS	0.25	0.5	0.75	0.9
ln(distance)	–0.467 (0.00300)	–0.431 (0.00276)	–0.464 (0.00234)	–0.482 (0.00234)	–0.515 (0.00388)
ln(cars)	–0.0406 (0.00145)	–0.0344 (0.00118)	–0.0403 (0.00113)	–0.0360 (0.00120)	–0.0400 (0.00196)
ln(number of railroads)	0.244 (0.00952)	0.189 (0.00441)	0.209 (0.00733)	0.236 (0.00607)	0.331 (0.0139)
No. of Class I within 10 mi of origin	–0.0224 (0.00117)	–0.0207 (0.000983)	–0.0212 (0.00105)	–0.0206 (0.00104)	–0.0122 (0.00157)
No. of Class I within 10 mi of destination	–0.0207 (0.00125)	–0.0232 (0.00108)	–0.02326 (0.00108)	–0.0210 (0.000893)	–0.0195 (0.00129)
Nowater (binary)	0.0735 (0.0116)	0.0962 (0.00743)	0.0762 (0.00987)	0.0314 (0.00723)	0.0696 (0.0174)
ln(mi from origin to port)	0.0231 (0.00383)	0.0203 (0.00226)	0.0197 (0.00336)	0.0128 (0.00251)	0.0245 (0.00534)
ln(mi from destination to port)	0.0218 (0.00380)	0.0277 (0.00261)	0.0217 (0.00326)	0.00939 (0.00320)	0.0201 (0.00604)
Private car	–0.134 (0.00443)	–0.116 (0.00370)	–0.109 (0.00358)	–0.129 (0.00316)	–0.116 (0.00539)
Observations	53,205	53,205	53,205	53,205	53,205
R^2	0.731				

NOTE: All standard errors are $p < .01$. All results are weighted by the expansion factor. OLS estimates are reported as an informal specification test of the functional form for the linear conditional quantile functions.

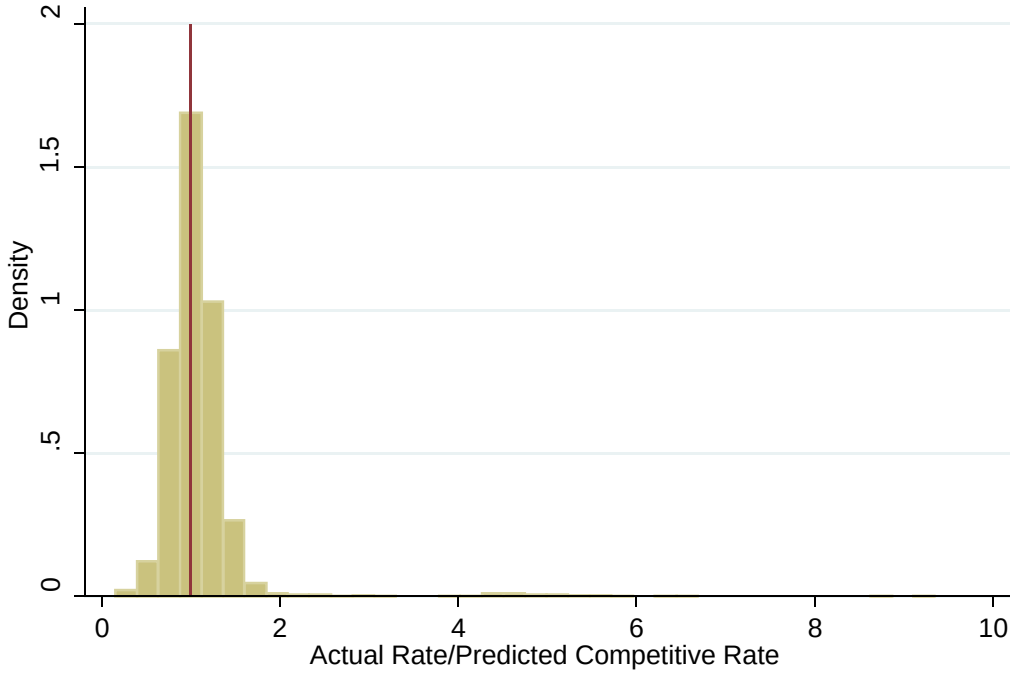

FIGURE B-1 Distribution of ratios of actual to predicted rates, nonbenchmark sample, farm products, no ratios excluded. ARTM = actual revenue per ton-mile.

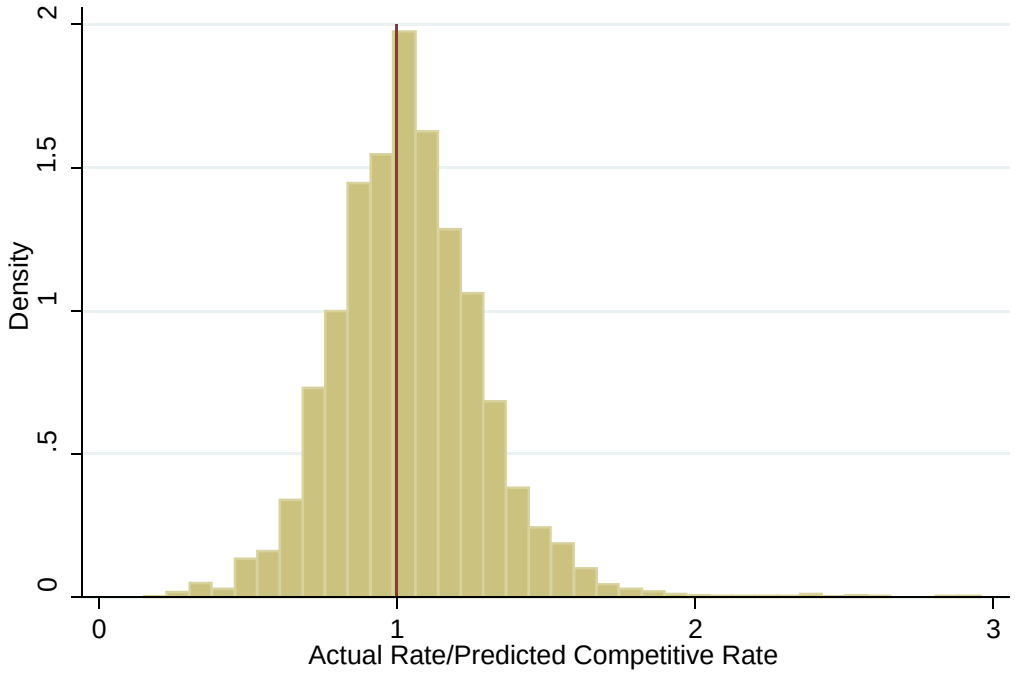

FIGURE B-2 Distribution of ratios of actual to predicted rates, nonbenchmark sample, farm products, ratios greater than 3 excluded.

TABLE B-3 Farm Products Model: Distribution of 2013 Test Group Observations, Ratios of Actual Rate to Benchmark Rate

	Observations					Expanded	
Group	Contract No.	Tariff No.	Total	%	Cum. %	%	Cum. %
$r \leq 1$	255	2,512	2,767	43.2	43.2	41.7	41.7
$1 < r \leq 1.2$	96	1,971	2,067	32.3	75.5	31.4	73.1
$1.2 < r \leq 1.4$	25	1,017	1,042	16.3	91.8	16.3	89.4
$1.4 < r \leq 1.6$	1	299	300	4.7	96.5	6.6	96
$1.6 < r \leq 1.8$	1	72	73	1.1	97.7	1.3	97.3
$1.8 < r \leq 2.0$	0	22	22	0.3	98.0	0.6	97.9
$r > 2.0$	5	123	128	2.0	100	2.1	100
Total	383	6,016	6,399	100		100	

NOTE: The groups are defined by the ratio (r) of ARTM to the predicted 50th percentile. Cum. = cumulative. The columns showing expanded percentages use the sample rate expansion factor associated with each observation.

The close agreement between the percentages in the "observations" and "expanded" columns in Table B-3 suggests that high ratios occur at roughly the same frequency in the sample as in the population of shipments. Because this finding holds across all four models, it is not repeated.

Coal

The descriptive statistics for coal are provided in Table B-4. There are 446,820 total observations, with 291,431 in the competitive benchmark sample and 155,389 in the nonbenchmark sample. The benchmark sample rates are lower on average (3.4 cents versus 4.2 cents per ton-mile), shipment distances are longer (721 versus 473 miles), and shipment sizes are greater (82 versus 24 cars). Water is a less likely competitive option for the benchmark group, since 36 percent of the observations have no water access within 50 miles, compared with 16 percent of the nonbenchmark group. Furthermore, the distances to water are higher for the benchmark group—304 miles from the origin and 89 miles from the destination versus 137 miles and 53 miles, respectively, for the nonbenchmark group. Finally, the percentage of private cars is much higher for the benchmark group (58 versus 23 percent).

The regression results are shown in Table B-5. The coal model was developed with a binary variable (West), which was set at 1 for shipments originating west of the Mississippi River. This variable was added to account for western coal shipments typically being much larger and moving longer distances than eastern coal shipments and because western coal has lower sulfur content than eastern coal, which makes them somewhat different products. Again,

TABLE B-4 Coal Summary Statistics, 2000–2013

Variable	Combined Samples	Benchmark Sample	Nonbenchmark Sample
Observations	446,820	291,431	155,389
Revenue per ton-mile (2009 dollars)	0.039	0.034	0.042
Distance (miles)	569	721	473
Shipment size (number of cars)	46	82	24
Number of railroads in shipment	1.19	1.30	1.16
Number of Class I railroads within 10 miles of origin	1.84	1.91	1.80
Number of Class I railroads within 10 miles of destination	2.52	2.72	2.40
No water ports within 50 miles (binary)	0.24	0.36	0.16
Distance to water from origin (miles)	202	304	137
Distance to water from destination (miles)	67	89	53
Private car (binary)	0.37	0.58	0.23

NOTE: All values are means weighted by the expansion factor associated with each sampled shipment.

TABLE B-5 Benchmark Models—Coal (Based on Competitive Benchmark Data)

		Quantile			
Variable	OLS	0.25	0.5	0.75	0.9
ln(distance)	–0.436 (0.00201)	–0.362 (0.00132)	–0.446 (0.00128)	–0.510 (0.00148)	–0.527 (0.000850)
ln(cars)	–0.114 (0.00153)	–0.111 (0.000684)	–0.112 (0.000634)	–0.113 (0.000701)	–0.103 (0.000821)
ln(number of railroads)	–0.0703 (0.00619)	–0.0994 (0.00319)	–0.0871 (0.00409)	0.135 (0.00437)	0.213 (0.00504)
No. of Class I within 10 mi of origin	–0.0899 (0.00104)	–0.0807 (0.000464)	–0.0965 (0.000541)	–0.101 (0.00109)	–0.0952 (0.00136)
No. of Class I within 10 mi of destination	–0.0468 (0.000902)	–0.0481 (0.000616)	–0.0521 (0.000689)	–0.0429 (0.000653)	–0.0418 (0.000644)
West (binary)	–0.265 (0.00833)	–0.346 (0.00430)	–0.235 (0.0114)	–0.0335 (0.00459)	–0.0400 (0.00988)
Nowater (binary)	0.204 (0.00901)	0.166 (0.00425)	0.203 (0.00427)	0.273 (0.00556)	0.160 (0.00706)
ln(mi from origin to port)	0.0299 (0.00145)	0.0235 (0.000901)	0.0275 (0.000657)	0.0414 (0.000977)	0.0112 (0.00125)
ln(mi from destination to port)	0.0257 (0.000825)	0.0279 (0.000679)	0.0280 (0.000453)	0.0290 (0.000692)	0.0249 (0.000607)
Private car (binary)	–0.124 (0.00297)	–0.115 (0.00204)	–0.104 (0.00213)	–0.0671 (0.00208)	–0.107 (0.00206)
Observations	289,718	289,718	289,718	289,718	289,718
R^2	0.785				

NOTE: All standard errors are $p < .01$. All results are weighted by the expansion factor.

the intercept effects (rail, STCC level 5, and annual dummies) are suppressed. As in the case of farm products, the signs of the coefficients are consistent across columns, and the results are stable across columns in terms of the magnitudes of the coefficient estimates. As might be expected, longer shipment distances and larger shipment sizes tend to predict lower rates (revenue per ton-mile). One anomaly is the number of railroads involved in the shipment. In some specifications this coefficient is negative, while in other specifications it is positive. However, for nearly 90 percent of the observations, one railroad is involved in the shipment. Rail competition at the origin or destination predicts lower prices in all specifications. The presence of water competition and shorter distances to water from the origin and destination both predict lower rates, while the use of private cars predicts lower rates. Western coal tends to have lower rates, all else equal, than eastern coal.

As before, the results in Table B-5 for the 50th percentile (median) are used to predict the rates for the 3,670 observations in the 2013 test group. The ratio of the actual rate to the predicted rate is summarized in Figure B-3 and Figure B-4 and in Table B-6. Most of the observations are clustered around 1, but some values exceed 3.

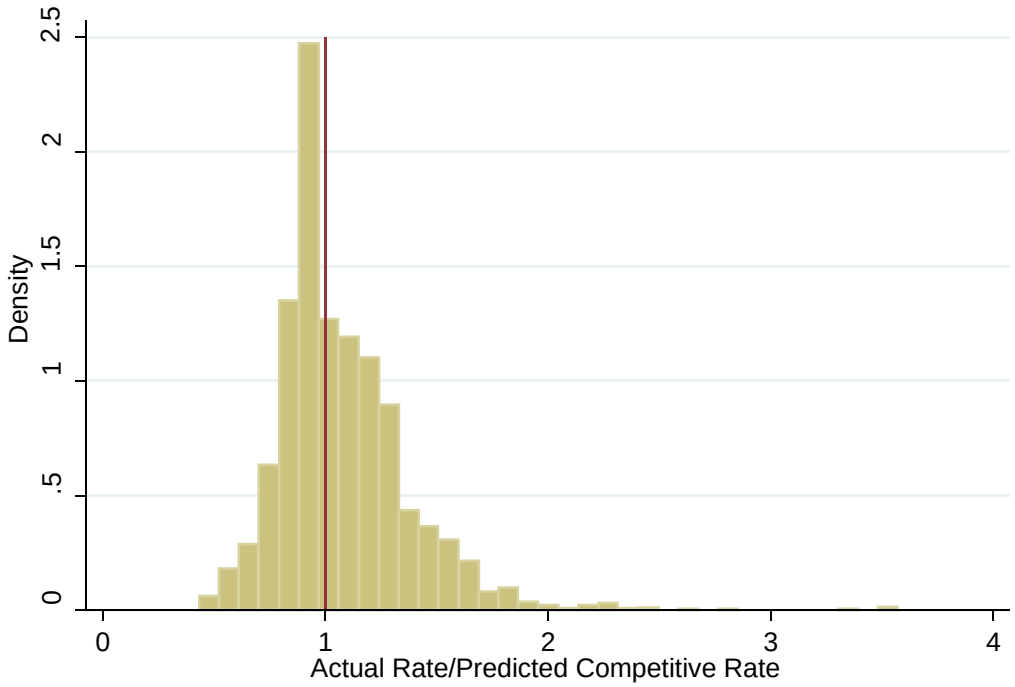

FIGURE B-3 Distribution of ratios of actual to predicted rates, nonbenchmark sample, coal, no ratios excluded.

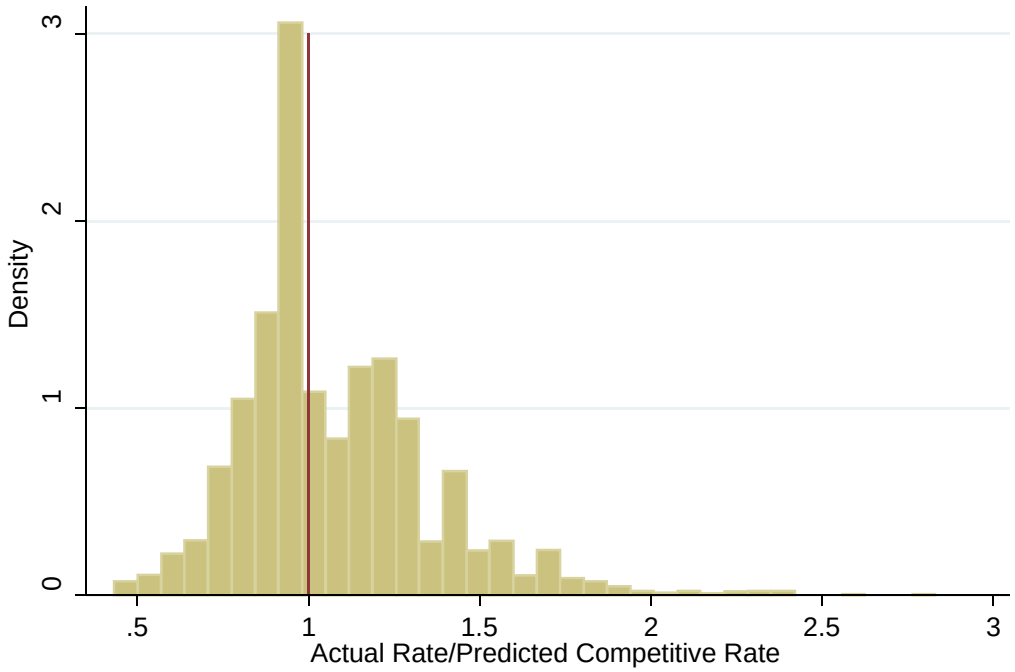

FIGURE B-4 Distribution of ratios of actual to predicted rates, nonbenchmark sample, coal, ratios greater than 3 excluded.

TABLE B-6 Coal Model: Distribution of 2013 Test Group Observations, Ratios of Actual Rate to Benchmark Rate

	Observations					Expanded	
Group	Contract No.	Tariff No.	Total	%	Cum. %	%	Cum. %
$r \leq 1$	679	1,175	1,854	50.5	50.5	54.7	54.7
$1 < r \leq 1.2$	85	657	742	20.2	70.7	20.1	74.9
$1.2 < r \leq 1.4$	167	412	579	15.8	86.5	12.9	87.7
$1.4 < r \leq 1.6$	77	213	290	7.9	94.4	6.9	94.6
$1.6 < r \leq 1.8$	61	50	111	3.0	97.4	2.5	97.1
$1.8 < r \leq 2.0$	13	24	37	1.0	98.4	1.1	98.2
$r > 2.0$	10	47	57	1.6	100	1.8	100
Total	1,092	2,578	3,670	100		100	

NOTE: The groups are defined by the ratio (r) of ARTM to the predicted 50th percentile. Cum. = cumulative. The columns showing expanded percentages use the sample rate expansion factor associated with each observation.

Chemicals

The descriptive statistics for chemicals for 2000 through 2013 are provided in Table B-7. There are 556,467 total observations, with 357,998 in the competitive benchmark group and 198,469 in the nonbenchmark group. In 2009 dollars, the average rate for the combined sample is 8.6 cents per ton-mile. The average distance traveled is 778 miles, and the average shipment size is 1.2 cars. Most shipments involve only one railroad, and shippers have on average 2.6 railroads within 10 miles of the origin and 2.5 railroads within 10 miles of the destination. About 20 percent of shipments have no water options within 50 miles. Finally, about 96 percent of movements are made in private cars, since railroads own few tank cars. There is little difference across the two groups for most variables. However, the nonbenchmark shipments tend to have less access to rail and water.

In the chemical specification, a dummy variable is added to denote hazardous materials in recognition of potential added costs associated with transporting hazardous chemicals. About 38 percent of the shipments are hazardous materials. The estimation results are summarized in Table B-8, excluding all fixed effects. The coefficient estimates for the same variable have the same sign across table columns. The magnitudes are also stable across columns. Increasing shipment distance and size both predict lower rates (revenue per ton-mile), while an increase in the number of railroads involved in the move predicts higher rates. The competition variables for both rail and water are statistically important and have signs that are consistent with the cited literature.

TABLE B-7 Chemicals Summary Statistics, 2000–2013

Variable	Combined Samples	Benchmark Sample	Nonbenchmark Sample
Observations	556,467	357,998	198,469
Average revenue per ton-mile (2009 dollars)	0.086	0.090	0.082
Distance (miles)	778	757	815
Shipment size (number of cars)	1.20	1.20	1.21
Number of railroads in shipment	1.30	1.31	1.28
Number of Class I railroads within 10 miles of origin	2.59	2.79	2.23
Number of Class I railroads within 10 miles of destination	2.54	2.59	2.44
No water ports within 50 miles (binary)	0.20	0.16	0.27
Distance to water from origin (miles)	95	76	129
Distance to water from destination (miles)	94	86	109
Private car (binary)	0.96	0.97	0.94

NOTE: All values are means weighted by the expansion factor associated with each sampled shipment.

The median regression (quantile = 0.5) results in Table B-8 are again used to predict the rates for the 2013 test group, which totaled 8,176 observations. The ratios of actual to predicted rates are summarized in Figure B-5 and Figure B-6 and in Table B-9. As shown in Figure B-5, the distribution is positively skewed, with some very large values. The maximum ratio is 19.8. As noted earlier, this large dispersion (compared with the other models), with more than 6 percent of observations having ratios greater than 2, may stem from the variability in the types of chemical products and their associated shipping characteristics. A more refined chemical model based on product may be warranted.

TABLE B-8 Benchmark Models—Chemicals (Based on Competitive Benchmark Data)

		Quantile			
Variable	OLS	0.25	0.5	0.75	0.9
ln(distance)	–0.537 (0.00106)	–0.478 (0.00105)	–0.526 (0.00115)	–0.576 (0.00100)	–0.611 (0.00134)
ln(cars)	–0.0674 (0.00133)	–0.0584 (0.000811)	–0.0643 (0.00108)	–0.0682 (0.00123)	–0.0705 (0.000964)
ln(number of railroads)	0.314 (0.00307)	0.248 (0.00246)	0.269 (0.00256)	0.294 (0.00253)	0.350 (0.00385)
No. of Class I within 10 mi of origin	–0.0093 (0.000603)	–0.0204 (0.000452)	–0.0233 (0.000580)	–0.0171 (0.000563)	–0.0076 (0.000718)
No. of Class I within 10 mi of destination	–0.0521 (0.000607)	–0.0609 (0.000557)	–0.0570 (0.000665)	–0.0470 (0.000649)	–0.0362 (0.000517)
Nowater (binary)	0.0564 (0.00364)	0.0739 (0.00300)	0.0687 (0.00371)	0.0614 (0.00356)	0.0333 (0.00419)
ln(mi from origin to port)	0.00864 (0.000572)	0.00947 (0.000484)	0.00963 (0.000586)	0.00653 (0.000557)	0.00285 (0.000617)
ln(mi from destination to port)	0.0146 (0.000574)	0.0194 (0.000521)	0.0189 (0.000612)	0.0168 (0.000579)	0.0135 (0.000649)
Private car (binary)	–0.102 (0.00437)	–0.115 (0.00320)	–0.0940 (0.00411)	–0.0817 (0.00350)	–0.0924 (0.00465)
Hazmat (binary)	0.0708 (0.00273)	0.0434 (0.00203)	0.0701 (0.00244)	0.0666 (0.00258)	0.0511 (0.00295)
Observations	356,187	356,187	356,187	356,187	356,187
R^2	0.656				

NOTE: All standard errors are $p < .01$. All results are weighted by the expansion factor

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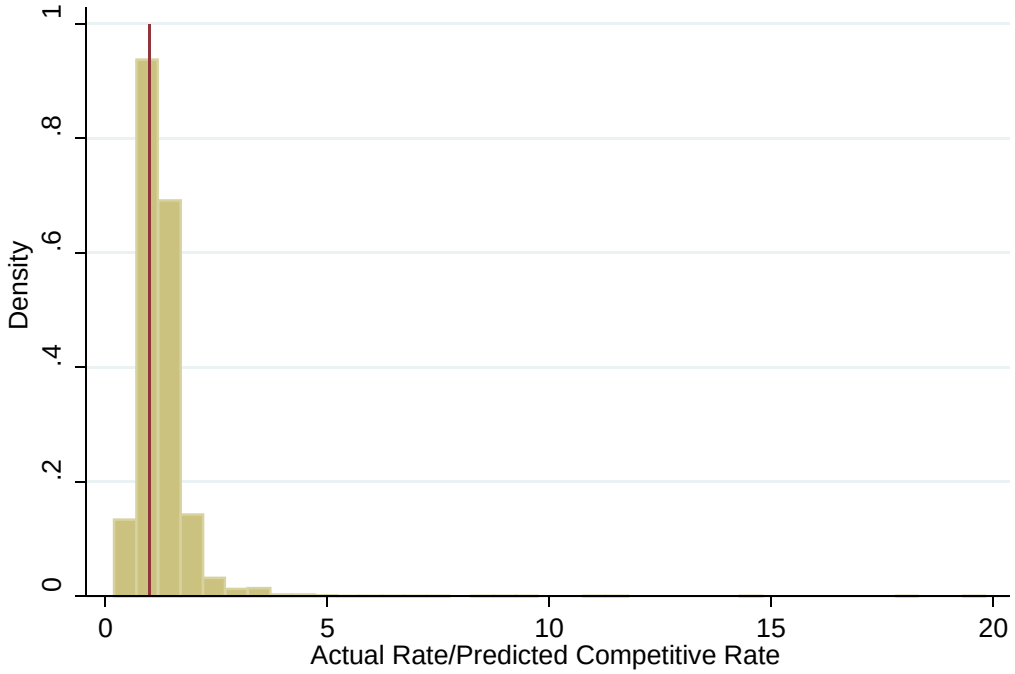

FIGURE B-5 Distribution of ratios of actual to predicted rates, nonbenchmark sample, chemicals, no ratios excluded.

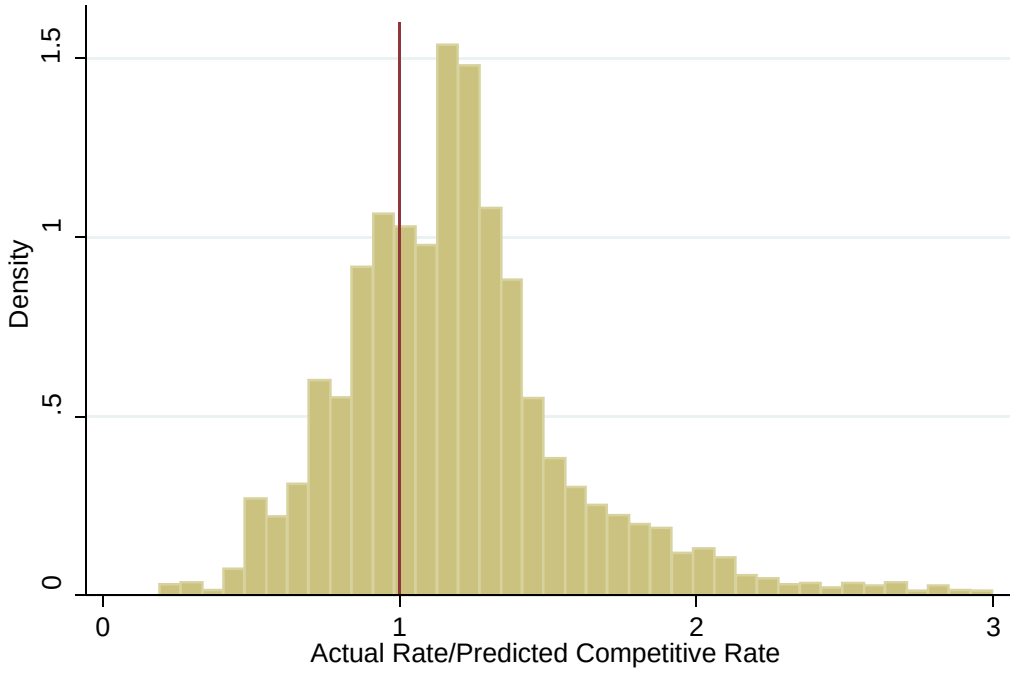

FIGURE B-6 Distribution of ratios of actual to predicted rates, nonbenchmark sample, chemicals, ratios greater than 3 excluded.

TABLE B-9 Chemicals Model: Distribution of 2013 Test Group Observations, Ratios of Actual Rate to Benchmark Rate

	Observations					Expanded	
Group	Contract No.	Tariff No.	Total	%	Cumulative %	%	Cumulative %
$r \leq 1$	521	1,991	2,512	30.7	30.7	33.0	33.0
$1 < r \leq 1.2$	187	1,719	1,906	23.3	54.0	24.1	57.1
$1.2 < r \leq 1.4$	108	1,774	1,882	23.0	77.1	21.4	78.5
$1.4 < r \leq 1.6$	71	658	729	8.9	86.0	7.7	86.2
$1.6 < r \leq 1.8$	60	328	388	4.7	90.7	4.4	90.6
$1.8 < r \leq 2.0$	44	223	267	3.3	94.0	3.1	93.7
$r > 2.0$	26	466	492	6.0	100	6.3	100
Total	1,017	7,159	8,176	100		100	

NOTE: The groups are defined by the ratio (r) of ARTM to the predicted 50th percentile. The columns showing expanded percentages use the sample rate expansion factor associated with each observation.

Petroleum

The descriptive statistics for petroleum for 2000–2013 are provided in Table B-10. There are 86,678 total observations, with 50,487 in the competitive benchmark group and 36,191 in the nonbenchmark group. In 2009 dollars, the average price for the combined sample is 9.9 cents per ton-mile. The average distance traveled is 793 miles, and the average shipment size is 1.1 cars. Most shipments involve only one railroad, and shippers on average have 2.5 railroads within 10 miles of the origin and 2.4 railroads within 10 miles of the destination. About 15 percent of total shipments have no water options within 50 miles, but the benchmark shippers have more access, with only about 9 percent having no water options; the nonbenchmark shippers are somewhat more restricted in their water options (about 23 percent have no water options). Finally, virtually all movements occur in private cars because railroads own very few tank cars. There is little difference across the two samples in most variables other than the water options and the distance to water for both origins and destinations.

The estimation results are summarized in Table B-11 with the intercept effects (railroad dummies, annual dummies, and STCC dummies) suppressed. In general, the coefficient estimates for the same variable have the same sign across columns of the table for most of the variables (i.e., distance, number of railroads in the movement, the number of Class I carriers within 10 miles of the destination, the presence of water, and the distance to water from the destination). However, there are some differences. They include shipment size, the number of Class I railroads within 10 miles of the origin, and the distance to water from the origin.

As with the other models, the median regression (quantile = 0.5) results in Table B-11 are used to predict the rates for the 2,670 observations in the test group. The ratios of actual to predicted rates are summarized in Figures B-7 and B-8 and in Table B-12. As shown in Figure B-7, the distribution is positively skewed, with some very large values. The maximum ratio is 10.31. However, most of the ratios are between 0 and 2, as shown in Figure B-8 and Table B-12.

TABLE B-10 Petroleum Summary Statistics, 2000–2013

Variable	Combined Samples	Benchmark Sample	Nonbenchmark Sample
Observations	86,678	50,487	36,191
Average revenue per ton-mile (2009 dollars)	0.099	0.095	0.104
Distance (miles)	793	786	804
Shipment size (number of cars)	1.10	1.09	1.12
Number of railroads in shipment	1.31	1.34	1.28
Number of Class I railroads within 10 miles of origin	2.50	2.70	2.21
Number of Class I railroads within 10 miles of destination	2.37	2.48	2.20
No water ports within 50 miles (binary)	0.15	0.09	0.23
Distance to water from origin (miles)	92	64	131
Distance to water from destination (miles)	92	76	113
Private car (binary)	0.99	0.99	0.99

NOTE: All values are means weighted by the expansion factor associated with each sampled shipment.

TABLE B-11 Benchmark Models—Petroleum and Products (Based on Competitive Benchmark Data)

		Quantile			
Variable	OLS	0.25	0.5	0.75	0.9
ln(distance)	–0.617 (0.00247)	–0.553 (0.00229)	–0.606 (0.00236)	–0.638 (0.00230)	–0.668 (0.00274)
ln(cars)	0.0196 (0.00470)	0.0311 (0.00478)	0.00899** (0.00366)	–0.00350 (0.00402)	–0.0115 (0.00275)
ln(number of railroads)	0.358 (0.00680)	0.326 (0.00498)	0.308 (0.00502)	0.326 (0.00563)	0.424 (0.00796)
No. of Class I within 10 mi of origin	0.00518 (0.00158)	–0.0165 (0.00147)	–0.0137 (0.00148)	0.00330** (0.00149)	0.0273 (0.00216)
No. of Class I within 10 mi of destination	–0.0569 (0.00161)	–0.0624 (0.00119)	–0.0671 (0.00139)	–0.0515 (0.00156)	–0.0344 (0.00214)
Nowater (binary)	0.113 (0.00784)	0.0965 (0.00654)	0.0759 (0.00880)	0.0513 (0.00728)	0.0181** (0.00843)
ln(mi from origin to port)	0.00669 (0.00116)	0.00492 (0.00115)	0.00698 (0.00113)	0.00120 (0.00103)	–0.00727 (0.00143)
ln(mi from destination to port)	0.0127 (0.00118)	0.0155 (0.00121)	0.0106 (0.00108)	0.00278** (0.00109)	0.00336** (0.00145)
Private car	0.0863* (0.0509)	–0.180 (0.0204)	0.000810 (0.0153)	0.134 (0.0768)	0.0414 (0.125)
Observations	50,340	50,340	50,340	50,340	50,340
R^2	0.749				

NOTE: All standard errors are $p < .01$, except ** = $p < .05$ and * = $p < .1$. All results are weighted by the expansion factor.

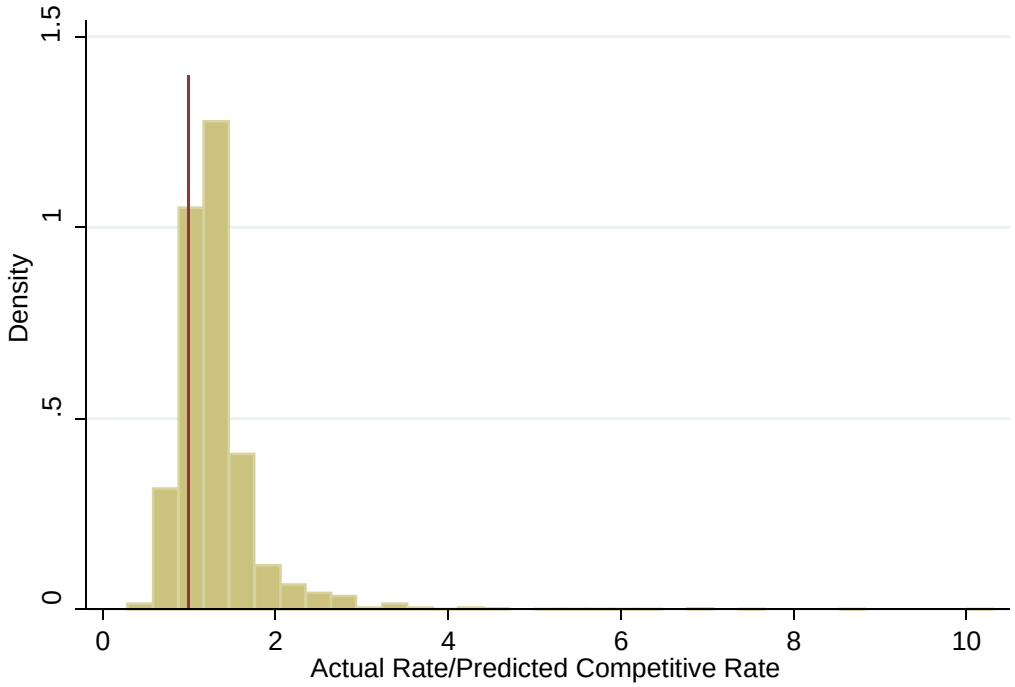

FIGURE B-7 Distribution of ratios of actual to predicted rates, nonbenchmark sample, petroleum, no ratios excluded.

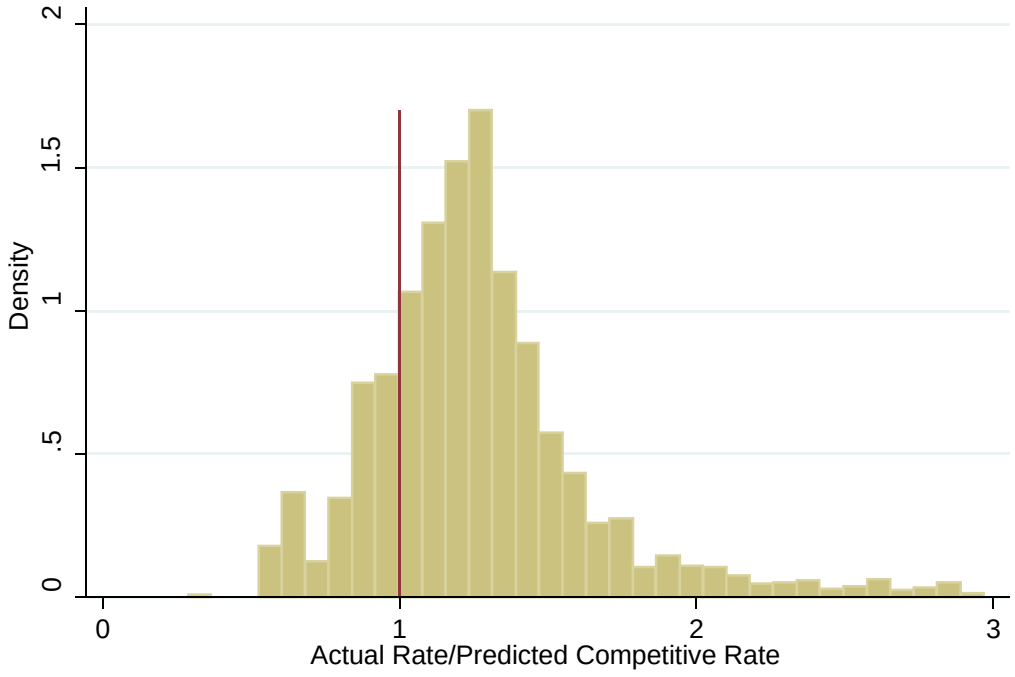

FIGURE B-8 Distribution of ratios of actual to predicted rates, nonbenchmark sample, petroleum, ratios greater than 3 excluded.

TABLE B-12 Petroleum Model: Distribution of 2013 Test Group Observations, Ratios of Actual Rate to Benchmark Rate

	Observations					Expanded	
Group	Contract No.	Tariff No.	Total	%	Cumulative %	%	Cumulative %
$r \leq 1$	117	418	535	20.0	20.0	19.3	19.3
$1 < r \leq 1.2$	4	665	669	25.1	45.1	24.9	44.3
$1.2 < r \leq 1.4$	9	724	733	27.5	72.5	27.6	71.9
$1.4 < r \leq 1.6$	6	354	360	13.5	86.0	13.8	85.7
$1.6 < r \leq 1.8$	0	137	137	5.1	91.2	5.3	91.0
$1.8 < r \leq 2.0$	10	43	53	2.0	93.1	2.0	93.0
$r > 2.0$	9	174	183	6.9	100	7.0	100
Total	155	2,515	2,670	100		100	

NOTE: The groups are defined by the ratio (r) of ARTM to the predicted 50th percentile. The columns showing expanded percentages use the sample rate expansion factor associated with each observation.

CONCLUSIONS

Railroads are subject to maximum rate regulation intended to allow the railroads to earn revenues adequate to cover their common costs while protecting shippers with few competitive options from unreasonably high common carrier rates. A major problem for regulators has been in determining whether a particular rate is high enough to warrant additional regulatory scrutiny. The current system uses a threshold of 180 percent of the Uniform Railroad Costing System–estimated average "variable cost" for this purpose, which is unreliable and arbitrary, as documented in this report.

An alternative approach for identifying unusually high rates is demonstrated in this appendix. The concept is that some shipments whose rates are determined under competitive conditions can be used to estimate competitive benchmark prices for other shipments with varying degrees of competition and cost-related characteristics. The method was demonstrated for movements of farm products, coal, chemicals, and petroleum. In general, the predictive models of the price of an effectively competitive movement given the route characteristics perform well in explaining the data. For the most part, the tested rates were close to the competitive rates, but the procedure identifies traffic having rates that far exceed the competitive benchmark rate. These rates might be candidates for further scrutiny for reasonableness.

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