

Rail

Competition and  
its Importance  
to Agriculture

Chapter 6

# Chapter 6: Rail Competition and its Importance to Agriculture

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The legislative language establishing this study requires an examination of: "... the sufficiency in rural areas of transportation capacity, the sufficiency of competition in the transportation system, the reliability of transportation services, and the reasonableness of rates..."<sup>96</sup> This chapter and the five that follow explore these questions with regard to rail freight transportation.

This analysis of rail transportation is covered in the next six chapters of the Study:

- Chapter 6, Rail Competition and Its Importance to Agriculture (this chapter)
- Chapter 7, Rail Rates
- Chapter 8, Rail Service Performance
- Chapter 9, Rail Capacity
- Chapter 10, Rail investment
- Chapter 11, Rail Rate Relief Processes for Shippers

## U.S. Agriculture Depends on Rail Transportation

Agricultural producers—farmers—are dispersed over the entire country. Unlike most other industries, they are unable to move their operations—they are tied to the land, and often to a particular climate. Because they are tied to the land, they must be able to transport their produce to markets, many of which are located long distances from the farms.

Nine of the ten top wheat-producing States are more than 150 miles from barge transportation on the Mississippi River, which usually provides the strongest intermodal competition to railroads for the long-distance movement of grain to export ports. Unlike other agricultural shippers in the United States, wheat shippers in much of the Great Plains have no cost-effective transportation alternatives to railroads. The wheat produced in these areas moves long distances to domestic markets for processing and consumption or to coastal ports for export. Shippers in these regions have little direct access to inland waterway transportation and the distances involved can make truck transportation uneconomical.

Large volumes of grain and oilseeds are produced each year in the United States. American farmers produced more than 18.8 billion bushels of grain and oilseeds in 2008, weighing more than 539 million tons.\* This volume of grain and oilseeds would require 19.6 million truckloads or 5.4 million railcar loads to haul.

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\* "Grains and oilseeds" includes barley, corn, millet, oats, rice, rye, sorghum, wheat, canola, flaxseed, peanuts, safflower, soybeans, and sunflower seeds.

The share of the grain harvest moved by rail has been declining since deregulation in 1980. In that year, railroads moved half the grain harvest. In 2004, the rail share had declined to 35 percent.<sup>97</sup> Most of the traffic lost to rail now moves by truck, partly as a result of changes in grain markets, especially the location of more cattle feedlots and newly constructed ethanol plants in grain-producing States. Most of the grain for these feedlots and ethanol plants moves relatively short distances, and most is moved by truck.

Although rail shipments of grains and oilseeds have increased at an average rate of 1.1 percent over the last fifteen years, truck shipments have increased by 4.4 percent.<sup>98</sup> In other words, rail's market share has been steadily decreasing. Farmers have other options, and they appear to be taking advantage of them.

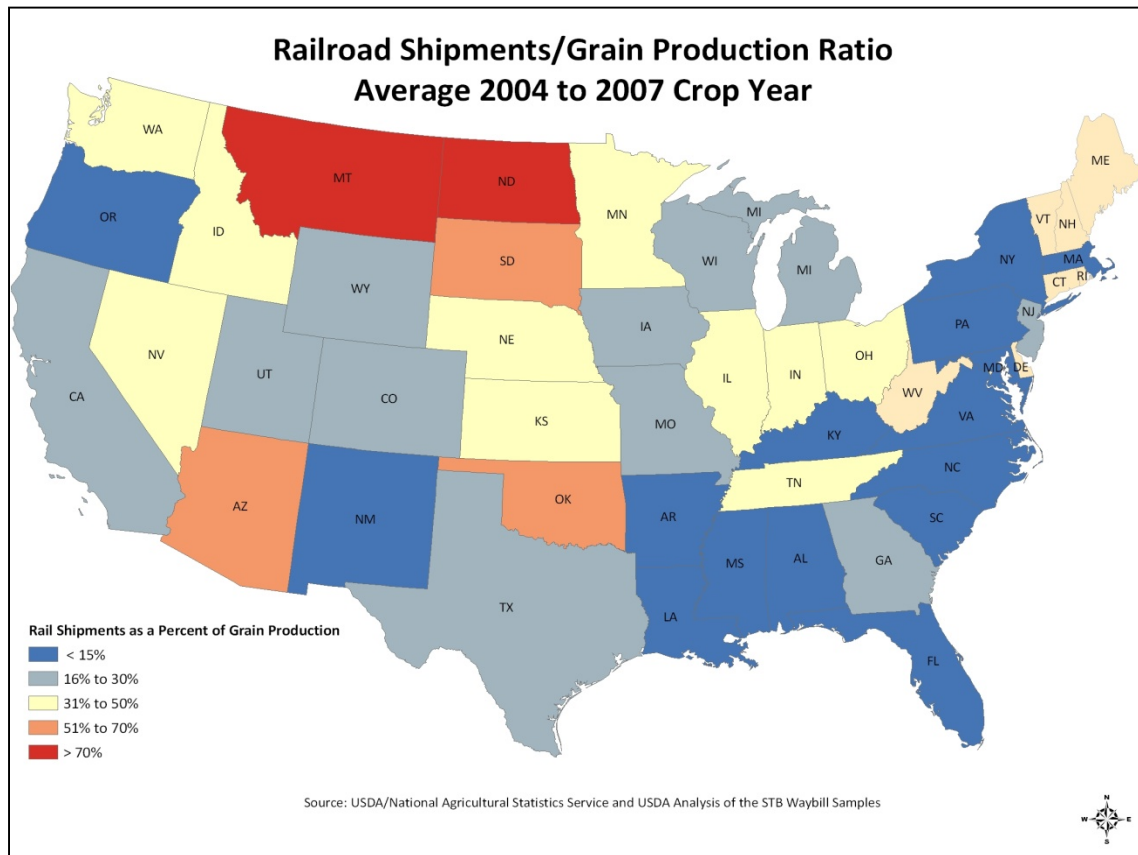
An affordable and reliable transportation network is necessary to maintain the strength and competitiveness of American agriculture and our rural communities. Rail service is a particularly important part of that network for U.S. agriculture, because it is virtually the only cost-effective shipping alternative available for low-value, bulky commodities in rural areas that are distant from water transportation and markets.

Agricultural shippers in Montana and North Dakota are particularly dependent on rail transportation because of their distance to inland waterways and the prohibitive distance for the use of trucks. Figure 6-1 shows that, on average, railroads transported more than 70 percent of the grains and oilseeds originated in Montana and North Dakota during the crop marketing years from 2004 to 2007. Another study indicates that during crop marketing year 2004, railroads transported 78 percent of North Dakota crops.<sup>99</sup> A recent study states that nearly 100 percent of Montana wheat is shipped by rail.<sup>100</sup>

During the crop marketing years 2004–2007, railroads transported more than 50 percent of the grain production of Arizona, Oklahoma, and South Dakota. During the same time period, rail moved more than 30 percent of grain and oilseed production in the States of Idaho, Illinois, Indiana, Kansas, Minnesota, Nebraska, Nevada, Ohio, Tennessee, and Washington.

During calendar year 2007, 33 percent of major grains and oilseeds and 46 percent of grain and oilseed exports moved to market by rail. Wheat is particularly dependent on rail; 66 percent of all wheat and wheat exports moved by rail during 2007.

Figure 6-1: Railroad shipment/grain production ratio, average 2004-2007 marketing years



## Government Promotion and Regulation of Railroads

During the 19<sup>th</sup> century, all levels of government promoted the development of railroads. Contrary to popular impression, most of the government promotion of railroads during this period was undertaken by State and local governments, not by the Federal Government. State and local governments promoted railroads in an attempt to attract commerce, and many of the nation's major cities and industrial centers can attribute their development in some measure to commerce generated by the availability of railroad transportation. State incentives for railroad development included government purchase of railroad stock, loans and loan guarantees, cash grants, and tax exemptions.<sup>101</sup> The Federal Government promoted rail transportation by surveying land for the railroads and providing land grants to encourage railroad development in Western States. These land grants were usually sold by the railroads to finance construction of their lines and to encourage agricultural production and traffic on the rail lines.

Because of government promotion, overcapacity was an early and lasting feature of the railroad industry, in part because of the intense competition among municipalities to obtain rail service. The consolidation of local railroads into larger rail systems during the 1870's and 1880's and the presence of excess capacity ensured periods of vigorous—and destructive—competition among railroads. These bouts of competition alternated with attempts by

railroads and Wall Street financiers to create a sustainable cartel that would boost the industry's profitability. Although each cartel failed, the apparent collusion of railroads, financiers, and government officials infuriated the public, especially the farmers and agricultural interests who were dependent on rail transportation.

### **Interstate Commerce Act of 1887**

Because they possessed and exercised considerable market power, railroads were the first industry regulated by the U.S. government. The Interstate Commerce Act of 1887 (ICC Act) created the Interstate Commerce Commission (ICC) and charged it with implementing the ICC Act. The ICC Act prohibited price discrimination by place, shipper groups, commodities, long haul/short haul, and on a personal basis. The ICC Act also prohibited pooling, or the formation of cartels, and required that rail rates be just and reasonable. Railroads were required to publish and adhere to tariffs to allow the ICC to monitor prices and price discrimination.<sup>102</sup>

### **Hepburn Act**

Congress broadened and strengthened the scope of railroad regulation over the ensuing years and Federal regulation of all facets of the industry became pervasive. The Hepburn Act, passed in 1906, allowed the ICC to establish maximum rail rates, increased its power to regulate joint rail rates, and extended its power to regulate personal price discrimination. Because some railroads gave preferential rates to commodities in which they had a financial interest, The Hepburn Act included the commodity clause, which prohibited railroads from hauling commodities they produced, owned, or in which they had a financial interest. Under The Hepburn Act, the ICC could suspend rate-change proposals for 120 days to determine rate reasonableness. Railroad profitability slipped between 1906 and 1920, as the ICC turned down nearly all rail rate increases. As a result, rail service deteriorated and many railroads went bankrupt.<sup>103</sup>

### **Transportation Act of 1920**

The Transportation Act of 1920 tried to address the financial needs of railroads by extending ICC regulations to minimum rail rates and by allowing pooling, if shown to be in the public interest. Also, the rule of rate-making was introduced, entitling railroads to charge prices which would result in a fair return on their investment. Regulation was extended to the control of exit and entry in the rail industry, the issuance of financial securities, and ICC approval of mergers. In spite of its good intentions, this law greatly hampered the ability of railroads to respond to competition, abandon unprofitable lines, cover their fixed costs, and provide flexible service.

Meanwhile, government construction of highways and locks and dams increased competition from other transportation modes, further depressing railroad profitability. The new commercial trucking industry and the beginnings of an extensive network of roads and highways greatly reduced truck transport costs. In addition, government construction of lock and dam systems on the upper Mississippi and Illinois Rivers and the promotion of inland waterway transportation further lessened the railroads' share of intercity freight movements.

Regulation of the rail system was not relaxed even though the Federal Government subsidized the rail industry's competitors by building the interstate highway system, the inland waterway system, and key portions of the nation's commercial aviation industry. Federal law still made it difficult for railroads to abandon track or eliminate unprofitable passenger service. As a result, railroads were unable to earn enough money to pay for the maintenance of their equipment and infrastructure throughout the 1950's, 1960's, and 1970's. Since cash flows were inadequate and it was difficult to abandon lines under the rail regulatory system, railroads often opted to defer maintenance on lighter traffic-density lines. The condition of the U.S. rail network deteriorated greatly until the mid-1970s. By 1976, approximately one-third of the Nation's railroads were bankrupt or nearly bankrupt.<sup>104</sup>

### **Start of Regulatory Reform**

Regulatory reform began with the Regional Rail Reorganization Act of 1973 (3-R Act), which was passed primarily to restructure the railroad network in the Northeastern United States, and was strengthened with the Railroad Revitalization and Regulatory Reform Act of 1976 (4-R Act), which relaxed regulation of railroad rates, mergers, and abandonments. The 4-R Act was designed to rescue the rail industry by giving railroads more flexibility and by relying more on market forces to set prices. The 4-R Act allowed minimum rail rates as low as railroad variable cost and removed regulation of maximum rail rates unless the railroad had market dominance. Finally, the 4-R Act gave the ICC the power to grant regulation exemptions for commodities and types of transportation in which railroads have no market power. Despite these changes, the 3-R Act and 4-R Act failed to revive the rail industry.

### **Staggers Rail Act of 1980**

The Staggers Rail Act of 1980 (Staggers Act) gave railroads increased freedom to price their services according to market conditions, including the freedom to use differential pricing. Perhaps most importantly, the Staggers Act permitted railroads to enter into confidential contracts with shippers, which were to be filed with the ICC, thereby enabling railroads to make investments in plant and equipment with a greater degree of certainty that these investments would be profitable.

At the same time, the Staggers Act gave the ICC, and later its successor, the Surface Transportation Board (STB), the authority to establish a rate appeals process so captive shippers could obtain relief from unreasonably high rail rates. Under the Staggers Act, the STB has no jurisdiction over maximum rail rates unless the railroad has market dominance and the revenue-to-variable cost ratio exceeds 180 percent. Furthermore, the STB has no authority over contract rates or the rates and service of exempt—including some agricultural—commodities.

**Figure 6-2: Many rail lines to local elevators were abandoned after the Staggers Act of 1980.**



Source: Wikimedia Commons

### **Interstate Commerce Commission Termination Act of 1995**

More recently, the Interstate Commerce Commission Termination Act of 1995 (ICCTA) eliminated the ICC as of January 1, 1996, replacing it with the much smaller STB. The ICCTA eliminated the requirement of railroads having to file tariffs with the STB and abolished the STB's authority to establish minimum rates. Under the ICCTA, the STB may not suspend any rail rates except to prevent irreparable harm. This contrasts to prior laws, in which the ICC had the authority to investigate and suspend new rail rates on its own initiative. The Act also imposed time limits on rate proceedings before the STB, ostensibly to prevent future rate appeals from lasting eighteen years as did the *McCarty Farms* case, which appealed agricultural grain rates in the Northern Plains (see Chapter 11 for more about the McCarty case).

The ICCTA requires a railroad's common carriage rates (tariff rates) and service terms to be disclosed on request and published in some form for agricultural products and fertilizer. Increases in these tariff rates or changes in the service terms require 20 days advance notice be given to any person who had requested such rates or made arrangements for shipment under the rate.

The STB may still require rail carriers to file their car service rules even though tariff filing has been eliminated. A railroad is allowed to fulfill its contractual commitments before handling requests for common carrier service. However, the contractual commitments of the carrier must be reasonable, and not prevent a carrier from responding to its common carrier

obligations. Railroad movements which use cars provided under guaranteed car systems are not considered contractual movements. The STB is also directed to consult as it considers necessary with the National Grain Car Council on matters involving the rail transportation of grain.

The ICCTA also accelerated and streamlined the procedures for rail consolidation proceedings. The STB retained the power to approve rail mergers, consolidations, and control transactions, but has added rules to guide that discretion. The conditions may include divestiture of parallel tracks, the granting of trackage rights, and access to other facilities to alleviate anti-competitive effects of the transaction. In addition to the criteria required in previous legislation, when a transaction involves the control of at least two Class I carriers, the STB is instructed to consider whether the proposed transaction would have an adverse effect on competition among all carriers, not just those in the affected region. Recently approved mergers by the STB have had more conditions and longer oversight periods, particularly in view of the Western rail crisis during 1997-98, which followed the Union Pacific/Southern Pacific merger.

## Rail Competition in an Era of Deregulation

This section discusses various types of competition in the railroad industry today and uses the inverse Herfindahl-Hirschman Index (HHI) analysis by Crop Reporting District (CRD) to explore how rail-to-rail competition has changed for agriculture since the mid-1980s.

### Deregulation of the Railroad Industry

The constraints of pervasive economic regulation, although meant to protect shippers from the abuse of railroad market power, resulted in nearly bankrupting the railroad industry as well as increasing shipper costs. Furthermore, Federal legislators recognized that industry regulation was expensive for both industry and government, and created market distortions for nearly all regulated markets.<sup>105</sup> Congress deregulated railroads in response to arguments that the industry needed greater pricing and operating freedom to avoid more bankruptcies.<sup>106</sup>

As the Nation deregulated the railroad industry, conflicting goals included the preservation of effective transportation competition, the regulatory protection of captive shippers, deregulation of rail rates when sufficient competition is present, and revenue adequacy of railroad firms.\* The concept of adequate competition is so important that competition is mentioned four times, avoidance of undue concentration of market power is mentioned once, and adequate railroad revenues or sound economic conditions is mentioned twice in the fifteen Rail Transportation Policy goals of the Staggers Act and ICCTA.<sup>107</sup> The presence of transportation competition was expected to protect most shippers by constraining the use of railroad market power. On the other hand, adequate revenues are necessary for rail service to remain viable and continue providing service.

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\* Although railroads are economically deregulated, they are still subject to significant safety, labor, and other laws and regulations.



**Figure 6-3: Decreased rail-to-rail competition reduces options for shippers.**



Source: Wikimedia Commons, Sean Lamb

In cases when rail-to-rail competition was not present, captive shippers expected meaningful protections against the excessive use of railroad market power. Until 2008, the only rail rate appeals used by shippers were Stand-Alone Cost procedures, which cost millions to adjudicate. (See Chapter 11 for detailed information on rate relief processes for rail shippers). Small shippers essentially had no protection until 1996, when the STB instituted small rate case appeals procedures. Small shippers, however, did not use those procedures because they did not perceive them to be cost-effective and were concerned about the uncertainty of the process. The STB held a proceeding regarding small rate case appeals procedures and set new rules for small rate case appeals in 2008. In response to appeals from both shippers and railroads, the U. S. Court of Appeals for the District of Columbia Circuit affirmed the STB decision on June 9, 2009.

### **Benefits of Railroad Deregulation and Agricultural Concerns**

Railroad deregulation encouraged greater reliance on free markets to promote railroad profitability and public benefits.<sup>108</sup> The Staggers Act significantly reduced economic regulation in the railroad industry, which has benefited shippers as well as railroads.

Since the Staggers Act, the average rate of return on investment for the railroad industry has increased from less than 2.5 percent during the 1970s to slightly more than 10 percent during 2006 and 2007. The Christensen study found that the return on equity for the railroad industry—when compared to revenue adequacy standards using STB’s Capital Asset Pricing Model (CAPM)\*—has exceeded revenue adequacy standards since 2001.<sup>109</sup> In addition, railroad industry earnings above CAPM revenue adequacy standards have widened in recent years.

During the first decade of railroad deregulation, the annual benefits to shippers amounted to more than \$12 billion in 1999 dollars, equivalent to \$14.7 billion in 2007 dollars.<sup>110</sup> Shippers have benefitted from 20 years of decreasing rail rates (in terms of inflation-adjusted revenue per ton mile) and the preservation of rural lines that were sold or leased to smaller railroad firms. Many of these new short line railroads have been able to operate profitably on rail lines abandoned by the major railroads and have generally provided more individualized service to shippers.<sup>111</sup>

Despite the initial success of the Staggers Act, agricultural producers and shippers continue to express concern about decreased rail-to-rail competition, rapidly increasing rail rates, poor rail service, rail capacity constraints, and the fair allocation of rail capacity. As expected, the distribution of benefits has tended to favor grain producers and shippers in regions with more transportation competition.<sup>112</sup> In addition, the GAO noted that rates have not declined uniformly for all commodities and that rates for some commodities are significantly higher than others. In particular, from 1987 to 2004, rail rates for grain have increased 9 percent, as rates have declined for coal, motor vehicles, and miscellaneous mixed shipments.<sup>113</sup>

### Role of Competition

Some economists claim that the way to preserve the benefits of deregulation is to increase rail competition; many shipper groups have echoed this conclusion in comments prepared for various proceedings before the Surface Transportation Board.<sup>114</sup> Market-based competition is a fundamental economic policy of the United States.<sup>115</sup> Competition requires businesses to become efficient and effective† in providing the kinds and quality of goods and services the consumer desires. Competitive markets reduce market distortions and result in the efficient allocation of resources, providing a basis for economic development. As the Antitrust Modernization Commission states, “The U.S. economy is an example of how free markets can lead to the creation of wealth, making possible improved living standards and greater prosperity.”<sup>116</sup> Furthermore, Michael Porter observes that industries sheltered from competition are less vigorous and successful than industries subject to competition.<sup>117</sup>

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\* At the time of the Christensen study, the STB used the CAPM standard to evaluate the revenue adequacy of the railroad industry. On January 28, 2009, STB adopted a new measure which is the simple average of the CAPM and a multi-stage Discounted Cash Flow method of estimating revenue adequacy.

† USDA defines “efficient” as being cost-efficient; “effective” is the production of a product or service having the features and quality that consumers want.

When an industry is economically regulated, competition is not as important because government protects the consumer and social welfare. When an industry is deregulated, however, competition and antitrust enforcement become the major forces protecting the consumer and society from unfair business practices. The loss of competition, combined with deregulation, could lead to the unrestrained use of market power. This is especially true in highly concentrated industries that possess market power, such as the railroad industry. Unrestrained use of railroad market power would likely result in unnecessarily high rail rates and the inability of agricultural producers to reach multiple and competing markets. Because agricultural producers typically receive a price net of transportation, higher rail rates and inability to access a variety of markets result in reduced producer income. The preservation and protection of competition is vital for the economic prosperity of agricultural producers and shippers contending with a deregulated railroad industry.

### **Effective Competition**

In order for competition to be effective, it must be cost-competitive. Four types of competition constrain the use of railroad market power:

- Intermodal competition from other transportation modes, such as motor carrier, multi-modal, and barge transportation
- Intramodal (rail-to-rail) competition among individual, independent railroads
- Geographic competition, in which a producer can haul products to rail loading facilities located on competing railroads or in which a buyer could obtain products from other originating locations
- Product competition, in which a producer can substitute other inputs in the manufacture of a product

### **Intermodal Competition**

Barges, railroads, and trucks not only compete against each other, they also complement each other. Before agricultural products reach the market, they have often been transported by two or more transportation modes. This balance between competition and integration provides agricultural shippers with a highly efficient, low-cost system of transportation. The competitiveness of U.S. agricultural products in world markets and the financial well-being of U.S. agricultural producers depend on this competitive balance. A highly competitive and efficient transportation system translates into lower shipping costs and more competitive export prices. Such efficiencies also result in lower food costs for U.S. consumers and higher market prices for producers.<sup>118</sup>

**Figure 6-4: Truck, trains, and barges meet at an elevator on the Mississippi River. The modes of transportation not only compete with each other, but also depend on each other.**



**Source: Wikimedia Commons, Kelly Martin**

Each transportation mode has its own role in the transportation of agricultural products.<sup>119</sup> Trucks provide excellent service and are most cost-effective for shorter hauls (up to about 500 miles). Truck transportation also serves as an assembler and disassembler by providing the first few miles and the last few miles of a haul. Rail and barge transportation are more cost-effective on longer hauls and can handle large volumes of bulk commodities. The disadvantages of barge and rail transportation are the inability to deliver to all sites, slower delivery times, and more variation in transit time. The service advantages of truck

transportation are not as relevant with bulk commodities, however, as they are in the movement of fruits, vegetables, and other commodities that need specialized services, such as refrigeration or timely delivery. In addition, the intermodal movement of agricultural products—in which more than one transportation mode is used—is becoming increasingly common.<sup>120</sup>

In many regions of the Nation, cost-effective intermodal transportation competition to rail is not available. For instance, barge competition is most effective for those shippers located within trucking distance of a barge-loading facility. Truck transportation has been most competitive with rail on hauls of less than 500 miles, but during periods of high fuel prices, which affect trucks more than rail, this distance shrinks substantially. Truck competition is not cost-effective in large portions of the Plains States because the producers are too far from both markets and navigable rivers.

During the record oil prices of 2008, high fuel prices increased the relative cost advantage of the more fuel-efficient transportation modes, shifting some traffic from trucks to rail and barges; fuel cost increases affect rail and barges less than trucks. Record fuel prices badly damaged the financial condition of the trucking industry, resulting in many small owner-operators being forced out of business.<sup>121</sup>

On a British thermal unit (Btu) basis, freight railroads are more fuel-efficient than either the barge or the trucking industries. Freight railroads use 344 Btu's per ton-mile; barges use 417 Btu's per ton-mile and trucks 3,476 Btu's. With this measure of fuel efficiency, freight railroads are about 1.2 times more fuel-efficient than barges and 10 times as efficient as trucks. Furthermore, from 1990 to 2002, rail improved by more than 20 percent in fuel efficiency while the trucking industry improved only 2.9 percent over the same period.<sup>122</sup>

On the basis of ton-miles per gallon of fuel, barge transportation can move a ton of cargo 576 miles on a gallon of fuel, railroads 413 miles, and trucks 155 miles. Again, rail and barge transportation are 2.7 and 3.7 times more fuel efficient, respectively, than truck transportation. But in this comparison, barge transportation is almost 1.4 times as fuel efficient than freight rail.<sup>123</sup>

## Rail-to-Rail Competition

USDA has had long-standing concerns regarding railroad consolidation, which has had adverse effects on agricultural shippers. In 1976, 63 Class I railroads operated in the United States; by the end of 1999, only seven of these major railroads remained.\* In 1996, 87 crop reporting districts (CRDs) in the top 20 grain-producing States were served by fewer than three railroads; only 58 CRDs were served by fewer than three railroads in 1992.† Twenty-nine of those crop-reporting districts lost competitive choices between 1992 and 1996.<sup>124</sup>

Even these numbers do not indicate the true extent of the decrease in rail-to-rail competition. Some of the railroads counted in these CRDs are short line railroads that may have physical barriers or contractual obligations preventing the exchange of freight traffic with railroads that compete with the railroad from which the line was purchased or leased.

Economists disagree on the competitive effects of end-to-end railroad mergers. Many economists believe that end-to-end railroad mergers are relatively free of competitive impacts because the number of captive shippers does not increase in purely end-to-end railroad mergers, and other forms of competition—intermodal, geographic, and product—are sufficient to constrain prices. Other economists, however, believe that end-to-end mergers allow competitive impacts through the creation of “bottlenecks” and the virtual foreclosure of markets.‡ A railroad can virtually foreclose the access of other railroads to markets by the denial of permission for competing railroads to use their track or facilities, by the elimination or cancellation of joint-line rates, through routes, and reciprocal switching agreements, and by the closure of gateways.<sup>125</sup>

The latter view is supported by shipper complaints that railroad consolidations have resulted in Class I railroads canceling reciprocal switching rights shortly before a planned merger is announced, closing gateways, and refusing to quote rates on newly created bottleneck segments.<sup>126</sup> The increased market power derived from railroad consolidations appears to have allowed Class I railroads to change service terms involving demurrage, railcar supply, and shipment size. These changes in service terms affect agricultural shippers, producers, and rural communities. Although some Class I railroads have made efforts to improve communications with grain shippers by establishing grain desks and ombudsmen, many agricultural shippers still

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\* Not all of this reduction in Class I railroads was due to merger activity; since the dollar volume threshold for the definition of Class I railroads was raised in 1991 from \$96.1 million to \$250 million (adjusted annually for inflation), several Class I railroads were reclassified as Class II railroads. In addition, prior to 1976, some of these Class I railroads were legally distinct, but operationally integrated.

† There were approximately 168 crop-reporting districts in the top 20 grain producing States in 1996. Thus, 81 crop-reporting districts in these 20 States, or nearly half, were served by more than three railroads.

‡ When two railroads compete for a haul from a single origin to a single destination but the second railroad has to rely on the other railroad for a portion of the haul, a “bottleneck” exists. The railroad able to complete the entire haul on its own line is able to charge the competing railroad an abnormally high price for the portion of the haul that it controls, thereby forcing the entire haul to its own line.

complain that railroad changes in service terms impose additional costs and effort on shippers without a commensurate increase in the responsibilities of the rail carrier.<sup>127</sup>

Decreased rail-to-rail competition among Class I railroads has resulted in an increased ability of railroads to raise rates. The presence of a competing railroad has a noticeable effect on rail rates; rail rates rise well above incremental costs in regions that have only one or two railroads and are far removed from navigable rivers.<sup>128</sup> In addition, rail consolidation has created more captive shippers and has increased the market power of railroads over shippers. Finally, many rail consolidations have resulted in service disruptions, which have been costly to agricultural shippers.

The extent of the loss of rail-to-rail competition because of rail mergers, which has resulted in increased railroad market power, was not foreseen by many at the time of enactment of the Staggers Act. The rationalization of the rail network, however, was anticipated by many economists. The regulated railroad industry was characterized by over-capacity. Consequently, reduction in excess capacity was a logical and expected result of deregulation. The concentration of increased tonnage on fewer track miles has enabled railroads to reap enormous economies of scale. Studies have shown that rail costs have fallen 60 percent in real terms—and that most of these savings have been passed on to shippers.

Nevertheless, rail rates have not fallen everywhere and for all shippers. In some areas of the country, the loss of rail-to-rail competition has resulted in poorer service and higher rates. Also, as railroads sought to concentrate traffic on fewer route miles, many branch lines and country grain elevators have been closed, requiring farmers to truck grain longer distances for rail shipment.

Since farmers are generally price-takers, and since farm product prices received are net of transportation costs, railroad actions since deregulation have in some cases reduced income to farmers. Rail consolidation also has led to a decline in competitive routes and marketing options for some agricultural shippers. The inability to cost-effectively market to numerous potential buyers can also result in lower prices received by agricultural producers.

Some regions, however, may not have adequate freight traffic to support additional rail infrastructure or to support a second railroad operating over the tracks of the incumbent railroad. In fact, the evidence in one study suggests that railroads may be natural monopolies. Consequently, the study concluded that some forms of mandated rail-to-rail competition could result in higher, rather than lower, rail prices.<sup>129</sup>

Although the number of Class I railroads has been reduced since deregulation, the railroad industry contends that rail-to-rail competition is actually more intense because the remaining large railroads are stronger and their market reach is greater. In addition, the railroad industry believes that the Nation is better served by having only a few strong railroads with broad network coverage that compete with each other throughout the West or the East than with a patchwork quilt of regional railroads that face limited rail-to-rail competition within their

territories.<sup>130</sup> Certainly shippers have benefitted from the enormous increases in productivity achieved by railroads since deregulation, and the financial condition of the industry has greatly improved since 1981.

Railroads also are concerned that the demand in the market may not be sufficient to support more rail-to-rail competition, especially if that competition is induced. Their position is based on an industry cost structure with high fixed costs that rail rates must cover, and a cost structure that decreases with volume until traffic approaches capacity. The industry is also concerned that firms could engage in destructive competition if more rail-to-rail competition is induced under this cost structure. They believe this could result in rail rates dropping to the point that they do not cover all costs, resulting in financially weaker rail firms. Furthermore, railroads face considerable investment risk; their assets are long-lived and shipping demand can shift rapidly. Rail lines are expensive to install and costly to remove, causing rail firms to be cautious in adding capacity.

## **Geographic and Product Competition**

Although product and geographic competition can limit railroad pricing in some cases, these forms of competition are less relevant to market dominance today in light of the rapid consolidation of the rail industry.

The average number of route miles operated by each of the Class I railroads in the United States has more than tripled since 1980, resulting in dominance over larger geographic regions by a single Class I railroad.<sup>131</sup> Railroad mergers of the 1960s and 1970s combined smaller rail systems that operated in smaller geographic territories. In the 1980s, newly merged rail systems began to gain dominance within some geographic regions. For instance, in 1960 the average Class I railroad in the United States operated 1,956 route miles. By 1980, this had increased to 4,226 miles, and by 2007, to 13,473 miles.



**Figure 6-5: Many farmers haul grain long distances by truck because rail is not available locally.**



**Source: USDA**

As a result, many farmers in the Plains States no longer have a cost-effective option of hauling grain to an elevator served by a competing railroad. In 1980, the ability of a farmer to haul grain to an elevator served by a competing railroad often provided the competition necessary to constrain rail rates. Today, only two Class I railroads are dominant in the western United States and two are dominant in the eastern United States. This decrease in rail-to-rail competition has decreased the effectiveness and the relevance of geographic and product competition.<sup>132, 133</sup>

### **Competition Decreases Opportunities for Collusive Behavior**

The number of competing railroads that a region can support depends on the level of rail demand. As described in a later section in this chapter, inverse Herfindahl Index maps demonstrate that rail line density in most of the West is much less than that in the East. The heavier rail line density in the east is supported by established manufacturing plants and consumer demand, fueled by higher population densities and availability of labor. In 2006, 59 percent of the U.S. population resided east of the Mississippi River and 52 percent resided in East Coast and West Coast States. Consequently, many grain producing regions located in the Plains States may have too few people and natural resources to support more than one or two competing railroads.

In past railroad mergers, the STB concluded that two railroads provide adequate competition—especially in the presence of effective intermodal competition—and have a better probability of operating profitably than when three railroads compete. Thus, STB has not placed competitive conditions on rail mergers in which the number of competing railroads in a region decreases from three to two. STB routinely places competitive conditions on rail mergers in which the number of competing railroads in a region decreases from two to one.

In 2002, the STB placed strict conditions on future mergers between two Class I railroads and tightened the requirements for mergers with competitive impacts. Nevertheless, some shippers—mainly in regions without cost-effective transportation alternatives—have complained that competitive conditions are also needed on mergers involving three-to-two loss of rail competition. Other shippers have complained that the competitive conditions placed on mergers involving two-to-one loss of rail competition have not been effective.

Empirical evidence indicates that competition between two rail companies in Canada has been inadequate in many markets, despite mandatory reciprocal switching at prescribed rates and the requirement to provide competitive line rates.<sup>134</sup> As few as two sellers would be adequate to produce effective rail-to-rail competition if the rivals were to compete consistently. If all rivals in a market were to collude or tacitly cooperate, however, even with several sellers competing in a market, prices would be higher than when competition is present.<sup>135</sup>

When only two or three firms serve a market, those firms recognize that it is not in their self-interest to have destructive competition—especially in an industry having high fixed costs such as the railroad industry.<sup>136</sup> It can be debated as to whether two rail companies will provide adequate rail-to-rail competition in the United States under the present regulatory framework.

Markets having only two or three firms may experience either tacit or explicit collusion. In order to collude, selling firms in a market must reach an agreement on price (or service) and adhere to that agreement. Consequently, each selling firm must make one-to-one agreements on both of these points with every one of the other competing firms involved. As the number of firms in the market declines, the competing firms face a progressively simpler problem<sup>137</sup> (Table 6-1). For instance, when three firms compete in a market, three agreements are needed. When only two firms compete in a market only one agreement is needed, making it much easier to collude.

**Table 6-1: Number of two-party agreements required to collude**

Number of Market Participants	Number of Two-party Agreements*
5	10
4	6
3	3
2	1
1	0

\* $[N(N-1)]/2$  where N is the number of sellers

Source: Allen R. Ferguson

Shippers have noted that Class I railroad actions closely mirror each other in the areas of fuel surcharges, hazardous materials rates and service, rail rate increases, demurrage charges, charges for storage of railcars, encouraging longer hauls and eliminating shorter hauls, and closure of access to off-line markets. Recently, shippers have engaged in class action law suits alleging price-fixing on the part of railroad firms in the setting of fuel surcharges.

### Railroad Antitrust Immunity

Railroads have enjoyed limited exemptions from antitrust laws since 1914. These exemptions, which were granted when railroads were economically regulated include:<sup>138</sup>

- The Surface Transportation Board (STB) holds sole authority to rule on railroad mergers and acquisitions. Although required to consider the position of the Department of Justice regarding proposed mergers, STB has approved several major railroad mergers which were opposed by the Department of Justice, USDA, and agricultural shippers.
- The STB reviews sales of rail lines, and its approval provides immunity for the transaction from antitrust laws. STB has approved line sales and leases that include contractual interchange agreements that limit the ability of the smaller railroad to interchange freely with railroads that compete with the selling railroad. Without STB antitrust immunity, these agreements may not meet the requirements of antitrust law.
- STB-approved agreements relating to leases, trackage rights, pooling arrangements, and agreements to divide traffic are exempted from the antitrust laws to the extent necessary to carry out the approved agreement. However, such agreements can be related to restrictive interchange agreements on leases and agreements to divide traffic in line sales discussed above. If antitrust immunity was removed, an expected condition might be the preservation of the ability of railroads to pool railcars, which would benefit consumers.

- Railroads are immune from certain rate-related agreements when approved by the STB, such as agreements establishing rules governing charges that one railroad must pay to use another's equipment.
- Private parties may not obtain injunctive relief under the antitrust laws against a common carrier subject to STB jurisdiction.
- Conferences among railroads, shippers, labor, consumer representatives, and government agencies may be convened by the Secretary of Transportation, and discussions or agreements entered into with the Secretary's approval through these conferences are exempted from antitrust laws.
- The STB and not the Federal Trade Commission has authority to enforce compliance with the Federal Trade Commission Act against railroads and other common carriers subject to STB jurisdiction.
- Railroads are immune from treble damages for antitrust violations on filed rates.

The Antitrust Modernization Commission and the American Bar Association's Section on Antitrust Law have recommend removal of the railroad industry's limited antitrust exemption.

Legislation to eliminate these antitrust exemptions and place railroads on an equal footing with most other industries is being considered by Congress. On June 1, 2009, the media reported on an agreement between the Senate Judiciary Antitrust Subcommittee and the Senate Commerce, Science and Transportation Committee to delay a floor vote on the proposed antitrust act so the two committees could work together on a more comprehensive rail policy overhaul in an act that would include the repeal of the railroad antitrust immunity.

The presence of transportation competition was expected to protect most shippers by constraining railroads' use of market power. In addition, due to the lack of sufficient railroad competition in some markets, the Staggers Act was expected to provide effective and adequate protection for captive shippers. On the other hand, revenue adequacy of the railroads was necessary for rail service to remain viable and for railroads to continue providing service.

Therefore, shippers argue that antitrust exemptions—which were granted during a time when railroads were regulated—probably should have been removed at the time of railroad deregulation. As Alfred Kahn elaborated to STB during a proceeding on rail access and competition issues in 1998,

When one relies on regulation to protect consumers, anti-trust law is relatively unimportant. When one deregulates and leaves the protection of customers to the plays of competition, then the anti-trust laws become very important. Anti-trust is a kind of regulation, but it is totally different

in spirit and substance from directly fixing prices, controlling entry, and controlling service quality. Its intention is to protect competition as an effective force in the market for protecting the public.<sup>139</sup>

Railroads, which must function as an interconnected network, say that limited anti-trust immunity helps them to provide better service to shippers. As an example, the railroad-owned corporation TTX owns and manages a fleet of intermodal equipment, auto carriers, box cars, and gondolas that is managed to maximize utilization and minimize cost. Revocation of the railroads' limited anti-trust exemption could mean the dissolution of TTX, and possibly lead to less efficient equipment utilization. Railroads are also concerned that removing the anti-trust exemption will act as a deterrent to future investment and redirect management focus to litigation rather than expansion.<sup>140</sup>

## **Railroad Concentration and Market Shares**

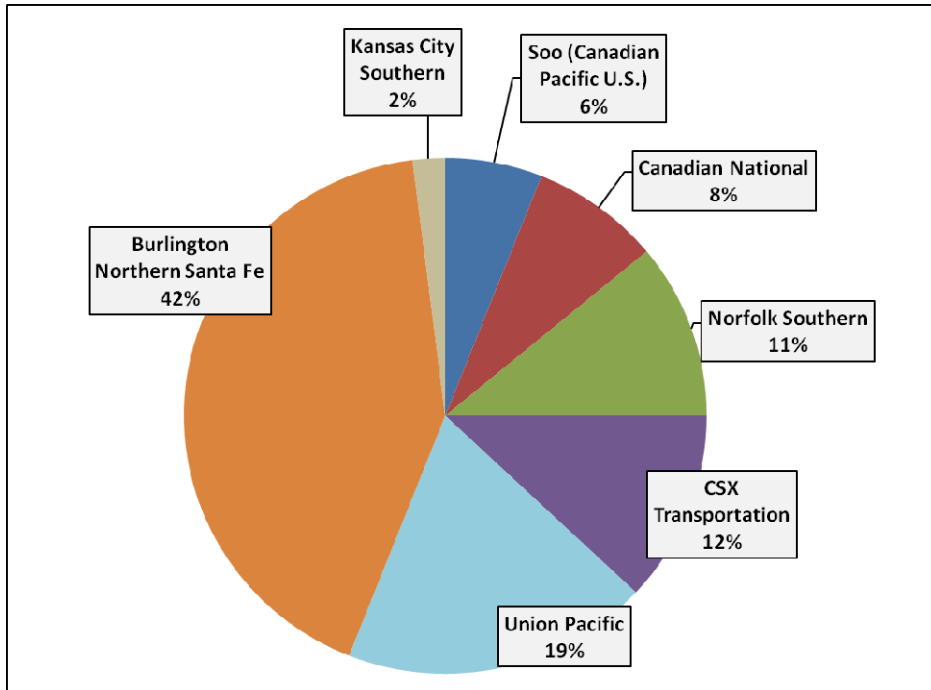
Since the 1920s, many railroads have merged. During the 1960s and 1970s, many of the mergers combined financially weak railroads with stronger firms, in the hope of developing a financially stable railroad that was large enough to compete effectively with other transportation modes. After deregulation, the pace of merger activity picked up as railroads strove to increase geographic range, eliminate duplicate lines, reduce costs by increasing the size of the firm, and gain increased market power.

Today we have two major duopolies—one serving the western United States and the other serving the East. In addition to these four mega railroads, during 2007 there were three smaller Class I railroads serving the central portion of the Nation, 33 regional railroads, and 523 local railroads.<sup>141</sup>

### **Market Concentration and Share**

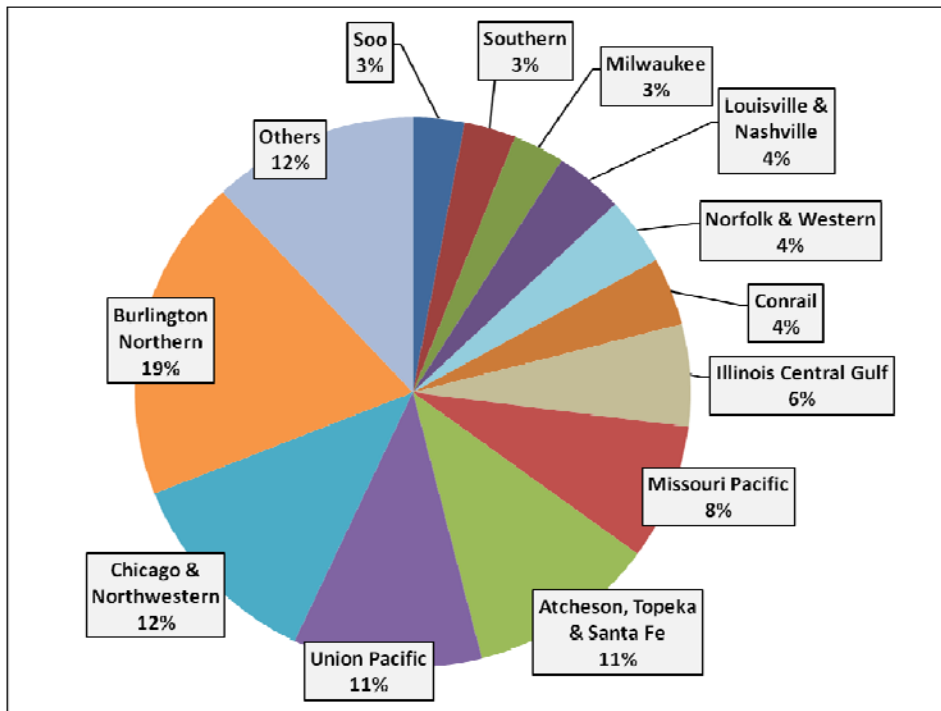
The top four Class I railroads originated 84 percent of grain and oilseed traffic in 2007, compared to only 53 percent in 1980 (see Figures 6-2 and 6-3). In addition, the market share of the predecessor railroads compared to the current railroads has changed. Whereas the Burlington Northern and Atchison, Topeka & Santa Fe combined for only 30 percent of the grain and oilseeds originations in 1980, by 2007 the Burlington Northern Santa Fe (BNSF) had 42 percent of the market. This compares to a 31 percent market share held by Chicago & Northwestern, Union Pacific, and Missouri Pacific in 1980 that has decreased to only 19 percent for Union Pacific (UP) in 2007.

**Figure 6-6: Railroad grain origination market shares, 2007**



Source: AAR

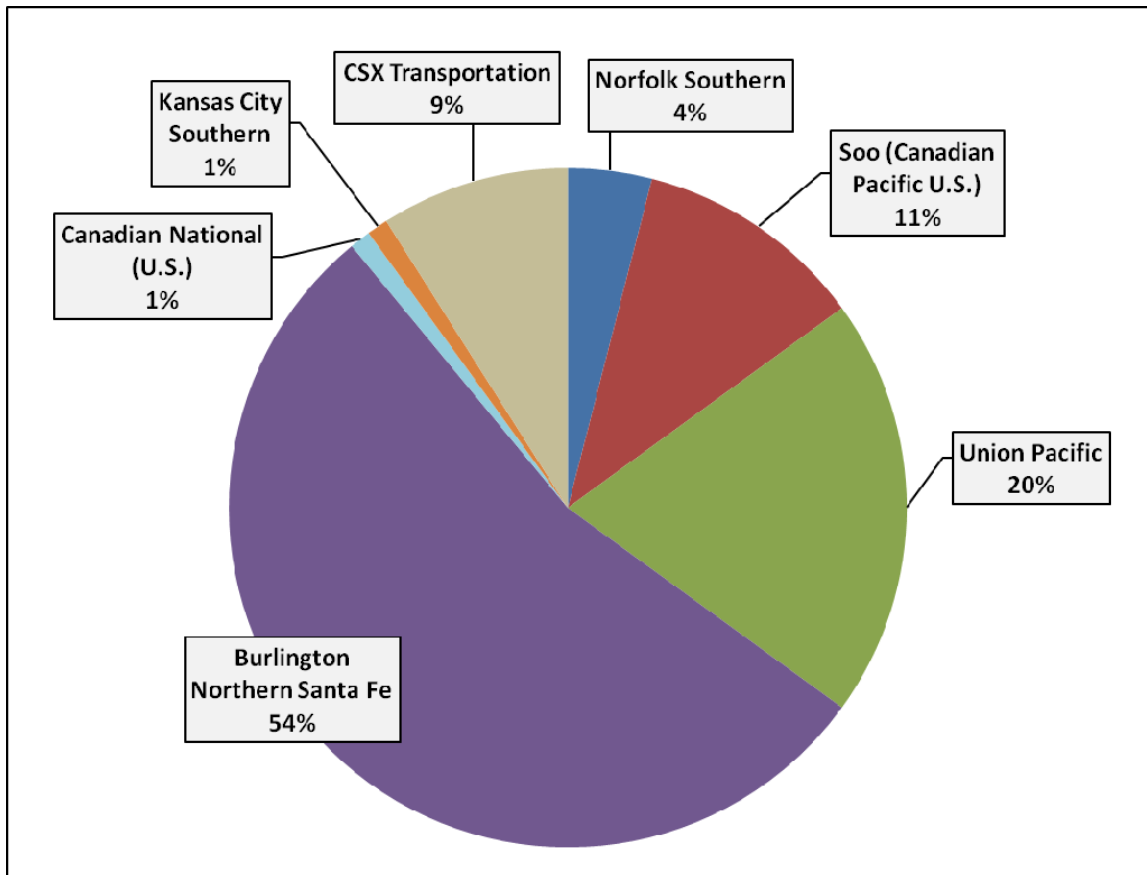
**Figure 6-7: Railroad grain origination market shares, 1980**



Source: AAR

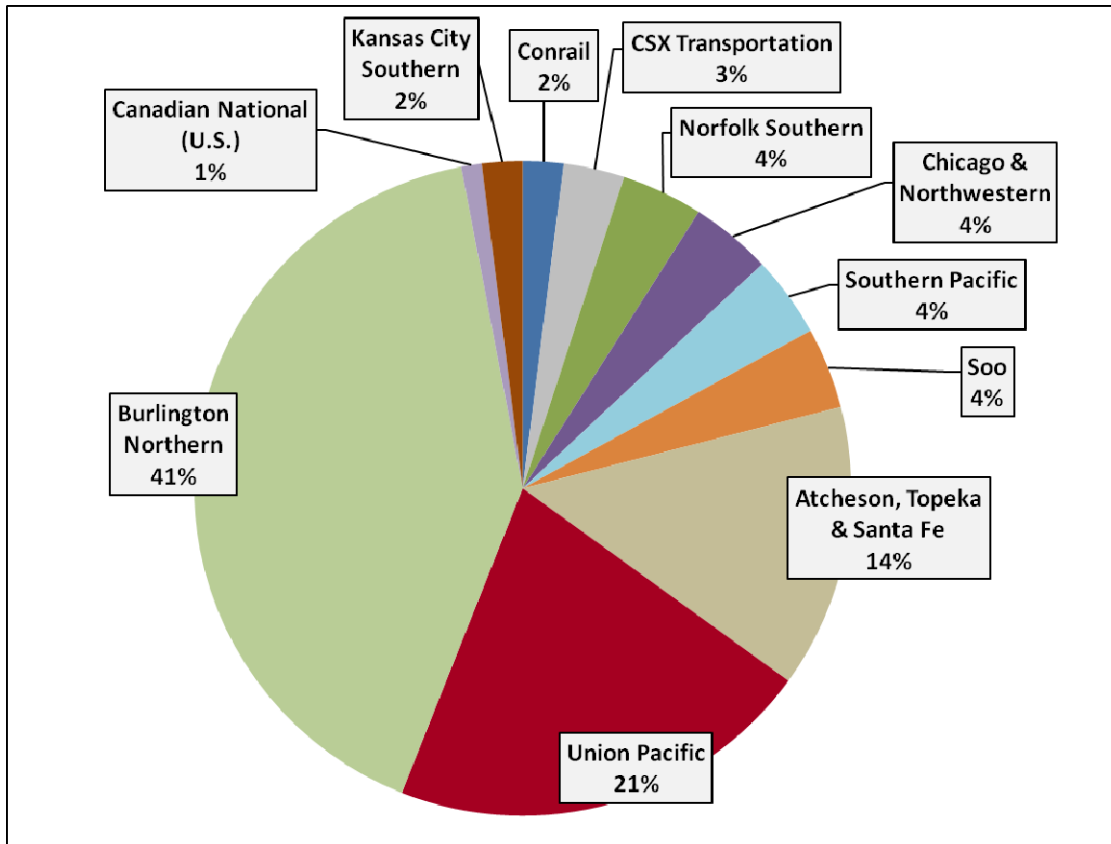
Railroad concentration and market shares are even higher for specific markets. For instance, the top four Class I railroads transported 94 percent of the wheat in 2007 compared to only 80 percent in 1994 (see Figures 6-4 and 6-5). The market share for BNSF increased in comparison to its predecessors—54 percent in 2007 compared to 41 percent in 1994. UP market share in 2007 was only 20 percent in 2007 compared to 29 percent for its predecessors in 1994. The Soo (Canadian Pacific U.S.) market share increased to 11 percent in 2007 from only 4 percent in 1994, while the CSX market share increased to 9 percent compared to only 4 percent for its predecessors.

**Figure 6-8: Railroad wheat origination market shares, 2007**



Source: AAR

Figure 6-9: Railroad wheat origination market shares, 1994



Source: AAR

However, the level of rail-to-rail competition is not a function of the market concentration of railroads in the Nation as a whole. Instead, it is a function of the quality and effectiveness of competitive options in particular markets. It is not only the number of competing railroads to which shippers or receivers have access, but also the effectiveness of competition from the other transportation modes.

## Inverse Herfindahl-Hirschman Analysis of Rail-to-Rail Competition

The Herfindahl-Hirschman Index (HHI) is a commonly accepted measure of market concentration. It estimates the ability of a firm to use market power. An HHI value, however, does not measure the actual use of market power. The HHI takes into account the relative size and distribution of the firms in a market and approaches zero when a market consists of a large number of firms of relatively equal size. It increases both as the number of firms in the market decreases and as the disparity in size among those firms increases.



## Advantages of Analyzing HHI by CRD

USDA has long used HHI for the analysis of changes in railroad concentration for the sub-State regions called crop reporting districts (CRD), which are multi-county areas comprised of 6 to 15 counties. The analysis of HHIs by CRD has advantages over the analysis of HHIs by counties.

One advantage of analysis by CRDs rather than by counties is that farmers often haul grain and oilseeds to the next county during the first movement from the farm. Consequently, a CRD better reflects the actual distance and area that producers haul their commodities during the first movement from the farm than does a county. The mean distance corn is hauled to the first handler is 22 miles and 25 percent of the corn is moved more than 28 miles. Similarly the mean for the first movement for soybeans and wheat are 24 miles and 21 miles, respectively. Twenty-five percent of soybeans are moved more than 30 miles and 25 percent of the wheat is moved more than 25 miles during the first movement from the farm.<sup>142</sup>

HHI analysis by CRD also captures the feasibility of farmers hauling grain and oilseeds to elevators located on potential alternative railroads, either for the first haul from the farm or for subsequent truck movements between elevators. HHI analysis by county ignores the feasibility of hauling grain to elevators located on competing railroads in adjacent counties. The mean county size in the United States is only about 1,000 square miles, which is a little less than 32 miles by 32 miles. From the center of an average county, an agricultural producer would only need to haul the commodity less than 16 miles to be in the next county. Counties in the East are smaller than those in the West. The median size of counties in the Corn Belt—Indiana,

## Calculating Inverse HHIs

An HHI is calculated by squaring the market share of each firm competing in a market, then summing the resulting numbers. For example, for a market consisting of four firms having market shares of 30, 30, 20, and 20 percent, the HHI is 2,600 ( $30^2 + 30^2 + 20^2 + 20^2 = 2,600$ ).

Markets in which the HHI is between 1,000 and 1,800 are considered moderately concentrated and those in which the HHI exceeds 1,800 are considered to be concentrated. The maximum value of the HHI is 10,000, which occurs when one firm has a monopoly in the market with a market share of 100 percent. Transactions that increase the HHI more than 100 points in concentrated markets raise antitrust concerns under the Horizontal Merger Guidelines issued by the U.S. Department of Justice and the Federal Trade Commission.\*

USDA frequently uses an inverse HHI, calculated by dividing 10,000 by the HHI, to measure railroad concentration. The advantage of an inverse HHI is that it is easier to visualize the number of equivalent railroads with equal market shares that are competing in the market.

An inverse HHI is always greater than one. An inverse HHI of 1.00 means that there is only one railroad competing in the movement of a commodity. An inverse HHI of 2.00 is the equivalent of two railroads competing, with each railroad moving half the tonnage. An inverse HHI of 3.00 is the equivalent of three railroads competing in the market, with each railroad moving a third of the tonnage.

The value of an inverse HHI also can be barely above 1.01 even when multiple railroads are competing in a CRD, depending on the relative market share of each. A market with two railroads, one of which carries 95 percent of the traffic, has an inverse HHI of 1.10. The value of the inverse HHI for a market with two railroads can range from 1.01 to 2.00. Likewise, the inverse HHI for a market with three competing railroads can range from 1.01 to 3.00.

\* U. S. Department of Justice, *Merger Guidelines*, §1.51.

Illinois, Iowa, eastern Kansas, northern Kentucky, Michigan, southern Minnesota, Missouri, Ohio, and Wisconsin—is closer to 500 square miles and only the largest counties comprise an area of 1,000 square miles. This compares to counties in the West, which often exceed 2,000 square miles. Consequently, county-based inverse HHI measures do not capture competitive options in the Corn Belt States. Many county-based inverse HHI measures may be 1 or very close to 1, but in the eastern Corn Belt, a competing railroad or a barge-loading facility in the next county may be within 20 miles of most grain shippers.<sup>143</sup>

### Findings from Past USDA HHI Studies

USDA research on rail rates by CRD has found that rail rates decline as the number of competitors increases. In a 1989 study, moving from a rail monopoly to a duopoly in a corn market 75 miles from water reduced rates by 17.4 percent, and increasing competition to a three-firm rail oligopoly reduced rates another 15.2 percent. The farther the shipper location is from navigable water, the greater the effect on rates as additional railroads enter the market.<sup>144</sup>

An updated study in 2008 found similar results for rail rates for soybeans. Rail rates decreased 10.9 percent when moving from a monopoly to two-railroad competition in a market 300 miles from a barge-loading facility. Adding a third railroad decreased rates another 6.5 percent. Furthermore, in the 12-State region studied, the average inverse HHI for corn had dropped to 1.86 in 2004, from 2.30 in 1983. The average inverse HHI for soybeans and wheat decreased from 2.46 in 1983 to 1.90 in 2004 and from 1.85 in 1983 to 1.58 in 2004, respectively.<sup>145</sup>

### Key Differences in this Analysis

This study has two main differences from the two recent studies by GAO and Laurits R. Christensen Associates, Inc. that used HHI to analyze railroad concentration in markets: For this study, only tariff rail rates are used for revenue calculations due to data limitations. Further, movements of railroads having only one connection are assigned to the connecting railroad.

Tariff rates for revenue calculations have been used because the STB has no jurisdiction over contract rates; STB has jurisdiction only on tariff rates having a revenue-to-variable cost ratio of 180 percent or more. Tariff rates were separated from contract rates using a “Contract Flag” field that STB provided from the Unmasked Confidential Waybill Sample. However, for calculation of the inverse HHI using tonnages, data from all movements were used—both tariff and contract.

The second major difference in this study is that tonnages originated on smaller railroads connecting to only one other railroad were considered as part of the connecting railroad. This gives a more accurate portrayal of actual market share controlled by each railroad. When smaller railroads connected to two or more railroads, no attempt was made to assign the smaller railroads’ volumes to a particular railroad. This is because little industry data are available regarding which railroads have contractual interchange commitments that strictly limit their ability to interchange with other railroads.

This study split the period from 1985 to 2007 into three time periods rather than using data for single years. This was done to obtain more CRDs having more than 30 observations, below which no results were reported for the CRD. The three periods include:

- Period 1: 1985–1992, an 8-year period representing the early years of deregulation, and including some important railroad mergers.
- Period 2: 1993–2002, 10 years that saw many mergers and the formation of the Eastern and Western railroad duopolies. Important operational issues arose during the implementation of these mergers.
- Period 3: 2003–2007, 5 years in which capacity constraints on the rail system first appeared, when the early retirement of engineers and conductors caused operational problems, and disruptions caused by storms were unusually severe. Major increases in rail rates due to capacity constraints and high fuel costs also occurred during this period.

An inverse HHI for originated tonnage by CRD was calculated and mapped for four major commodity groups:

- Grain and oilseeds
- Grain products including dried distillers grains with solubles (DDGS)
- Food products excluding grain products and DDGS
- Fertilizers

More information about the methodology of this study can be found in Appendix 6-3: Waybill

### **Calculation Methodology**

#### **Grain and Oilseeds Analysis of Inverse HHI and Revenue-to-Variable Cost Ratio**

As rail-to-rail competition decreases in a CRD, the market power of the railroads increases. A decrease in competition could result in higher rail rates and gives railroads the market power to change service terms. The revenue-to-variable cost ratio is an indicator of that market power.

This part of the study uses inverse HHIs to measure the degree of rail-to-rail competition in each CRD. The absolute value of the inverse HHIs and the degree of change are both important to an understanding of competitive status.

## HHI Analysis

Based on the HHI analysis, the overall level of rail-to-rail competition by CRD for grain and oilseed shippers has fallen significantly between Period 1 (1985 to 1992) and Period 3 (2003 to 2007). The level of rail-to-rail competition decreased in 109 CRDs, and only 38 CRDs had an increase in rail-to-rail competition. The analysis of the grain and oilseeds group will be discussed in this section; the maps for grain products, food products, and fertilizers are located in Appendix 6-1: Maps of Inverse Herfindahl Index for Rail Shipments.

The number of CRDs in which a railroad had a monopoly for grain and oilseeds (inverse HHI equal to 1.00) increased from 20 (9.9 percent of the total CRDs) in Period 1, to 25 (15.3 percent) in Period 3 (see Table 6-2). Eleven CRDs in this group of 20 had a change in the inverse HHI and nine had no change. Only two CRDs had an increase in competition since Period 1; one had an increase of 0.09 and the other had an increase of 0.80.\*

CRDs with an inverse HHI between 1.0 and 2.0 increased from 77 (38.1 percent of the total) in Period 1, to 96 (58.9 percent) in Period 3. Twenty had inverse HHIs less than 1.25 (very weak two-railroad competition) and 14 had inverse HHIs between 1.25 and 1.50 (limited two-railroad competition). In Period 3, this had increased to 25 and 19, respectively. Five CRDs in this group during Period 1 had an increase in inverse HHIs of between 0.80 and 2.04 (see Table 6-2).

The number of CRDs with an inverse HHI greater than 2 fell from 105 CRDs (51.9 percent) in Period 1, to 42 (25.8 percent) in Period 3. The trend has been a marked decrease in rail-to-rail competition; many of the CRDs having higher inverse HHIs moved to lower inverse HHIs by Period 3. Seven CRDs had a decrease in the inverse HHI between 2.58 and 4.25, 30 CRDs had a decrease in the inverse HHI between 1.41 and 2.58, and 25 CRDs had a decrease in the inverse HHI between 0.44 and 1.41 (see Table 6-2).

### What do the Numbers Mean?

An inverse HHI above 2.00 indicates strong competition among two or more railroads, and is a marker of healthy competition. One below 1.25 indicates weak rail-to-rail competition involving two or more rail firms, one of which is strongly dominant. An inverse HHI of 1.00 indicates a rail monopoly. In this study, the change in inverse HHIs ranges from -4.25 (equivalent to the loss of more than four strong competing railroads) to 2.04 (equivalent to the addition of another two strong rail competitors to the market).

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\* Not all CRDs are represented in both Period 1 and Period 2. Thus, the numbers do not always tally.

**Table 6-2: Grain and oilseeds, changes in inverse HHI by number of CRD**

Inverse HHI Range	Number of Crop Reporting Districts		Change in Inverse HHI by Inverse HHI Range*	Number of CRDs
	Inverse HHI Period 1	Inverse HHI Period 3		
1.00	20	25	Change by > 0 to ≤ 0.80	10
			Increase by > 0 to ≤ 2.04	1
> 1.00 and ≤ 2.00	77	96	Decrease by > -4.25 to ≤ -2.58	0
> 1.00 and ≤ 1.50	34	44	Decrease by > -2.58 to ≤ -1.41	0
> 1.00 and ≤ 1.25	20	25	Decrease by > -1.41 to ≤ -0.44	10
> 1.25 and ≤ 1.50	14	19	Change by > -0.44 to ≤ 0.80	45
> 1.50 and ≤ 2.00	43	52	Increase by > 0.80 to ≤ 2.04	5
> 2.00 and ≤ 3.00	56	31	Decrease by > -4.25 to ≤ -2.58	0
			Decrease by > -2.58 to ≤ -1.41	4
			Decrease by > -1.41 to ≤ -0.44	19
			Change by > -0.44 to ≤ 0.80	20
			Increase by > 0.80 to ≤ 2.04	1
> 3.00 and ≤ 4.00	32	10	Decrease by > -4.25 to ≤ -2.58	0
			Decrease by > -2.58 to ≤ -1.41	21
			Decrease by > -1.41 to ≤ -0.44	5
			Change by > -0.44 to ≤ 0.80	1
			Increase by > 0.80 to ≤ 2.04	0
> 4.00 and ≤ 5.75	17	1	Decrease by > -4.25 to ≤ -2.58	7
			Decrease by > -2.58 to ≤ -1.41	5
			Decrease by > -1.41 to ≤ -0.44	1
			Change by > -0.44 to ≤ 0.80	1
			Increase by > 0.80 to ≤ 2.04	0
Total Number of CRDs	202	163		156
Maximum Inverse HHI	5.72298	5.1688	Maximum change in Inverse HHI	2.03612
Minimum Inverse HHI	1.00	1.00	Maximum change in Inverse HHI	-4.24547

\*Calculated on tariff rail rates only when more than 30 observations in a CRD.

Source: Surface Transportation Board, Confidential Waybill Samples

## R/VC Ratio Analysis

Increased competition results in lower rail rates. Table 6-3 shows that the percentage of CRDs having average R/VC ratios below 180 increases as the level of rail competition increases during periods 1 and 3. For example, during period 3, only 50 percent of the CRDs that were served by a rail monopoly had average R/VC ratios below 180. In contrast, during the same period, 93 percent of the CRDs had average R/VC ratios below 180 when more than 4 strong railroads were competing. The finding that increased competition results in lower rail rates is consistent with the conclusions of studies by MacDonald and Harbor.

The number of CRDs with average R/VC ratios less than 100 (less than variable cost) decreased from 19 of 163 CRDs (11.6 percent) in Period 1 to 7 of 141 CRDs (5.0 percent) in Period 3. The number of CRDs from all HHI ranges having average R/VC ratios between 100 and 180 (the STB jurisdictional threshold is 180) decreased from 134 in Period 1 to 110 in Period 3. Those CRDs having average R/VC ratios from 180 to 240 (slightly above the jurisdictional threshold) increased from 10 in Period 1 to 24 in Period 3. A summary table including the other three commodity groups is included in the appendix and shows that the trends for HHI and R/VC are similar to those of the grain and oilseeds commodity group.

### What Does the R/VC Ratio Mean?

R/VC ratios have a degree of error because they are calculated from the STB Uniform Rail Costing System, which has not been updated to reflect current conditions for 30 years. In theory, railroads are recovering only their variable costs when their ratio of revenue to variable cost (R/VC) is 100. They are recovering less than variable costs—losing money—when it is less than 100 and recovering variable and a portion of fixed costs when it is above 100. The STB has jurisdiction to examine the rates they charge when the R/VC is 180 or above.

**Table 6-3: Grain and oilseeds, changes in R/VC ratios by inverse HHI\***

		Number of CRDs			
Inverse HHI Range	Percent Revenue-to-Variable Cost (R/VC) Range	R/VC Period 1	Percent of HHI Range	R/VA Period 3	Percent of HHI Range
1.00	< 100	0	0%	0	0%
	> 100 and ≤ 180	6	60%	5	50%
	> 180 and ≤ 240	4	40%	5	50%
	> 240 and ≤ 300	0	0%	0	0%
	> 300	0	0%	0	0%
> 1.00 and ≤ 2.00	< 100	8	12%	2	4%
	> 100 and ≤ 180	53	83%	43	78%
	> 180 and ≤ 240	3	5%	10	18%
	> 240 and ≤ 300	0	0%	0	0%
	> 300	0	0%	0	0%
> 2.00 and ≤ 3.00	< 100	7	15%	4	10%
	> 100 and ≤ 180	37	80%	29	75%
	> 180 and ≤ 240	2	5%	6	15%
	> 240 and ≤ 300	0	0%	0	0%
	> 300	0	0%	0	0%
> 3.00 and ≤ 4.00	< 100	3	11%	1	4%
	> 100 and ≤ 180	22	85%	20	87%
	> 180 and ≤ 240	1	4%	2	9%
	> 240 and ≤ 300	0	0%	0	0%
	> 300	0	0%	0	0%
> 4.00 and ≤ 5.75	< 100	1	6%	0	0%
	> 100 and ≤ 180	16	94%	13	93%
	> 180 and ≤ 240	0	0%	1	7%
	> 240 and ≤ 300	0	0%	0	0%
	> 300	0	0%	0	0%
Total Number of CRDs		163		141	
Maximum R/VC percentage		198.62		228.56	
Minimum R/VC percentage		65.17		68.98	

\*Calculated on tariff rail rates only when more than 30 observations in a CRD.

Source: Surface Transportation Board, Confidential Waybill Samples

R/VC ratios for grain and oilseeds shifted into the higher R/VC ranges. One hundred eight CRDs (83 percent) had an increase in the R/VC ratio, but only 22 (17 percent) had a decrease.

The red highlighted regions on Figures 6-6 and 6-7 indicate CRDs having only one railroad serving the grain and oilseeds market; the tan highlighted regions show CRDs having at least two competing railroads, and the light yellow regions have at least three. Regions that changed to a rail monopoly since Period 1 include parts of Arkansas, Louisiana, Michigan, Mississippi, Ohio, Nebraska, Oregon, South Dakota, Tennessee, Virginia, Washington, and Wyoming. Many of the regions colored red or tan are in areas of the country important in the production of grain and oilseeds and distant from barge-loading facilities.

**Figure 6-10: Inverse HHI for grain and oilseed shipments by rail, 2003-2007**

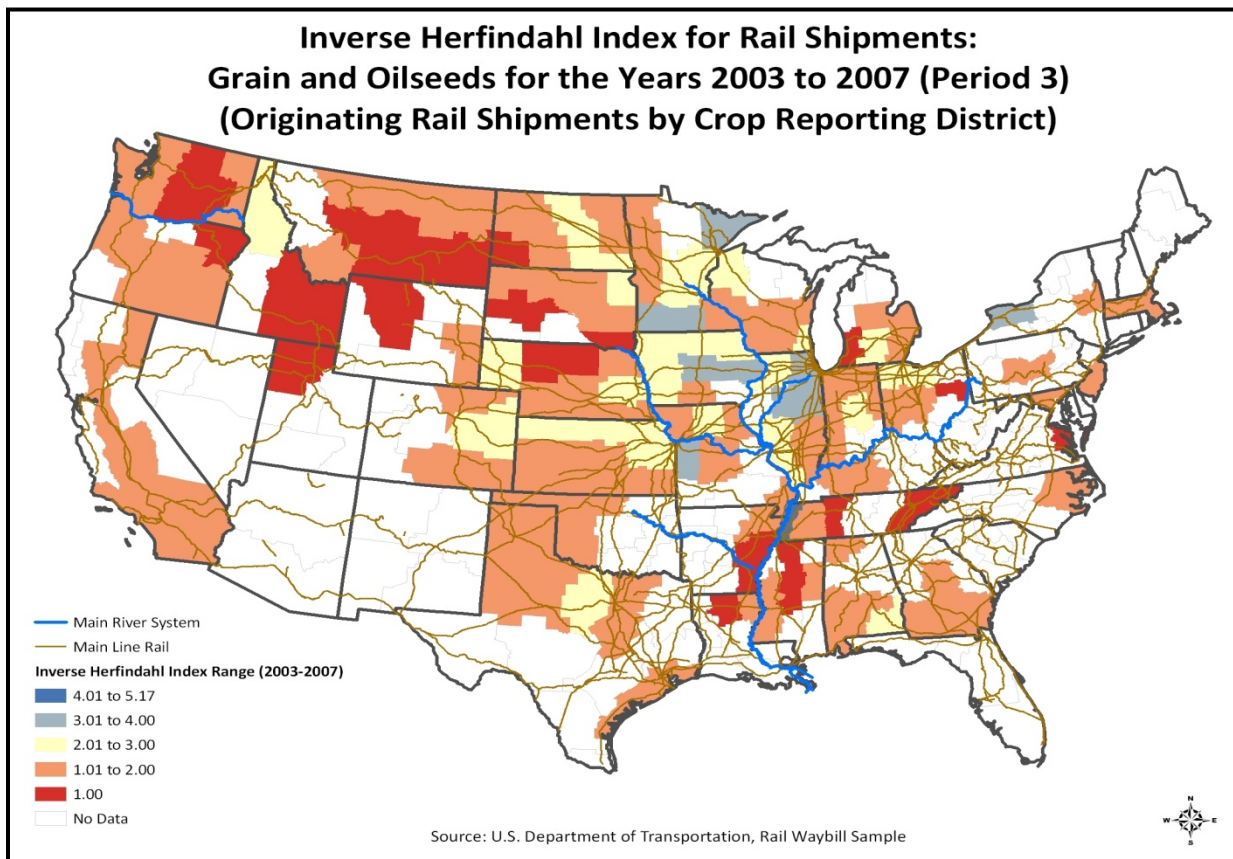




Figure 6-11: Inverse HHI for grain and oilseed shipments by rail, 1985-1992

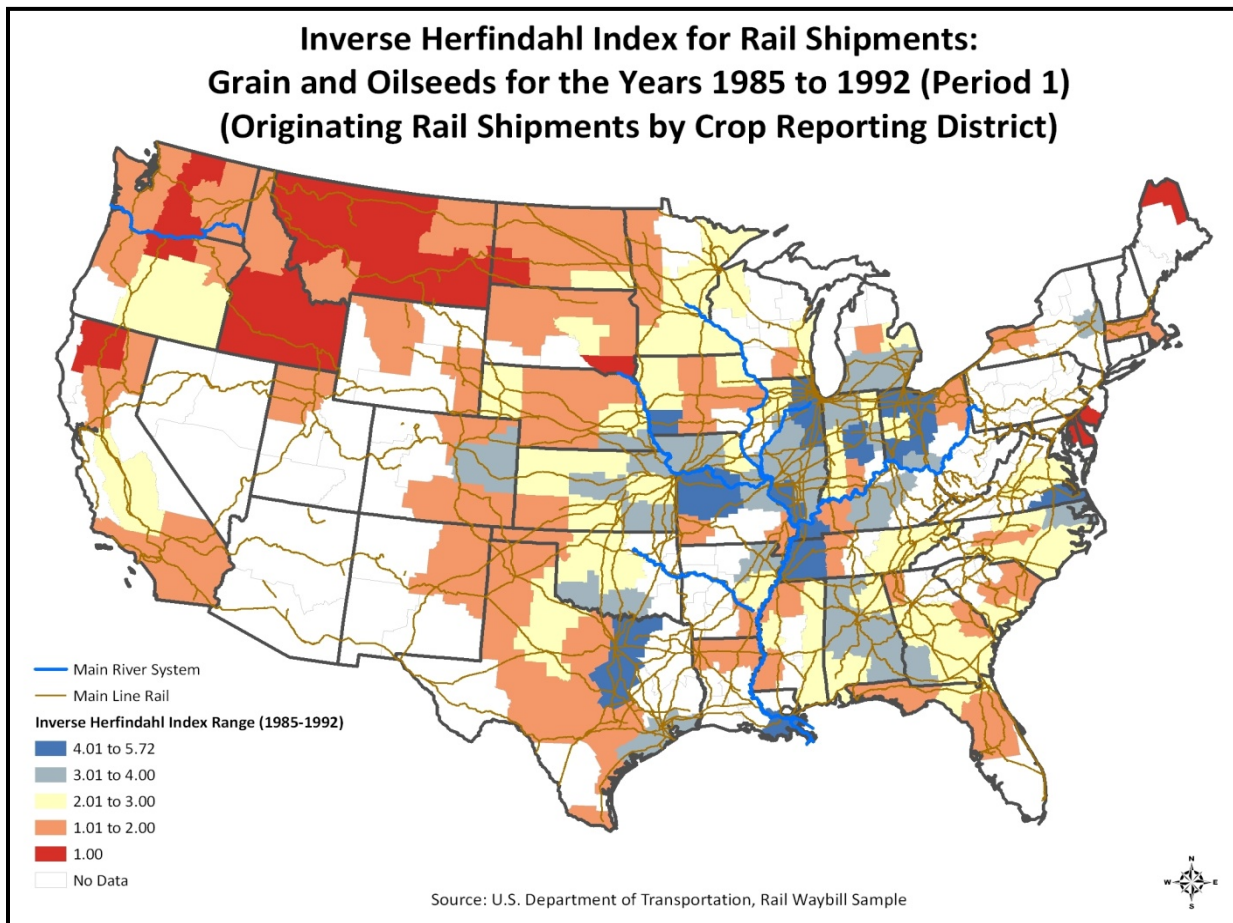
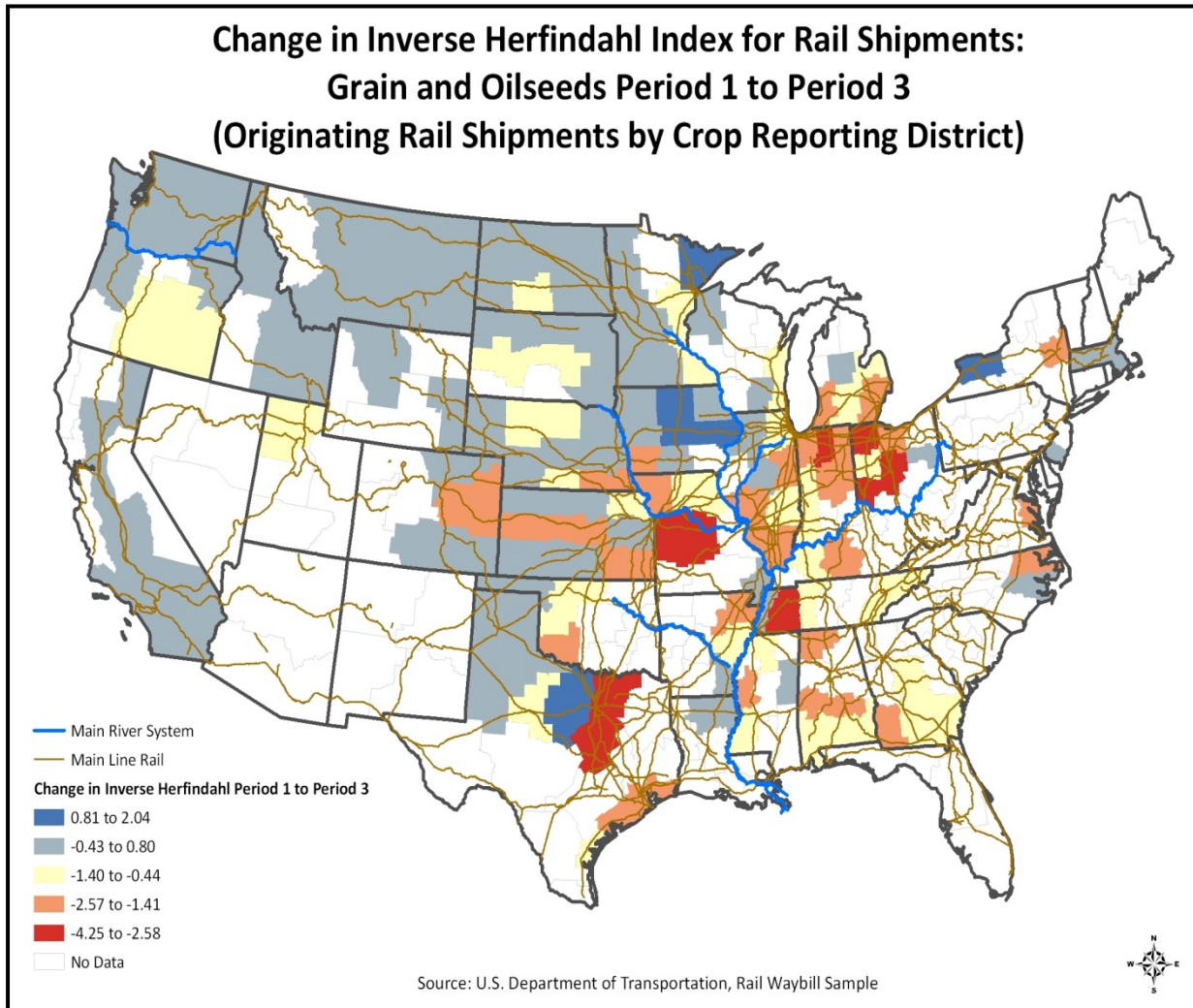


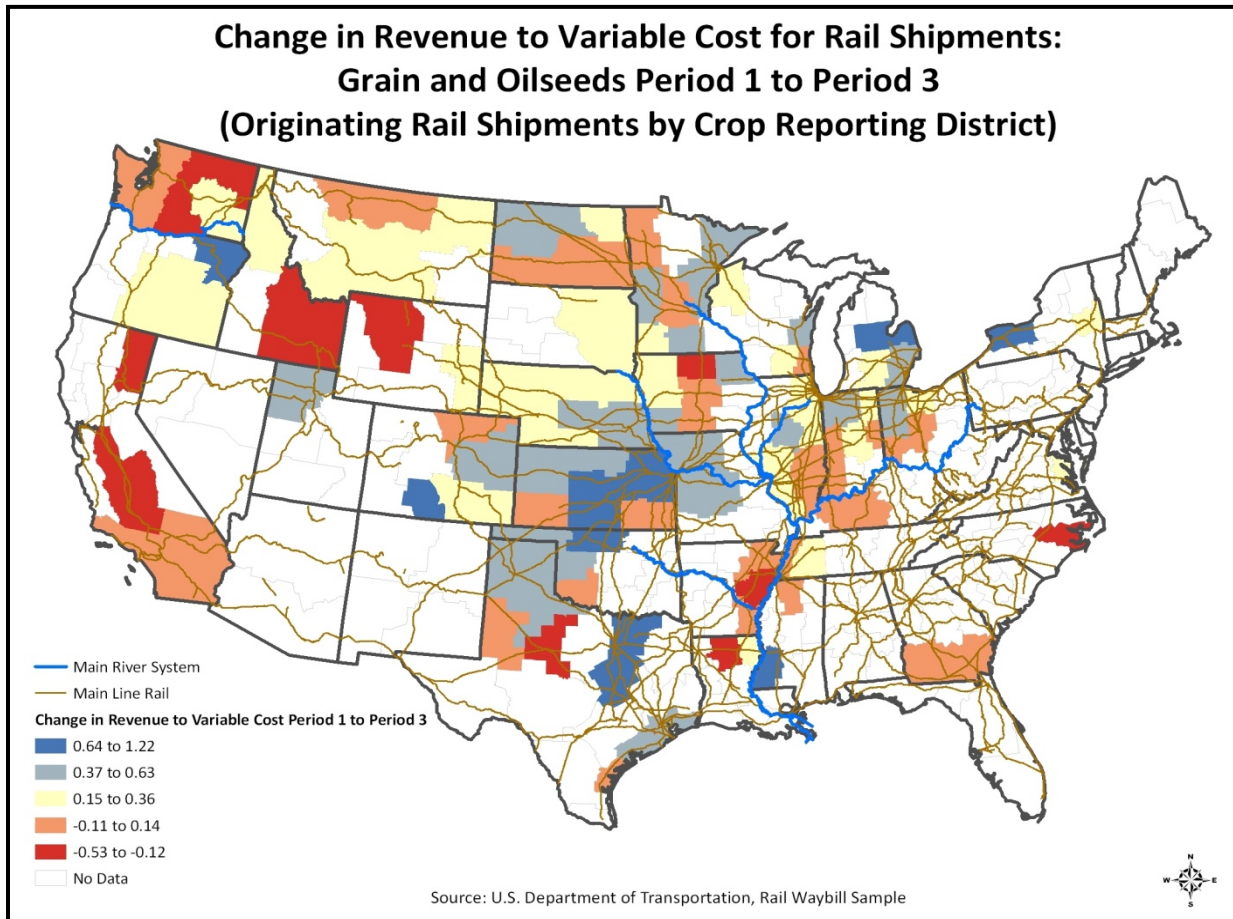
Figure 6-12 shows the changes in the inverse HHI by CRD. Major grain production regions that have gained rail-to-rail competition since Period 1 are highlighted in blue and include northeast Minnesota, central and eastern Iowa, and the Dallas/Fort Worth region of Texas. Inverse HHIs for CRDs highlighted in red have lost the equivalent of 4.25 to 2.58 competing railroads. These regions include west central Missouri, western Tennessee, north central Indiana, parts of Ohio, and a portion of Texas. The tan regions, which include parts of Arkansas, Colorado, Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Missouri, Nebraska, Ohio, Oklahoma, and Texas shows CRDs that have lost the equivalent of 1.41 to 2.58 competing railroads since Period 1. All of these States were in the top 20 U.S. grain- and oilseed-producing States during 2007.

Figure 6-12: Change in inverse HHI for grain and oilseed shipments by rail, 1985-1992 compared to 2003-2007



The change in R/VC ratios shown in Figure 6-13 indicate some regions with the lowest inverse HHIs have lower R/VC ratios than Period 1, and other regions have higher R/VC ratios. The CRDs in blue and grey have increased R/VC ratios. The blue regions include parts of Colorado, Kansas, Michigan, Mississippi, Oklahoma, Oregon, and Texas.

**Figure 6-13: Change in R/VC for grain and oilseed shipments by rail, 1985-1992 compared to 2003-2007**



### Additional Analyses Needed

Due to data limitations and time constraints, USDA was unable to do the types of analyses required to draw conclusive results on the relationship between rail-to-rail competition and R/VC ratios, or to fully examine shipper concerns about the use of railroad market power. More exhaustive analyses are required. For example, the R/VC ratios presented in this study are an average of the R/VC ratios for movements by tariff rates only. It is possible that some contract rail rates, which were not available for this analysis, equal or exceed the tariff rates in particular CRDs. Also, an analysis of the range of the R/VC ratios for particular CRDs may give more conclusive information. USDA plans to statistically test the use of railroad market power by CRD, and pursue more detailed and exhaustive rail revenue analyses in the future.

## Comparison of Rail-to-Rail Competition and Distance-to-Water Transportation by State

This part of the study looks at annual statewide tariff rail rates from 1988 through 2007 for a group of six States with limited rail-to-rail competition and varying distances from barge-loading facilities, and a group of four States with more rail-to-rail competition and closer barge loading facilities. With the use of annual data, rail rate trends become more apparent, and interesting differences between the States are revealed.

States in the first group—with less rail-to-rail competition and varying distances from barge-loading facilities—include Montana, North Dakota, South Dakota, Nebraska, Kansas, and Colorado. The average distance to barge-loading facilities from the middle of these States ranges from 200 to 850 miles. For States showing a range of distances to water, the shorter distances are to facilities on the Missouri, Arkansas, Snake, or Illinois Rivers; the longer distances are to facilities on the Mississippi or Ohio Rivers. Barge movements on the Missouri and Arkansas Rivers have fewer cost efficiencies compared to rail transportation; barge movements on the Mississippi, Ohio, and Illinois Rivers do realize cost efficiencies compared to rail.

All these States produce large amounts of grain and oilseeds. For instance, Nebraska is ranked 3<sup>rd</sup> in the United States in grain and oilseed production, Kansas 6<sup>th</sup>, South Dakota 7<sup>th</sup>, North Dakota 9<sup>th</sup>, Colorado 14<sup>th</sup>, and Montana 18<sup>th</sup>.

Grain producers in Montana and North Dakota have complained for years about high rail rates— rates often higher than those for South Dakota, Nebraska, and Kansas grain that travels shorter distances over the same track to reach Pacific Northwest markets. The States of Montana and North Dakota have appropriated funds to study grain and oilseed rail rates and to appeal those rates to the STB.

The States with more rail-to-rail competition and proximity to barge-loading facilities are Illinois, Indiana, Iowa, and Missouri. These States, also, are major grain and oilseed producers; Iowa is ranked 1<sup>st</sup> in the United States, Illinois 2<sup>nd</sup>, Indiana 5<sup>th</sup>, and Missouri 10<sup>th</sup>. They all border the Mississippi or Ohio Rivers,

### Contract Rates and Tariff Rates

The comparison of inverse HHIs and tariff rail rates by CRD is limited by the lack of revenue data for many of the CRDs and groupings. These limitations can have an averaging effect on the data, which makes the results less distinct. USDA did not have access to unmasked contract rates, so could only analyze the tariff rates. Substantial amounts of grain move under contract and, in recent years, controversy has arisen over the definition of contract rates. Because of the lack of transparency, concerns have been raised that some rail contracts may establish rates at the same level as for tariff, with no differentiation or guarantee on service levels. Since STB has no jurisdiction over contracts, the concern is that such contracts may have been designed to prevent the possibility of rate appeals.

and the Illinois River runs through Illinois. The average distance from the middle of these States to barge-loading facilities is from 50 to 150 miles.

In 1988, Montana and North Dakota paid the highest nominal (not adjusted for inflation) rail rates in the nation to move grain and oilseeds (see Table 6-4). Montana grain shippers paid \$25.41 per ton and North Dakota \$22.61. Kansas shippers paid only \$11.69 and Nebraska \$17.59. The average rates for States with more competition ranged from \$9.06 to \$12.12 per ton.

**Table 6-4: Grain and oilseeds, comparisons of nominal tariff rail revenue per ton and ton-mile and R/VC by State (in \$/ton)**

State	Avg. Miles of Water Trans.	Revenue per ton (\$)			Revenue per ton-mile (cents)			Revenue to Variable Cost Ratio		
		1988	2007	Change	1988	2007	Change	1988	2007	Change
<i>Lower levels of rail competition and distance from water transportation:</i>										
Montana	400	25.41	27.70	2.29	2.58	2.90	0.32	186	187	1
North Dakota	410	22.61	28.89	6.28	2.56	2.46	-0.10	166	191	25
South Dakota	200-340	18.41	29.64	11.23	1.54	1.95	0.41	117	151	34
Nebraska	250-530	17.59	30.07	12.48	1.51	2.10	0.59	108	148	40
Kansas	220-460	11.69	22.92	11.23	1.91	2.79	0.88	117	176	59
Colorado	500-850	18.34	26.34	8.00	1.64	2.82	1.18	125	167	42
<i>Higher levels of rail competition and closer to water transportation:</i>										
Illinois	50-90	9.06	16.82	7.76	1.97	2.27	0.30	115	151	36
Indiana	120	11.79	19.64	7.85	2.10	2.93	0.83	132	151	19
Iowa	150	9.30	28.28	18.98	1.87	2.28	0.41	134	171	37
Missouri	125	12.12	19.73	7.61	1.91	2.73	0.82	108	162	54

**Source: Surface Transportation Board, Confidential Waybill Samples**

By 2007, however, four States paid more to ship grain than shippers in Montana (\$27.70): Nebraska paid \$30.07 per ton, South Dakota \$29.64, North Dakota \$28.89, and Iowa \$28.28. Montana rates per ton had increased 8.3 percent and North Dakota 21.7 percent since 1988, but the rate increase for the other eight States shown in Table 6.4 ranged from 30.4 percent (Colorado) to 67.1 percent (Iowa). The greater distances for Iowa shippers contributed to the unusually large increase in their rate per ton (compare to revenue/ton-mile column of the table).

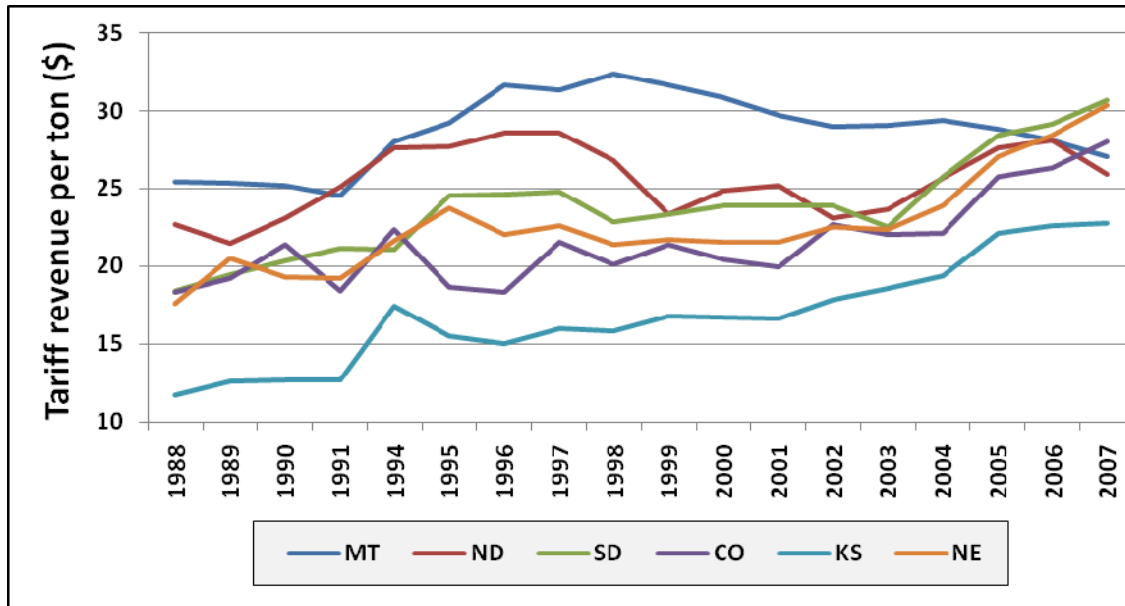
Nominal tariff rates per ton-mile show that States lacking rail-to-rail competition do not necessarily pay higher rates than States having more transportation competition. Examining tariff rates on a ton-mile basis adjusts for the distance shipped; some States ship grain farther than others. In 1988, Montana and North Dakota paid the highest nominal tariff rates per ton-mile, but Illinois, Indiana, and Missouri paid the next highest rates (see Table 6-4). By 2007, Indiana paid the highest tariff rates per ton-mile, followed by Montana, Colorado, and Kansas. The States having the least increase in tariff rates per ton-mile include North Dakota (with a 0.10 cent decrease), Illinois, South Dakota, and Montana. Colorado, Kansas, and Indiana had the steepest increases.

An analysis of R/VC ratios based on tariff rates, which indicate the profitability of a movement for the railroads, shows mixed results relative to the amount of transportation competition. In 1988, Montana and North Dakota grain shippers had the highest R/VC ratios, at 186 and 166. The R/VC ratio for Montana was nearly 40 percent higher than it was for Iowa, which had the 3<sup>rd</sup> highest R/VC rate among the 10 States selected for comparison (see Table 6-4). In 2007, North Dakota and Montana grain shippers still paid the highest R/VC ratio, and Kansas, Iowa, and Colorado paid the next highest ratios. In 2007, however, the Montana R/VC ratio was only 10 percent higher than Iowa's. The R/VC ratio for Montana increased 0.5 percent and North Dakota's 13 percent between 1988 and 2007. The ratio for Missouri increased 33 percent, that of Kansas 34 percent, and that of Nebraska 27 percent.

The use of state-wide averages may have masked the relationship between rail-to-rail competition and R/VC. Prior studies by McDonald and Harbor, which are based upon individual waybills, show a relationship between rail-to-rail and intermodal competition and rail rates.

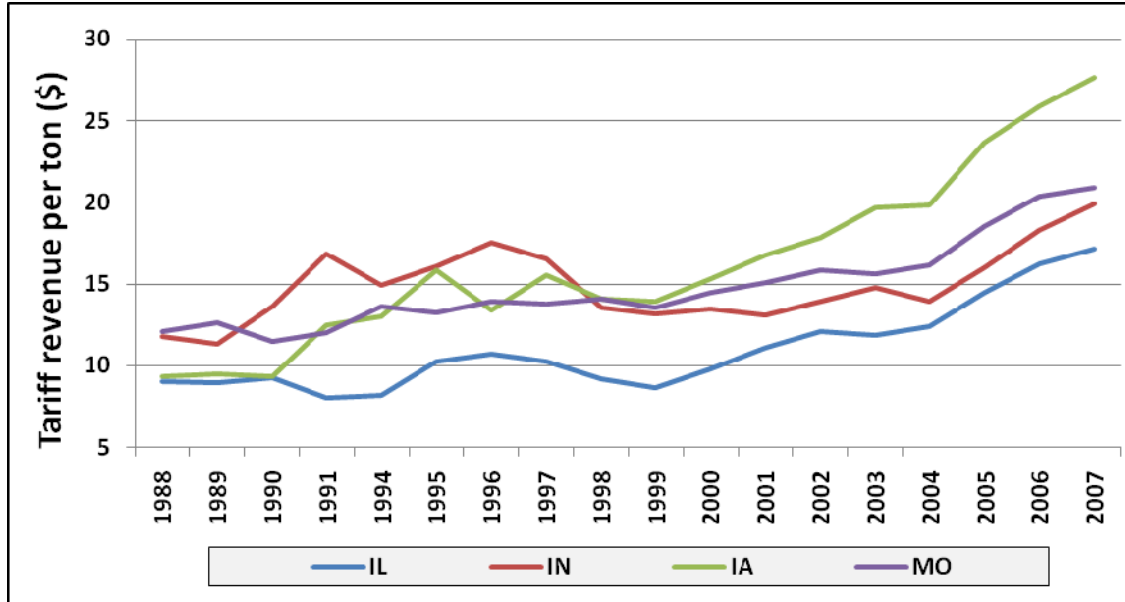
Figures 6-10 and 6-11 show the trends of the nominal rail tariff revenues per ton from 1988 through 2007 (the information for 1992 and 1993 was not available). Montana, North Dakota, and South Dakota grain shippers consistently paid high rates, but by 2007, Nebraska, South Dakota, North Dakota, and Iowa paid higher tariff rates per ton than Montana. Rates for Montana peaked in 1998 and then steadily decreased through 2007. Rates for North Dakota peaked in 1997, decreased until 1999, fluctuated until 2003, and then increased to new highs. Grain shippers in the States of South Dakota, Nebraska, Colorado, and Iowa had the steepest rate of increase since 2003.

Figure 6-14: Grain and oilseeds: nominal rail (tariff only) revenues per ton for States with less transportation competition, by year



Source: Surface Transportation Board, Confidential Waybill Samples

Figure 6-15: Grain and oilseeds: nominal rail (tariff only) revenues per ton for States with more transportation competition, by year

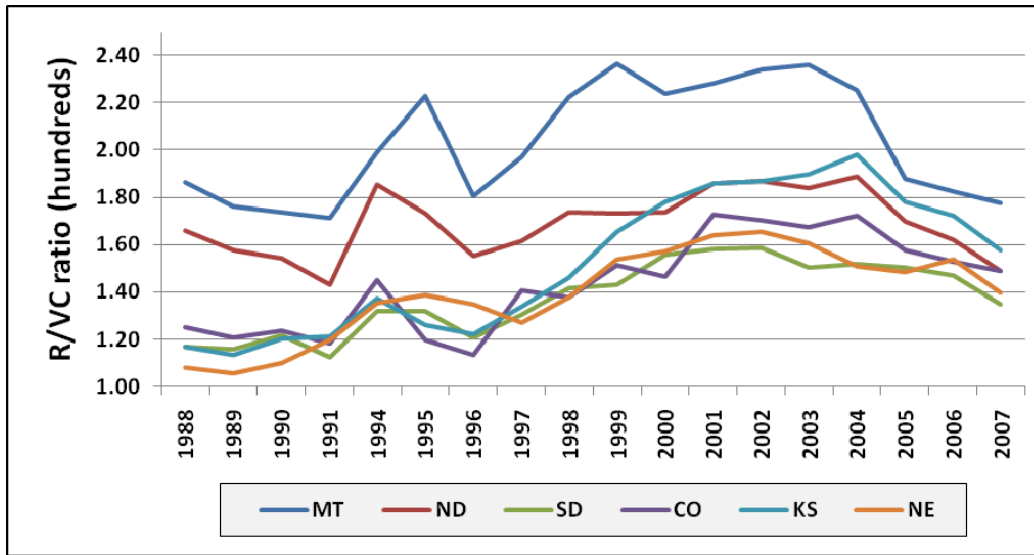


Source: Surface Transportation Board, Confidential Waybill Samples

The States of Montana and North Dakota, which are distant from barge competition, have substantially higher R/VC ratios than States having more rail-to-rail and barge competition. In addition, R/VC ratios have considerable variation by year for some States. Figures 6-12 and 6-13 show that Montana and North Dakota grain shippers have had some of the highest R/VC

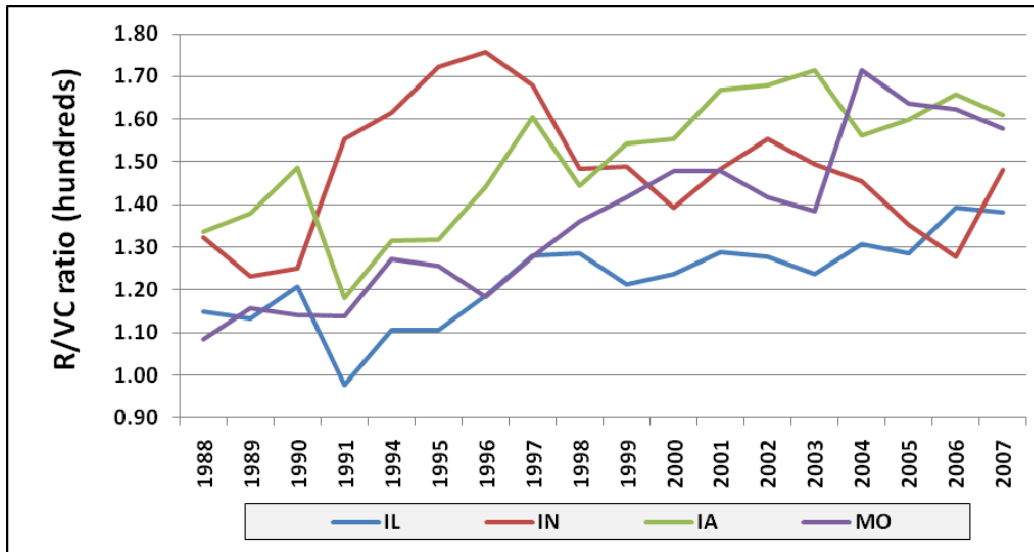
ratios. From 2000 through 2006, Kansas grain shippers have had higher R/VC ratios than North Dakota shippers. Tariff rate R/VC ratios for all of the States with less competition, though, have decreased since 2003 and 2004. The R/VC ratio in Missouri increased sharply in 2004 and has decreased since then. The R/VC ratio in Indiana increased from 1990, peaked in 1994, decreased until 1996, and then increased through 2004.

**Figure 6-16: Grain and oilseeds: rail R/VC ratios (tariff) for States with less transportation competition, by year**



Source: Surface Transportation Board, Confidential Waybill Samples

**Figure 6-17: Grain and oilseeds: rail R/VC Ratios (tariff only) for States with more transportation competition, by year**



Source: Surface Transportation Board, Confidential Waybill Samples



## Conclusions

An affordable and reliable transportation network is necessary to maintain the strength and competitiveness of American agriculture and rural communities. Agricultural commodities are often produced in large quantities at locations distant from domestic and international markets, making rail a natural and preferred choice of transportation. Truck transportation is not cost-effective for many agricultural shippers, who are often located long distances from markets, and barge transportation is not an option for most. Rail is the only cost-effective transportation mode broadly available for many agricultural producers. Railroads transport nearly all of the grains and oilseeds produced in Montana, more than 70 percent of that produced in North Dakota, and more than 50 percent of that produced in Arizona, Oklahoma, and South Dakota.

Railroads were the first transportation industry regulated by the U.S. government because they possessed and exercised market power deemed contrary to the public good. Eventually, railroad economic regulation became so pervasive and limiting that the railroad industry was nearly bankrupted.

The ensuing deregulation encouraged greater reliance on free markets to promote railroad profitability and public benefits, but relied on competition to protect shippers and the general public. The loss of rail-to-rail competition due to railroad mergers, and the associated increase in market power, was not foreseen by many when the Staggers Act was passed. However, the abandonment of rail lines was a predictable outcome of railroad deregulation. Railroads under regulation were burdened by significant excess capacity. Deregulation permitted mergers and line abandonments, which eliminated overcapacity as a problem for railroads; and also greatly increased railroad market power and profitability.

The preservation and protection of competition is vital for the economic prosperity of agricultural producers and shippers contending with a deregulated railroad industry. However, in deregulating the rail industry Congress recognized that intermodal competition had the potential to be as effective as rail-to-rail competition in restraining the exercise of market power. In fact, rail rates fell substantially following deregulation, but not all rates fell for all shippers. In recent years, rail rates have increased as costs have risen.

The loss of rail-to-rail competition also increases the opportunities for collusive behavior. Empirical evidence in Canada indicates that competition between two rail firms in Canada has been inadequate in many markets, despite mandated reciprocal switching and a requirement to provide competitive line rates. It is much more difficult to collude—either tacitly or overtly—when three railroad firms or more serve a market.

Railroads have had some exemptions from antitrust laws since 1914. Shippers believe that antitrust exemptions, which were granted during a time when railroads were regulated, should have been removed when the railroads were deregulated. Railroads, which must function as an

interconnected network, argue that limited anti-trust immunity helps them to provide better service to shippers. Congress is currently considering legislation in this arena.

Railroad concentration for grains and oilseeds has increased substantially since 1980 due to railroad consolidation. Market concentration is even greater for some individual commodities, such as wheat.

Analysis shows the level of rail-to-rail competition for grains and oilseeds decreased significantly between 1985 and 2007. The number of competing lines declined in many areas and only increased in a few, and the areas served by only one railroad increased significantly. As competition fell, rail rates rose. The ratio of revenue to variable costs increased in 83 percent of the measured areas but declined in only 17 percent.

Many grain- and oilseed-producing regions that are distant from barge-loading facilities changed to rail monopolies after deregulation. Many areas with less rail-to-rail competition are in regions important in the production of grain and oilseeds and are distant from barge-loading facilities.

Since the early 1990's, portions of west central Missouri, western Tennessee, north central Indiana, parts of Ohio, and a portion of Texas have lost the equivalent of 4.25 to 2.58 competing railroads. Parts of Arkansas, Colorado, Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Missouri, Nebraska, Ohio, Oklahoma, and Texas have lost the equivalent of 1.41 to 2.58 competing railroads. All were among the top 20 grain- and oilseed-producing States in 2007.

In 1988, Montana and North Dakota shippers paid the highest nominal (not adjusted for inflation) tariff rail rates in the nation to move grain and oilseeds. By 2007, however, Nebraska, South Dakota, North Dakota, and Iowa all paid more to ship grain than Montana.

Nominal tariff rates per ton-mile show that States lacking rail-to-rail competition do not necessarily pay higher rates than States with more transportation competition. This may be due to individual railroads being more sensitive to shippers' needs or could be due to greater engagement by governments at the state level. In addition, data analyzed at the State level can mask relationships that may be more apparent in analyses done at the CRD level.

Although rail shipments of grains and oilseeds have increased at an average rate of 1.1 percent over the last fifteen years, truck shipments have increased by 4.4 percent. In other words, rail's market share has decreased. Farmers have other shipping options, and they appear to be taking advantage of them.

# Appendix 6-1: Maps of Inverse Herfindahl Index for Rail Shipments

Figure 6-18: Inverse Herfindahl Index for rail shipments: grain products for 2003 to 2007

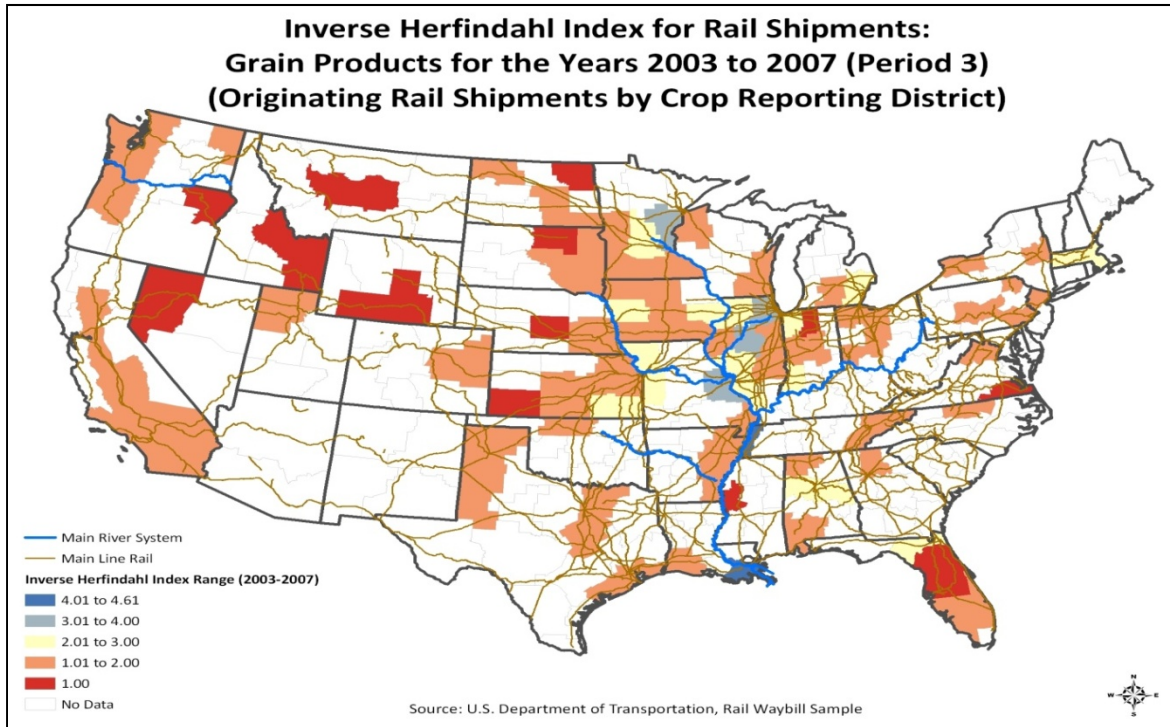


Figure 6-19: Inverse Herfindahl Index for rail shipments: grain products for 1985 to 1992

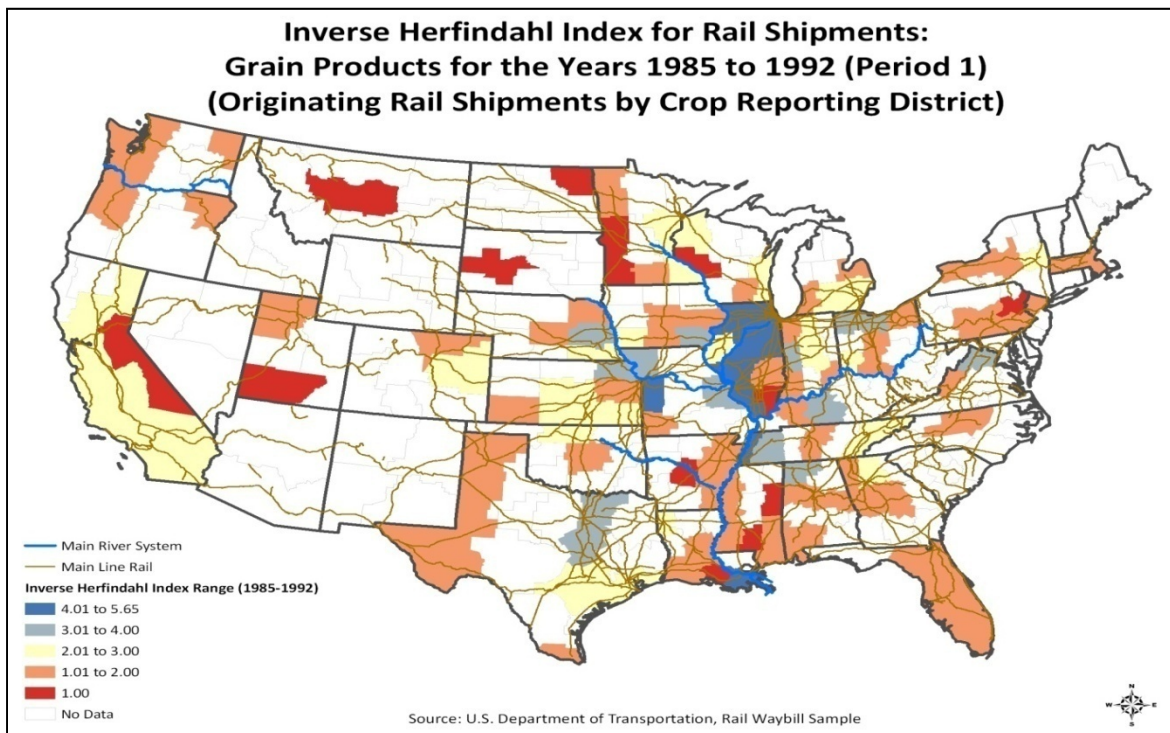


Figure 6-20: Inverse Herfindahl Index for rail shipments: grain products period 1 to period 3

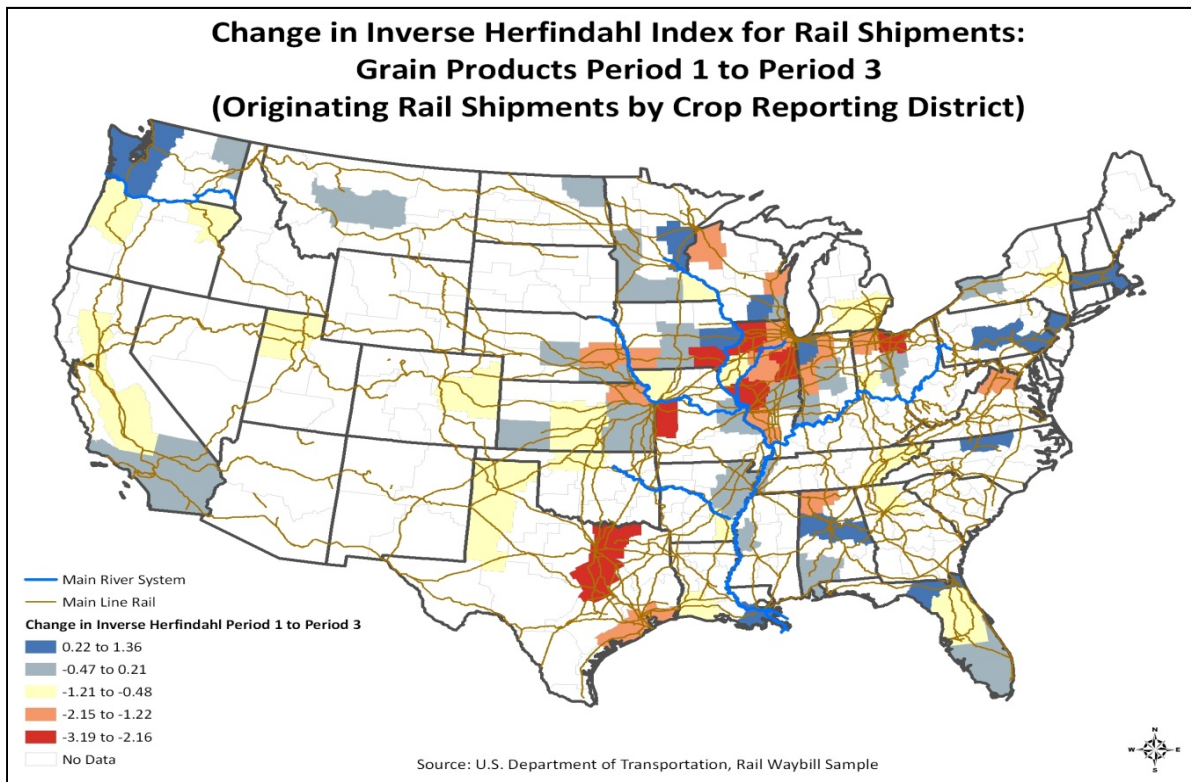


Figure 6-21: Inverse Herfindahl Index for rail shipments: grain products period 1 to period 3

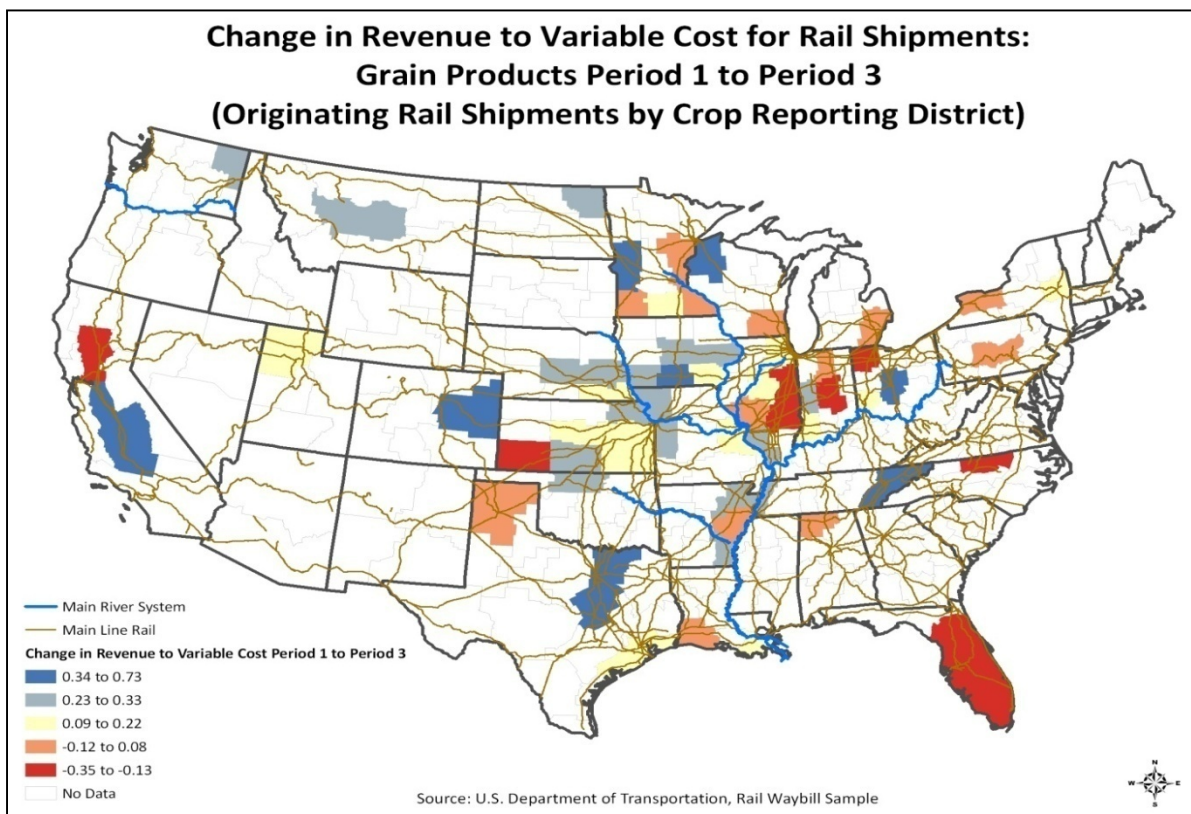


Figure 6-22: Inverse Herfindahl Index for rail shipments: food products 2003 to 2007

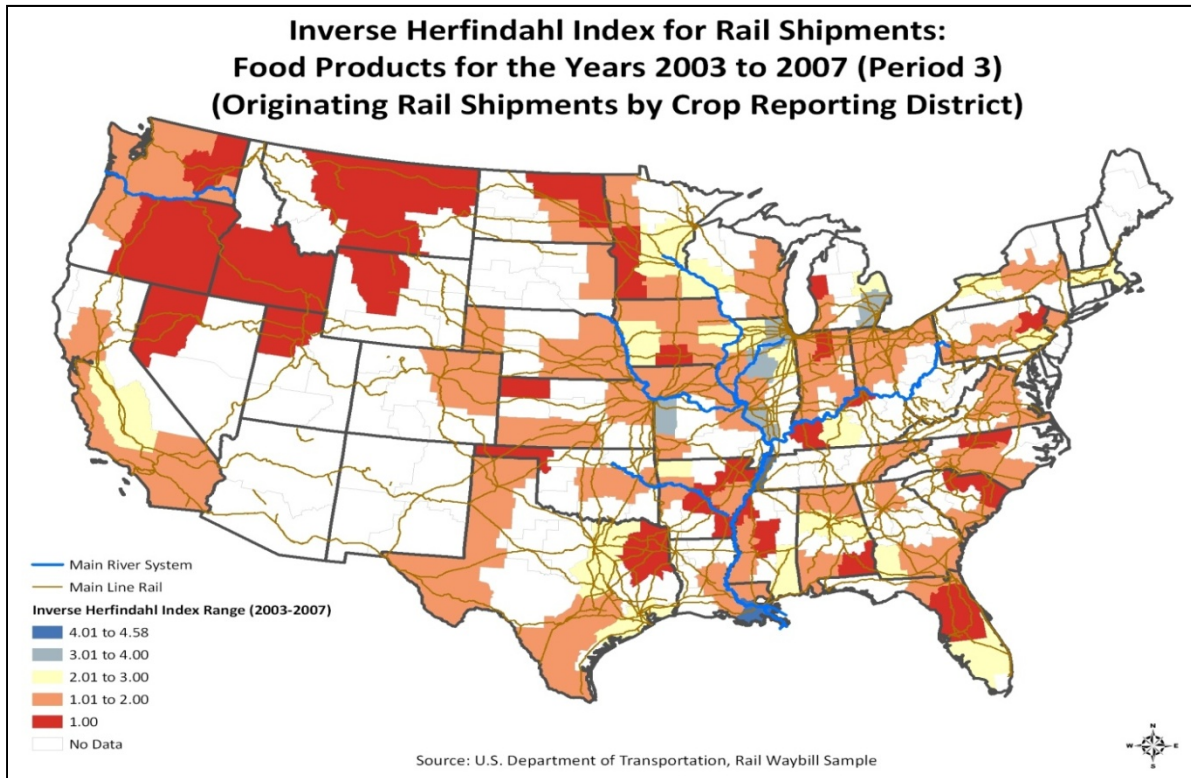
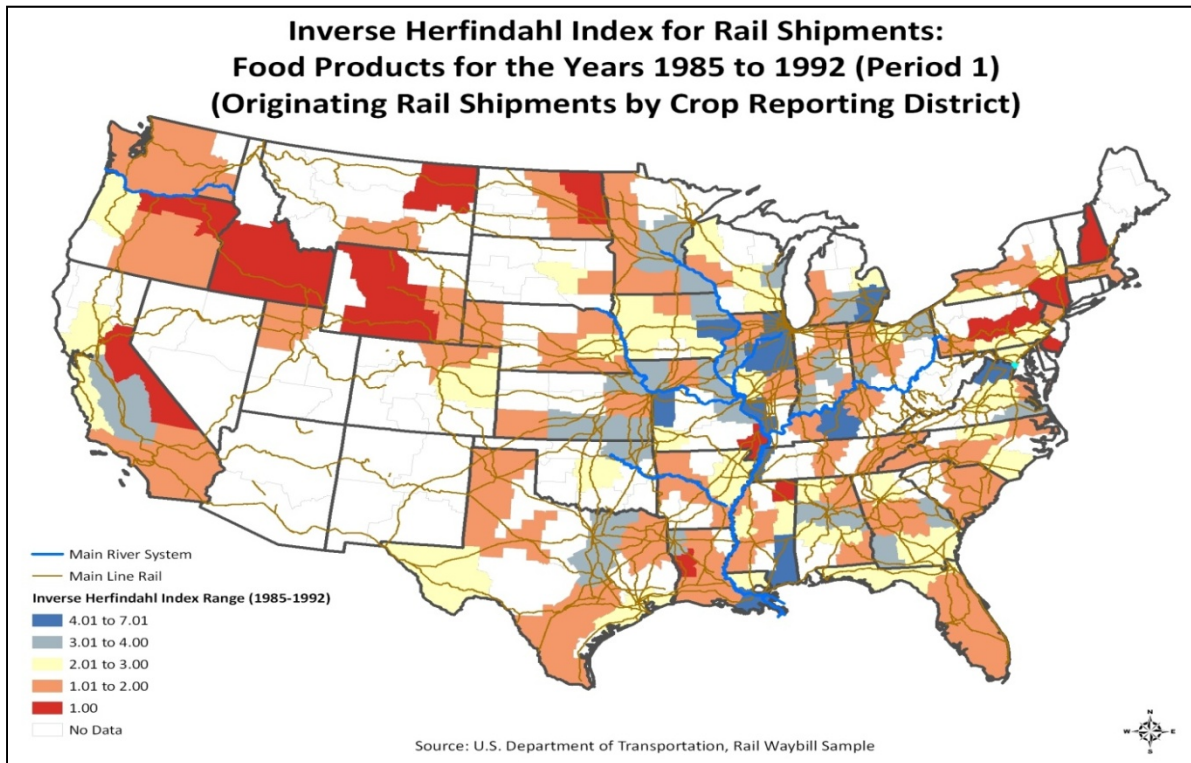
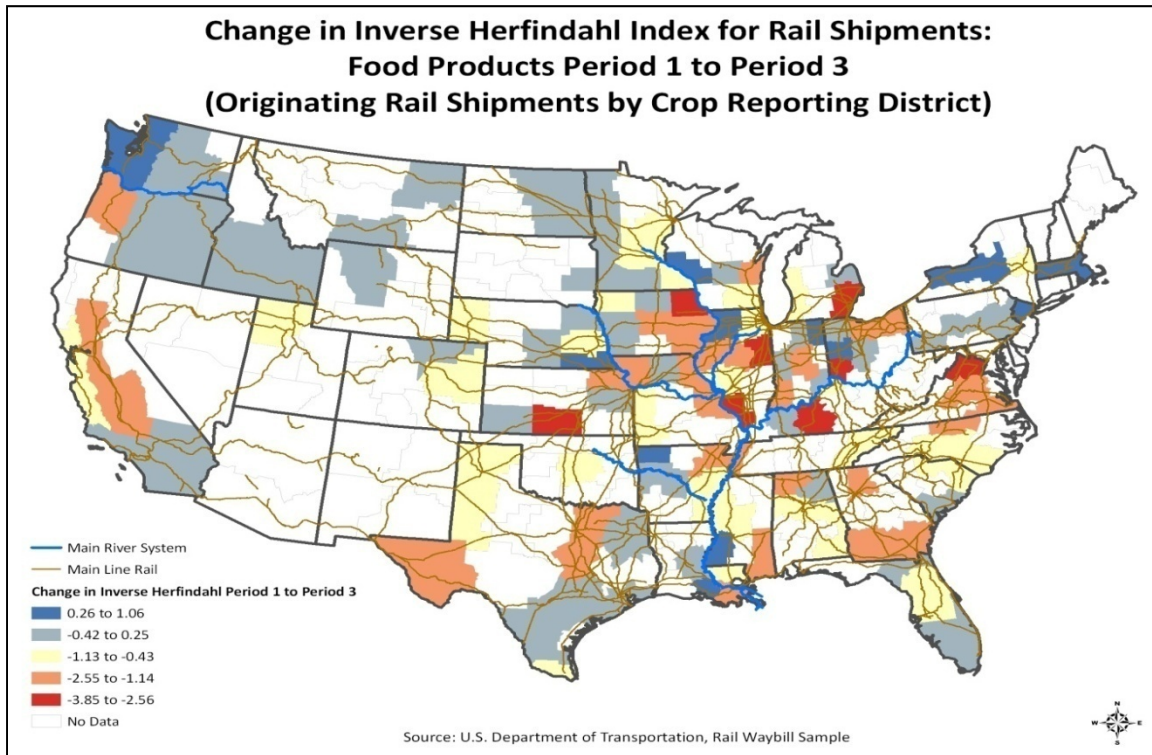


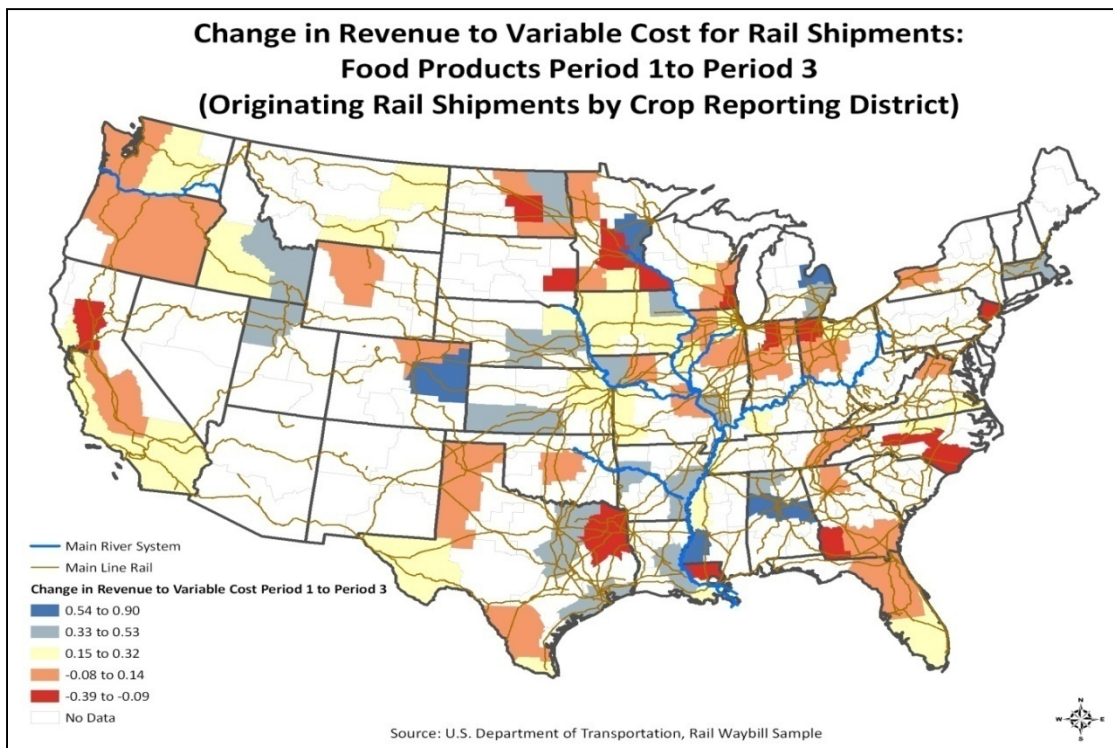
Figure 6-23: Inverse Herfindahl Index for rail shipments: food products 1985 to 1992



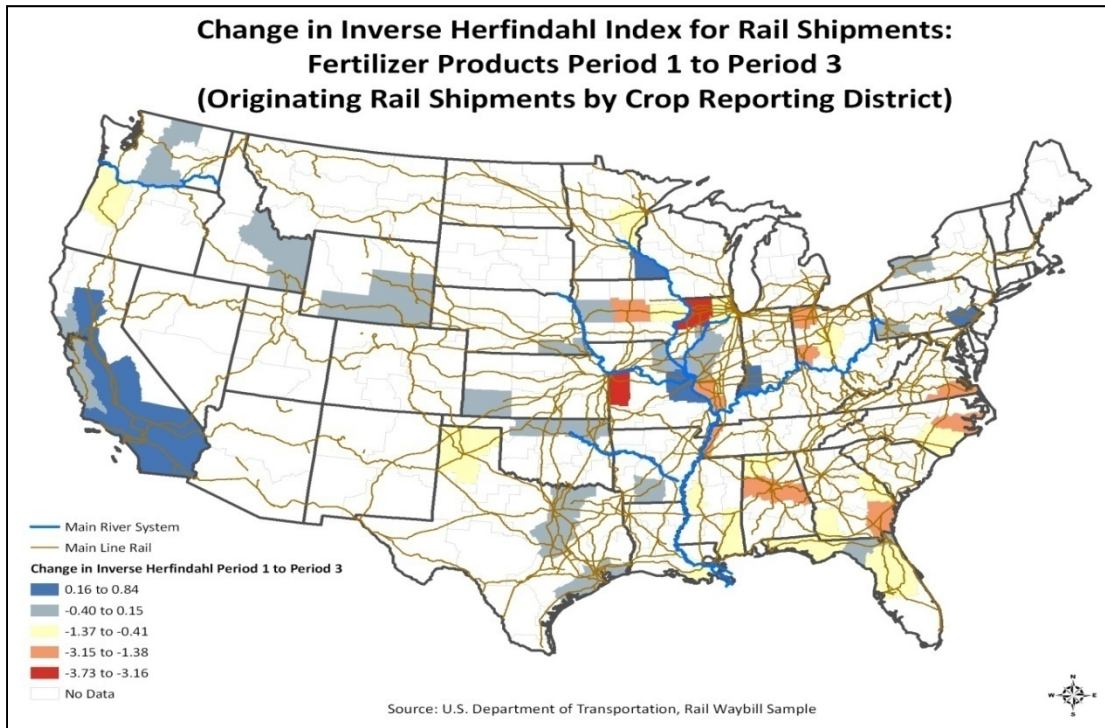
**Figure 6-24: Change in Inverse Herfindahl Index for rail shipments: food products period 1 to period 3**



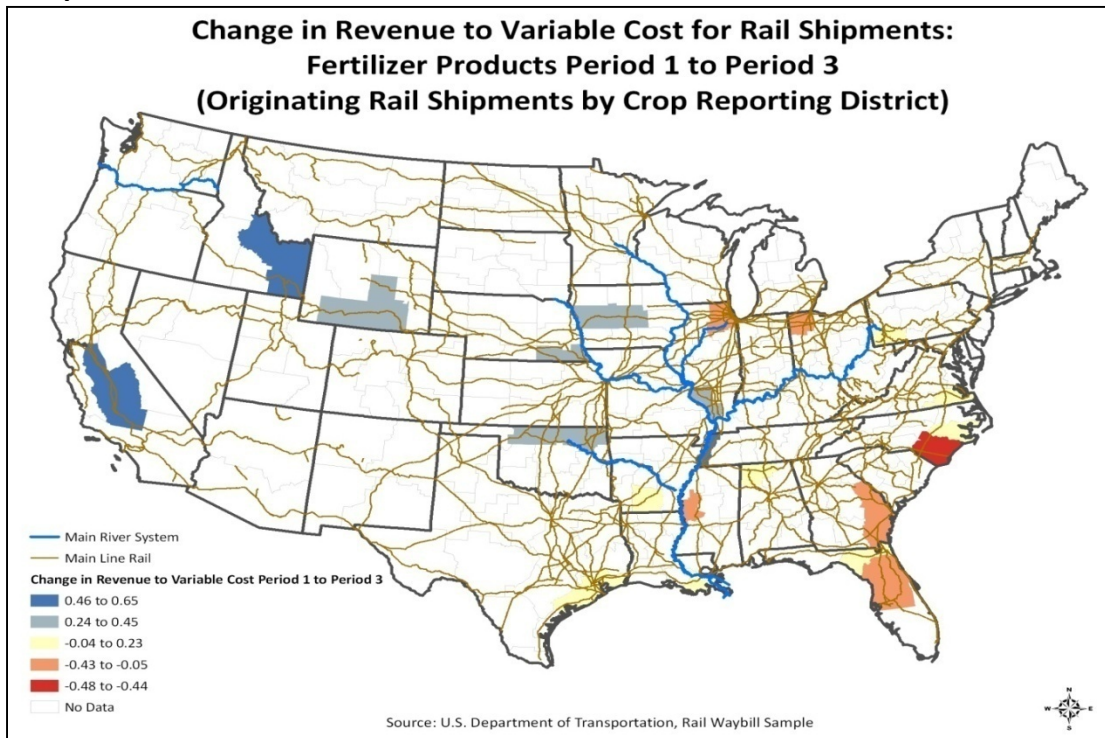
**Figure 6-25: Change in revenue to variable cost for rail shipments: food products period 1 to period 3**



**Figure 6-26: Change in Inverse Herfindahl Index for rail shipments: fertilizer products period 1 to period 3**



**Figure 6-27: Change in revenue to variable costs for rail shipments: fertilizer products period 1 to period 3**



## Appendix 6-2: HHIs and R/VCs for Commodity Groups Analyzed by Number of CRD

Table 6-5: Summary of HHIs and R/VCs for four commodity groups analyzed by number of CRDs

Commodity Group		Change in HHI			Change in R/VC		No. of CRDs HHI =1	
		>0	Same	<0	>0	<0	Period 1	Period 3
Grains & oilseeds	No.	38	9	109	108	22	20	25
	%	24	6	70	83	17	10	15
Grain Products	No.	23	2	59	48	13	14	13
	%	27	2	70	79	21	11	13
Food Products	No.	25	11	113	84	25	20	40
	%	17	7	76	77	23	11	25
Fertilizers	No.	12	5	35	19	5	11	12
	%	23	10	67	79	21	13	21

Source: USDA analysis of Surface Transportation Board, Confidential Waybill Samples



## Appendix 6-3: Waybill Calculation Methodology

For this report, USDA conducted analysis focused on the adequacy of rail competition. Several analytical measures were calculated from the STB Carload Waybill samples to show trends and identify areas of competition where there was a potential for railroads to exercise market power.

USDA obtained this information from the STB:

- Confidential Waybill samples for the years 1985 through 2007
- A supplemental file containing
- Information about whether a movement was from a contract (true revenue is masked) or from a tariff rate
- The calculated variable costs of the movement.\*

The supplemental file told only if the waybill for a shipment was carried under a contract rate (true revenue is masked) or a tariff rate (actual revenue). USDA chose to look at waybills and rail revenues for non-contract or tariff rate shipments. This was done for several reasons, but mainly because the contract shipments revenue was masked and in most cases multiplied by a scaling factor. USDA believed any analysis done using the scaled masked contract revenues would be misleading. Also, the STB has no jurisdiction over contract rates and rates for exempt movements, so contract rates generally cannot be appealed by shippers.

Preparing Data for Analysis from Original Waybill Sample

The raw waybill data is screened by STB for anomalous observations and checked for errors before it is provided to USDA and other requesters. USDA further reviewed and cleaned the Confidential Waybill data for obvious omissions, errors, and outliers.

These Waybills were excluded from the Study:

- Shipments originating outside the 48 contiguous United States.
- Shipments with unusually heavy (more than 157.5 tons) or extremely light (less than 1 ton) average tons per car.
- Trains longer than 150 cars.
- Shipment distances less than 20 miles and more than 3,500 miles for domestic movements or 4,500 miles for export movements (Mexico and Canada).
- Waybills with a gross weight above 315,000 pounds, which exceed the maximum possible.

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\* The Total Variable Cost field was not available for 1985, 1986, 1987, 1992, and 1993, and the supplemental data for the years 1986, 1987, 1992, and 1993 was not available. Thus, those years are not included in the USDA rate analysis.