The Distribution of the Post-Staggers Act Railroad Productivity Gains

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Abstract

We present a method for tracking productivity growth into industry and customer gains. We use public data to apply the method to the U.S. Class I railroads. Since the Staggers Act partially deregulated the U.S. freight railroad industry in 1980, the rate of productivity growth for Class I railroads has been about three-and-a-half times the productivity growth rate in the rest of the U.S. economy. Customers have received 85 percent of the productivity gains with the railroads retaining 15 percent. Closer analysis reveals distinct periods in the back-and-forth struggle between the railroads and their customers to capture the productivity gains.

JEL Classification: D24, L92

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1.0 Introduction

The Staggers Rail Act of 1980 was the last of several pieces of legislation that largely deregulated the transportation sector in the United States. The Staggers Act is widely called “deregulation” because of the pricing flexibility it allows the railroads and the ability it gives the railroads to abandon unprofitable routes. But, just as important, the Staggers Act maintains a regulatory framework that allows captive shippers to appeal for route/shipment-specific rate relief. This regulatory backstop distinguishes the Staggers Act from the airline and trucking deregulation acts. Another distinguishing feature is that the Staggers Act explicitly calls for a financially stable industry.

Regulation of an industry may be justified when unfettered market forces would lead to inefficient or inequitable outcomes. In these cases, the regulation is often evaluated in terms of how well it guides the industry toward competitive benchmarks, even though those benchmarks may not be attainable. Two basic benchmarks are how does the regulated price compare to marginal cost, and, how much profit is the regulated firm allowed to earn?

In the case of railroads, economies of density make marginal cost pricing infeasible. Consequently, non-linear pricing and/or a markup of marginal cost is needed to recover cost. That is, some market power must be exercised for the firm to break-even.\(^1\)

In a competitive industry, economic profits would be zero in the long run. This implies that all productivity gains would ultimately be passed on to the consumers in the...

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\(^1\) We have investigated the exercise of market power by the Class I railroads in our studies for the Surface Transportation Board. See Christensen Associates (2010).
form of lower prices and higher quality products. However, if an industry starts out in
disequilibrium with insufficient revenues, then movement toward a competition-like
equilibrium would require the industry to retain a fraction of the productivity gains.

In 1980, the operating expenses for the Class I railroads were more than 93 percent of
the industry’s operating revenue. The resulting 4.2 percent return on investment was
only about a third of the regulatory cost of capital. (AAR, 2009, pp. 12-19). Thus, the
industry was in an unsustainable position. However, help was on the way in the form of
strong productivity gains. These gains were largely the result of the market flexibilities
that the Staggers Act provided the industry.

Since the passage of the Staggers Rail Act, the railroads have exhibited productivity
growth that has far exceeded the productivity growth in other transportation sectors and
the private business sector as a whole. In general, productivity growth benefits the firms
in the industry and the consumers of the industry’s goods. That is, more productive firms
become more profitable as the result of lower average costs. But competitive forces will
pass most or all of those cost decreases through to consumers in the form of lower prices.

This paper sets forth a simple method for tracking railroad productivity growth into
gains to railroads and gains to shippers. We apply the method to the U.S. Class I railroad

2.0 Method

Our method to determine how productivity gains have been shared is founded on an
equation reflecting the industry’s profit margin. That is,

\[ M = \frac{P \cdot Y}{W \cdot X} \]  

\[ (1) \]

2 Time subscripts are omitted.
M expresses the profit margin as the ratio of revenue to cost where P and Y are indexes of output price and output, respectively, and W and X are indexes of input prices and input usage, respectively.³

The logarithmic form of (1) is

\[ \ln M = \ln P + \ln Y - \ln W - \ln X \]  

(2)

Differentiating (2) with respect to time gives the percentage changes in the variables over time. That is,

\[ \dot{M} = \dot{P} + \dot{Y} - \dot{W} - \dot{X} \]  

(3)

where \( \dot{M} = d \ln M/dt \), \( \dot{P} = d \ln P/dt \), \( \dot{Y} = d \ln Y/dt \), \( \dot{W} = d \ln W/dt \), and \( \dot{X} = d \ln X/dt \).

Total factor productivity is given by the output index relative to the input index,

\[ TFP = Y/X \]  

(4)

Productivity growth is simply

\[ \dot{TFP} = \dot{Y} - \dot{X} \]  

(5)

Substituting (5) into (3) and rearranging gives

\[ TFP = \dot{M} + (\dot{W} - \dot{P}) \]  

(6)

Thus, TFP growth separates into the gains kept by the industry in the form of increased profit margin and gains to the consumers in the form of rate increases being less than industry cost inflation. The shares of productivity gain are

\[ \text{Industry Share} = \frac{\dot{M}}{TFP} \]  

(7)

\[ \text{Consumers’ Share} = \frac{(\dot{W} - \dot{P})}{TFP} \]  

(8)

TFP growth can be further separated to allow for some of the gains to flow upstream to the factors of production. That is, equation (6) can be rewritten as

³ The margin ratio is a re-arrangement of the firm’s accounting identity presented as equation (1) in Diewert and Fox (2000).
where $V$ is what the input price index would be if the factors of production received none of the productivity gains. Given unionization, labor seems the most likely of all the factors to be able to secure a share of the productivity gains. The other factors are more likely to be traded competitively in markets much larger than the just the railroad industry. Thus, we consider only the possibility of labor receiving a share of the productivity gains. That is, $W$ and $V$ potentially differ only because of the bargaining strength of railroad labor relative to labor in general. Allowing for productivity gains to flow upstream, the shares of productivity gain become

\begin{align*}
\text{Industry Share} & = \frac{\dot{M}}{\text{TFP}} \\
\text{Labor’s Share} & = \frac{\dot{W} - \dot{V}}{\text{TFP}} \\
\text{Consumers’ Share} & = \frac{\dot{V} - \dot{P}}{\text{TFP}}
\end{align*}

$V$ is a counterfactual, which poses a data problem. If labor were the only input able to capture productivity gains, then an economy-wide labor price index might be an acceptable proxy for what labor prices would be if railroad labor did not have extraordinary bargaining strength. But even then labor costs are just one component of the input price index. The input price index would need to be re-constructed using different factor share weights implied by the counterfactual labor price to get the counterfactual input price index $V$.\(^4\)

In this paper, we do not go through the exercise of constructing the counterfactual input price index $V$. Instead, we note that between 1980 and 2008, the railroad labor price index grew annually by 4.2 percent while the economy-wide labor price index grew

\(^4\) This exercise would be more complicated if more than one factor of production captured a share of the productivity gains.
by 4.1 percent per year.\textsuperscript{5} When we couple this small difference between the labor price indexes with the fact that labor was a 35-40 percent share of the railroad cost index, we roughly estimate that less than one percent of the productivity gains went upstream in the form of higher wage payments. Thus, we return to equations (7) and (8) to report how the productivity gains are shared between the railroads and their customers.

Others have addressed the issue of the distribution of productivity gains, but we are not aware of any research that employs the method we propose in this paper to determine how the productivity gains are shared among the stakeholders. The research by Martland (2006) is the most similar to ours. He looks at the Class I railroads for the period 1995-2004 and make comparisons between the productivity, rail rate, and rail cost indexes. Martland does not explicitly calculate the share distribution of the productivity gains, but he reaches the qualitative finding that “(W)hile the industry did manage substantial improvements in productivity, most of the benefits were once again passed on to rail customers in terms of lower rates.”

Two other recent papers address the distribution of productivity gains to stakeholders. Lawrence, Diewert and Fox (2006) analyze Australia’s largest telecommunications firm. They calculate a cumulative productivity dividend and estimate that for 1990-1994 customers received about half of the productivity gains, labor received about three-eighths, and the firm retained about one-eighth. They note that their method “probably overstates the benefits to labor as it ignores skill and compositional changes.”

\textsuperscript{5} The railroad labor price index is part of the Rail Cost Recovery Index, developed by the Association of American Railroads and reported quarterly to the Surface Transportation Board. For an economy-wide labor price index we use the Employment Cost Index for Total Compensation, for private industry workers; Employment Cost Index Historical Listing, Continuous Occupational and Industry Series, Table 5, http://www.bls.gov/web/eci/ecicois.pdf
Tatjé and Lovell (2008) analyze the U.S. Postal Service from 1972-2004 using a method that decomposes productivity gain into changes in profits, output price, and input prices. They conclude that the vast majority of productivity gains went to postal employees in the form of increased wages.

3.0 Data

We implement our method of measuring the distribution of productivity gains using time-series data on total factor productivity (TFP), an index of input prices facing the railroads (W), and an index of rates charged by the railroads (P). Table 1 displays these data for the Class I railroad industry in the United States from 1980 through 2008. The railroad productivity data and the input price index each come from a single source. However, the railroad rate index requires multiple sources.

Research conducted by Schoech and Swanson (2010) provides the productivity index. Between 1980 and 2008, the productivity index increased by a factor of 2.79, representing an average annual growth rate of about 3.7 percent. They show that this robust rate of growth is more than three-and-a-half times that achieved in the U.S. private sector overall.

The Railroad Cost Recovery Index (RCRI) gives the change in the aggregate price level of the inputs to railroad operations. The index, which is available from 1977 on, is published annually by the Association of American Railroads (AAR).

We draw on multiple sources to assemble a rate index for 1980-2008. A 2009 rate study by the Surface Transportation Board (STB) provides a railroad rate index for 1985-
A 1998 STB rate study presents both real and nominal railroad rate indexes for 1982-1996 (STB 1998). We use the data for 1982-1985 from the 1998 STB rate study to fill in index values for 1982-84. In our 2010 report to the STB (Christensen Associates, 2010), we employed a methodology very similar to the STB’s to calculate a nominal rate index for 1985-2008. We use our rate index calculations for 2007-08 to fill in the index for 2008. Finally, data on revenue per ton-mile for 1980-1982 allow us to construct rate index proxies for 1980 and 1981.

Figures 1-3 present the logarithmic values for the indexes in Table 1. In these figures, the difference between any two adjacent data points gives the year-to-year growth rate using continuous compounding. The slope of the line segment between any two points indicates the average annual growth rate over that time span.

Figure 1 shows the Class I railroad productivity growth in the post-Staggers period. Between 1980 and 2008 railroad productivity increased by an average of 3.7 percent per year. There are two distinct periods as indicated by the bold kinked line. Between 1980 and 1996 railroad productivity increased by an annual average of 4.7 percent. However, since 1996 railroad productivity has grown by only 2.3 percent per year, less than half the earlier pace.

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6 This STB study reported a real-dollar rate index which we converted to a nominal rate index using the GDP Implicit Price Deflator.
7 The indexes for the overlapping years from the 2009 and 1998 STB studies are similar, but due to method changes and data adjustments they are not exactly the same.
8 Data on revenue per ton-mile are published annually in the Association of American Railroads, Class I Railroad Statistics. Using changes in revenue per ton mile as a proxy for rate changes can be biased because of shifts in the mix of traffic.
Figure 2 shows the performance of nominal and real (constant-dollar) railroad rates since 1980. Nominal rates rose for the first couple of years after the Staggers Act, but then began a long, steady decline. Between 1980 and 2000, nominal rates declined by an average of one-half percent per year. In contrast, since 2000 nominal rates have increased at an annual average of 5.6 percent. Taking general inflation into account, we see that real rates continued to decline until 2004 by an average of 3.3 percent per year for 1980-2004. After 2004, driven primarily by increasing fuel prices, real rates have taken a sharp turn upward, increasing by 7.7 percent per year. Between 1980 and 2008, nominal rates increased by 41 percent and real rates decreased by 38 percent.

Figure 3 presents two series of data: the logarithmic values of the RCRI and the Gross Domestic Product (GDP) price deflator. The RCRI is a measure of the inflation facing the railroads while the GDP price deflator is a general measure of inflation in the economy. Between 1980 and 2008, the GDP price deflator shows low and steady inflation of about 2.9 percent per year, while the RCRI has increased at a substantially faster average pace of 4.3 percent. Between 1980 and 2004, the RCRI increased by an average of 3.6 percent per year. However, since 2004, the annual increase in the RCRI has averaged 8.7 percent, more than four times the rate of general inflation over this period.

9 Real rates are included in this figure because they are of general interest and they indicate how consumer welfare has changed. However, it is the nominal rates that are used in the calculation of the productivity gains distribution.

10 The GDP price deflator is included to show that railroad cost inflation significantly exceeded the general inflation in the economy. However, it is only the RCRI, and not the GDP price deflator, that is used in the separation of the productivity gains.
4.0 Productivity Gains and Their Distribution

Between 1980 and 2008, the Class I railroads revenue ton-miles almost doubled while input usage decreased by about 30 percent. Of particular note, the railroads shed over 40 percent of their road and trackage and reduced their labor force by two-thirds (Association of American Railroads, 2009). The net result was that since the Staggers Act was signed railroad productivity has almost tripled.

Economies of density, long recognized as a distinguishing characteristic of the railroad industry, underlie this increase in productivity.11 The ratio of revenue ton-miles to miles of road provides a straightforward measure of traffic density. Between 1980 and 2008, this ratio increased by a factor of 3.4. The Christensen Associates study (2010) found that the industry exhibited strong economies of density in 1987 and that those economies have substantially diminished over the years as traffic density has increased. Eakin, Schoech and Swanson (2010) show the increase in density to be a primary driver of the productivity growth in the post-Staggers period. Furthermore, they find that by 2008 the marginal impact on productivity of a one percent increase in traffic density is about half what the impact was in 1987.

Equations (7) and (8) reveal how productivity gains have been shared between the railroads and their customers. In principle, year-to-year calculations can be made, but such analyses produce large, mainly transitory, swings. The year-to-year volatility of the data tends to cancel out and dissipate over longer time spans.

Table 2 shows that the cumulative productivity gains since the Staggers Act have been shared between the railroads and their customers, with the vast majority going to the

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11 Economies of density exist if cost increases less than proportionate to output, holding network size constant. Caves, Christensen and Swanson (1981) found substantial economies of density for U.S. railroads over the period 1955-1974.
customers. Between 1980 and 2008, approximately 85 percent of the gains have gone to the railroads’ customers. Because there may be some debate about when the Stagger’s Act began to show an effect, we also present the split of the productivity gains using other years as the starting point. While the shares change by a few percentage points depending on the starting year, the qualitative conclusion remains the same -- customers have received the bulk of the post-Staggers Class I railroad productivity gains.12

Our finding on the distribution of the productivity gains reinforces the conclusion of Schoech and Swanson that Class I railroads have had significantly greater productivity growth than has the rest of the economy. If, instead of the average 3.7 percent productivity growth, the railroad industry had managed only a 2.5 percent average growth rate (which would still be more than double the rate of productivity growth in the economy), then the customers’ share of the productivity gains would be 125 percent and the railroads would be worse off in 2008 than they were in 1980. Clearly, this was not the case.

A beginning-to-end comparison masks the nuances and changing trends in the underlying factors. In particular, as was shown in Figures 1-3, productivity growth showed a marked slowdown starting around 1996, a sharp reversal of trend in nominal rates occurred in 2000, and a notable uptick in railroad cost increases began in 2004. Accordingly, our analysis looks at the distribution of the cumulative gains for every year in the post-Staggers era.

Table 3 presents a matrix accounting for how customers and railroads fared in the years since the Staggers Act. Overall, productivity increased in 24 out of 28 years. Customers have received some of the productivity gains in 23 of the years while railroads

12 This conclusion is consistent with the findings of Brennan (2005) and Martland (2006).
have benefited in 19. Only in 1985 did both customers and railroads become worse off. There have been 5 years in which productivity has increased but the railroads lost ground (1986, 1989, 1997, 2000, 2003), and 4 years where customers have become worse off despite productivity gains (1993, 2002, 2006 and 2008).

Figure 4 presents the cumulative distribution of the productivity gains at each year, 1981-2008. This figure provides a chronology of an arm wrestling match as the railroads and customers battle over economic value, largely through private contracting enabled by the Staggers Act. The back-and-forth between the railroads and their customers reveal four distinct periods in the post-Staggers era. Table 4 provides the total growth for productivity, rail rates, input prices and the railroads’ aggregate margin for each of these periods, while Table 5 shows how the productivity gains were shared between customers and the railroads.

4.1 Early Deregulation: 1981-1986

The first few years immediately following the signing of the Staggers Act demonstrate a herky-jerky distribution of productivity gains. The data indicate up-and-down swings in both productivity and rates. At the time of the signing, the economy had just emerged from a mild recession and was about to experience a much deeper recession during 1981-1982. Between 1980 and 1982, revenue ton-miles decreased by 13 percent and the railroads were only able to shed about 3 percent of their road. Consequently, traffic density decreased and, as a result, productivity actually declined.

More than the full burden of the initial productivity decline fell on the railroads. Financially, the industry hit bottom in 1982. In contrast, shippers were already

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13 There are no data points for 1982 in Figure 4. Railroad productivity declined between 1980 and 1982. The railroads bore more than the full burden of this productivity decline as their collective margin ratio declined by 11 percent between 1980 and 1982.
benefiting, as real rates had begun their long decline. As the recession ended, the situation stabilized and by 1986 the cumulative distribution of the productivity gains began to converge.

As the industry struggled financially, several of the Class I railroads were combined or folded into larger systems, while a handful shrank and were declassified. As a result, between 1980 and 1986 the number of Class I railroads fell from 39 to 17 and the concentration of the industry, measured by the Herfindahl-Hirschman Index (HHI) of revenue ton-miles, increased from 663 to about 1280.

The industry was able to mitigate the impact of a 6 percent decline in traffic by reducing miles of road by 15 percent. The net result of the consolidation, the increase in density and the reduction in labor was a 16 percent increase in productivity. This represented an average annual rate of productivity growth of 2.5 percent, an improvement from the years just prior to the Staggers Act, better than the productivity growth in the private sector overall, but low relative to what was to come.

Customers clearly had the upper hand in these years just after the Staggers Act. As a result of price competition, rate increases were small relative to the increase in the railroad cost index. Both the railroad cost index and the GDP Price Index increased 32 percent over this period. In contrast, nominal rail rates increased by only 4 percent, meaning real rail rates decreased by 21 percent. Sorting this out into the shares, mitigated rate increases to customers amounted to 161 percent of the productivity gains of this period. Consequently, the railroads lost ground as their collective margin ratio worsened by 9 percent.
4.2 Consolidation and Railroad Strengthening: 1986-1996

1986-1996, a period of continued industry consolidation, saw the strongest productivity growth in the post-Staggers era. The railroads improved financially as they were able to wrestle some productivity gains from the customers. Each year, with the exception of the recession year of 1991, the railroads were able to secure an increasing fraction of the productivity gains. While the railroads situation quit worsening around 1983, it was not until 1994 that the railroads’ share of cumulative post-Staggers Act gains actually became positive.

Between 1986 and 1996 the number of Class I railroads went from 17 to 10 and the HHI continued to increase to 1938. Most of the consolidation in this period involved small- to medium-sized firm being acquired by the Union Pacific (UP) and Southern Pacific (SP) systems. However, the merger in this period with the biggest impact on concentration occurred in 1995 as the Burlington Northern system joined with the Atchison, Topeka and Santa Fe to become BNSF, the largest railroad at the time.

The continued consolidation allowed the industry to shed almost a quarter of its road. At the same time, revenue ton-miles increased by 56 percent. The increase in traffic was largely reflective of the growth in intermodal and coal shipments. Intermodal rail volumes in this period increased by a greater percentage than did any other commodity group. This reflected the growth of consumer good imports from Asia, as well as the shifting of domestic goods from the highways to the rails as fuel prices and highway congestion increased. Coal volumes increased in response to the economy’s growing demand for electricity. Furthermore, the 1990 Clean Air Act Amendments
increased the demand for low-sulfur coal from the western U.S., particularly the Powder River Basin.

The result of the growth of coal and intermodal traffic was that more tons were shipped longer distances, on a smaller network. All these factors contributed to increased traffic density such that the density ratio more than doubled during this period. Consequently, productivity increased by 83 percent, representing a blistering average growth of 6 percent per year.

Both the railroads and their customers shared the productivity gains. The railroads’ margin ratio increased by 17 percent and nominal rates to customers decreased by 9 percent. Accounting for this distribution, we find that, over this period, customers received 74 percent of the productivity gains and the railroads received 26 percent. The end result was that by 1996 customers had captured 91 percent of the post-Staggers gains and the railroads 9 percent.

4.3 Stability: 1996-2004

Between 1996 and 2004, railroad productivity growth slowed dramatically. Rail input prices continued to increase, but nominal rates barely changed. Consequently, customers were able to seize all of the productivity gains from this period and recapture a small amount of gains the railroads had secured earlier.

Industry consolidation continued with the largest merger in railroad history. The merger of UP and SP, the second and third largest systems at the time was completed in 1996-97 to form the largest system. However, significant integration challenges adversely impacted the productivity of the new UP. Between 1996 and 1998, the volume of ton-miles shipped by UP/SP decreased by almost 12 percent while volumes for the rest
of the industry increased by 9 percent. The combined effect was a mere 1.5 percent increase in industry volumes which translated into flat industry productivity between 1996 and 1998. The UP system did not regain its pre-merger volumes (that is, UP + SP volumes) until 2001.

Rail traffic continued to grow during this period, but at only about half the pace of the previous period. The industry continued to downsize its network, but at one-third the earlier pace. Density increased during this period, but only by 33 percent. Furthermore, research by Eakin, Schoech and Swanson (2010) has shown that by 2004 the marginal productivity impact of increasing density was only about half the value it was in 1996. In summary, the opportunities for density economies had become harder to achieve and when achieved they had substantially less impact. This largely explains the slowdown in railroad productivity growth since 1996.

Between 1996 and 2004, productivity increased by 19 percent, an average of 2.2 percent per year. Nominal rates increased by 1 percent in total while the railroad cost index increased by 27 percent. Consequently, the customers received 127 percent of the period’s productivity gains while the railroads’ margin ratio decreased by 5 percent. The end result was that by 2004 the customers had accumulated 98 percent of the post-Staggers productivity gains. Our findings for this period are qualitatively similar to those of Martland (2006) who found “financial performance for the industry peaked around 1996, then stabilized at a lower level through 2004.”

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14 Our quantitative findings differ from those of Martland. Over the period 1995-2004, we find less productivity growth (28 percent versus 57 percent) and less nominal rate reduction (0 percent versus 17 percent) than does Martland. The net result is that we find that customers receive a larger share of the productivity gains over this period (117 percent versus 102 percent).

Most recently, railroads have regained the upper hand in the arm wrestling match. They have taken more than all of the productivity gains achieved since 2004. But these gains have been noticeably smaller than the gains of the 1980s and 1990s, when customers were getting the lion’s share of the gains. Since 2004, railroad productivity has increased at a rate only about two-thirds the rate averaged from 1980-2004.

The continued slowdown in railroad productivity growth was marked by relatively low growth in traffic and only a small reduction in miles of road. As a result, traffic density increased modestly and yielded only a small impact on productivity.

Nominal rates in 2004 were about what they were in 1980. However, between 2004 and 2008 nominal rates increased by 9.6 percent per year. Similarly, the railroad cost index, which had been increasing since 1980 by an average of 3.6 percent per year, took a sharp turn upward in 2004, increasing by 8.7 percent per year though 2008. The net result is that the railroads regained some ground, securing more than all of the 2004-2008 productivity gains and leading to a 14 percent increase in the railroads’ aggregate margin ratio.

This period represents some of the greatest financial strengthening of the railroads in the post-Staggers era even though the productivity gains have been relatively small. In particular, 2006 appears as the year with the greatest improvement in the financial position of the industry. Looking at the year-to-year changes between 2005 and 2006, we observe productivity increasing by more than 3 percent, rates increasing by about 9 percent and input prices increasing by about 5 percent. Consequently, the industry was able to increase its cumulative share of the gains from 4 to 11 percent. Elsewhere, using
a different method and different data, we have identified 2006 as a year of significant financial improvement for the railroads such that by 2006 the industry appears to be revenue sufficient.\textsuperscript{15}

This improvement of the railroads financial condition suggests that 2006 might be an appropriate reference year to assess how future productivity gains are shared between the railroads and their customers. Looking at 2007-2008, with the above noted caveat that year-to-year comparisons can have large and transitory swings, we find that the railroads have captured 181 percent of the productivity gains generated since 2006. However, the railroad productivity growth has averaged less than 1.3 percent per year over this short span.

The cumulative result is that by 2008, 85 percent of the post-Staggers productivity gains had gone to customers while 15 percent went to the railroads. This differs from the competitive benchmark where all of the productivity gains would flow to the customers. However, the Class I railroad industry was not in a equilibrium in 1980 -- it was in a deep hole with revenues insufficient to cover costs. The 85/15 split appears to be an outcome that has given the industry just enough to become financially sound and delivered all the rest of the productivity gains to the customers.

\textbf{5.0 Summary and Conclusions}

The Class I railroad industry has experienced strong productivity growth since the Staggers Act was passed. In this paper, we have presented and implemented a straightforward method to measure how the railroads and their customers have shared this

\textsuperscript{15} See Christensen Associates (2010), pp. 4-4 – 4-8.
productivity growth. The overall finding is that customers have received about 85 percent of the gains with the railroads receiving 15 percent.

A more detailed examination revealed that neither railroad productivity growth nor the sharing of these gains followed a smooth pattern. We identified four distinct periods in a back-and-forth struggle between the railroads and their customers. Customers benefited early and consistently, up until about 2004. In contrast, the railroads continued to struggle in the first years after the Staggers Act, saw some financial improvement in the first half of the 1990s, but have achieved most of their recovery since 2004.

While customers have received the bulk of the productivity gains, the distribution of the post-Staggers productivity gains has fallen short of the competitive benchmark that gives customers all of the gains. This was, however, an unattainable outcome because of the dire straits the industry was already in when the Staggers Act was passed. Given the industry’s distress in 1980, the only way to achieve the goals of the Staggers Act was through an increase in productivity with the railroads retaining some of those gains. By 2006, the railroads had captured just enough of the productivity gains to become revenue sufficient. Thus, the competitive benchmark can be used to assess how productivity gains are distributed from 2006 forward.

We conclude this paper with two views of the performance of the post-Staggers railroad industry. The upbeat view is that the industry has performed very well. Productivity has grown at rate more than triple that achieved in the rest of the economy, the bulk of the productivity gains have gone to customers, and the railroads have retained just enough to regain their financial health.
The other view is one of concern. The productivity growth that has allowed both railroads and customers to benefit has slowed substantially. In the midst of this slowed productivity, the railroads have achieved most of their recovery through relatively steep rate increases. While it appears that the cumulative productivity distribution is currently in balance, it is not clear that the back-and-forth is stable.

So, the arm wrestling goes on. But unlike a real arm wrestling match, the contest under the Staggers framework has the objective of balance, rather than dominance by one party or the other. The industry has performed well in the post-Staggers era under the oversight of the Interstate Commerce Commission and then the Surface Transportation Board. Strong productivity growth and a sharing of the gains have produced the balance of a financially sound industry and substantial consumer benefits. However, the current trend favors the railroads. The Surface Transportation Board as referee needs to keep its close watch.
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TABLE 1: U.S. CLASS I RAILROADS PRODUCTIVITY, RATE, AND INPUT PRICE INDEXES

<table>
<thead>
<tr>
<th>YEAR</th>
<th>PRODUCTIVITY INDEX* (TFP)</th>
<th>NOMINAL RATE INDEX** (P)</th>
<th>RAILROAD COST RECOVERY INDEX*** (W)</th>
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* Schoech and Swanson, 2010.
*** AAR, *Railroad Ten-Year Trends*, various years.
TABLE 2: DISTRIBUTION OF POST-STAGGERS ACT PRODUCTIVITY GAINS FOR DIFFERENT STARTING YEARS

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<td>CUSTOMERS’ SHARE</td>
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TABLE 3: SUMMARY OF PRODUCTIVITY CHANGES AND STAKEHOLDER IMPACTS 1981-2008

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<tr>
<td>TOTAL</td>
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### Table 4: Cumulative Percentage Changes in U.S. Class I Railroad Productivity, Rates, Input Prices, and Industry Margin

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<tbody>
<tr>
<td><strong>TFP</strong></td>
<td>+16%</td>
<td>+83%</td>
<td>+19%</td>
<td>+10%</td>
<td>+179%</td>
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<tr>
<td><strong>RAIL RATES (P)</strong></td>
<td>+4%</td>
<td>-9%</td>
<td>+1%</td>
<td>+47%</td>
<td>+41%</td>
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<tr>
<td><strong>INPUT PRICES (W)</strong></td>
<td>+32%</td>
<td>+42%</td>
<td>+27%</td>
<td>+42%</td>
<td>+237%</td>
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<tr>
<td><em><em>MARGIN RATIO</em> (M)</em>*</td>
<td>-9%</td>
<td>+17%</td>
<td>-5%</td>
<td>+14%</td>
<td>+17%</td>
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</table>

*Imputed value.
<table>
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<tbody>
<tr>
<td>CUSTOMERS’ SHARE</td>
<td>161%</td>
<td>74%</td>
<td>127%</td>
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<td>RAILROADS’ SHARE</td>
<td>-61%</td>
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<td>137%</td>
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FIGURE 1: TOTAL FACTOR PRODUCTIVITY (logarithmic values)
FIGURE 2: NOMINAL AND REAL RATE INDEXES (logarithmic values)
FIGURE 3: RAILROAD COST RECOVERY INDEX AND GDP PRICE INDEX (logarithmic values)