



RAIL PASSENGERS
ASSOCIATION RESEARCH NOTE



IMPACTS FROM A SECOND TRAIN TO
MINNESOTA

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SUMMARY

By diverting thousands of car trips and inducing new travel and spending that would not otherwise take place, a new, second daily train between Chicago and the Twin Cities could generate total annual economic returns in the range of eight- to ten- times Minnesota’s annual net spending to support the service.

In this **RailPassengers Research Note**, the Rail Passengers Association examined a 2015 Amtrak report – “*Feasibility Report on Proposed Amtrak Service Chicago-Milwaukee-LaCrosse-Twin Cities (St. Cloud)*” – and also performed our own assessment of the total benefits using the IMPLAN economic-impact planning tool.

Among the key findings:

- The new train will garner diverse ridership by diverting trips from crowded roadways
 - Most diverted trips will be from cars, with a small fraction diverting from buses
 - An additional fourteen thousand trips each year will come from induced demand, i.e., trips that would not otherwise have been taken
- Induced travel will inject \$2.9 million worth of new revenue into Minnesota’s economy each year
- Minnesota will save many multiples of what it will cost to run the train
 - Taking cars off the road will save an annual \$20.8 million in Minnesota
 - Additional annual savings of \$1.3 million from avoiding traffic accidents
 - Total annual economic benefit -- \$25 million; Total annual state cost -- \$2-\$3 million (estimated)

A summary table of the findings concerning the new train appears below:

Benefit	Minnesota-specific benefit	MN, WI & IL total regional benefit
New Visitor Spending	\$2.9 Million	(not calculated)
Highway Maintenance Costs Avoided	\$20.8 Million	\$32.5 Million
Traffic Accidents Avoided	\$1.3 Million	\$1.8 Million
Pollution Abatement Avoided	\$88,000	\$120,000
Operations & Maintenance	(included in regional benefit)	\$47 Million

INTRODUCTION

Amtrak’s “*Feasibility Report on Proposed Amtrak Service Chicago-Milwaukee-LaCrosse-Twin Cities (St. Cloud)*” in 2015 laid out a promising framework for new service, with encouraging ridership estimates. A second train added to the single daily run of the *Empire Builder* service in each direction would carry, conservatively, 155,500 passengers at a cost ratio comparable to other short-distance corridors. Given that the *Empire Builder* in 2017 carried about 110,000 passengers within the origin and destination points in the study area, this projection alone suggests that an additional train on a different schedule is worthwhile.

Although Amtrak's review found that these 155,500 additional passengers made a second train feasible, the company stopped short of quantifying the larger implications and benefits of the new service. This **Research Note** will do just that. Passenger trains mean trips that are taken off of highways and out of the sky, saving lives, limiting pollution and opening up new possibilities. These new trains also mean new trips that would not have otherwise taken place at all, producing direct returns for the communities they serve. Amtrak showed that the train *could* exist, but our findings illustrate a compelling case as to why it *should* exist.

RAILPASSENGERS' FINDINGS

The majority (~60%) of passengers for the new service would come at the expense of automotive trips, leaving their cars behind, limiting pollution and easing congestion. It is estimated that 90,000 people who would otherwise use personal automobiles would be taken off the roads, **saving \$32 million** across the region in **highway maintenance costs**. Trains are 17 times safer than personal automobiles, meaning that the region will **save \$1.8 million** due to **traffic accidents avoided**. Trains are among the greenest modes of ground transportation. While reliable net-pollution cost models aren't available, a very conservative estimate is that eliminating these car trips would save more than \$120,000 in pollution-related costs to the economy each year.

There's also little risk of the new train hurting the existing Empire Builder's ridership given the effects seen elsewhere of adding service, or diverting substantial numbers of travelers from bus service. Assuming current ridership trends hold for the introduction of new service, only 11% of the train's new ridership will have otherwise used a bus. About as many passengers as the would-be bus riders will not have taken the trip at all, as 9% of Amtrak passengers in the region include *induced ridership*, taking trips that won't be made without the train. Such ridership on the new train will result in **new visitor spending** in Minnesota **worth at least \$2.8 million each year**.

Amtrak today spends \$62 million directly in Minnesota, basing 38 employees in the state. This staff and their work together generate total benefits of nearly \$150 million each year for Minnesota.

Costs to operate the new train, estimated at \$13.4 million annually would be more than offset by the total economic benefit. Ridership revenue (i.e., fares paid and some associated spending on-board) can be expected to contribute about \$6.8 million each year to offsetting that annual operational cost. The balance of the direct costs, about \$6.6 million, could be spread across each of the three states in the corridor (Minnesota, Wisconsin, and Illinois). Simultaneously, however, the states would collectively see a \$47 million annual economic benefit from the new service – a return on investment of better than 7-to-1.

METHODS AND APPROACH

Amtrak offered broad estimates of ridership revenue, operating costs, maintenance and other key metrics in “*Feasibility Report on Proposed Amtrak Service Chicago-Milwaukee-LaCrosse-Twin Cities (St. Cloud)*”¹, which are as follows:

Ridership Projection: 155,500 Passengers²

Total Annual Expenses = \$13.4 Million

+\$12.4 Million (Operating expense)

+\$1.0 Million (Annual capitalized maintenance costs)

Total Annual Revenue = \$13.4 Million

+\$6.8 Million (Revenue from passenger tickets, etc) +

+\$6.6 Million (Combined estimated annual total operating support for all states)

Thus, the Amtrak paper posits \$6.6 million in net cost each year to the three states to produce 155,500 trips that did not exist before. These figures can be placed in context by comparing them with the existing *Empire Builder* service.

Saved highway maintenance costs, traffic accidents avoided, pollution savings, and new visitor spending were derived by overlaying new ridership projections on current ridership patterns aboard the *Empire Builder*, as well as assuming current passenger profiles as to modal choice from passengers in the region.

Operations and Maintenance impacts were derived from reported Amtrak numbers, and extrapolated through the IMPLAN economic-impact modeling tool, as was **new visitor spending**. IMPLAN allows the estimation of the multiplier effects of changes in final demand for one industry on all other industries within a local economic area, in this case, various permutations of the states of Minnesota, Wisconsin, and Illinois.

RIDERSHIP PROJECTIONS AND CURRENT MODAL CHOICES

RailPassengers used the ridership profile from Amtrak’s operation of the *Empire Builder* to estimate the number of passenger boardings and alightings for those 155,000 passengers that would occur at each stop.³ Using the *Empire Builder*’s performance from 2017, the new, larger, number of passengers projected to travel along corridor were estimated to use the train in the following manner:

¹ “Feasibility Report on Proposed Amtrak Service Chicago-Milwaukee-LaCrosse-Twin Cities-(St. Cloud)”, Amtrak, [online]: <https://www.leg.state.mn.us/docs/2015/other/150685.pdf>

² Option 4-B outlined in the report, Chicago – St. Paul

³ Excepting the Milwaukee Airport Station outlined in the feasibility report, the the stations served by the *Empire Builder* and the proposed new train are identical on that section of the corridor

Station	New Train Ridership (Projected)	Empire Builder Ridership (2017 CHI-MSP corridor traffic only)
Chicago	50,930	36,331
Glenview	3,418	2,438
Milwaukee	10,117	7,217
Columbus	6,293	4,489
Portage	5,083	3,626
Wisconsin Dells	8,746	6,239
Tomah	8,658	6,176
La Crosse	16,057	11,454
Winona	9,838	7,018
Red Wing	4,469	3,188
St Paul	31,892	22,750
TOTAL	155,500	110,926

The *Empire Builder* also served to illustrate the profile of passenger that would use the new service. Averaging data from Amtrak's Economic Impact Brochures⁴ concerning Minnesota, Wisconsin, and Illinois, the would-be passengers of the new train are currently driving, flying, taking buses, and not travelling, in that order:

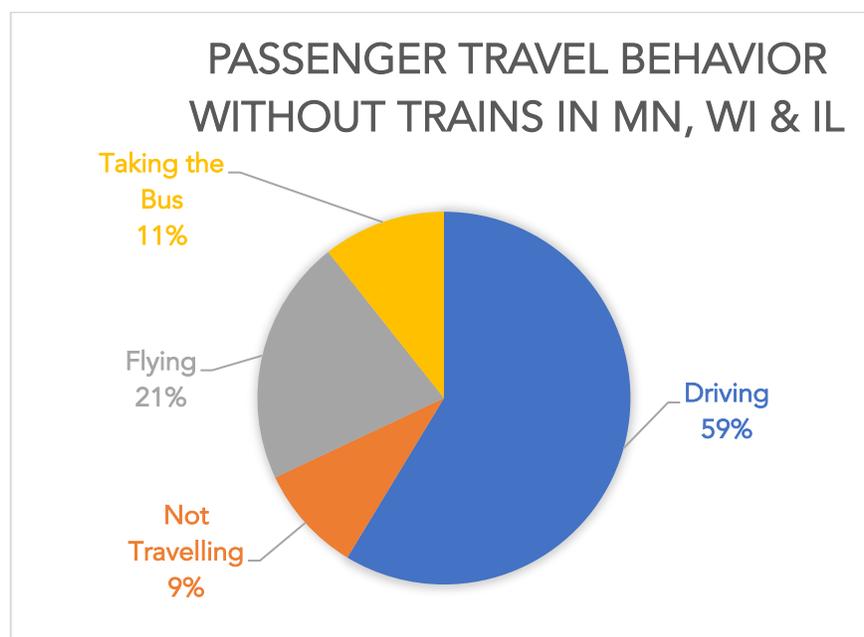


Figure 1

⁴ "State Economic Impact Brochures" Amtrak [online] available: <https://www.amtrak.com/state-economic-impact-brochures>

Projected ridership per origin and destination pair, combined with mode preference if Amtrak was unavailable, helped us to estimate how much the train would affect use of the other travel modes, or in the case of new visitor spending, how much spending would be enabled from new ridership.

VISITOR SPENDING

Per *Figure 1*, 9% of Amtrak Passengers in the region would not travel without a train, and are therefore considered as **induced ridership**. Other projected ridership will presumably make the trip, and spend money in state without the train, although we believe this is a conservative approach. It's quite possible that even if the trip were to occur, the *nature* of that spending might change by virtue of the train making particular kinds of trips easier to make. Further data from Amtrak shows that 46% of passengers arriving in Minnesota are "tourists," visitors from out of state.⁴ The number of visitors that the train will uniquely enable is therefore derived as:

$$\text{Projected ridership in state} \times \text{induced ridership \% (.9)} \times \text{tourist ridership \% (.46)} \\ = \text{Induced Tourist Ridership}$$

According to *Explore Minnesota Tourism* and the University of Minnesota Tourism Center, the average visitor daily spend per person per day was calculated in 2008 as being \$118⁵, updated through a CPI inflation calculator brings that figure to \$140.17 for 2019. Average length of stay for out of state visitors was surveyed in 2014 at three nights.⁶ This gave the induced tourist ridership a profile to estimate the amount they contribute, calculated as:

$$\text{Induced Tourist Ridership} \times \text{Average Daily Spend (140.17)} \times \text{Duration (3)} \\ = \text{Visitor Spending}$$

	New Train Induced Visitor Spending	Empire Builder Induced Visitor Spending
Winona	\$179,700.74	\$61,523.81
Red Wing	\$79,888.49	\$54,873.53
St Paul	\$586,106.84	\$539,247.31
St. Cloud	-	\$196,061.44
Staples	-	\$644,433.17
Detroit Lakes	-	\$215,803.38
Total	\$845,696.07	\$1,711,942.63

⁵ "Economic Impact of Traveler Expenditures, June 2007-May 2008" [online] available:

<https://staging.exploreminnesota.com/industry-minnesota/research-reports/researchdetails/?nid=136>

⁶ "Minnesota 2014 Visitor Profile Report" [online] available: <https://staging.exploreminnesota.com/industry-minnesota/research-reports/researchdetails/?nid=1499>

Furthermore, from *Explore Minnesota*, the average pattern of spending for visits to Minnesota can be broken down to 25% shopping, 14% lodging, 12% ground transportation, 25% recreation, and 24% on food. Using these as guide for industry input into IMPLAN renders the following results for indirect impacts of this direct visitor spending:

New Train Visitor Spending Impact in Minnesota

Impact Type	Employment	Labor Income (\$)	Value Added (\$)	Output (\$)
Direct Effect	14	\$329,429.66	\$403,497.58	\$735,923.87
Indirect Effect	2	\$112,487.17	\$177,897.43	\$329,618.02
Induced Effect	3	\$140,182.66	\$234,611.98	\$410,092.09
Total Effect	19	\$582,099.00	\$816,007.00	\$1,475,634.00
Sum	\$2,873,740.00			

Empire Builder Visitor Spending Impact in Minnesota

Impact Type	Employment	Labor Income (\$)	Value Added (\$)	Output (\$)
Direct Effect	29	\$666,711.99	\$816,613.40	\$1,489,390.10
Indirect Effect	4	\$227,655.71	\$360,035.43	\$667,093.20
Induced Effect	6	\$283,707.03	\$474,816.68	\$829,960.04
Total Effect	39	\$1,178,075.00	\$1,651,466.00	\$2,986,443.00
Sum	\$5,815,984.00			

For Railroad Transportation, multipliers estimate three components of total change within the study area (the State of Minnesota, in this case):

- *Direct effects* represent the initial change in the industry in question.
- *Indirect effects* are changes in inter-industry transactions as supplying industries respond to increased demands from the directly affected industries.
- *Induced effects* reflect changes in local spending that result from income changes in the directly and indirectly affected industry sectors.

AUTOMOTIVE VEHICLE MILES TRAVELED (VMT) AVOIDED

A full 59% of train passengers would drive if not for passenger rail service in the study region, making would-be drivers by far the majority of rail passengers. Based on the passenger miles traveled within a county or a state, vehicle miles traveled is estimated by using the modal preference split, and the national average of 1.64 passengers per vehicle.

Automotive VMT Avoided

$$\begin{aligned}
 &= \textit{Travel Distance} \textit{ (milage between origin \&destination train stops)} \\
 &\times \textit{Passengers that would Drive} \\
 &(\textit{No. of passengers} \times (1 - \textit{induced \%}) \times \textit{automobile mode share (59\%)}) \\
 &\div \textit{No. of passengers in an automobile (1.64)}
 \end{aligned}$$

Using this formula, it is estimated that the new train would avoid 15,188,939 car miles traveled in the corridor.

Traffic Accidents Avoided

Among the many advantages passenger trains have over private automobiles, trains are on average 17 times safer than driving.⁷

According to "Transportation Cost and Benefit Analysis II-Safety and Health Costs" conducted by Victoria Transport Policy Institute⁸, a comprehensive study for the National Highway Traffic Safety Administration estimates that in 2010 the U.S., motor vehicle crash costs totaled \$242 billion in economic costs and \$836 billion considering non-market values (pain and suffering from injuries and deaths), which averages 8¢ to 28¢ per mile driven.

Cost of accidents per vehicle mile was estimated conservatively from this study using the former market-based figure of \$.08 per vehicle mile, adjusted for inflation from 2010 to 2019 to \$.12.

$$\begin{aligned}
 &\textit{Saved crash cost by shifting from automobile to passenger rail} \\
 &= \textit{Automobile VMT Avoided} \times \textit{cost of accidents per vehicle mile} (\$.12)
 \end{aligned}$$

By this calculation, passengers that took the train rather than driving in their cars departing and arriving in Minnesota on the Empire Builder to Chicago and points in between saved the region **\$3,441,687** in 2017. Passengers aboard the new train would save the three states an additional **\$1,822,673**, of which **\$1,320,797** would be saved by passengers leaving or arriving in Minnesota if it were running this year.

⁷ "Comparing the fatality risks in United States transportation across modes and over time" Ian Savage, *Research in Transportation Economics*, July 2013 [online] available: <https://www.sciencedirect.com/science/article/abs/pii/S0739885912002156>

⁸ "Transportation Cost and Benefit Analysis II – Safety and Health Costs," *Victoria Transport Policy Institute*, 2018.

Highway Maintenance Costs Saved

Freeways are anything but “free” and involve by far the bulk of transportation spending in the United States, as illustrated below by the Bureau of Transportation Statistics for expenditures by mode for 2014⁹ (in billions of dollars):

Mode	State & Local Expenditures	Federal Expenditures	TOTAL
Highway	\$203.95	\$16.92	\$220.87 Billion
Transit	\$59.56	\$8.29	\$67.85 Billion
Air	\$21.65	\$3.17	\$24.83 Billion
Water	\$6.01	\$2.81	\$8.82 Billion
Amtrak ¹⁰	\$0.23	\$1.40	\$1.63 Billion
Pipeline	\$0.04	\$1.37	\$1.41 Billion
Railroads	\$0.00	\$0.14	\$0.14 Billion
General support	\$0.02	\$0.04	\$0.07 Billion

According to “Transportation Cost and Benefit Analysis II-Roadway Costs”¹¹ conducted by Victoria Transport Policy Institute, the American Association of State Highway and Transportation Officials reported that the 2015 benefit related to congestion and road maintenance was estimated to be \$2 per vehicle mile avoided, adjusted to \$2.14 for 2019.

$$\begin{aligned} & \text{No. of passengers} \times (1 - \text{induced } \%) \times \text{Automobile VMT Avoided} \\ & \times \text{Maintenance and Congestion cost per vehicle mile } (\$2.14) \end{aligned}$$

With this calculation, it is estimated that passengers aboard the new train would save the three states **\$32,504,330**, of which **\$20,859,139** would be saved by passengers leaving or arriving in Minnesota if it were running this year.

Pollution Savings

Trains are inherently energy efficient, in the United States they consume about 30% less energy per passenger mile than automobiles.¹²

⁹ US Department of Transportation, Bureau of Transportation Statistics, Government Transportation Financial Statistics, Table 17-A, [online] available: <https://www.bts.gov/browse-statistical-products-and-data/transportation-economic-trends/tet-2017-chapter-7-government>

¹⁰ “Amtrak Annual Report Fiscal Year 2014” Amtrak [online] Available: <https://www.amtrak.com/content/dam/projects/dotcom/english/public/documents/corporate/AnnualReport/Amtrak-Annual-Report-2014.pdf>

¹¹

¹² “Amtrak Sustainability Report 2016-2017” Amtrak [online] available: <https://www.amtrak.com/content/dam/projects/dotcom/english/public/documents/environmental1/2016-2017-Amtrak-Sustainability-Report.pdf>

According to a "Comparison of Energy Use & CO₂ Emissions From Different Transportation Modes"¹³, CO₂ generated by train, air, car, and bus was estimated to be 177 grams per passenger miles traveled, 243 grams per passenger miles traveled, 371 grams per passenger miles traveled, and 299 grams per passenger miles traveled, respectively.

According to the "Transportation Cost and Benefit Analysis II – Air Pollution Cost"¹⁴ published by Victoria Transport Policy Institute (VTPI), CO₂ Emissions are very difficult to price, given varying climate forecasts and future discounting behavior. Per tonne, studies have estimated that CO₂ Emissions have an impact from \$17 to \$917. VTPI settled on a control cost in 2007 for CO₂ used a default value of \$35 per tonne emitted. This value adjusted for inflation rises to \$42.7 in 2019.

$$\begin{aligned} & \textit{Cost of pollution from driving per VMT} \times \textit{Automobile VMT Avoided} \times \\ & \times (1 - \textit{Cost ratio between train and auto}) \end{aligned}$$

With this calculation, it is estimated that Passengers aboard the new train would save the three states **\$121,512** , of which **\$88,053** would be saved by passengers leaving or arriving in Minnesota if it were running this year.

DIRECT OPERATIONS & MAINTENANCE SPENDING

Direct spending by Amtrak on a given route is composed of several parts listed below:

$$\begin{aligned} & \textit{Amtrak Spending} \\ & = \textit{Spending on employee salaries} + \textit{Spending on fuel} \\ & + \textit{Spending on food} + \textit{Spending on Maintenance} \\ & + \textit{Cost of variable activities} \end{aligned}$$

When a direct spending profile is not available, as in this case, total revenue or employment can be used as the input multiplier of direct impact from operating the railway service. Note that the total revenue for a passenger railway service should include not only the revenue from operations, but also any revenue from government subsidies.

For Railroad Transportation, multipliers estimate three components of total change within the study area (the State of Minnesota in the first case, the entire area of Minnesota, Wisconsin, and Illinois in the second):

¹³ M. B. & Associates, "Comparison of Energy Use & CO₂ Emissions From Different Transportation Modes," *American Bus Association*, 2007.

¹⁴ Todd Litman "Transportation Cost and Benefit Analysis II – Air Pollution Costs," *Victoria Transport Policy Institute*, 2018.

- *Direct effects* represent the initial change in the industry in question.
- *Indirect effects* are changes in inter-industry transactions as supplying industries respond to increased demands from the directly affected industries.
- *Induced effects* reflect changes in local spending that result from income changes in the directly and indirectly affected industry sectors.

Current Service Direct Operations & Maintenance Impacts

Amtrak spent \$63,286,092 on goods and services in fiscal year 2017 Minnesota,¹⁵ including employing 38 Minnesota residents with wages totaling \$3,127,246. Using these as inputs for IMPLAN, the following impacts were found:

Impact Type	Employment	Labor Income (\$)	Value Added (\$)	Output (\$)
Direct Effect	38	\$3,035,130.98	\$22,865,806.88	\$63,286,092.00
Indirect Effect	111	\$7,614,073.91	\$11,297,340.56	\$22,436,525.68
Induced Effect	70	\$3,381,163.36	\$5,658,416.92	\$9,891,074.39
Total Effect	219	\$14,030,368.00	\$39,821,564.00	\$95,613,692.00
Sum	\$149,465,624.00			

New Train Service Direct Operations & Maintenance Impacts

The new train service as outlined in Amtrak's feasibility study is projected to cost a total of \$13.4 million. Expected ticket revenue will cover \$6.8 million of costs, and a \$6.6 million annual contribution from the three states the train will serve could cover the rest, as contemplated in Section 209 of the Passenger Rail Investment and Improvement Act of 2008.¹⁶

Using the total \$13.4 million figure as an input for IMPLAN, the following benefits were estimated for the entire study area from Minnesota through Wisconsin to Illinois:

Impact Type	Employment	Labor Income (\$)	Value Added (\$)	Output (\$)
Direct Effect	33	\$4,161,997.15	\$7,410,605.85	\$13,400,000.00
Indirect Effect	28	\$1,935,163.99	\$3,030,526.84	\$5,726,022.11
Induced Effect	43	\$2,087,709.79	\$3,674,038.64	\$6,286,329.40
Total Effect	103	\$8,184,871.00	\$14,115,171.00	\$25,412,352.00
Sum	\$47,712,394.00			

¹⁵ Amtrak Fact Sheet, Fiscal Year 2016 State of Minnesota[online] accessible: <https://www.amtrak.com/content/dam/projects/dotcom/english/public/documents/corporate/statefactsheets/MINNESOTA16.pdf>

¹⁶ "ISSUE BRIEF PRIIA Section 209 Intercity Passenger Rail Service" AASHTO [online] available: <http://www.highspeed-rail.org/Documents/S209%20Issue%20Brief%20061011.pdf>

NOTES & LIMITATIONS

First, a word about cannibals... in the sense that passenger trains do not act like them. When additional train service is added to an existing route, ridership is not usually “cannibalized” in the sense of a new train stealing another’s patronage. It is reasonable to assume that the 155,500 projected riders of the new train will not come at the expense of Empire Builder ridership. In sheer numbers, ridership is almost always induced at a higher rate than seats made available, much like the phenomenon of *induced demand* that plagues new urban highways instantaneously with gridlocked traffic.¹⁷

For direct examples, the Capitol Corridor service in California increased from 4 to 15 frequencies each way, and ridership climbed geometrically with train service, from 463,000 to 1.7 Million. A more dramatic example can be found in Maine with Downeaster Corridor service, which started with 4 trips per day, and has since only increased to 5. However, ridership has ballooned from 240,000 to more than half a million annual riders.¹⁸ Or, as put by the architect of service expansion on the Capitol Corridor:

*The more travel time choices you provide for travelers, the more likely that they will consider the train as a viable option for them. Few people will build their travel around a train schedule, but if there are frequent choices in departure times, people will travel on the train because a frequency is there at the time(s) they want to travel.*¹⁸

-Eugene Skoropowski, Senior Vice President of Brightline

Finally, for the IMPLAN calculations, all local purchase coefficients are assumed to be 100% for all study areas and all industries.

¹⁷ “What’s up with that: Building Bigger Roads Actually Makes Traffic Worse” *Wired* 06/17/14 [online] available: <https://www.wired.com/2014/06/wuwt-traffic-induced-demand/>

¹⁸ Skoropowski, Eugene “Re: Proving the worth of frequency?” Message to James Zumwalt 02/11/2019