A Preliminary Investigation of Private Railcars in North America

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This paper analyzes the economic conditions of a dramatic change in railcar ownership over the last 10 years. Private railcar ownership has increased to the point where they now carry 54% of ton-miles and 56% of tonnage for all railroads. Despite the increasing reliance on private railcars, returns to railcar ownership are decreasing, with current rates of return falling below those necessary to fund future investment. The problem is further exacerbated by shifting costs from railroad to shipper. A large drop in private investment could pose a serious threat to the railroad industry, shippers, and the economy as a whole.

INTRODUCTION

The role of private ownership of the freight car fleet has been one of steady evolution, with railroad investment in and ownership of freight cars progressively declining over the past decades. William E. O'Connell, Jr[1] (1970) documented the increasing role of the private fleet and offered some suggestions as to the initial and continuing cause, noting:

> *"After initial widespread use of private cars under the "common road" concept of early railways, railroad-owned freight cars predominated from the 1840's through the 1860's, except for a short-lived boom in cars owned by "fast freight" lines. From this time on, however, the percentage of private cars has increased as railroads refused to build specialized freight cars because of high initial costs, rapid technological obsolescence, outside pressure, and managerial shortsightedness."* (O'Connell 1970)

This trend has continued unabated. Currently, over 50% of the tons shipped on the North American railroads are moved in cars owned by non-railroad leasing companies and shippers (Surface Transportation Board 2008). Concurrent with this change in car ownership, there has been an apparent shift of costs from the railroads to private car owners (Prater et al. 2010). The purpose of this research paper is to investigate, identify, and document these changes and offer some implications on the future of the rail industry. Producers who rely on railcars as a link in their supply chain stand to be greatly impacted by such changes in the structure of the industry. The growing reliance on a single source of railcars exposes sectors that depend on a steady supply of cars to increased risk, either through declining investment in railcars, increased costs, or both. This paper reviews current car-hire practices, car rules, and interchange rules that may inhibit sustained investment in the private car fleet.

Between 2000 and 2008, there was a dramatic increase in the share of freight cars owned by non-railroad leasing companies and shippers in order to compensate for the decreased investment in these cars by railroads (Surface Transportation Board 2008). Not only have private cars increased in numbers but also in the share of tons carried and in revenue generated (Surface Transportation Board 2008). Our national economy, as well as the overall financial health of the entire railroad industry, has benefited from this heavy reliance on the continuing investment in freight cars by leasing companies and shippers; however, current investment rates are not large enough to replace an aging North American fleet. This analysis suggests that future private investment levels could be dramatically below those required given the increased system dependence on private railcars.

LITERATURE REVIEW

This paper adds to the literature on the railcar composition of the North American fleet. Previous work has focused on both the concern about track infrastructure and rolling stock, especially looking at the particular categories of cars. Here particular attention has been paid to the impacts of the heavier rail grain hopper on local infrastructure.

Norton and Klindworth (1989) also highlight potential fleet shortages, however, their focus is on a single commodity (i.e., grain) rather than ownership structure. Another closely related paper is Bitzan and Tolliver (2003), who also use return on investment analysis on railroad equipment. Bitzan and Tolliver (2003) model the railroad's decision to abandon track due to 286,000-pound railcars, while this paper is concerned with returns to the cars themselves.

A large literature that analyses particular car types exists. Resor et al. (2000) look at 286,000-pound cars, as does Martens (1999) and Casavant and Tolliver (2001). This literature is primarily concerned with the impact of a particular type of car (heavy-axle) regardless of who owns the cars in question. The main contribution of this paper is to analyze the rate of return for cars based not on type, but ownership category.

This paper is not the first to investigate investment in railcars. For example, Bortko, Babcock, and Barkley (1995) examine a sharp decline in jumbo covered hopper car investment. The authors estimate a model of investment in jumbo covered hopper cars to explain why investment fell sharply in the 1980s. They find that deregulation, combined with falling prices for commodities primarily moved in jumbo covered hopper cars, explain most of the fall in investment. In response to the fall in investment identified by Bortko, Babcock, and Barkley (1995), Norton and Klindworth (1989) examine whether the jumbo covered hopper fleet will be able to meet future demand. Like these authors, this paper attempts to identify one potential cause of falling investment, but only for private railcars.

To study the impact of changes in the ownership structure of railcars this paper uses rate of return on investment analysis, similar to Babcock and Sanderson (2006), who use return on investment analysis to determine the likelihood of shortline railroad owners upgrading their tracks and bridges to handle 286,000-pound cars. The authors calculate the internal rate of return for shortline investment and conclude that needed upgrades are unlikely to attract private investment due to negative rates of return. The main contribution of this paper is to identify the changing trends in railcar ownership, and show that this trend is unsustainable at current rates of returns to private car owners. Lastly, the paper identifies some possible economic implications if returns, which could come from the competitive workings of the railcar market, do not improve.

SHIFT IN RAILCAR OWNERSHIP

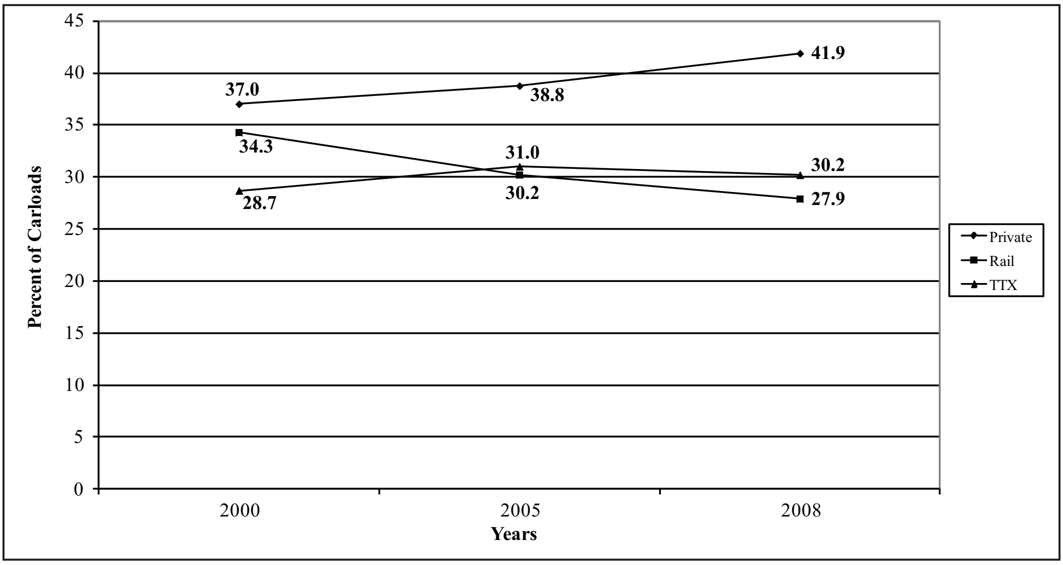
The analysis in this paper documents the shift to a fleet of railcars dominated by non-railroad leasing companies and shippers. The primary data sources used to illustrate these trends are the Railroad Carload Waybill Public Use data files from 2000, 2005, and 2008. The Railroad Waybill database, available from the Surface Transportation Board, Washington, D.C.,[2] is a stratified 1% sample of carload waybills for all U.S. rail traffic of U.S., Canadian, and Mexican origin submitted by those U.S. railcarriers terminating 4,500 or more revenue carloads annually (Surface Transportation Board 2008). It forms the basis for an estimation of the annual railroad carloads, tons, ton-miles, and revenues associated with U.S. railroad traffic. The Railroad Waybill database allows identification of the ownership of each freight car as well as the type of freight car involved in each shipment.

There are three freight car ownership categories identified in the waybill data. The first category is the private ownership category, which represents non-railroad leasing companies and shippers. The second category is the railroad ownership category which represents freight cars owned by individual railroads. The third category of freight cars is labeled as TTX cars, [3] which are owned by North America's leading railroads through the railroad-owned and controlled leasing company, TTX. TTX cars are leased to individual railroads on an as-needed basis.

Growth in Private Cars 2000-2008: Carloads, Tons, Ton-Miles, and Revenue

Figure 1 shows that private cars' share of total carloads increased 4.9% from 37% of total carloads in 2000 to 41.9% in 2008.[4] The increase in private car ownership share came from declines in the rail ownership category. The ownership share of TTX cars remained relatively stable over the study period. Clearly, private cars have become the dominant ownership category on a carload basis.

Figure 1: Distribution of Total Carloads by Ownership Category, 2000-2008



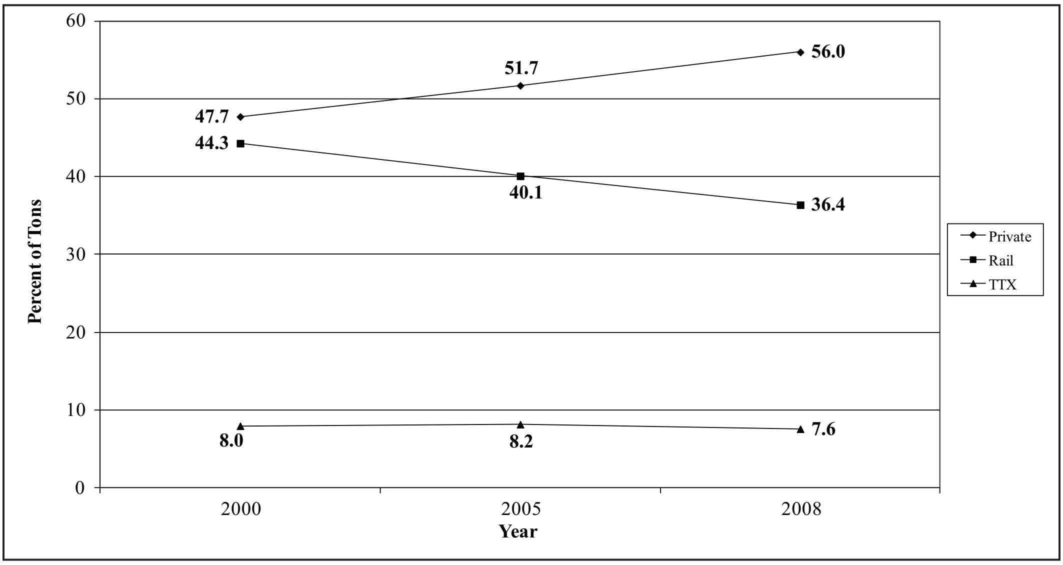
Source: Railroad Carload Waybill Data, Surface Transportation Board, Washington, D.C., Public Use File, 2000, 2005, and 2008.

Figure 2 reflects total tons moved on the railroad system by ownership category. The growth in the share of tons moved in private cars is very significant. In 2000, private cars accounted for 47.7% of total rail tonnage. By 2008, private cars accounted for 56% of the total rail tonnage, even as total rail tonnage was increasing. In contrast, rail-owned cars were responsible for 44.3% of total tonnage in 2000, but only 36.4% in 2008. The share of total tonnage in TTX-owned cars has been relatively stable.

In 2008, private cars moved 1.2 billion tons of freight on the railroad system, rail-owned cars moved 770 million tons, and TTX cars moved 160 million tons (Corsi and Casavant 2010). TTX cars handle a much smaller share of total tonnage carried on the railroads versus the percentage of carloads on the system. This is due to TTX cars' heavy participation in the intermodal market, which involves merchandise traffic with lower car weights than many of the bulk commodities (Corsi and Casavant 2011).

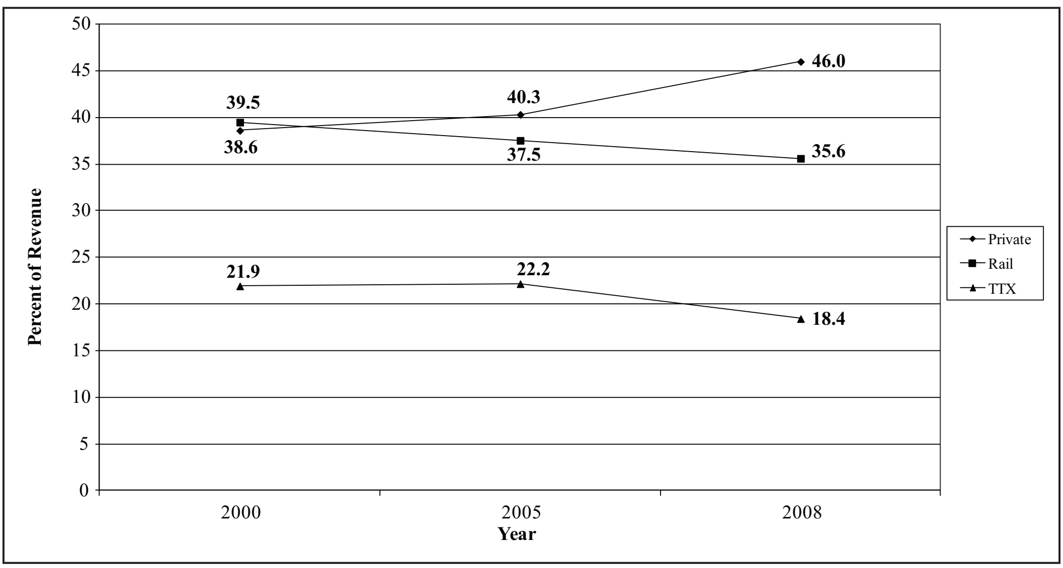
The distribution of total railroad revenue by ownership category is provided in Figure 3. Once again, participation of private cars increased throughout the study period. In 2000, 39.6% of railroad revenue was generated by private cars, increasing to 46% in 2008. In contrast, rail-owned cars accounted for 39.5% of the revenue in 2000, decreasing to only 35.6% in 2008. TTX cars accounted for 21.9% of total railroad revenue in 2000, dropping to only 18.4% of the revenue in 2008. In 2008, the railroads generated $72.6 billion in revenues; $33.4 billion was derived from private cars, $25.9 billion from rail-owned cars, and $13.4 billion from TTX cars.

Figure 2: Distribution of Total Tons by Ownership Category, 2000-2008



Source: Railroad Carload Waybill Data, Surface Transportation Board, Washington, D.C., Public Use File, 2000, 2005, and 2008.

Figure 3: Distribution of Total Railroad Revenues by Ownership Category, 2000-2008



Source: Railroad Carload Waybill Data, Surface Transportation Board, Washington, D.C., Public Use File, 2000, 2005, and 2008.

TTX cars, which represent a significant portion of the railroads' investment in railcars, accounted for 27.9% of all carloads in 2008, but represented only 7.6% of all tons, 12.3% of all ton-miles on the system, and 18.4% of their revenue (Surface Transportation Board 2008). This is a reflection of the TOFC/COFC movements in TTX cars, which more often than not consist typically of lighter weight-manufactured goods in contrast to movements in other car types, which focus on heavier bulk commodities, (e.g. private cars account for 41.9% of all carloads, but 56% of all tons and 54.3% of all ton-miles due to the heavier weight bulk commodities they carry).

Private Car Usage by Car Type, 2000-2008

This section investigates the significance of private railcars in a number of different car type segments, as well as the growing reliance on private railcars in these segments. Table 1 shows total rail system revenues in 2008 by car type and ownership category. Rail shipments are listed in 15 car type categories in accordance with Surface Transportation Board definitions.

Of the 15 car type categories, private cars account for the majority of railroad system revenue in six of the categories. The highest category of private car revenue generation is in the two tank car categories (under 22,000 gallons and 22,000 gallons and over); where over 99% of revenue is generated in private cars. There are virtually no railroad or TTX-owned tank cars even though tank car categories account for 11.7% of total railroad revenues in 2008. The second highest category of private car revenue generation involves open top hopper cars (special service). Private cars in this category contributed 75.2% of all railroad system revenues derived from this type of car and 9.1% of all railroad revenues.

Not only do private cars generate the majority of revenue for specific categories of cars but they also create the majority of revenues for the entire rail system. Private cars in three car type categories — plain box cars (50 feet and above), plain gondola cars, and covered hopper cars — accounted for over 50% of total railroad revenues in all three car types in 2008. In these three categories, private cars were responsible for 53.1%, 60.4%, and 59.0%, respectively, of the total revenues by these types of cars across all types of ownership. The covered hopper car category generated 20.6% of total rail system revenues in 2008, 59% of which was derived from privately owned cars.

TTX, which represents a significant railroad investment in railcars, did not participate in any of these six car type categories, although 53.81% of total railroad system revenues are generated by these six car types.[5] The TTX cars do, however, account for a majority of total railroad system revenues for TOFC/COFC intermodal movements.

Types of Products and Commodities Predominately Moved in Private Cars

Numerous industries in the U.S. economy are dependent on the availability of private railcars. The private rail fleet is singularly responsible for tank car movements, which primarily contain food products, chemical or allied products, and petroleum or coal products. The food product category includes primarily corn syrup, soybean oils, tropical oils and nut or vegetable oils. The chemical or allied product category consists predominately of alcohol, sulfuric acid, and fertilizers. Lastly, the petroleum or coal products category consists of liquefied gases, coal, or petroleum (Corsi and Casavant 2011). It is these industries that are so dependent on the continued availability of private tank cars.

Privately owned plain box cars are used to move the following commodities and products: paper waste, scrap, fiberboard, paperboard, pulp board, and beer. (Corsi and Casavant 2011). Coal is the primary commodity moving in privately owned open hopper cars and in plain gondolas (Surface Transportation Board 2010). Additionally, privately owned open hopper cars are used extensively to transport crushed stone, pulpwood, and other wood chips, while iron and steel scrap are the

Table 1: Railroad Revenue Distributed by Car Type and Ownership Category, 2008

Category	Private Revenue	% Private	Rail Revenue	% Rail	TTX Revenue	% TTX	Total Revenue	% of Total
All Cars	$33,391,590	45.98	$25,858,581,660	35.60	$13,378,665,046	18.42	$72,628,586,296	100.00
Plain Box Cars 50 ft. and Above	$248,461,061	53.15	$219,045,719	46.85	$0	0.00	$467,506,781	0.64
Equipped Box Cars	$542,362,011	10.51	$4,617,999,750	89.46	$1,841,080	0.04	$5,162,202,841	7.11
Plain Gondola Cars	$5,153,671,811	60.40	$3,379,570,732	39.60	$0	0.00	$8,533,242,543	11.75
Equipped Gondola Cars	$419,035,251	13.18i	$2,757,733,896	86.76	$1,741,200	0.05	$3,178,510,347	4.38
Covered Hopper Cars	$8,825,517,576	59.04	$6,121,275,268	40.95	$794,120	0.01	$14,947,586,964	20.58
Open Top Hopper Cars-- General Service	$996,167,748	29.11	$2,426,052,239	70.89	$0	0.00	$3,422,219,987	4.71
Open Top Hopper Cars--Special Service	$4,973,123,429	75.20	$1,640,271,651	24.80	$0	0.00	$6,613,395,080	9.11
Refrigerator Cars--Mechanical	$135,808,776	22.46	$468,933,643	77.54	$0	0.00	$604,742,419	0.83
Refrigerator Cars--Non-Mechanical	$18,048,440	4.96	$345,840,566	95.04	$0	0.00	$363,889,006	0.50
Flat Cars TOFC/COFC	$3,209,449,172	24.00	$1,470,997,537	11.00	$8,692,258,174	65.00	$13,372,704,883	18.41
Flat Cars--Multi-Level	$6,530,520	0.15	$583,326,737	13.55	$3,716,447,748	86.30	$4,306,305,005	5.93
FlatCats--General Service	$5,009,211	36.09	$7,128,600	51.36	$1,742,560	12.55	$13,880,371	0.02
Flat Cars--Other	$187,952,486	6.49	$1,745,894,119	60.28	$962,222,780	33.23	$2,896,069,385	3.99
Tank Cars-- Under 22,000 Gallons	$3,128,769,194	99.90	$3,251,084	0.10	$0	0.00	$3,132,020,278	4.31
Tank Cars-- 22,000 Gallons and Over	$5,389,617,640	99.99	$371,760	0.01	$0	0.00	$5,389,989,400	7.42

Source: Railroad Carload Waybill Data, Surface Transportation Board, Washington, D.C., Public Use File, 2008.

Table 2: Railroad Ton-Miles Distributed by Car Type and Ownership Category, 2008

Category	Private Ton-Miles	% Private	Rail Ton-Miles	% Rail	TTX Ton-Miles	% TTX	Total Ton-Mles	% of Total
All Cars	941386	54.26	580989	33.49	212670	12.26	1735045	100.00
Plain Box Cars 50 ft. and Above	3967	51.76	397	48.24	0	0.00	7664	0.44
Equipped Box Cars	11135	13.54	71096	86.43	32	0.04	82263	4.75
Plain Gondola Cars	285407	72.83	106458	27.17	0	0.00	391865	22.59
Equipped Gondola Cars	8105	16.62	40624	83.30	38	0.08	48766	2.81
Covered Hopper Cars	191741	52.65	172440	47.35	8	0.00	364189	20.99
Open Top Hopper Cars-- General Service	28593	35.30	52416	64.70	0	0.00	81009	4.67
Open Top Hopper Cars--Special Service	184695	79.27	48312	20.73	0	0.00	233007	13.43
Refrigerator Cars--Mechanical	2517	24.80	7629	75.20	0	0.00	10146	0.58
Refrigerator Cars--Non-Mechanical	393	5.68	6524	94.32	0	0.00	6917	0.40
Flat Cars TOFC/COFC	63732	24.00	292.10	11.00	172606	65.00	265548	15.30
Flat Cars--Multi-Level	73	0.25	3849	13.33	24961	86.42	28882	1.66
FlatCats--General Service	44	20.79	137	65.46	29	13.75	210	0.01
Flat Cars--Other	1723	3.19	37313	69.09	14972	27.72	54008	3.11
Tank Cars-- Under 22,000 Gallons	59805	99.91	53	0.09	0	0.00	59859	3.45
Tank Cars-- 22,000 Gallons and Over	97201	100.00	4	0.00	0	0.00	97205	5.60

Source: Railroad Carload Waybill Data, Surface Transportation Board, Washington, D.C., Public Use File, 2008 commodities that move predominately in privately owned plain gondolas. The importance of these industries in the U.S. economy is far reaching.

Finally, the major shippers of privately owned covered hopper cars transport bulk grains (including corn, soybeans, wheat, barley, sorghum), prepared feed, soybean meal and pellets, feed ingredients, flour, corn products, and grits; dry fertilizers, salt, clay, plastic materials, or synthetic resins; sodium compounds; and hydraulic cement (Surface Transportation Board 2000). Both the privately owned and TTX-owned TOFC/COFC flat cars handle miscellaneous mixed shipments.

Table 2 portrays the distribution of total rail system ton-miles in 2008 by car type and ownership category. Of the 15 car type categories listed in Table 2, private cars account for the majority of railroad ton-miles in six of the categories, identical to the ones in which they provided a majority of the total railroad revenues. The tank car categories accounted for 9.1% of total railroad system ton-miles in 2008. Private open top hopper cars (special service) transport 79.3% of all system ton-miles transported in this type car and generated 13.4% of all railroad system ton-miles. Privately owned plain gondola cars transport 72.8% of all system ton-miles transported in these gondola cars and generated 22.6% of total railroad system ton-miles. Plain box cars (50 feet and above) and covered hopper cars were responsible for 51.8% and 52.7% of the total ton-miles generated in these car types, respectively.

REPLACEMENT COST OF PRIVATE RAILCARS

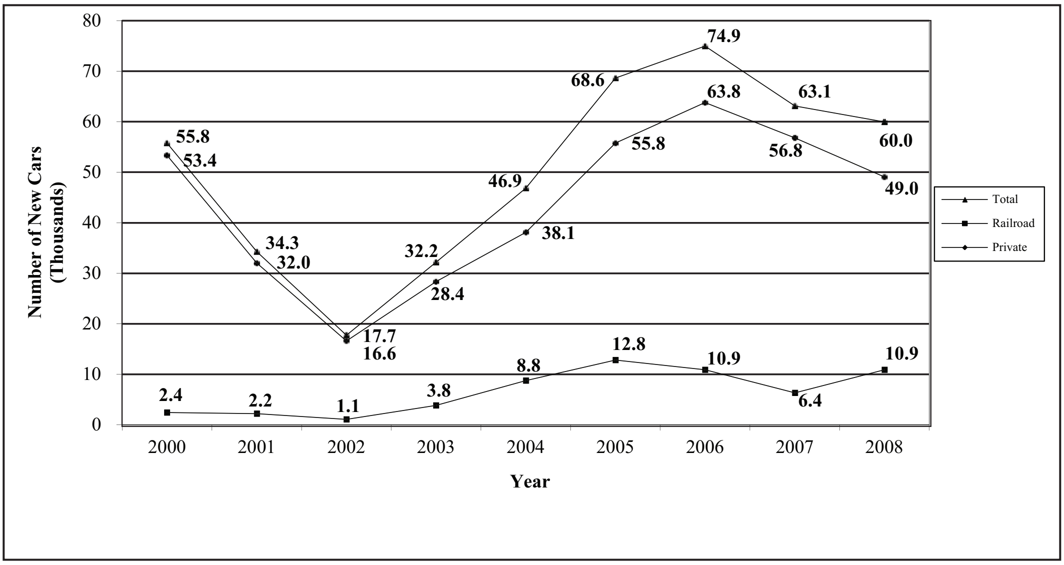
The total investment in the private fleet of railcars is highly significant and reflects investment that the railroads have not had to make. Railroads could not replace the investment made in the private fleet with their own equipment. Service disruptions would almost certainly result if private investment declined significantly. This would represent a significant challenge for distressed industries and an already strained national economy. Table 3 provides estimates of the magnitude of the investment costs associated with replacing the entire fleet of private railcars by identifying the current number of private railcars by category.[6] Investment in railcars represents a long term commitment since railcars are assets that typically have 40- to 50-year lives.

Table 3: Replacement Cost of Fleet of Private Railcars by Car Type

Equipment Category	Number of Private-Owned Cars	Replacement Costs Per Car	Total Replacement Costs
Plain Box Cars 50 ft and above	68,784	$107,000	$7,359,888,000
Plain Gondola Cars	154,593	$72,000	$11,130,696,000
Covered Hopper Cars	393,545	$74,500	$29,319,102,500
Open Top Hopper Cars	103,062	$80,000	$8,244,960,000
Flat Cars TOFC/COFC	15,524	$196,000	$3,042,704,000
Flat-Cars-General Service	37,133	$70,000	$2,599,310,000
Tank Cars-Under 22,000 Gallons	315,926	$86,000	$27,169,636,000
All Cars	1,088,567	--	$88,866,296,500

Source: Private railcar fleet size by car type from industry sources; Estimates of private railcar replacement costs by car type averaged from manufacturers, owners, and lessors. Costs are retail costs based on typical car in each car type category. Number of private-owned car data from UMLER (Equipment Management Information System 2010).

Figure 4: New Railcar Installations by Ownership Category, 2000-2008



Source: Progressive Railroading, June 2009.

If all 1.088 million private railcars were to be replaced, the total investment cost would be $88.9 billion. The car type category generating the largest portion of the total replacement cost is the private covered hopper category – the 393,545 covered hopper cars in the private fleet have an estimated replacement cost of $29.3 billion. The replacement cost for the second largest car type – tank cars – would be $ 27.2 billion for 315,926 tank cars.

To further analyze the importance of the investment in private cars to the railroad industry, we examined investments in freight cars brought into the fleet during the 2000-2008 time period. Figure 4 shows the number of new railcars by ownership category during this time period. There were 453,495 new railcars built, with non-railroad, private cars representing 87%, and only 13% being provided by the railroads.

During 2006-2008, the 169,644 new private railcars added to the fleet – at an average replacement cost of a new railcar at $87,056– represented a non-railroad investment in private railcars of $14.8 billion, minus the scrap value of any older cars retired. This compares with the approximately $10 billion in total annual expenditures for capital improvements by the railroads themselves.

A decline in the rate of return to private owners has coincided with a decrease in the number of new railcar installations. Even though new railcars continue to enter service, the numbers have fallen in recent years. The number of new installations is not enough to meet the replacement rate of old cars. As a result, the railcar fleet in North America is aging. The average car age has increased to over 25 years in the last 10 years (FTA Associates 2005). Low rates of return may cause problems in the future as the system ages and private investment drops off.

Overall, the rail industry, both railroads and shippers alike, have become almost completely reliant upon private car owners for investment capital in railcars. The railroads provide the locomotive power and physical infrastructure, while the overwhelming share of railcars comes from private, non-railroad investment dollars.

ADEQUACY OF RETURNS FROM INVESTMENTS IN PRIVATE CARS

The continued viability of the private fleet of freight-carrying railcars is dependent upon private fleet owners' returns on their investments. The options available to private railcar owners to obtain revenues for their cars include leasing their cars to shippers and railroads directly on both short- and long-term leases and arranging car-hire-based leases with individual railroads to compensate them for the use of their equipment, and selling cars to shippers.[7]

The following section provides an analysis of rates of returns in those cases in which data were available, and a summary of shippers' evaluation of their individual experiences with compensatory or non-compensatory rates. The analysis is based on a survey of all members of the North American Freight Car Association. Members of the association account for approximately 70% all privately owned railcars in North America (North American Freight Car Association 2011). Members were sent electronic surveys in which they filled in their answers to specific questions, including some with open-ended text-based answers. The response rate for the survey was near 100%, but with some item nonresponses.[8]

Questions in the national survey were focused on evaluating the extent of recent interchange rules and standards, the distribution of benefits and costs associated with these changes, and the perceived or documented impact of those changes on the cost structure of private car owners. Specific questions dealt with the changes in car maintenance costs, the causes of those changes, and the distribution of new costs between railroads and car owners. For a full description see Corsi and Casavant 2010.

Rates for Shipper Owned and Leased Cars

The majority of cars in the rail fleet are private cars either owned or leased by the shippers and provided to the railroads. Generally, private car owners negotiate a lease contract with a shipper, commonly a three-to five-year term tenure, at a given lease rate that provides expectations of a return over time to the lessor. Under this scenario, private car owners and shippers (lessees) assume the risk of market fluctuations, decreased demand, and other factors that affect the capital value of the car. Shippers pay the lease cost for the equipment and run the additional risk of reduced or inadequate compensation from the railroad, and any accessorial charges and other costs that arise from use of the equipment. While the shipper does obtain some benefit from providing cars, such as relief from demurrage if the cars are on industry track, the principal benefit is derived from ensuring the availability of cars at times when the market or the supply-chain needs require capacity and service.

The Interstate Commerce Act provides that shippers who furnish their own cars are entitled to reasonable compensation from the railroads. The Interstate Commerce Commission (ICC) has determined that private covered hopper cars operated by shippers are not entitled to fixed compensation from the railroads, but instead to a "market-level compensation," which was not defined by the ICC. A similar standard applies to privately financed cars furnished to (small) railroads by private sources. Indeed, market-level compensation is not easily identifiable or quantifiable in all cases. Of the survey respondents, 90% indicated that the costs they bore for routine running maintenance expenses, and the newly imposed accessorial charges assessed by the railroads, were, in some fashion, not being covered by the compensation paid by the railroads (Corsi and Casavant 2010).

As railroads worked with shippers to encourage them to provide car capacity, the method of compensation to shippers initially agreed upon for equipment other than tank cars was per mile allowances. Later, an alternative was adopted; a "differential" in rates between tariffs for railroad-provided cars and shipper-provided cars. Other early incentives for shipper investment in cars included initial mileage allowances of 35 cents to 50 cents, to as high as 60 cents per loaded mile for some commodities and movements (Corsi and Casavant 2010). Approximately 40% of survey respondents noted how over time these allowances have been substantially reduced, resulting in the current mileage allowances in the 18-21 cents per loaded mile range, a range identified by shippers as being non-compensatory. In some cases these allowances are not provided at all. Regardless of the method of compensation, shippers currently face a "silent investment loss" wherein allowances do not generate a return on leasing and accessorial charges sufficient to encourage future and continuing investment by shippers in the car fleet (Corsi and Casavant 2011).

The initial mileage allowances, resulting from statutory requirements, were designed to compensate shippers for their investment or the lease charges they paid, and served as an incentive for shipper-provided capacity. Currently, however, mileage charges at the existing level are only offered to and used by shippers for about 5%-10% of the railcar fleet, and these are offered only by select railroads (Corsi and Casavant 2010).

The common alternative is to use a spread rate for a given movement. The spread is the difference between the rates for a shipper-provided car versus a carrier-provided car. In this case, shippers are private car owners who negotiate directly with railroads.

This spread, or reduced tariff rate for the shipper-provided car, was originally calculated by using the basic mileage allowance of 24 cents per loaded mile times the estimated "turns" per month. A turn is a car's round trip to and from the originating market. Increased number of turns per time period means increased revenue. Over 50% of the responding shippers in the survey reported that the original 24 cents per loaded mile was not a compensatory rate, so any differential based on that rate was flawed.

This is even truer today where the current purchase price of cars is double what it was 20 or 30 years ago. The rate spread methodology was accepted, and, in most cases, welcomed by both carriers and shippers only because of the significant decrease in administrative activities of tracking mileage and determining costs. Today many carriers do not even offer spreads. For many of their rates they simply offer a rate in private cars for which car compensation is invisible.

In the mid to late 1990s, the shortage of cars, particularly covered hopper cars, resulted in shippers struggling to find adequate supply. To ensure a guaranteed car supply, shippers leased many cars and in numerous cases subleased them to railroads, which guaranteed shippers a minimum monthly supply of cars in return. In addition to the benefit of an increased supply of shipper-provided cars, sublease rates were compensatory. These sublease programs have since been discontinued by the railroads.

Additionally, more and more railroad rates have abandoned spreads and allowances altogether, with railroads claiming that their freight rates would have to increase if they paid private car compensation of any sort. Some private car movements today are entirely without discernable compensation to the car owner, according to 60% of the survey respondents that answered this question (Corsi and Casavant 2010). The main cost categories identified in survey responses were: lease costs, maintenance, repair, and new accessorial costs. These are costs that are covered by the shipper/private car owner and not the railroad.

Rate differentials are the difference in rates for railroad-owned or non-railroad-owned railcar shipments. Goods shipped in railroad-owned cars are typically charged more than if the shipper provides their own car. However, most rate differentials do not cover the lease or ownership costs due to additional costs imposed by railroads that were previously covered by the differential rates, such as routine maintenance costs as well as new accessorial costs, according to 90% of the survey respondents that answered this question. Private car owners identified operating, maintenance, and running repair costs at anywhere from \$800 annually per car for a low-mileage general purpose freight car to over \$10,000 per car for a high-mileage multi-platform intermodal car (Corsi and Casavant 2010). Furthermore, recent unilateral decisions by the railroads have put shippers in a position of paying additional costs in varying forms.

Significant rail line abandonments have severely shrunk the branch tracks available for storage and positioning of cars. For the past 10 years, shippers have had to move empty private cars off railroads' lines after being returned to a loading point or pay storage charges, or lease or rent track. The carrier-compelled need for storage of private cars has resulted in some shippers building new rail yards and facilities encompassing multiple private tracks that shippers have to maintain. Thus, in addition to providing their own fleets, shippers now find they are required to provide infrastructure and locomotive power. Railroads historically made these investments, but now shippers are forced to make up for the inadequacy of the railroad investment in cars. When normal maintenance costs along with storage charges are considered, then the rates of return outlined below fall significantly, making the overall investment in private railcars less justifiable from a rate-of-return perspective.

Finally, for railroad car types in which the railroads have no investments, e.g., tank cars, the railroads usually quote only a single rate to the shipper, which they assert is lower than it would be if they were providing the car. In this case, the shipper may also own railcars or have to contract with a third party to provide them. However, 50% of the survey respondents emphasized that they were left with no real way to verify these railroad claims. As indicated above, the railroads do pay mileage compensation on about 10% of tank car movements.

Car-Hire-Based Leases/Deprescription Rates

Private car owners may also act as leasers through formal agreements with producers who ultimately are the shippers. While some large producers, e.g., coal companies, have their own railcars, private shippers, e.g., grain elevators, who are separate from the railroad often handle the exchange from agricultural producer to destination. Car-hire-based leases compensate railcar owners who lease their cars to railroads who use their equipment in revenue-generating services. These types of arrangements generally involve small railroads with limited ability to make capital investments in cars. Through these leases, the leasing companies and railcar owners provide cars to railroads and receive payments based on hourly and mileage revenues that the car lessee receives from the railroads using their equipment as cars are interchanged.

Car-hire rates were initially determined through the use of a formula, developed by the ICC, to compensate car owners for the cost of equipment ownership along with a fair return on the investment. In an order effective on January 1, 1993, the ICC repealed the existing formulas for car-hire rates and adopted a then called market-based approach for setting car-hire rates, except for tank cars, which remained subject to prescribed car-hire rates (Corsi and Casavant 2011). The ICC's deprescription order was phased in over a 10-year period with full implementation becoming effective on January 1, 2003.

Deprescription rates are negotiated rates departing from the published rates. In theory, these rates are designed to reflect the market conditions of supply and demand. Deprescription is designed to result in negotiated rates between equipment owners and users to reflect market conditions. If, however, negotiations between the parties fail to reach an agreement, either party may request binding best and final offer arbitration, somewhat similar to the process employed by Major League Baseball to resolve player salary disputes. In the established Surface Transportation Board rules, the arbitration process is mandatory and legally binding. The associated arbitration fees are shared by both parties, up to a total of $2,000. Fees beyond this ceiling, however, are borne by the losing party in the arbitration process. Each party bears its own costs and legal fees.

Of overriding significance for the owners of railcars, however, is the extent to which market-based deprescribed rates provides the owners with a revenue stream that compensates them for the costs of ownership, plus a return on their original investment. In the case of railcars operating under deprescription rules, returns to private car owners have declined to the point of being marginally compensatory or nonexistent; such cars in many cases offer an average return of 3%, which is substantially below the railroad revenue adequacy standard of 10% defined by the STB (Corsi and Casavant 2011). In order to investigate this question, an empirical analysis was conducted of the adequacy of return rates associated with market-based deprescribed rates for the five most common different types of railroad cars: A405 Boxcars (50 ft. in length); A606 Boxcars (60 ft. or above in length); E530 Gondola cars; C112 Hopper Cars (3,000-4,000 cubic ft.); and C114 Hopper Cars (5,000 cubic ft.).

Estimating Rates of Return

Market deprescription rates were obtained from the Association of American Railroad (AAR) website, from which all records were selected where the Car-Hire Accounting Rate Master (CHARM) rate type code is equal to M (market rate) or S (spot market rate).[9] These rates are collected by railroads themselves. For each railroad car type, the average hourly market rate was calculated for each month of 2009 to get an annual average hourly rate.

It was assumed that the equipment would have a 70% utilization rate or 511 revenue hours per month (an industry average performance). Annual revenue was estimated on the basis of the hourly market rates and the assumed utilization factor. It is assumed that the mileage revenue received by the equipment owner would offset any maintenance expenses associated with the equipment.

Thirty-year rates of return were calculated for each type of equipment under the following set of assumptions: (1) annual revenue based on 730 revenue hours per month times 12 months times the average annual hourly market rate; (2) industry estimated car replacement costs based on current equipment retail prices; (3) a $5,000 residual equipment value at age 30; and (4) gross rail load of 286,000 lbs. for each railcar. The use of average annual rates is appropriate since railcar leases are typically a year or longer. Very few leases are signed for less than a calendar year.

Table 4 provides the implied 30-year rates of return under 2009 market-based deprescription rates for each of the five railroad car types. The return rates vary from a low of 2.19% for the A405 Boxcars to 3.84% for the C112 Hopper Cars and the E530 Gondola Cars. In all cases, these rates of return are below the 20-year risk-free treasury rate of 4.27% (as of May 4, 2010) and dramatically below the STB revenue adequacy return of around 10%.

Table 4: Market Deprescription Rates: Adequacy of Returns

Equipment Type	Average Hourly Rate	Equipment Replacement	Implied 30 Yr Return Rate	Risk Free 20 Yr. T-Rate
Boxcar A405	$0.78	$107,000	2.19%	4.27%
Boxcar A606	$0.8	$120,000	2.33%	4.27%
Gondola E530	$0.65	$72,000	3.84%	4.27%
Hopper C112	$0.63	$74,500	3.84%	4.27%
Hopper C114	$0.64	$80,000	2.95%	4.27%

Source: Equipment Management Information System, 2010 (286 GRL assumed); average hourly rate: 2009 average market rate; equipment cost: industry estimates; 30-year return rate: assumes 70% utilization, 511 revenue hours per month $5,000 residual value at age 30; risk-free 20-year T-Rate as of May 4, 2010.

The market-based deprescribed rates appear to have not yielded car owners a return rate that compensates them for their investments compared with available alternatives. In part because the difference in price charged by railroads based on whether cars are private or owned by the railroad has been declining (Corsi and Casavant 2011).

Indeed, the 30-year rates of return are substantially below the risk-free Treasury bill rates. It is safe to assume that unless rates of return are increased, investors will find more appropriate uses for their capital investments, and the railroad industry will find itself in an unsustainable position going forward absent a substantial investment in railcars. This analysis is limited to the monetary returns of railcar ownership. Surely, owners benefit from car ownership in other ways, for example, faster and more reliable service, increased certainty in car capacity availability, and improved ability to forecast their own movements for their internal needs.

Note too that the comparison on return rates of the risk-free Treasury bill does not even compare with a more appropriate point of reference—the internal rate of return used by the railroads themselves in making investments. Indeed, the railroads seek a 10% return rate on their own investments—significantly above the Treasury bill return rate. The data show that deprescribed rates have failed to deliver compensatory rates of return for equipment owners. If rates of return remain at low levels, future private investments will decrease. The next section details some of the costs that have been shifting to car owners; however, a full investigation into all sources of low returns is beyond the scope of this paper and left to future work.

Continued Shifting of Costs

The previous section covered economic conditions that affect revenue generation from private car ownership. This section analyzes factors that impact the cost of car ownership. Many costs that were traditionally paid by railroad companies are now being paid by car owners. Such shifts amplify pressures on the revenue side.

Railroads are in charge of fitting cars with wheel sets. A wheel set consists of a single axle and two wheel plates which roll along the track. An issue has arisen regarding the allocation of new versus used wheel sets. Some survey responses indicated that some railroads are applying the higher priced new wheel sets to privately owned freight cars and retaining the lower priced turned wheel sets for their own fleet of freight cars (Corsi and Casavant 2010). Another issue is the Single Car Air Brake Test. The AAR chargeable price for a car that is past due is higher than the cost of a car not overdue. While not well documented in the survey, the understanding is that the added charge is for the cost to move the car to a repair track. However, that cost is also included in the AAR Labor Rate Overhead under "Switching."

When car parts are found missing from cars in railroad possession, the railroads historically paid for the missing parts. Now, railroads accept responsibility only when railroad documentation of their removal is produced. Car parts lost or stolen while a car is in a railroad's possession are left for the car owner to pay, even though the car owner has no control of the car in the train. Looking into the future, the advent of electronic brakes and positive train control has both safety and efficiency benefits. The Federal Railroad Administration has already identified the benefits of electronic brakes as accruing to railroads primarily as a result of increased railroad operating efficiency and fuel cost reductions. Concerns about the future allocation of the estimated $6 billion cost of this innovation are self-evident.

The industry survey found numerous instances of new rules shifting costs or increasing costs to car owners when car owners do not share in the benefits resulting from implementation of those rules. Most changes in the AAR Interchange Rules are related to safety or efficiency improvements on the part of the railroads and the private car owners (who may also be shippers). Two major changes, the Wheel Impact Load Detectors (WILD) rule and the Long Travel Constant Contact Side Bearings (LTCCSB) rule, have been shown to produce substantial efficiency benefits to the railroads and minor public safety benefits.

From an economic efficiency and welfare perspective, benefit/cost ratios should be calculated both for the industry as a whole, and the distribution of benefits between railroads and car owners. The results should form the basis for distributing costs among affected parties. For the market to work for car investment there needs to be an equitable, non-discriminatory, and transparent interchange rule process.

CONCLUSION

The dependence of the railroad industry, the shippers using that industry, and the United States economy on the private car rail fleet is dramatic and growing. Private car owner equipment now carries 54% of total ton miles and 56% of total tonnage moved by railroads, and 87% of new investment in railroad cars has been made by private car owners.

Returns to the private car owners are considered barely compensatory. Under the deprescription rules, the ROI of the revenue streams is at least 30% below the lowest risk-free Treasury Bill (an average of 3%, compared with 4.27%, both substantially below the railroad revenue adequacy standard of 10%). While there are other benefits to private car ownership, such as more responsive service, car capacity availability, and ability to forecast their own movements, the monetary returns remain low. The required investment to replace the current private car numbers is staggering, about $90 billion would be required to replace the current private car fleet at current replacement values. The overall adequate supply of railcars is a critical component of the freight rail supply chain, including the efficient delivery of products to the nation's producers and consumers.

The results presented here are based on readily available data, and are a good starting point for documenting the low rates of return to railcar ownership. A more formal statistical investigation into exact causes of low returns is a promising question that is left for future work. This paper suggests that more work is needed to understand why rates are low, and if the driving force is market driven, regulatory driven, or both. It is possible that market forces would resolve the returns issue over time if no significant market imperfections exist. Otherwise, regulatory action may be needed.

This tenuous situation is further exacerbated by continual cost shifting from railroads to shippers or owners. Changes in regulations have forced significant increased costs, such as those for WILD, LTCCSB, among others, to be borne by the car owner, even though the benefits of these improvements are received in most cases by the railroads. Other shifts have forced car owners to build new rail yards and facilities encompassing multiple private tracks. They now have to maintain investments they were forced to make to achieve what the railroads used to provide. The loss or lessening of these private car investments would create dramatic economic impacts.

Endnotes

1. William E. O'Connell is the retired Chessie Professor of Business at the College of William & Mary, Williamsburg, Virginia.

2. Surface Transportation Board. "2008 Public Use Waybill. Washington DC,. 2008 Accessed August 2, 2011 http://stb.dot.gov/stb/industry/econ_waybill.html.

3. Although the 1990 Railroad Carload Waybill Public Use data files are available, the 1990 data file does not identify the TTX ownership category, instead including the TTX data in the private car ownership category. In order to portray an accurate picture of the dynamic redistribution of traffic among the three categories, this paper focuses on the years for which the three ownership categories were identified.

4. Data for all figures come from the Railroad Carload Waybill Data, Surface Transportation Board, Washington, D.C., Public Use File, 2000, 2005, and 2008.

5. The six car types are: plain box cars 50 ft. and above, plain gondola cars, covered hopper cars, tank cars under 22,000 gallons, tank cars 22,000 gallons and over, and open top hopper cars-special service.

6. While it is unlikely the entire private fleet would be replaced with new railroad-owned cars, if low returns resulted in all private car owners leaving the business, the actual investment decisions in these circumstances are difficult to predict, as it would involve railroad choices between keeping older, smaller, and more maintenance-intensive cars and replacing them with newer, larger cars.

7. All private cars must obtain OT-5 operating authority to originate loads. We found some private car owners noting that certain railroads have been denying OT-5 operating authority on the grounds that they have too many cars. This is against STB rules stating that OT-5 operating authority may not be denied except for safety or mechanical reasons or a lack of adequate storage space for the cars. Such denials may, indeed, impact the revenue opportunities for private car owners.

8. The North American Freight Car Association has approximately 31 members, so a 100% response rate is not unexpected.

9. Accessed May 10, 2011. http://www.aar.org/StatisticsAndPublications.aspx.

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