Mississippi Log Trucking Liability Insurance Premiums: A Hedonic Analysis

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Abstract

Rising liability insurance premiums have negatively impacted log trucking businesses in Mississippi and across the southeastern United States. A statewide mixed-mode log trucking business owner survey was used to study factors impacting liability insurance for Mississippi timber transportation. A hedonic regression model was developed to identify operational characteristics that significantly influenced insurance premiums. Marginal implicit prices were calculated to reveal an average per unit monetary contribution of each significant attribute while holding the others constant. The 3-year inflation-adjusted average for Mississippi companies was $12,466 per truck per year, with a minimum value of $4,000 per truck per year and a maximum of $24,404 per truck per year (all values in US$). On average, each year of owner experience provided a mean insurance premium discount of $72.42. Each additional 1,000 miles (1600 km) traveled by log trucks at the mean insurance premium was valued at $50.00; each safety violation was valued at $3,322; and an overweight violation was valued at $1,311. Implementation of safety practices and safety equipment did not significantly impact insurance premiums. Companies were not directly rewarded for using safety equipment and safety practices but were penalized through increased policy rates when cited for safety and overweight violations. Investing in safety practices (e.g., regular truck inspections, truck driver training, repair and maintenance programs, etc.) and safety equipment (truck scales, cameras, truck tracking, telematics, etc.) would reduce roadside inspection citations and crashes, which contribute to rising liability insurance premiums.

The log trucking industry, which is the overwhelming mode used for transporting harvested timber from harvesting sites to wood processing mills in the United States, has been negatively impacted by rising insurance premiums (Conrad 2017, 2018; Conrad and Blinn 2024). Some log trucking businesses have been forced to restructure or cease operation (Conrad 2023). The American Transportation Research Institute (ATRI) reported liability insurance cost per mile increases of 40 percent from 2012 through 2022 for the United States trucking industry across all sectors (ATRI 2023, Leslie and Murray 2023). Insurance providers have increased premiums largely due to high risk, the rising cost of claims from lawsuits, and inflation relating to equipment and medical costs (Baker and Tyson 2017, Murray and Glidewell 2019, Amacher 2023), which has constrained profits (Murray et al. 2020, Leslie and Murray 2023).

Liability insurance premiums increased, on average, by 50 percent from 2011 to 2016 for Georgia log trucking firms, which was more than three times higher than other sectors in the trucking industry (Conrad 2017). Between 2018 and 2021, average liability insurance increases above 50 percent continued for log trucking firms in Alabama, Arkansas, Florida, Georgia, Louisiana, and Mississippi (Conrad 2023). The differences in premiums paid between log trucking and other trucking sectors could be related to the adverse in-woods conditions in which log trucks operate, traveling on rural roads away from interstates, the severity of crashes, the use of older trucks compared to other industries, and inconsistency related to repair and maintenance procedures (Baker and Tyson 2017, Conrad 2023). Substantial variation in liability insurance premiums paid by individual companies has also been documented. Across the southeastern United States, over 20 percent of log trucking companies reported relatively low increases, while a similar proportion noted increases of over 50 percent (Conrad 2017, 2023). This variation can be attributed to

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differences in operation size (Leslie and Murray 2022), driver safety records (Conrad 2017), safety violations (Baker and Tyson 2017), safety strategies, and crashes (Conrad 2023).

Variation in insurance premiums paid by log trucking firms provided an opportunity to research business management practices and company characteristics that contribute in some manner to the prices set by insurers. This study sought to determine attributes that were key predictors of insurance premiums paid by log trucking firms in Mississippi, southeastern United States.

Conceptual Framework

The use of supply and demand concepts to determine prices for uniform farm outputs, such as corn and soybeans, is relatively uncomplicated (Kennedy et al. 1997). Valuation of differentiated goods, such as a house, becomes more complex because bedrooms, bathrooms, and other attributes cannot be sold individually (Kennedy et al. 1997). Hedonic regression, as a revealed preference approach, is useful for determining the value contributions of specific characteristics to a product (DeHaan and Diewert 2013). The asset's price is considered to be the whole of a disaggregated set of prices, often termed marginal implicit prices, for each value-added component (Sopranzetti 2015).

The hedonic model's implicit form is

$$P(Q) = P(q_1, q_2, \ldots, q_r), \quad (1)$$

with product Q possessing a number of r characteristics denoted by q. The product Q carries price $P(Q)$, which depends on the intensity of each q embodied in Q (Rosen 1974). When theory or prior knowledge from the literature does not provide guidance on an explicit functional form, Box-Cox methods have been employed (e.g., Jordan et al. 1985). Palmquist and Danielson (1989) stated that the semilogarithmic hedonic model was a preferred functional form for farmland economic studies, including variables with both linear and nonlinear relationships with price per acre. Timberland economic studies in both Louisiana and Mississippi have applied the semilogarithmic function because price per acre decreased nonlinearly with tract size, but it changed linearly with other noncategorical factors (Kennedy et al. 2011, Hussain et al. 2013). Hedonic methods have been applied in agriculture and forestry in the southern United States for decision-making, determining land values based on tract qualities, and to analyze characteristics that influence loblolly pine (*Pinus taeda*) plantation thinning logging costs. Palmquist and Danielson (1989) originally applied hedonic models in agriculture to provide useful decision-making tools for agriculture landowners when considering erosion control, drainage practices, and US Department of Agriculture cost-share programs in North Carolina. Kennedy et al. (2011) applied hedonic modeling in northern Louisiana to calculate marginal implicit prices of factors that impacted timberland values, which included tract location and tract development. King and Schreiner (2004) examined the characteristics that had the largest impact on timberland sale price in southeast Oklahoma. McConnell (2022) investigated how loblolly pine plantation logging costs were impacted by tract acreage, site index, and planting density.

Hedonics have also been applied to attributes within the trucking industry. Spady and Friedlaender (1977) established the use of hedonics to consider factors such as length of haul, insurance, average load size, and shipment type when making loaded ton-mile (kg/km) comparisons between full truckloads and partial truckloads. Konishi et al. (2014) developed models with hedonic principles to analyze factors relating to the costs and benefits of time-efficiency technologies in the trucking industry. Adenbaum et al. (2019) applied hedonic principles to evaluate the desire of trucking business owners to invest in fuel-saving truck attributes.

Methods

Survey data

Log trucking firms based in Mississippi, southeastern United States, were surveyed during late 2022 and early 2023. A foundational study in evaluating the log trucking industry at the state level by Mason et al. (2008) provided a framework for analyzing the log trucking industry in Mississippi. Specificity was then added to this study's questionnaire to better understand localized factors affecting Mississippi log trucking businesses. It was reviewed and pretested by Mississippi log trucking companies, industry trade association representatives, forest operations researchers, and insurance industry professionals. The Mississippi State University Human Research Protection Program and Institutional Review ruled the study qualified for an Exemption Determination (the survey may be referenced using number IRB-22-200).

In total, 1,051 log trucking firms, identified through the Mississippi Forestry Association's Professional Logging Manager database, were provided an opportunity to participate through either in-person or Internet-based survey phases. The tailored design method was followed to inform businesses of the survey and to increase participation through reminders and by offering multiple opportunities for response during separate survey phases (Dillman et al. 2014).

The initial phase surveyed participants at Mississippi Loggers Association (MLA) district meetings and a forest products manufacturer's producer meeting during October and November 2022. Businesses unable to attend a meeting but with email addresses listed in the database were asked to participate in an online version of the survey in Qualtrics during November and December 2022 (Qualtrics 2022). Companies unable to attend an MLA meeting but without email addresses listed in the database were mailed a series of three postcards with a quick response (QR) code during January and February 2023. Scanning the code allowed the survey to be completed using smartphones or other devices. Wave analysis of the separate survey phases, as described in Armstrong and Overton (1977), was conducted as a nonresponse bias assessment using the Kruskal-Wallis test at alpha = 0.05 in SAS version 9.4.

Response data were entered into a Microsoft Excel spreadsheet, where survey respondents resided along the rows, and survey questions were coded down columns. The authors' knowledge of the log trucking industry identified 81 clear occurrences of non-sampling error along with missing values out of 1,078 data points. Examples of non-sampling error included responses that listed owner age

Table 1.—Mississippi log trucking semilogarithmic hedonic regression model variables for analysis of mixed-mode survey data collected during 2022 to 2023. Independent variable names are per Equation 2.

Distribution	Variable	Description	Original data units
Continuous	ln(premium)	Logged insurance premium	Dollars per year per truck
Continuous	ln(years hauling)	Logged years in business	Years
Continuous	ln(owner age)	Logged owner's age	Years
Continuous	ln(miles per year)	Logged average total distance traveled	Miles traveled per year per truck
Continuous	ln(haul distance)	Logged average one-way haul distance	Miles from forest to mill per truck
Continuous	ln(loads per week)	Logged average production	Loads per week per truck
Discrete	Number drivers	Number of employees	Count of drivers
Discrete	Safety vio	Number of safety violations	Count of 2021 citations
Discrete	Service vio	Number of out-of-service violations	Count of 2021 citations
Discrete	Weight vio	Number of overweight violations	Count of 2021 citations
Discrete	Safety tech practs	Safety technology and practices	Score (total number utilized)

below five years old, unrealistically low yearly individual truck mileage totals of less than 16,000 miles (25,750 km) per year, and excessive trucking distance of 300,000 miles (482,800 km) per year. An example of improbable production totals in relation to equipment used included a firm that reported 28 loads per week using seven trucks. Missing values occurred when respondents did not provide the requested information. All blank entries, either from respondent omission or removal due to perceived non-sampling errors, were replaced with a period (.) as an SAS coding requirement. It is critical to note that weight, service, and safety violations were left as provided by respondents and not modified in any way. It was not known if there were truly no violations or if the respondents did not want to reveal their shortcomings.

The joint hot deck method in SAS replaced missing values and those deemed as non-sampling errors (SAS Institute 2021). The hot deck procedure first sorted observations with complete data pertaining to variables, such as production per week and number of trucks used, to form a deck, also known as a donor pool (Myers 2011). The missing data cells are imputed with information from a donor with comparable characteristics from the same deck (Andridge and Little 2010). Steiner et al. (2016) found that the hot deck method improved performance during a forest product manufacturing process by replacing values missing due to sensor errors. Nusser and Goebel (1997) used hot deck imputation to replace missing historical US Department of Agriculture Natural Resources Inventory data to create a database for analyzing agricultural and ecological variables over time.

Hot deck imputation was performed using the SURVEYIMPUTE procedure with the simple random samples with replacement (SRSWR) option (SAS Institute 2020). This option randomly sampled data provided by the log trucking business owners by allowing an observation to be selected more than once (SAS Institute 2021). A seed number was set to consistently generate identical output for analysis. There were 13 instances of no response to the number of safety, weight, and out-of-service violations incurred. Again, these data were not imputed because it was not known whether the omissions meant there were no violations or there was another reason for not providing the information. The SURVEYIMPUTE procedure discarded an entire replicate's data row when cells were recorded as blanks.

Hedonic regression model

A two-step hedonic regression process was used to analyze a liability insurance premium paid as a function of its attributes. The first step determined the regression equation's coefficients and then calculated a predicted average liability insurance premium while holding all predictors at their mean levels. Statistical significance was assessed at alpha = 0.05. Then, a marginal implicit price associated with each significant independent variable was calculated from the predicted liability insurance premium. Company attributes examined included operation size (number of drivers), level of experience (years hauling timber and owner age), exposure to accidents (truck mileage per year and one-way haul distance), traffic law violations (overweight and safety citations), and the use of safety technology and safety equipment.

Visualization of the independent variables alongside the insurance premium showed that continuous variables had nonlinear associations, and discrete variables possessed linear relationships (Table 1). Natural logarithms were calculated for the continuous variables' data; these were insurance premium per truck, years hauling timber, owner age, average reported values over a year for truck mileage, loaded one-way haul distance, and loads per week. The discrete variables' recorded data included numbers of drivers, safety violations, service violations, weight violations, and safety practices and technologies implemented (hereafter collectively termed a score).

The log trucking insurance premium hedonic model constructed was of semilogarithmic functional form

$$\begin{aligned} ln(premium) = {} & ln\alpha_0 + \alpha_1 ln(years\ hauling) \\ & + \alpha_2 ln(owner\ age) + \alpha_3 ln(miles\ per\ year) \\ & + \alpha_4 ln(haul\ distance) \\ & + \alpha_5 ln(loads\ per\ week) \\ & + \beta_1\ (number\ drivers) + \beta_2\ (safety\ vio) \\ & + \beta_3\ (service\ vio) + \beta_4\ (weight\ vio) \\ & + \beta_5\ (safety\ tech\ practs) + \varepsilon \qquad (2) \end{aligned}$$

where α_i represent the regression coefficients associated with the continuous variables in Table 1, β_j are the regression coefficients associated with the discrete variables in Table 1, and ε is the error term. Equation 3 calculated marginal

Table 2.—Descriptive statistics for Mississippi log trucking firms ($n = 98$) responding to a mixed-mode survey during 2022 to 2023.

Variable	Mean	Median	SD	Min.	Max.
Insurance premium ($)[a]	12,465.63	11,580.46	4,815.01	3,999.80	24,403.94
Years in business	20.34	18.00	13.83	1.00	60.00
Owner age (yr)	51.32	52.00	12.23	27.00	81.00
Miles per year traveled[a]	69,530.51	70,003.46	25,894.87	20,000.25	174,992.78
One-way miles of haul[a]	56.50	59.00	14.71	30.00	100.00
Loads per week[a]	16.88	13.54	11.24	5.00	90.00
Drivers per company	3.91	3.00	2.71	0.00	16.00
Safety violations[a]	0.19	0.00	0.44	0.00	3.00
Out-of-service violations[a]	0.04	0.00	0.12	0.00	0.67
Overweight violations[a]	0.83	0.57	0.89	0.00	4.00
Safety score[a]	7.03	7.00	2.98	1.00	16.00

[a] Per truck basis.

implicit prices of the continuous variables using the natural log-log back transformation

$$MIPx = \left[\left(\left(e^{\frac{\alpha_i}{\overline{x_i}}}\right) - 1\right) \times 100\%\right] \times \bar{Y} \tag{3}$$

where $MIPx$ is the marginal implicit price of a continuous variable, e is the natural logarithmic base, α_i is the hedonic regression coefficient associated with x_i, $\overline{x_i}$ is the mean of untransformed values of each continuous predictor variable x_i, and $\bar{Y}$ is the predicted arithmetic mean liability insurance rate at the average levels of all x and z. The $\bar{Y}$ was corrected from a geometric mean to an arithmetic mean using the correction factor of one-half the regression's mean square error, $MSE/2$. Equation 4 determined marginal implicit prices of the discrete variables using the natural log-linear back transformation

$$MIPz = \left[\left(\left(e^{\beta_j}\right) - 1\right) \times 100\%\right] \times \bar{Y} \tag{4}$$

where $MIPz$ is the marginal implicit price of linear discrete variables, e is the natural logarithmic base, β_j is the regression coefficient associated with z_j, and $\bar{Y}$ is the predicted mean liability insurance rate at the average levels of all x and z. The $\bar{Y}$ was corrected to an arithmetic mean as described earlier.

Results

In total, 130 companies provided usable information for a response rate of 12.4 percent. Analysis was conducted using data from $n = 98$ firms that completed at least 75 percent of the questionnaire for a response rate of 9.3 percent. Nonresponse bias was insignificant across survey waves for any questions used in this study ($p > 0.05$ in all cases). Descriptive statistics are provided in Table 2. Means for the continuous variables, normalized on a per truck basis, included insurance premium per truck ($12,466/truck), years hauling timber (20 yr), owner age (51 yr), truck mileage per year (69,531 miles/yr/truck), loaded one-way haul distance from the forest to the mill (57 miles/truck), and loads per week (17 loads/wk/truck). Means for the discrete variables included number of drivers per company (4 drivers/company), safety violations (0.19 violations/truck), out-of-service violations (0.04 violations/truck), overweight violations (0.83 violations/truck), and safety practices and technologies score (7). Violations from Mississippi Department of Public Safety inspections were collected for 2021 and normalized on a per truck basis. Safety violations resulted in a citation, but the vehicle was allowed to continue operating. Out-of-service violations were more serious, resulting in the vehicle being ruled inoperable. Overweight violations occurred when a ticket was issued for exceeding the state law maximum payload. The safety practices and technology score was the sum of responses affirming the use of safety equipment and safety practices from the provided lists.

The hedonic model was built on $n = 85$ observations. No linear regression assumptions were violated, such as residual normality (Shapiro-Wilk $p = 0.1616$) and heteroscedasticity (Breusch-Pagan $p = 0.3946$). Variance inflation factors (VIF) were well below 10.0, indicating no problems with multicollinearity. While the R^2 value indicated that 25 percent of the variance in logged trucking premiums was explained by the independent variables included in the model, those variables significantly influenced log trucking liability insurance premiums ($p = 0.0120$).

Significant predictors included logged years in business ($p = 0.0442$), logged miles annually traveled by log trucks ($p = 0.0044$), number of safety violations ($p = 0.0118$), and number of overweight violations ($p = 0.0339$) (Table 3). Coefficients with a positive value indicated an increase in mean insurance premium with each additional unit, while negative values meant each additional unit reduced the mean premium. Other company attributes examined but not significantly different from zero at alpha $= 0.05$ included the one-way haul distance from the harvest site to the mill ($p = 0.1595$), owner age ($p = 0.1790$), loads per week ($p = 0.4766$), safety score ($p = 0.4939$), the number of company-employed drivers ($p = 0.8064$), and out-of-service violations ($p = 0.8718$; Table 3).

The marginal implicit price of each significant attribute was calculated per Equations 3 or 4 as appropriate. This revealed the value contribution of each additional unit of a characteristic while holding all other factors constant. The predicted arithmetic mean insurance premium per truck, when all predictors were entered at their average values, was $12,069 (all values in US$). Each year of operation reduced a business's mean insurance premium by $72.42 due to the negative coefficient (Table 4). The average insurance premium increased by $0.05 per mile driven per year, or $50.00 per 1,000 miles (1600 km) traveled. Every safety

Table 3.—Hedonic regression results where the dependent variable was logged Mississippi log trucking business insurance premium. Independent variable names are per Equation 2. Significant variables at alpha = 0.05 are italicized. Data were collected using a mixed-mode survey during 2022 to 2023.[a]

Independent variables	Estimated coefficient	Standard error	*t* statistic	*p*-value
Intercept	6.1329	1.4034	4.37	<0.0001
ln(years hauling)	*−0.1224*	*0.0598*	*−2.05*	*0.0442*
ln(owner age)	0.3249	0.2350	1.38	0.1709
ln(miles per year)	*0.2709*	*0.0920*	*2.94*	*0.0044*
ln(haul distance)	−0.2311	0.1626	−1.42	0.1595
ln(loads per week)	0.0578	0.0808	0.72	0.4766
Number drivers	−0.0048	0.0194	−0.25	0.8064
Safety vio	*0.2431*	*0.0941*	*2.58*	*0.0118*
Service vio	−0.0546	0.3372	−0.16	0.8718
Weight vio	*0.1031*	*0.0477*	*2.16*	*0.0339*
Safety tech practs	−0.0097	0.0142	−0.69	0.4939

[a] Mean square error = 0.1214; $R^2 = 0.2528$; $F = 2.5035$, $p = 0.0120$.

violation influenced the average insurance premium by $3,322. An overweight violation contributed $1,311 to the average insurance premium.

Discussion

Log trucking firms in the southeastern United States have experienced large increases in liability insurance premiums since 2012 (Conrad 2017). In 2013, Georgia log trucking companies paid an average yearly liability insurance premium of $2,969 per truck, with the range from minimum to maximum values being $2,300 (Conrad 2018). In 2017, the average premium paid by Georgia firms was $6,458 per truck, with a reported range of $10,000 (Conrad 2018). The inflation-adjusted equivalents of this study's average Mississippi insurance premiums were $10,818 in 2013 constant dollars, with a range of $17,706 and $11,330 in 2017 constant dollars with a range of $18,545. These comparisons cannot necessarily capture compositional and size differences of firms between the two states, regulatory environment divergences, or other unexplained differences not captured by inflation. They do show, in general terms, the magnitude of the increase in the average and spread of insurance premiums over the previous eight years. The expanding range illustrates the utility of calculating marginal implicit prices to determine business attributes contributing to insurance premiums.

The greater marginal implicit prices associated with log trucking insurance premiums were linked to safety violations ($3,322 per violation) and being cited for overweight loads ($1,311 per violation). Implementing safety practices and/or safety equipment and technologies did not significantly affect log trucking insurance premiums ($p = 0.4939$). This indicated that insurance companies did not directly reward companies for implementing safety practices to adhere to highway laws and regulations. However, business owners were penalized through increased insurance premiums when cited for safety and overweight violations. While insurance premiums were not directly influenced, it is known that using scales, cameras, truck tracking, pretrip inspections, safety meetings, driver training, and other tools collectively can create an environment where numbers of potential crashes are diminished (Camden et al. 2022; Conrad 2019, 2023; Smidt et al. 2021). Reduction in traffic crashes was found to be the most significant approach to combat rising log truck liability insurance premiums (Conrad 2023). This suggests that safety tools, technologies, and practices perhaps instead act as a more indirect effect on insurance premiums that is transmitted through crash data.

The challenges associated with rising insurance premiums are amplified within the log trucking sector due to risks associated with heavy loads hauled on rural county and state roads (Greene et al. 1996). These road classes experience increased travel through congested intersections, school zones, and traffic lights (Conrad 2019). The transportation network in Mississippi consists of 74,000 miles (120,000 km) of roads, with approximately 85 percent of this total occurring in rural areas where log trucking primarily operates (Federal Motor Carrier Safety Administration [FMCSA] 2023). The Mississippi Motor Carrier Safety Division (MCSD) prioritizes these rural areas to patrol and conduct roadside inspections to reduce the number of commercial vehicle crashes in these areas (FMCSA 2023). The MCSD's goals have included increasing the number of roadside inspections and reporting trucking firm and driver infractions to the FMCSA's Compliance, Safety, Accountability (CSA) program (FMCSA 2023). These actions have improved highway safety and prevented mechanical failures that contribute to accidents (FMCSA

Table 4.—Hedonic regression results and marginal implicit prices (MIP) for statistically significant independent variables where the dependent variable was logged Mississippi log trucking business insurance premium. Variable names are per Equation 2. Data were collected using a mixed-mode survey during 2022 to 2023.

Independent variables	Estimated coefficient	MIP at arithmetic mean	Unit
ln(years hauling)	−0.1224	(−$72.42)	Per year
ln(miles per year)	0.2709	$0.05	Miles per year
Safety vio	0.2431	$3,321.85	Per violation
Weight vio	0.1031	$1,310.54	Per violation

2023). Log truck crashes due to mechanical failure, specifically related to brakes, tires, lighting, and other defects, decreased significantly in Georgia after roadside inspections of log trucks were implemented in 1991 (Greene et al. 1996, 2007). Clonch et al. (2023) found that increased enforcement of Occupational Safety and Health Administration safety standards in Washinton and Oregon reduced the odds of accidents that included injury or death compared to Idaho and Montana, which had reduced levels of administration.

The CSA program, administered by FMCSA, identifies unsafe drivers and companies largely through state law enforcement agency roadside inspections (Bray 2020). Interstate trucking companies with US Department of Transportation identification numbers are included in the CSA program (J.J. Keller and Associates n.d.). Data from compliance investigations, roadside inspections, and crashes are uploaded monthly into the Safety Measurement System (SMS) (FMCSA 2016). A safety record is created by organizing driver and trucking company infractions by seven Behavior Analysis and Safety Improvement Categories (BASICs) (Bray 2020). These categories reflect unsafe driving, crash indicators, hours of service, vehicle maintenance, controlled substances, hazardous materials, and driver fitness (FMSCA 2016). The CSA program allows insurance providers to better identify firms with a higher risk of being involved in an accident (Conrad 2018). Firms with elevated CSA scores that include safety infractions and accident claims, on average, carried higher insurance premiums (Conrad 2017).

Intrastate log trucking companies, without US Department of Transportation identification numbers, lack the opportunity to have positive data reported through CSA scores (Dollar 2024). The Mississippi Commercial Vehicle Safety Program allows all commercial trucking companies to voluntarily have tractor-trailer units inspected by the Mississippi Department of Public Safety for a fee (Mississippi Code Title 772024, § 77-7-345). The Commercial Vehicle Safety Program aims to improve intrastate and interstate vehicle safety and to provide a database of inspected trucks available to law enforcement officers (Dollar 2024). Positive results from voluntary log truck inspections provide evidence of commitment to regulation compliance to insurance underwriters and law enforcement (Livingston 2024). Documentation required during voluntary inspections includes vehicle maintenance records, mandatory yearly inspections, licenses, and proof of $1 million liability insurance coverage (Dollar 2024). Units that pass inspection will receive a decal valid for 12 months (Mississippi Code Title 77 2024, § 77-7-345). The inspections examine brake systems, load securement, coupling devices, drivelines, driver seats, exhaust systems, truck frames, fuel systems, lighting devices, steering components, suspension, tires, and wheels (Dollar 2024). The program seeks to prevent safety and out-of-service citations by educating log trucking business owners on elements to look for when performing pretrip inspections and routine maintenance, so needed repairs are completed (Livingston 2024).

Sixty-seven percent of surveyed Mississippi log trucking companies reported conducting pretrip inspections, and 64 percent used truck scales (Shannon et al. 2024). Close to one-third of the log trucking firms reporting that these accident-prevention measures were not used regularly suggested opportunities for the industry to improve its safety record. Citations resulting from standardized inspections are intended to identify frequent violators and to lower the occurrence and severity of commercial transportation crashes (Bray 2020). This system of oversight and the financial repercussions from citations, including increased liability insurance premiums, make the goal of reducing crashes through an internal system of compliance vital for businesses to be responsible and maintain a level of profitability.

The descriptive statistics for variables used in the hedonic analyses were comparable to other recent studies conducted in the US South. The average owner was 51 years old, with 20 years of experience in Mississippi log trucking businesses. In comparison, the median age and average experience were 56 years old and 25 years of experience in Georgia and 58 years old and 27 years of experience in Florida in 2022 (Conrad et al. 2024). The average travel distance per year by Mississippi log trucks was 69,531 miles (112,000 km). Truck mileage reported in separate studies included 66,122 miles (106,415 km) in Washington State in 2006 (Mason et al. 2008), 59,292 miles (96,421 km) per year in Georgia in 2017 (Conrad 2017), and 79,116 miles (127,325 km) per year in Georgia in 2017 (Conrad 2018). The average one-way haul distance for Mississippi log trucking companies was 57 miles (92 km). The one-way haul distances were 51 miles (82 km) across the southeastern United States in 2021 (Conrad 2023) and 56 miles (90 km) in 2017 in Georgia (Conrad 2018). The weekly production per truck was 17 loads per week in Mississippi. The average weekly production per truck was 16 loads per week in Georgia in 2017 (3.1 loads per truck × 5 days) (Conrad 2018) and 18 loads per week in Georgia in 2022 (3.6 loads per truck × 5 days) (Conrad 2023).

This study added to the limited foundation of hedonic modeling in timber harvesting research by illustrating how identifying characteristics can impact the value of a good, service, or asset. It provided an initial step in differentiating variable costs contributing to liability insurance premiums in the log trucking industry. Accident frequency and severity of injury data were unfortunately not collected in the survey. These variables will provide additional clarity to future hedonic models. An additional limiting factor was the low response rate to the survey overall. The overall and usable response rates were within the ranges of other surveys reported. For example, response rates for logging contractor studies in Georgia and South Carolina ranged from 15 to 41 percent (Conrad et al. 2018). A West Virginia logger survey had an overall response rate of 10.2 percent, with 6.2 percent providing usable data (Milauskas and Wang 2006). The lack of nonresponse bias provided a level of assurance in the responses' consistencies across three disparate modes.

This study provided a risk versus reward scenario to help log trucking business owners prioritize interventions that can reduce the probability of violations that can lead to inordinate increases in liability insurance premiums. All log trucking firms should consider employing truck scales, since the more common citation was violating the legal gross vehicular weight limit. Second, participation in Mississippi's voluntary Commercial Vehicle Safety Program could prevent safety and out-of-service citations by cooperating with law enforcement and through focused truck inspection, repair, and maintenance procedures. More broadly, industry trade associations or allied interested parties could initiate a cost-share program to help defray the cost of purchasing some of these tools and technologies, similar to the Tennessee Forestry Association's Safety Cost Share Grant Program (Tennessee Forestry Association n.d.).

Conclusion

Hedonic regression and the resulting marginal implicit price calculations provided value estimations for Mississippi log trucking firm attributes that significantly contributed to mean liability insurance premiums. This placed insurance costs within the context of a firm's attributes to allow owners to make informed business decisions and investments. Properly managing risk is crucial for business owners when taking steps to avoid occurrences that lead to liability insurance rate increases. Some risks are unavoidable, as evidenced by the $50 increase for each additional 1,000 miles (1600 km) traveled per truck contributed to the average premium. However, this was partially offset by the owner's experience, as each additional year a firm operated provided the equivalent of a discount to the mean insurance premium of $72.42. Marginal implicit prices related to safety violations and overweight violations had the highest impact on insurance premiums, with values of $3,322 and $1,311, respectively, for each occurrence. These citations likely contribute to higher CSA scores for interstate firms, which are used as predictors of the likelihood of crashes and claims by insurance companies when determining premiums. Submission to voluntary log truck inspections through the Mississippi Department of Public Safety Commercial Vehicle Safety Program by both interstate and intrastate firms could further document positive regulation compliance and a commitment to safety.

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