Structural Pressures and Risky Driving Behavior among Commercial Drivers in Nigeria: Evidence from a Theory of Planned Behavior Framework

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ABSTRACT

Risky driving behavior among commercial transport drivers remains a major contributor to road safety challenges in many developing countries. While previous studies have largely focused on individual attitudes and driver characteristics, limited attention has been given to the broader institutional and economic pressures that shape driver's behavior. Drawing on the Theory of Planned Behavior, this study examines how perceived behavioral control, enforcement dynamics, peer influence, and financial pressures affect fatigue, driving behavior and regulatory non-compliance among commercial drivers. A structured questionnaire survey was administered to commercial drivers operating in Kaduna State, and the data was analyzed using multiple regression techniques. The results show that financial pressure, perceived behavioral control, and owner–loan repayment obligations significantly increase fatigue-related driving behavior, while regulatory non-compliance is primarily influenced by financial pressure, enforcement pressure, and peer norms within driver networks. The findings suggest that risky driving behavior in informal transport systems is shaped not only by individual decision-making but also by structural labor and institutional conditions. The study emphasizes the need for transport safety policies that address economic incentives, enforcement practices, and operational governance within the commercial transport sector.

Key words: Risky driving behavior; commercial driver, Theory of Planned Behavior; structural pressure

INTRODUCTION

Road traffic injuries remain one of the leading causes of mortality globally, accounting for about 1.19 million deaths annually, with the burden disproportionately concentrated in low-and middle-income countries [1]. Within many African transport systems, commercial road transport serves as the backbone of passenger mobility and freight distribution, yet the sector is frequently characterized by elevated crash risks, weak regulatory enforcement, and highly informal labor arrangements [2]. Commercial road transport, in the context of this study, refers to fare-based passenger transport services provided by vehicle operators for income within the predominantly informal public transport system in Nigeria; particularly minibuses, tricycles, taxis, and intercity vehicles are used to render services.

In Nigeria, road traffic accidents contribute significantly to public health and economic crises, with commercial drivers serving as a primary contributor to the country's high mortality rates [3], [4], a situation exacerbated by systemic structural pressures that influence commercial drivers' decisions and behaviors on the road, including factors such as long working hours, vehicle overloading, inadequate road infrastructure, poor regulatory enforcement, and economic precarity [5]-[7]. In this study, structural pressure refers to external socio-economic and institutional forces that influence the Behavioral choices of commercial drivers by constraining or incentivizing particular driving practices.

The dominant Behavioral paradigm in road safety research has historically focused on individual-level determinants as the major contributor to crash risk across diverse road environments. Frameworks such as the

Theory of Planned Behavior (TPB) draw on psychological frameworks that emphasize individual attitudes, subjective norms, and perceived behavioral control as primary determinants of risky driving [8]-[10]. Despite the successes of TBS in understanding Behavioral determinates, they often neglect the influence of cognitive determinants and structural pressures that shape drivers' decision-making, particularly in informal transport systems where drivers face strong structural pressure [11], [5]. In the context of commercial drivers, this means examining how these internal psychological factors interact with external structural pressures to manifest risky behaviors such as speeding, fatigued driving, and non-compliance with traffic regulations [12], [3].

Driver Behavior and Road Safety

In Nigeria, various risky driving behaviors such as overspeeding, driving under the influence of substances, and fatigue driving are prevalent issues among commercial drivers who are often driven by the desire to maximize income or adhere to demanding schedules [13]-[15]. Despite drivers being knowledgeable about the adverse consequences of speeding, they still often choose to speed because they believe it gives them advantages such as making more trips, earning more money, etc., creating a knowledge-behavior gap [15]. These Behaviors have frequently been analyzed using psychological frameworks such as the Theory of Planned Behavior (TPB) [8] and the Driver Behavior Questionnaire approach [16], which are widely used for understanding and predicting these risky behaviors. However, the efficacy of TPB in predicting high-risk driving behaviors in diverse settings, including speeding, distracted driving, and driving under the influence, can vary. [11], [17]. Fatigue and drowsy driving are also critical issues, particularly among long-distance commercial drivers who often operate with insufficient rest. In addition, substance abuse, such as alcohol consumption, further impairs judgment and reaction times, which contributes to the likelihood of accidents among inter-city commercial drivers [13], [14]. Low compliance with basic safety measures, such as seatbelt use, in many low- and middle-income countries, which include Nigeria, reflects a broader safety culture in which social and cultural norms significantly influence driver Behavior, contributing to violations, errors, and aggressive driving across different regions. These behaviors are not merely individual choices but are often influenced by underlying structural pressures, as discussed in subsequent sections. In contrast, some studies still emphasize the primacy of individual responsibility, arguing that enforcement, driver education, and behavioral interventions remain the most effective tools for improving road safety outcomes [8],[13]. This divergence in perspectives highlights an ongoing debate within the literature regarding the relative importance of individual versus structural determinants of risky driving behavior.

Informal Transport Systems

Informal transport systems are prevalent in many developing countries, which include Nigeria. These systems of transport are often characterized by a lack of formal regulation, diverse operational practices, and often precarious working conditions, which significantly affect the driving behavior of drivers and implications for road safety [15], [18], [19]. In Nigeria, for example, commercial bus drivers operating in the informal transport systems often face difficult and unstable working conditions, which affect both their well-being and driving behavior. Most often, drivers often work under stressful psychosocial conditions, which include long working hours, job insecurity, and pressure to make money; this pressure can affect drivers' mental well-being and encourage risky driving behaviors. As a result, many drivers prioritize earning income (more trips, more passengers) over road safety. Contrasting evidence, however, suggests that even within informal systems, regulatory interventions and formalization efforts can lead to measurable improvements in driver compliance and safety outcomes [6]. This indicates that institutional structures are not entirely deterministic but can be reshaped through policy interventions.

In the Nigerian context, commercial transport systems are characterized by strong union presence, informal labor arrangements, and daily remittance systems. These structural conditions create economic incentives that may encourage extended driving hours, risk-taking behavior, and regulatory non-compliance [3], [6]. Despite this, empirical studies explicitly linking these pressures to specific behavioral outcomes remain limited.

Economic Precarity and Transport Labor

Economic precarity is one of the profound structural pressures that significantly impacts the driving behavior of commercial drivers within informal transport systems. Commercial drivers often depend on daily earnings to survive; as a result, commercial drivers are faced with immense pressure to deliver goods and passengers quickly to maximize their earnings, often under poor working conditions [20], [3]. This financial pressure pushes them to speed, drive for extended periods without adequate rest [21], and ignore safety risks, even though they are aware that these Behaviors can lead to accidents. Occupational stress stemming from these economic and operational demands is a significant factor affecting road safety for commercial drivers [11].

The financial constraints faced by these drivers often lead to neglecting proper vehicle maintenance, which can increase the risk of mechanical failure and accidents. At the same time, the stress and long working hours associated with their job may lead some drivers to use substances like alcohol to cope or stay awake while driving, which can further impair their judgment and driving performance [11], [14]. Furthermore, because drivers often work long hours with little rest and limited access to healthcare, they are more likely to develop health issues such as cardiovascular diseases and musculoskeletal disorders. These health problems can reduce their physical and mental ability to drive safely, thereby increasing the risk of accidents. Therefore, economic precarity directly influences driver choices, often compelling them towards risky behaviors to sustain their livelihoods.

Enforcement and Compliance Behavior

The effectiveness of enforcement mechanisms and drivers' compliance behavior are critical components of road safety. However, in developing countries such as Nigeria, traffic laws and regulations are not always strictly enforced, allowing drivers to feel that they can break traffic rules such as speeding or violating regulations without facing serious consequences [22], which, over time, reduces the deterrent effect of the law, which can create a social environment where risky driving behaviors become normal or acceptable among drivers [23]. The lack of stringent regulatory oversight and enforcement can lead to a cycle where violations are normalized, and compliance becomes optional, rather than mandatory [24].

Studies exploring driver behavior within the TPB framework often highlight perceived behavioral control as a key factor. When traffic law enforcement is weak, drivers believe they can easily get away with violations, so their perceived behavioral control over risky actions increases, making them more likely to intend to break traffic rules. This is evidence in studies where bus drivers are seen to be more likely to violate traffic rules when enforcement is lacking and when opportunities such as pressure to keep schedule are present. On the other hand, when enforcement is strong and consistent, drivers perceive that violating rules is difficult and risky, which reduces their intention to engage in risky driving [24]. Road safety education programs are also crucial to influencing driving behavior; however, the success of safety education depends on other factors, particularly how well traffic laws are enforced [22]. Therefore, road safety education alone is not enough without strong enforcement on drivers [25].

Theory of Planned Behavior in Transport Research

The Theory of Planned Behavior (TPB) has been widely applied in transport research to explain driver behavior, which, according to [8], posits that behavior is influenced by attitudes, subjective norms, and perceived behavioral control. Results from numerous studies have validated the predictive power of TPB in explaining behaviors such as speeding, seatbelt use, and compliance with traffic regulations. Recent applications of TPB have extended the framework by incorporating contextual variables such as enforcement intensity, environmental constraints, and socio-economic conditions [3], [11]. These extensions recognize that behavioral intentions are often shaped by external factors beyond individual cognition.

However, critics argue that TPB remains limited in its ability to fully capture structural and institutional influences on behavior, particularly in contexts characterized by economic vulnerability and informal governance [6], [24]. This critique has led to calls for integrating TPB with broader political–economic perspectives. Consequently, this study adapted the Theory of Planned Behavior (TPB) framework to examine how perceived behavioral control, enforcement dynamics, peer influence, and financial pressures jointly shape risky driving Behavior among commercial drivers. To address this, the following hypotheses are formulated.

H1: Perceived behavioral control significantly influences fatigue-driving behavior and non-compliance with traffic regulations among commercial transport drivers.

H2: Law enforcement pressure significantly influences non-compliance with traffic regulations among commercial transport drivers.

H3: Union or peer pressure significantly influences non-compliance with traffic regulations among commercial transport drivers.

H4: Owner or loan repayment pressure significantly increases fatigue-driving behavior among commercial transport drivers.

H5: Financial pressure significantly increases both fatigue-driving Behavior and non-compliance with traffic regulations among commercial transport drivers.

Figure 1 presents the conceptual framework guiding this study. Drawing on the Theory of Planned Behavior, the model illustrates how perceived behavioral control interacts with institutional and economic pressures, including law enforcement, peer influence, ownership structures, and financial constraints, which influence two distinct behavioral outcomes: fatigued driving behavior and non-compliance with traffic regulations. The framework reflects the study's central argument that risky driving behavior emerges from the interaction between psychological and structural factors within the transport system.

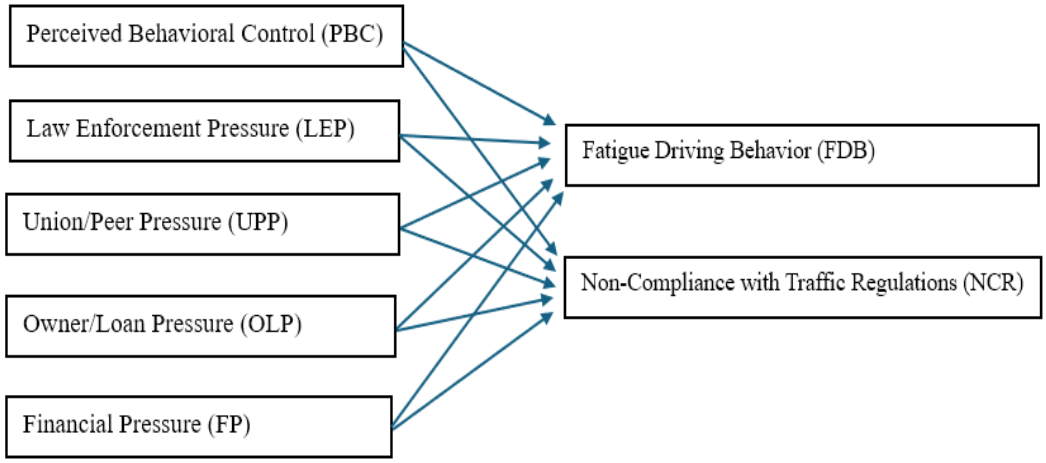

Figure 1. Conceptual framework of structural pressures and risky driving behavior.

MATERIALS AND METHODS

Study Design and Data Collection

A cross-sectional survey was conducted among commercial drivers operating from Kaduna (Nigeria) to other cities across the country; 349 drivers voluntarily participated in the survey. Respondents in this study were recruited through a collaboration with transport union representatives who granted access to drivers operating within Kawo and Mando motor parks at Kaduna. These motor parks were purposely selected based on high patronage and destinations to most cities across Nigeria. Data for the study was collected between Nov 2024 and March 2025 using a structured driver behavior questionnaire with participation entirely voluntary without any compensation. Convenient sampling was employed to select respondents at the motor parks, where drivers waiting for loading or just concluding a trip were considered for this study. 14 trained field assistants were employed for the data collection process.

The questionnaire used in this study was designed to capture the socio-demographic characteristics of drivers, operational conditions of commercial driving, institutional interactions with unions and enforcement agencies,

and behavioral indicators of risky driving practices. Items measuring driving behaviors were informed by existing driving behavior literature and then adopted to reflect the specific institutional realities of Nigeria's informal transport economy. In particular, the instrument incorporated behavioral constructs that are consistent with the Theory of Planned Behavior (TPB) while extending the framework to include structural pressures experienced by commercial drivers. For the validity of the instrument, content validity was established through consultation with experts in transport planning, road safety research, and transport management to check whether the items properly represented the realities and institutional conditions of commercial driving in Nigeria. Based on their suggestions, some items were modified or reworded to make them clearer and avoid confusion or misinterpretation by respondents. Reliability testing was used to refine the questionnaire and ensure the survey items consistently measured the study variables. This was assessed using Cronbach's alpha reliability tests, with acceptable thresholds exceeding 0.70, indicating satisfactory reliability of the constructs used in the analysis. Items that demonstrated limited comprehension or weak correlations during the pilot phase were revised or removed before the final survey administration.

Statistical Analysis

Descriptive Analysis

Descriptive statistical analysis was conducted to summarize the socio-demographic characteristics of respondents and the distribution of behavioral indicators captured in the survey. Items were processed using SPSS Statistics 25 software, and the analysis included frequency distributions, percentage values, and mean scores for key variables. These results also served as a basis for understanding the prevalence of risky driving behaviors and the distribution of structural pressures experienced by drivers.

Variable Measurement

The study operationalizes risky driving behavior and structural pressures using composite indices derived from survey responses.

Dependent Variables

Two behavioral outcomes are considered:

- **Fatigue Driving Behavior (FDB):** Measures the extent to which drivers engage in prolonged driving despite physical exhaustion.
- **Non-Compliance with Traffic Regulations (NCR):** Captures behaviors such as violation of traffic rules, avoidance of enforcement, and unsafe driving practices.

Both variables are constructed as continuous indices based on Likert-scale responses.

Independent Variables

Five key explanatory variables representing structural pressures are included:

- **Perceived Behavioral Control (PBC):** Drivers' perceived ability to regulate their driving behavior under operational constraints.
- **Law Enforcement Pressure (LEP):** Frequency and intensity of interactions with traffic enforcement authorities.
- **Union/Peer Pressure (UPP):** Influence of driver unions and peer networks on driving behavior.
- **Owner/Loan Pressure (OLP):** Financial obligations related to vehicle ownership or daily remittance systems.

- **Financial Pressure (FP):** Economic stress arising from income instability, operational costs, and livelihood demands.

All variables are measured using Likert-scale items and aggregated into standardized indices.

Regression Model Specification

To examine the influence of structural political–economic pressures on risky driving behavior among commercial drivers, the study employs multiple linear regression models estimated using ordinary least squares (OLS).

Let Y_i represent the behavioral outcome for driver i. The general regression specification is expressed as:

General model: $Y_i = \beta_0 + \beta_1 PBC_i + \beta_2 LEP_i + \beta_3 UPP_i + \beta_4 OLP_i + \beta_5 FP_i + \varepsilon_i$

Where:

$Y_i =$ behavioural outcome for driver i,

$\beta_0 =$ regression intercept,

$\beta_0 \ldots . \beta_5 =$ coefficients estimating the effect of each independent variable,

$\varepsilon_i =$ stochastic error term.

Model 1: Fatigue Driving Behavior

$$FDB_i = \beta_0 + \beta_1 PBC_i + \beta_2 LEP_i + \beta_3 UPP_i + \beta_4 OLP_i + \beta_5 FP_i + \varepsilon_i$$

Model 2: Non-Compliance to Regulation

$$NCR_i = \beta_0 + \beta_1 PBC_i + \beta_2 LEP_i + \beta_3 UPP_i + \beta_4 OLP_i + \beta_5 FP_i + \varepsilon_i$$

Estimation and Diagnostics Tests

The regression models were estimated using ordinary least squares (OLS) techniques in SPSS 25 with several diagnostic tests conducted to ensure the validity of the estimate. The results indicate that the regression models meet the key statistical assumptions required for reliable estimation. The result from multicollinearity among the explanatory variables shows Variance Inflation Factors (VIF) values remained below 4, with a value ranging between 1.42 and 3.78, which is below the commonly accepted threshold of 5.0 [26]. and the Durbin–Watson statistics were close to 2, indicating the absence of problematic multicollinearity or serial correlation in the models. In the case of the assumptions of normality and linearity of residuals, they were evaluated through Q–Q plots and residual-versus-fitted scatterplots with most standardized residuals falling within ±2.5, and no systematic curvature was observed; this suggests that the linearity assumption was reasonably satisfied.

RESULTS AND DISCUSSION

Descriptive analysis

The socio-demographic characteristics of the surveyed commercial drivers reveal a predominantly middle-aged and male workforce. Out of 346 valid responses on age distribution, the largest proportion of drivers were aged 36–45 years (37.9%), followed by those aged 46–55 years (24.3%) and 26–35 years (19.1%). Drivers aged 56 years and above accounted for 14.2%, while younger drivers aged 18–25 constituted only 3.8%, with those below 18 representing less than 1%. Gender distribution was highly skewed, with males accounting for 95.4% of respondents. Marital status data indicate that the vast majority of drivers were married (95.9%). Educational attainment varied, though secondary education was most common (40%), followed by no formal education

(26.7%), primary education (20%), and tertiary education (13.3%). In terms of household responsibilities, a significant proportion of drivers reported having large families, with 66.5% indicating more than five dependents. Overall, the findings suggest a workforce characterized by significant family obligations and varied educational backgrounds. See Table 1.

Table 1. Drivers' Socio-demographic Characteristics

Characteristics	Category	No of Respondents	Percentage
Age range of Driver	Below 18years	3	0.9
	18 - 25 years	13	3.8
	26 - 35 years	66	19.1
	36 - 45 years	131	37.9
	46 - 55 years	84	24.3
	56 years and above	49	14.2
	valid responses	**346**	**100**
Gender of Driver	Male	331	95.4
	Female	16	4.6
	valid responses	347	100
Driver's marital status	Single	10	2.9
	Married	329	95.9
	Divorced	1	0.3
	Widowed	3	0.9
	valid responses	**343**	**100**
Driver's level of education	No formal Education	40	26.7
	Primary Education	30	20
	Secondary Education	60	40
	Tertiary Education	20	13.3
	valid responses	**150**	**100**
Number of Dependents of Driver	One	5	1.4
	Two	18	5.2
	Three	10	2.9

	Four	38	10.9
	Five	46	13.2
	More than five	232	66.5
	valid responses	**349**	**100**

Results from Table 2 revealed prevalences of risky driving Behaviors among commercial drivers**.** The mean scores of risky practices such as over-speeding (Mean = 2.12), driving when tired or sleepy (Mean = 2.05), and distracted driving (Mean = 2.31), suggest that these Behaviors are relatively common among drivers. Other Behaviors, such as over-loading, and general non-compliance with traffic regulations, were reported at moderate levels. The relatively moderate standard deviations across most items suggest that these Behaviors are not isolated incidents among drivers but shared experiences. Overall, the findings point to a transport environment where every day risky Behaviors are shaped by structural pressures, enforcement practices, and economic necessity, rather than by deliberate recklessness alone.

Table 2. Risky Driving Behaviors among Drivers

Behavior	**Mean**	**Std. Deviation**
Over speeding.	2.12	0.84
Dangerous Driving.	2.35	0.79
Overloading.	2.41	0.92
None/infrequent use of safety belt	2.28	0.97
Drive without a license & other vehicle document.	2.56	0.88
I disobey any traffic rules to avoid law enforcement officers.	2.47	0.91
Drive while distracted or thinking of other things.	2.31	0.86
Drive when very weak, tired, and sleepy.	2.05	0.82
Disobey traffic rules and regulations.	2.38	0.89
Disregarding traffic lights.	2.61	0.94
Wrongful Overtaking.	2.29	0.83
Driving in an opposite direction.	2.74	0.90
Drunk driving/driving after intake of alcohol.	3.46	0.62
Intake of drug and other local substances while driving.	3.58	0.55

(Scale: 1 = Strongly Agree, 4 = Strongly Disagree)

Table 3 underlines the extent to which structural imperatives shape the attitudes, subjective social pressure, and Perception of control over risky behavior of drivers within the structure of the principle of the Theory of Planned Behavior (TPB). The findings revealed that attitudinal justification for risky driving is generally low, with mean scores ranging from 1.61 to 2.47, the highest being "working at night is worth the risk" (M = 2.47, SD = 0.82). Results from subjective norms reflect moderate social pressures on drivers, particularly from union or financial obligations (M = 1.97, SD = 0.54) and loan repayment expectations (M = 1.93, SD = 0.72). In contrast, perceived behavioral control records higher values (M = 2.17–3.25), suggesting that drivers generally perceive some capacity to maintain safe driving despite structural pressures.

Table 3. Drivers' Attitudinal Justifications for Risky Driving (Likert Scale)

	Statement	Mean	Std
Drivers' Attitudes Toward Risky Driving	Driving fast helps me meet my financial obligations.	1.94	0.99
	Risky driving is necessary to keep my job.	1.61	0.53
	Working at night is worth the risk.	2.47	0.82
	Competing for passengers justifies risky driving.	1.74	0.58
	Driving tired helps meet financial goals.	1.67	0.54
	Avoiding enforcement reduces financial pressure.	1.97	0.76
Subjective Norms and Social Pressures	I feel pressured to engage in risky driving because of others. drivers do the same.	1.41	0.52
	The expectation to repay my loan influences how I drive.	1.93	0.72
	Union dues and financial responsibilities add risk pressure.	1.97	0.54
	I feel pressure to avoid law enforcement by any means.	1.93	0.56
	Passengers pressure to reach destinations quickly.	1.51	0.5
	Owner/loan provider pressure to drive long hours or take risks.	1.67	0.51
Perceived Behavioral Control	I feel I have no choice but to engage in risky driving to meet. my financial needs.	1.6	0.57
	I can manage my daily obligations without resorting to risky driving behaviors.	2.83	0.74
	Despite my financial pressures, I feel in control of how I drive.	3.25	0.55
	I believe I can safely drive without breaking traffic laws, even when under pressure.	3.04	0.5
	I feel powerless to negotiate my working conditions with vehicle owners or union officials.	2.17	0.83
	I am confident in my ability to avoid risky driving, even when facing financial and work pressure.	2.76	0.76

(Scale: 1 = Strongly Agree, 4 = Strongly Disagree)

Model Results

Two multiple regression models were estimated to examine the influence of behavioral and structural pressures on risky driving behavior among commercial transport drivers. Model 1 evaluates the determinants of fatigue driving behavior, while Model 2 examines the determinants of non-compliance with traffic regulations.

Composite Index and Reliability Scores

For operationalizing the Theory of Planned Behavior (TPB), the Likert-scale responses from sections D (Attitudes), E (Subjective Norms), and F (Perceived Behavioral Control) of the drivers' questionnaires were systematically combined into composite indices that captured structural pressures affecting drivers. The significant items were then combined into composite indices used as independent variables in the models to explain drivers' behavior as shown in Table 4.

Table 4. Composite Index and Reliability Scores

Independent variables	Items Included (Likert scale)	(Cronbach's Alpha)
Financial Pressure Index	- Driving fast helps me meet obligations. - Driving tired helps meet financial goals. - Working at night is worth the risk.	0.78
Owner/Loan Pressure Index	- Pressure from vehicle owners/loan. providers to drive long hours. - Expectation to repay loan influences driving.	0.82
Union Peer Pressure Index	- Union add pressure to drive riskily. - Peer drivers' risky driving influences me. - Passenger pressure to drive faster.	0.75
Law Enforcement Pressure Index	- Avoiding enforcement is necessary. - I feel pressured to avoid enforcement (bribes, driving without documents).	0.79
PBC Index (Perceived Control)	- I have no choice but to drive riskily. - I feel powerless to negotiate conditions. - I can manage without risky driving. - I can avoid risky driving under pressure.	0.81
Fatigue Driving Score (DV)	- Driving while tired. - Driving late into the night. - Overworking to meet financial targets.	0.84
Non-Compliance Score (DV)	- Ignoring traffic rules.	0.82

	- Overloading. - Over speeding. - Failure to use safety equipment.	

Model 1: Determinants of Fatigue Driving Behavior

Results from model 1 show that the regression model for fatigue driving Behavior is statistically significant ($F = 43.87$, $p < 0.001$), with the model explaining 42.5% of the variance in fatigue driving ($R^2 = 0.425$; Adjusted $R^2 = 0.417$), suggesting moderate explanatory power. Among the independent variables, the result revealed that 'owner or loan pressure' emerged as the strongest determinant of fatigue Behavior ($\beta = 0.481$, $p < 0.001$). This indicates that drivers operating under vehicle repayment or daily remittance arrangements are significantly more likely to engage in fatigue-inducing driving patterns. In addition, Perceived behavioral control' also shows a significant positive effect ($\beta = 0.298$, $p < 0.001$); this suggests that drivers who perceive limited control over their work schedules are more likely to continue driving despite fatigue. Similarly, 'financial pressure' significantly predicts fatigue behavior ($\beta = 0.287$, $p < 0.001$), indicating that economic strain encourages drivers to extend driving hours in order to meet income expectations. In contrast, law enforcement pressure does not significantly influence fatigued driving behavior ($\beta = 0.051$, $p = 0.217$). Union or peer pressure exhibits a weak negative association ($\beta = -0.082$, $p < 0.10$), suggesting only a marginal influence.

Table 1. Regression results for fatigue driving and non-compliance Behavior

Variables	**Model 1: Fatigue Driving (β)**	**Model 2: Non-Compliance (β)**
Perceived Behavioral Control	0.298***	0.341***
Law Enforcement Pressure	0.051	0.312***
Union / Peer Pressure	−0.082†	0.221***
Owner / Loan Pressure	0.481***	−0.052
Financial Pressure	0.287***	0.418***
Constant	9.842**	6.041
R^2	0.425	0.496
Adjusted R^2	0.417	0.488
F-Statistic	43.87***	69.78***

Notes: ***$p < 0.001$, **$p < 0.01$, †$p < 0.10$

Model 3.2.3: Determinants of Non-Compliance with Regulations

The second model examines the determinants of regulatory non-compliance among commercial drivers. The model demonstrates strong explanatory power, accounting for nearly 50% of the variance in non-compliance behavior. Results show that 'financial pressure' again emerges as the strongest predictor ($\beta = 0.418$, $p < 0.001$), indicating that drivers facing financial strain appear more likely to violate traffic regulations in order to maximize their income opportunities. Law enforcement pressure significantly influences drivers' behavior, but not necessarily in the expected way. The positive coefficient ($\beta = 0.312$, $p < 0.001$) suggests that as drivers encounter more enforcement pressure, they may not simply comply with traffic rules. Instead, they may adapt their behavior by trying to avoid enforcement, such as taking alternative routes, evading checkpoints, or temporarily

adjusting their driving only when enforcement is visible. This is especially common in situations where law enforcement is perceived as inconsistent or discretionary. In addition, perceived behavioral control is another significant predictor ($\beta = 0.341$, $p < 0.001$). The result indicates that drivers who perceive limited operational autonomy may resort to regulatory violations as coping strategies. Union or peer pressure likewise contributes significantly to non-compliance behavior ($\beta = 0.221$, $p < 0.001$), highlighting the role of informal social norms within driver networks. In contrast, owner or loan pressure is not statistically significant in this model, suggesting that repayment obligations primarily influence fatigue-related risks rather than regulatory compliance decisions.

Effect Size Comparison Across Models

A comparison of standardized coefficients across the two models reveals distinct behavioral mechanisms underlying different forms of driving risk. The result shows that fatigue-related driving, for example, driving long hours without rest, is mainly influenced by ownership and repayment pressures, particularly owner or loan pressure ($\beta = 0.481$). This reflects the economic realities of the informal transport system, where drivers must meet daily remittances or repay vehicle loans. In contrast, non-compliance behaviors like violating traffic rules or avoiding enforcement are more strongly linked to financial pressure ($\beta = 0.418$) and law enforcement pressure ($\beta = 0.312$); this suggests that economic stress and interactions with enforcement authorities shape these behaviors. These findings suggest that different categories of risky driving behavior arise from different structural pressures within the transport system. While fatigue risks stem largely from economic survival pressures, regulatory violations appear more closely linked to institutional interactions and peer-network norms. Figure 1 highlights the dominance of owner-loan pressure in fatigue behavior and the strong influence of financial pressure and enforcement dynamics in regulatory non-compliance.

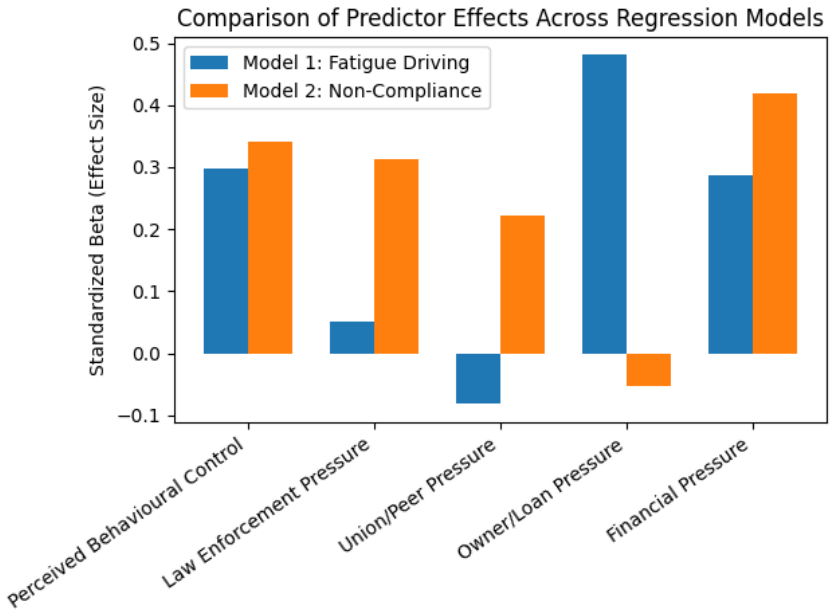

Figure 2. Comparison of independent variables Effects across Models

DISCUSSION

This study examined how behavioral and structural pressures influence risky driving behavior among commercial transport drivers. Using the Theory of Planned Behavior (TPB), the findings show that drivers' behavior is influenced by perceived behavioral control, institutional pressures such as enforcement or unions, and financial constraints. Results revealed that these factors do not influence behavior in the same way; instead, they shape drivers' behavior in different ways.

perceived behavioral control significantly influences both fatigue driving behavior and non-compliance with traffic regulations, which is consistent with hypothesis 1. In this case, perceived behavioral control refers to drivers' belief about how much control they have over their actions despite work constraints. The findings

indicate that drivers who feel they have little control over their work conditions, such as schedules or trip demands, are more likely to drive while fatigued or violate traffic rules. This can be seen in places like Nigeria, where drivers often work in flexible but economically pressured environments, making more trips and earning income the priority. Because of these pressures, drivers may continue driving even when tired or break rules to meet operational demands. Similar relationships between perceived behavioral control and risky driving behavior have been reported in studies applying the TPB to transport safety contexts [6], [27]. This finding aligns with recent studies that extend TPB by incorporating contextual constraints, showing that perceived behavioral control is often shaped by structural limitations rather than purely individual capability [3], [11]. Under such conditions, drivers may continue driving despite fatigue or engage in rule violations in order to meet operational demands.

Supporting Hypothesis 2, the result showed that law enforcement pressure would significantly influence regulatory non-compliance behavior. The positive relationship found in the results suggests that increased enforcement does not always lead to better compliance. Instead, drivers may develop strategies to avoid enforcement. In the Nigerian commercial transport sector, enforcement interactions are often perceived by drivers as discretionary or inconsistent, particularly along high-traffic urban corridors. In such institutional environments, drivers may develop strategies aimed at minimizing regulatory exposure rather than fully complying with traffic regulations. Similar behavioral patterns have been observed in informal transport systems in other developing countries. where enforcement practices may shape drivers' behavior through negotiation and avoidance rather than deterrence. This indicates that when enforcement is discretionary, drivers tend to develop avoidance strategies instead of genuinely complying with traffic regulations. This result is consistent with emerging evidence from informal transport systems, where enforcement practices are often perceived as inconsistent or negotiable, thereby shaping driver behavior through strategic compliance rather than deterrence [3], [6]. In the Nigerian context, such dynamics are particularly relevant given the discretionary nature of roadside enforcement.

Similarly, union or co-driver peer pressure significantly influences non-compliance behavior; thus, hypothesis 3 is supported. Transport unions and driver networks often create informal rules or expectations that guide how drivers operate, and when these norms emphasize quick passenger turnover, competition on routes, or maximizing trips, drivers may feel social pressure to break traffic rules in order to keep up with others. This suggests that informal norms within driver unions and peer networks can pressure drivers to violate traffic regulations to remain competitive in the transport system. Recent studies have emphasised the role of social regulation within informal transport systems, where peer norms and collective practices often override formal traffic rules [6]. This suggests that compliance behaviour is not solely an individual decision but is embedded within a network of social expectations.

The results provide strong support for Hypothesis 4, which predicted that owner or loan repayment pressure would increase fatigue driving behavior. This finding highlights the role of labor arrangements in shaping driving risk, which shows that pressure to repay vehicle loans or meet owner remittance requirements increases fatigue driving behavior. However, many of the commercial drivers operate under hire-purchase or daily remittance systems, where they must first pay the vehicle owner or repay loans before earning any personal income. This arrangement motivates drivers to work longer hours and complete more trips, which often results in driving while fatigued. This indicates that financial repayment pressures within the transport labor system push drivers to extend their driving hours, increasing fatigue-related driving risks. This finding is consistent with recent research linking economic precarity to increased risk-taking behavior among transport workers, particularly in low-income and informal labor settings [3],[20],[21]. Under such conditions, fatigue emerges not as a behavioral choice but as a structural necessity.

Financial pressure significantly affects both fatigue-related driving and regulatory violations; this confirms Hypothesis 5. Financial pressure also plays a sustained role in predicting fatigue behavior. When drivers experience economic strain such as high-income instability, operational costs, or daily remittance obligations, they are more likely to work longer hours beyond safety limits or not comply with traffic regulations to earn more money. This finding aligns with previous research indicating that economic hardship pushes commercial drivers to extend driving hours and sometimes violate regulations in order to meet their financial needs [28]-

[30]. This reinforces a growing body of literature arguing that economic survival pressures are a key determinant of unsafe driving behaviour in developing countries [21]. Drivers facing income instability may prioritise earnings over safety considerations.

Theoretical Contribution

This study makes an important contribution to transport behavior research by extending the Theory of Planned Behavior to incorporate political–economic and institutional constraints within informal transport systems. While TPB traditionally emphasizes individual attitudes, subjective norms, and perceived behavioral control, the findings demonstrate that behavioral outcomes are also shaped by structural pressures beyond individual cognition. Specifically, the study shows that different categories of structural pressures produce distinct behavioral responses. Fatigue-related driving behavior is primarily driven by labor and financial constraints, particularly ownership and income pressures. In contrast, regulatory non-compliance is more strongly influenced by enforcement dynamics and peer network norms. By demonstrating these differentiated pathways, the study advances the application of TPB in transport research, particularly in developing country contexts where informal institutions and economic precarity play a central role in shaping behavior. This contributes to a growing body of literature calling for the integration of behavioral theory with political–economic perspectives.

Implications for Behavioral Theory and Transport Safety

Taken together, the findings suggest that risky driving behavior among commercial drivers cannot explain risky driving solely by looking at drivers' personal attitudes or psychological factors. Instead, behavior is influenced by broader structural and institutional conditions in which the drivers operate. Within the Theory of Planned Behavior (TPB) framework, perceived behavioral control is shaped by external pressures, such as financial obligations, enforcement, and social norms, which highlight that behavior emerges from the interaction between internal perceptions and external pressures. In the case of fatigue behavior, financial and ownership pressures appear to play a dominant role, while in contrast, regulatory non-compliance is more strongly associated with enforcement dynamics and peer network influences. These findings highlight the importance of addressing structural conditions within the commercial transport sector, particularly in informal transport systems such as those found in Nigeria. Policies aimed at improving transport safety should therefore consider not only driver education and enforcement strategies but also address the economic and institutional incentives that drive risky behavior in informal transport systems, like payment structures, enforcement practices, and social norms. Therefore, risky driving is a systemic problem that is shaped by both psychological and structural conditions, and effective policy must address both levels.

Limitations and Future Research

This study has several limitations. First, the cross-sectional design limits causal inference, and future research could adopt longitudinal approaches to better capture behavioral dynamics over time. Second, the reliance on self-reported data may introduce response bias, particularly for sensitive behaviors such as regulatory non-compliance; integrating observational or telematics data would enhance robustness.

Third, the study focuses on commercial drivers in Kaduna State, which may limit generalizability. Future studies should consider comparative analyses across different regions, transport systems, or countries to improve external validity. Finally, additional contextual factors, such as infrastructure conditions and regulatory changes were not explicitly modelled and warranted further investigation.

CONCLUSION

This study examined the influence of institutional and economic pressures on risky driving behavior among commercial transport drivers, drawing on the theory of planned behavior. Using survey data from commercial drivers operating in Kaduna State, Nigeria, two regression models were estimated to analyses the determinants of fatigue driving behavior and non-compliance with traffic regulations among drivers. The results show different structural pressures shape different forms of risky driving behavior Fatigue-related driving is primarily influenced by owner–loan repayment obligations, financial pressure, and perceived behavioral control, reflecting

the role of labor and income constraints within the commercial transport sector. In contrast, regulatory non-compliance is more strongly associated with financial pressure, law enforcement pressure, and peer network influence among drivers. These results suggest that risky driving behavior in informal transport systems cannot be explained solely by individual attitudes but must also be understood within broader institutional and economic contexts. Improving road safety in such settings therefore requires policy interventions that address driver remuneration systems, enforcement practices, and operational governance within the commercial transport industry.

REFERENCES

1. World Health Organization, Global status report on road safety. Geneva, Switzerland: WHO, 2023.
2. G. G. Mchunu, D. G. Sokhela, Y. Pillay, I. Niranjan, and C. T. Nxumalo, "Promoting health and safety in public transportation: A call to action for sub-Saharan Africa," African Journal of Primary Health Care & Family Medicine, vol. 17, no. 1, 2025, Art. no. a4570, doi.org/10.4102/phcfm.v17i1.4570.
3. O. A. Taiwo, N. Mahmud, S. A. Hassan, and R. B. Mohsin, "Influence of commercial drivers' risky behavior on accident involvement: Moderating effect of positive driving behavior," Journal of Engineering and Applied Science, vol. 71, no. 1, 2024, https://doi.org/10.1186/s44147-024-00403-z.
4. R. Adeleke and A. E. Iyanda, "Transport fare and road traffic crashes in Nigeria: Insights from a geographical analysis, "International Journal of Injury Control and Safety Promotion, vol. 31, no. 2, pp. 323–331, 2024, https://doi.org/10.1080/17457300.2024.2319620.
5. S. Yusuf, Olayinka, A. A. I. Forson, and T. Ositimehin, "Occupational stress management of truck drivers and its effect on road safety," Journal of Economics, Finance and Management Studies, vol. 7, no. 7, 2024, doi.org/10.47191/jefms/v7-i7-16.
6. M. Amoadu, E. W. Ansah, and J. O. Sarfo, "Psychosocial factors, psychological well-being and safety incidents among long-distance bus drivers in Ghana," Acta Psychological, vol. 244, 2024, Art. no. 104193, https://doi.org/10.1016/j.actpsy.2024.104193.
7. O. Mohammed and H. A. Khudhair, "Understanding the impact of driver behavior on traffic safety," Rafidain Journal of Engineering Science, vol. 3, no. 1, pp. 626–642, 2025, https://doi.org/10.61268/8mb3nc73.
8. Ajzen, "The theory of planned behavior, "Organizational Behavior and Human Decision Processes, vol. 50, no. 2, pp. 179–211, 1991.
9. D. Parker, J. Reason, A. Manstead, and S. Stradling, "Driving errors, violations and accidents," Accident Analysis & Prevention, vol. 27, no. 4, pp. 571–581, 1995.
10. M. Elliott, C. Armitage, and C. Baughan, "Drivers' compliance with speed limits," Accident Analysis & Prevention, vol. 39, no. 6, pp. 1117–1125, 2007.
11. K. Somoray, K. M. White, B. Watson, and I. Lewis, "Predicting risky driving behaviours using the theory of planned behaviour: A meta-analysis". Accident Analysis & Prevention, 208, 107797. 2024, https://doi.org/10.1016/j.aap.2024.107797.
12. D. Komolafe et al., "If you sleep, you have missed it: Perceptions of sleep among long-distance drivers in Nigeria," SLEEP, vol. 47, Suppl. 1, 2024, https://doi.org/10.1093/sleep/zsae067.01091.
13. M. I. Osarenmwinda and I. S. Moses, "Assessment of use of alcohol by inter-city commercial drivers in Benin City, Nigeria," Dutse Journal of Pure and Applied Sciences, vol. 10, no. 2a, pp. 230–239, 2024, https://doi.org/10.4314/dujopas.v10i2a.22.
14. K. G. Didi and I. Igwe, "Public perception on alcohol consumption among commercial drivers," International Journal of Social Science Research and Review, vol. 7, no. 10, pp. 188–201, 2024, https://doi.org/10.47814/ijssrr.v7i10.2333.
15. Etika, N. Merat, and O. Carsten, "Identifying salient beliefs underlying speeding behavior, "Transportation Research Interdisciplinary Perspectives, vol. 9, 2021, Art. no. 100279, https://doi.org/10.1016/j.trip.2020.100279.
16. J. Reason et al., "Errors and violations on the roads: A real distinction?" Ergonomics, vol. 33, no. 10–11, pp. 1315–1332, 1990.
17. Ö. Özkan et al., "Predicting drivers' intentions to use intelligent speed assistance systems," Transportation Research Part F, vol. 104, pp. 532–543, 2024, https://doi.org/10.1016/j.trf.2024.06.003.

18. S. K. Fondzenyuy et al., "Self-reported speed compliance and drivers speeding behavior in Cameroon," Future Transportation, vol. 4, no. 2, pp. 659–680, 2024, https://doi.org/10.3390/futuretransp4020031.
19. C. Amoako, I.-N. Dinye, and A. B. Kwarteng, "Nuances of informal transport operation," in Hybrid Urbanisms in Secondary Cities of the Global South, 2025, https://doi.org/10.4324/9781003511137-5.
20. B. Zahara et al., "Effects of COVID-19 on public and paratransit drivers," Journal of Transport & Health, vol. 34, 2024, Art. no. 101749, https://doi.org/10.1016/j.jth.2023.101749.
21. S. Ju and M. H. Belzer, "Follow the money: Trucker pay incentives, working time, and safety," Economic and Labour Relations Review, vol. 35, no. 1, pp. 7–26, 2024, https://doi.org/10.1017/elr.2024.5.
22. J. Adenigbo, "Effects of road users' education programmes on driving behavior in Nigeria," Journal of Infrastructure Policy and Development, vol. 8, no. 15, 2024, https://doi.org/10.24294/jipd9960.
23. M. S. Labbo, X. Jiang, and G. Jean de Dieu, "Cultural implications on driver behavior and road safety in Nigeria," International Journal of Crashworthiness, vol. 30, no. 2, pp. 147–153, 2024, https://doi.org/10.1080/13588265.2024.2366586.
24. H. Singh and A. Kathuria, "Opportunity, motivation and bus drivers' intention to commit traffic violations," Safety Science, vol. 166, 2023, Art. no. 106216, https://doi.org/10.1016/j.ssci.2023.106216.
25. A. A. Addo et al., "Factors influencing road safety protocol compliance among commercial drivers in Ghana," medRxiv, 2025, https://doi.org/10.1101/2025.09.04.25335130.
26. S. Haynes, D. Richard, and E. Kubany, "Content validity in psychological assessment," Psychological Assessment, vol. 7, no. 3, p. 238, 1995.
27. R. D. Soliani et al., "Relationship between fatigue and self-employed truck drivers," in Occupational and Environmental Safety and Health V. Springer, 2024, doi.org/10.1007/978-3-031-38277-2_1.
28. M. K. Lemke, A. Hege, Y. Apostolopoulos, and S. Sönmez, "Hours-of-service compliance and safety outcomes among long-haul truck drivers," Transportation Research Part F, vol. 76, pp. 297–308, 2021, doi.org/10.1016/j.trf.2020.11.017.
29. J. E. Mabry et al., "Irregular shiftwork, fatigue and safety among commercial drivers," International Journal of Environmental Research and Public Health, vol. 19, no. 22, 2022, https://doi.org/10.3390/ijerph192214780.
30. S. M. Mortazavi et al., "Driver behavior and systemic issues interactions to crashes," 2024, doi.org/10.21203/rs.3.rs-4009122/v1.