The Influence of Working Conditions on Health and Job Satisfaction of Long-Haul Truck Drivers in Vietnam

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ABSTRACT

This study applies partial least squares structural equation modeling (PLS-SEM) to examine how working conditions are associated with health and job satisfaction among long-haul truck drivers in Vietnam. Survey data from 312 drivers were analyzed. Working conditions were modeled as six first-order dimensions: reasonable working time, manageable work pressure, favourable work environment, safety and protection, reward policy, and technology and vehicle equipment. Health was specified as a higher-order construct and job satisfaction as the outcome. All working-condition dimensions were positively associated with health (β = 0.165–0.363), and health strongly predicted job satisfaction (β = 0.587). The implied indirect effects via health were largest for reward policy, reasonable working time, and safety/protection. Because the study is cross-sectional and based on self-reported data, the results should be interpreted as associations; future work should incorporate longitudinal designs and objective indicators.

Keywords: Working conditions, Occupational health, Job satisfaction, Long-haul drivers, Vietnam.

INTRODUCTION

Long-haul truck drivers face many serious health risks and unfavorable work outcomes. International data show that this occupational group has much higher rates of obesity, hypertension, sleep problems, and risky behaviors than the general population. Two key explanatory factors are work organization, including long working hours and night shifts, and poor sleep quality (Apostolopoulos et al., 2013; Hege et al., 2018). In fact, occupational health examinations show that more than half of commercial drivers are obese and often present with additional diseases. This situation directly affects traffic safety and the maintenance of professional driver certification (Thiese et al., 2015; Thiese et al., 2017). Beyond metabolic or cardiovascular disorders, recent reviews and meta-analyses report an alarming figure: about 62% of truck drivers have musculoskeletal disorders (MSD). Main causes include long periods in a static sitting posture, exposure to vibration and noise, and poor cabin conditions. Such factors lead to accumulated fatigue and reduce work ability (Crizzle et al., 2017; Tahernejad et al., 2024). The discussion does not stop at physical health; job satisfaction also represents a very important outcome variable. A large meta-analysis including nearly 500 studies

confirmed a meaningful association between job satisfaction and general health, both physical and psychological, among workers. These findings emphasize the importance of managing stress and mechanisms of burnout (Faragher et al., 2005). To explain these relationships, modern frameworks such as Job Demands-Resources (JD-R) and Effort-Reward Imbalance (ERI) provide a strong theoretical foundation. The JD-R theory suggests that when job demands are high but resources and autonomy are low, worker health gradually deteriorates. Meanwhile, the ERI model states that an imbalance between effort given and reward received generates chronic stress and leads to negative health consequences (Bakker & Demerouti, 2007; Siegrist, 1996).

LITERATURE REVIEW
Overview of Previous Studies
Studies on long-haul drivers have identified serious health problems. Compared with the general population, long-haul drivers show clearly higher rates of obesity, hypertension, sleep disorders, and risky behaviors (Sieber et al., 2014; Hege et al., 2018; Krishnamoorthy et al., 2020; Argel et al., 2023). Systematic reviews also show that musculoskeletal disorders are very common among long-haul drivers. In both long-haul and bus drivers, a multi-factor health burden appears, including smoking, physical inactivity, poor nutrition, stress, and sleep deprivation (Crizzle et al., 2017). Epidemiological evidence confirms that metabolic disadvantages, low HDL, high BMI, and smoking are linked to work organization and poor sleep quality (Hege et al., 2018). Recently, a survey on team driving reported less sleepiness and better alertness when a co-driver was present. These findings suggest an important role for job resources in this occupational context (Ebrahimi et al., 2024). Overall, the main health risk profile for long-haul drivers can be described as high job demands combined with limited resources.
In the Vietnam context, current research mainly focuses on urban bus drivers and

delivery workers. These studies show that job demands, burnout, and difficult operating conditions are linked to risky behavior and turnover intention. In contrast, provision of sufficient resources and rewards helps reduce these adverse outcomes (Ha et al., 2025; Nguyen et al., 2025; Nguyen-Phuoc et al., 2022). The Job Demands-Resources (JD-R) framework has been applied to explain unsafe behaviors and turnover intention among bus drivers in Hanoi and motorbike delivery workers (Nguyen et al., 2025; Nguyen-Phuoc et al., 2022). Even though large-scale quantitative studies specifically on long-haul drivers remain absent, results from bus drivers and delivery workers suggest similar occupational mechanisms. Specifically, high job demands, poor sleep, chronic stress, and insufficient resources act as main drivers of negative health outcomes and occupational attitudes.

Research Gaps
Currently, several important research gaps in Vietnam can be identified. First, research on long-haul drivers remains limited and often focuses on single outcomes rather than integrating working conditions, health, and job attitudes in one model. Second, many existing studies rely on ad hoc or single-item indicators, with limited evidence on how multiple working-condition dimensions jointly relate to both physical/mental health and job satisfaction. This study addresses these gaps by proposing a multidimensional working-conditions framework and measuring health with multi-item indicators inspired by widely used health questionnaires, while emphasizing that the survey items are used for occupational research rather than clinical screening.

Theoretical Background
The foundation of this study is a combination of three complementary theoretical frameworks on occupational health. First is the Job Demands-Resources (JD-R) model. The Job Demands-Resources model divides working conditions into two main groups: demands, such as long hours, night shifts,

delivery pressure, and bad environment, and resources, such as autonomy, support, rewards, and good vehicles. This theory explains that job demands trigger a health impairment process, such as burnout and various symptoms. In contrast, job resources boost the motivational process and, importantly, reduce the negative effects of job demands (Demerouti et al., 2001; Bakker & Demerouti, 2007; Bakker et al., 2023). Second is the Job Demand-Control (JDC) model. The JDC model argues that psychological stress increases when workers face high job demands but have low autonomy or control. In this model, social support is viewed as an important modifying factor (Karasek, 1979; Johnson & Hall, 1988). Third is the Effort-Reward Imbalance (ERI) model. The ERI model highlights the imbalance between the effort given and the reward received, such as money, esteem, or promotion prospects. This imbalance is considered a main source of chronic stress and health disadvantages, especially when workers have a tendency toward overcommitment (Siegrist, 1996).

Combining the JD-R, JDC, and ERI perspectives, we expect that the demands and resources embedded in drivers' working conditions shape their physical and mental health, which in turn relates to job satisfaction. For conceptual clarity, demand-related constructs in this study are operationalized in a positive direction (e.g., more reasonable schedules; more manageable pressure), so higher scores consistently represent more favourable conditions. This allows all hypotheses to be stated in the same (positive) direction and reduces the risk of interpreting coefficients in the wrong direction.

Development of Research Hypotheses
Continuous driving for many hours with irregular schedules is known to reduce sleep quality. This work pattern builds up fatigue and increases the risk of metabolic diseases in long-haul drivers. Survey data show that long-haul drivers have higher rates of obesity and cardiovascular risk factors than the general population. This situation is closely related to work organization and chronic lack of sleep (Hege et al., 2018). An early study with objective measurements reported that drivers slept only about 4.8 hours per day (Mitler et al., 1997). In general, the occupational health profile of long-haul drivers shows very high rates of overweight status and sleep disorders (Apostolopoulos et al., 2013). Based on this evidence, Hypothesis (H1) proposes that more reasonable working-time conditions (coded so that higher values indicate more reasonable schedules) positively affect the health of long-haul drivers.

Not only working time but also job pressure is a key factor. Chasing progress, strict delivery deadlines, and poor scheduling practices increase stress and sleep disorders (Hege et al., 2019). This pattern fits well with the Demand-Control model. The Demand-Control model states that psychological strain appears when workers meet high demands but have low autonomy (Karasek, 1979). The JD-R theory also predicts a similar health impairment process when workers carry heavy job demands (Demerouti et al., 2001). For professional drivers, high stress levels are associated with poorer health and weaker safety outcomes (Useche et al., 2018). Therefore, Hypothesis (H2) proposes that more manageable work pressure (i.e., lower perceived pressure; higher scores indicate more manageable pressure) positively affects drivers' health.

Physical factors in the work environment also play a major role. Cabin conditions such as vibration, noise, temperature, and air quality, together with limited rest space and long static posture, are strongly related to musculoskeletal disorders, back pain, and exhaustion (Crizzle et al., 2017). A recent review and meta-analysis estimated that up to 61.8% of drivers suffer from musculoskeletal disorders, especially in the shoulders, neck, and lower back (Tahernejad et al., 2024). These unfavourable environmental features can also harm sleep and cardiovascular indicators, reducing general health. Hypothesis (H3) proposes that a more

favourable work environment (coded so that higher values indicate more favourable conditions) positively affects drivers' health. In contrast to risk factors, some protective factors can improve the situation. A positive safety climate at work, with clear safety policies, procedures, supervision, and support, reduces risky driving behaviors such as speeding and rule violations and improves drivers' general well-being (Amponsah-Tawiah & Mensah, 2016; Silla et al., 2018). Evidence from public transport drivers also supports this conclusion. These studies show that high occupational stress is closely linked to poor safety outcomes (Useche et al., 2018). The hypothesis (H4) of this study is that safety and protective factors at the workplace have a significant positive impact on the overall health of long-haul drivers.

Another important factor is fairness, which is explained by the Effort-Reward Imbalance (ERI) theory. ERI theory states that a state of high effort but low reward creates chronic stress and worsens cardiovascular health and immune function (Siegrist, 1996; Eddy et al., 2016; Dragano et al., 2017). A large-scale review confirmed that exposure to ERI imbalance increases the risk of coronary heart disease, independent of other stress models (Dragano et al., 2017). The ERI scale has also been standardized. This scale shows a meaningful link with the health and occupational psychology of professional drivers (Useche et al., 2021; Montoro et al., 2022). Therefore, hypothesis (H5) is that positive policies and reward systems have a positive impact on the health of long-haul drivers.

Direct support resources in the job, such as technology and people, also play a positive role. In-vehicle monitoring and feedback technologies (IVMS, telematics) and team driving have shown effectiveness in reducing risky behavior and fatigue and in improving alertness. Field tests show that feedback combined with coaching clearly reduces dangerous driving behavior (Bell et al., 2017). Meanwhile, an RCT showed that telematics combined with feedback and financial incentives improves the overall safety driving score, although the impact on speeding alone was not consistent (Stevenson et al., 2021). Similarly, team driving helps reduce sleepiness, boosts driving performance, and reduces fatigue (Ebrahimi et al., 2024). The hypothesis (H6) is that the application of technology and support vehicles has a positive impact on the health of long-haul drivers.

Finally, health is an important predictor of job attitude. Good health, both physical and psychological, usually predicts higher job satisfaction. A huge meta-analysis of 485 studies showed a significant link between job satisfaction and health. The strongest link was found with psychological indicators such as burnout, depression, and anxiety (Faragher et al., 2005). In the JD-R framework, burnout, as a result of high demands, leads to negative job attitudes. Meanwhile, resources that help keep good health support engagement and job satisfaction (Bakker & Demerouti, 2007; Bakker et al., 2023). Therefore, the final hypothesis (H7) is that health has a significant positive impact on the job satisfaction of long-haul drivers.

Research Model
This study is based on a combined framework that uses three main theories. First is the Job Demands-Resources (JD-R) model. The JD-R model says that when job demands are high, for example long working hours and strong delivery pressure, workers become tired and health becomes worse over time. In contrast, job resources such as fair rewards, safety policies, and helpful technology protect workers' health and support job engagement. Second is the Job Demand-Control (JDC) model. The JDC model says that stress and health problems are worst when job demands are high but workers have little control over work. Such a situation is common in long-haul driving, where drivers must follow fixed routes and tight schedules. Third is the Effort-Reward Imbalance (ERI) model. The ERI model focuses on the balance between effort and rewards. The ERI model suggests that high

effort with low rewards or little recognition over a long time leads to chronic stress and negative health effects.

In this study, working conditions of long-haul drivers are measured as six dimensions (reasonable working time, manageable work pressure, favourable work environment, safety and protection, reward policy, and technology and vehicle equipment). Health is conceptualised as a central outcome of working conditions and as a health-related pathway associated with job satisfaction. Accordingly, the model estimates associations from each working-condition dimension to health, and from health to job satisfaction, and reports the implied indirect

associations of working conditions with job satisfaction through health.

Based on these ideas, the research model tests the relationships between each working-condition dimension and drivers' health (H1-H6), and the relationship between health and job satisfaction (H7). The analysis also reports the implied indirect effects of working conditions on job satisfaction through health. Since direct paths from working conditions to job satisfaction are not specified in this model, the reported indirect effects should be interpreted as evidence consistent with a health-related pathway rather than as a formal test of partial or full mediation.
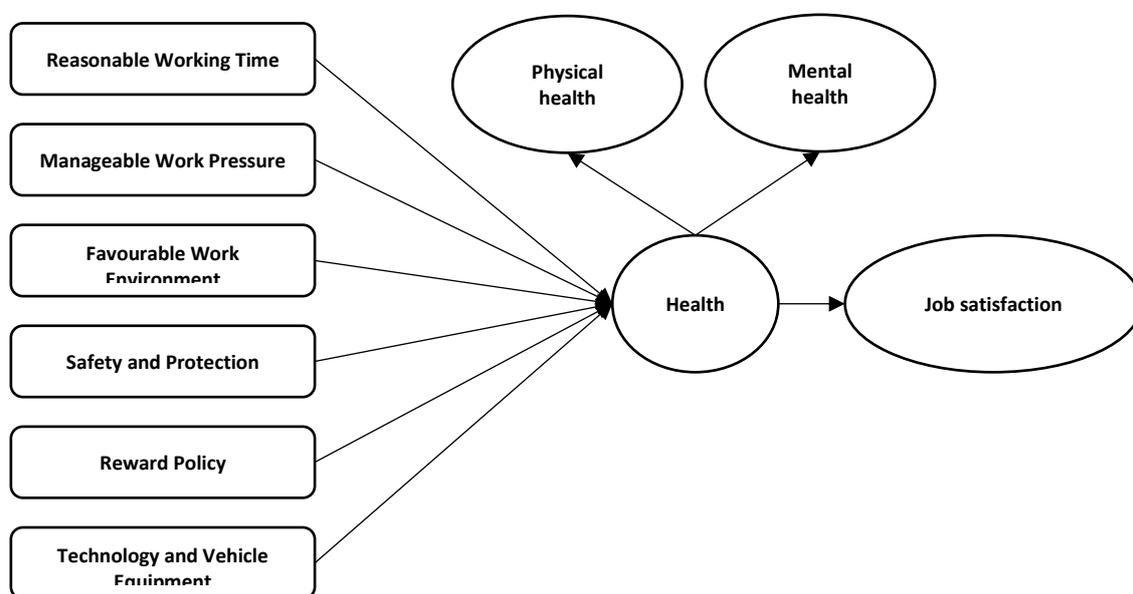

Figure 1: Research Model
Source: Proposed by the authors, 2025

Measurement Scales

The measurement items were adapted to the local context from established constructs and prior empirical studies on occupational health and professional drivers. Reasonable Working Time and Manageable Work Pressure were informed by job demand concepts from the JD-R and JDC literature. Reward Policy items capture perceived adequacy and fairness of rewards (pay, benefits, recognition) based on the 'reward' concept in the ERI framework, without computing an effort–reward imbalance ratio. Safety and Protection items were derived from safety climate and safety management

measures used in transport settings. Technology and Vehicle Equipment items reflect perceived adequacy of vehicle condition and driver-support technologies (e.g., monitoring/telematics systems). Favourable Work Environment items capture day-to-day physical and social working conditions. Health items were designed to capture common physical and mental symptoms relevant to long-haul drivers and were inspired by prior questionnaires; they were not scored or interpreted as clinical screening instruments.

All constructs were measured using a 5-point Likert scale (1 = strongly disagree; 5 =

strongly agree). To reduce social desirability and defensiveness, working-condition items were phrased so that higher values indicate more favourable conditions (e.g., more reasonable working time; more manageable pressure). Health items were also phrased in a positive/low-symptom direction (e.g., "rarely…"). Therefore, reverse-coding was not required for the final item set; if any negatively worded items were retained during piloting, they were reverse-coded before analysis.

Reasonable Working Time (WT) captures perceived adequacy of working hours and recovery opportunities, with higher scores indicating more reasonable schedules. Positively worded items cover reasonable daily working hours (WT1), adequate break time during trips (WT2), sufficient rest time between trips (WT3), and limits on unplanned extension of working hours (WT4). Manageable Work Pressure (WP) reflects how manageable workload and performance expectations are, with higher scores indicating lower perceived strain. Items cover acceptable performance targets (WP1), workload that is rarely overloading (WP2), ability to maintain focus and drive safely under time constraints (WP3), and rare feelings of exhaustion due to work demands (WP4). Favourable Work Environment (WE) reflects day-to-day physical and social working conditions, with higher scores indicating a more supportive and comfortable environment. Items cover safe and comfortable working conditions (WE1), adequate rest areas and basic facilities during trips (WE2), respectful and supportive communication with supervisors/dispatch (WE3), and comfortable interaction with customers and dispatch staff (WE4).

Safety and Protection (SP) reflect perceived safety climate and protective measures, where higher scores indicate a stronger safety culture and better protection. Items refer to clear safety rules (SP1), active supervision and encouragement of safe driving (SP2), regular safety training and reminders (SP3), and adequate protective equipment and incident support (SP4). Reward Policy (RP)

reflects perceived adequacy and fairness of pay, benefits, and recognition relative to effort, where higher scores indicate more favourable rewards. Items cover salary and welfare adequacy (RP1), fairness of performance-based bonuses (RP2), competitiveness of total rewards compared with similar companies (RP3), and recognition and appreciation of effort (RP4). Technology and Vehicle Equipment (TV) reflects perceived adequacy of vehicle condition and driver-support technologies, where higher scores indicate better technical support. Items refer to well-maintained vehicles (TV1), safety features and monitoring that support safe driving (TV2), useful feedback from monitoring/telematics systems (TV3), and availability of technologies/equipment that support safe and efficient driving (TV4).

Health (HL) is conceptualised as a second-order construct that reflects overall well-being and is made up of Physical Health (PH) and Mental Health (MH). Both PH and MH were measured reflectively using positively framed items (higher scores indicate better health). PH describes physical functioning and low frequency of physical symptoms relevant to long-haul driving, such as rarely experiencing fatigue during driving (PH1), rarely having headaches or dizziness while working (PH2), rarely experiencing musculoskeletal pain or stiffness (PH3), and having good sleep quality and recovery (PH4). MH describes low frequency of negative emotional states and better psychological balance at work, such as rarely feeling anxious or tense while working (MH1), rarely feeling depressed or hopeless (MH2), feeling calm and positive during daily work (MH3), and emotional stability and balance in daily work (MH4). These items were inspired by prior health questionnaires but were not scored or interpreted as clinical screening measures.

Job Satisfaction (JS) reflects drivers' overall positive evaluation of their job. Items include an overall satisfaction rating (JS1), willingness to choose the same job again (JS2), perceived meaningfulness and pride in

the job (JS3), and satisfaction with long-term job fit and future prospects in the current role (JS4).

MATERIALS & METHODS

This study uses a quantitative cross-sectional design. The study uses two main data sources. Secondary data include industry reports, legal documents, and academic papers on working conditions, health, and satisfaction of long-haul drivers in Vietnam, and this source is used to define the research context and to help build the scales. For primary data, collection is carried out in two stages. The first stage consists of in-depth interviews with working long-haul drivers; the goal of this stage is to adjust wording and add indicators so that items fit reality. The second stage is a structural survey using a standardised questionnaire with a 1-5 Likert scale. Most first-order constructs are measured by four items, while Health is a second-order construct measured by two first-order dimensions, Physical Health and Mental Health.

Participants are long-haul drivers in Vietnam, working either for companies or in self-employment. Inclusion criteria are: age 21 or older, at least 6 months of driving experience, and active work within the last 3 months. The survey was carried out from June to September 2025 and produced a final sample of N = 312. Sampling uses convenience sampling combined with a snowball technique. The survey is implemented in two modes: face-to-face paper forms at bus stations, rest stops, or companies, and an online form using Google Form. To ensure quality, the instruments went through translation and back-translation, and after that, the instruments were pilot tested with about 30 drivers. The official data collection process guarantees anonymity and voluntary participation. The study also includes attention check questions, and responses completed too quickly or with straight-line patterns in one column are removed.

STATISTICAL ANALYSIS

After collection, the dataset was cleaned and screened for missing values and patterned responses. The study uses SmartPLS to analyse data following a two-stage approach: (1) evaluate the measurement model (indicator loadings, reliability, convergent validity, and discriminant validity); and (2) evaluate the structural model (path coefficients, R^2, collinearity checks, and bootstrapped confidence intervals). Indirect effects of working conditions on job satisfaction via health were computed using bootstrapping.

RESULT

Description of the Survey Sample

The survey sample consists of 312 drivers; male 100% (312), female 0% (0). This reflects the male-dominated nature of the profession. Regarding marital status, 78.2% are married (244), 16.7% are single (52), and 5.1% are others (16). This shows that family responsibilities are common. They can influence reward expectations, work schedules, and welfare needs. For education level, the majority is high school or below at 58.0% (181), followed by intermediate/college at 31.1% (97), and university or higher at 10.9% (34).

Table 1: Characteristics of the Survey Sample

Criteria	Category	Number	Percentage (%)
Gender	Male	312	100.0
	Female	0	0.0
Marital Status	Single	52	16.7
	Married	244	78.2
	Other	16	5.1
Education Level	High school or below	181	58.0
	Vocational/College	97	31.1
	University or above	34	10.9

Source: Data analysis results, 2025

Assessment of the Measurement Model

Results of the PLS-SEM measurement model are generally strong and consistent across all constructs, satisfying both technical criteria and substantive interpretability. For SAFETY AND PROTECTION, standardized loadings range from 0.804 to 0.873, Cronbach's α = 0.864, and AVE = 0.709 (√AVE = 0.842), showing high internal consistency and convergent validity.

Table 2: Results of the Measurement Model Analysis

Construct	Standardized Loadings Range	Cronbach's alpha	AVE	Square Root of AVE	Maximum Correlation with Other Constructs	Maximum HTMT with Other Constructs
Safety and Protection	0.804-0.873	0.864	0.709	0.842	0.355	0.449
Manageable Work Pressure	0.711-0.879	0.832	0.638	0.799	0.154	0.187
Reward Policy	0.858-0.896	0.900	0.770	0.877	0.390	0.488
Technology and Vehicle Equipment	0.852-0.877	0.891	0.753	0.868	0.192	0.218
Favourable Work Environment	0.860-0.895	0.903	0.775	0.880	0.257	0.322
Health	0.875-0.885	0.708	0.774	0.880	0.587	0.747
Job Satisfaction	0.830-0.866	0.870	0.719	0.848	0.587	0.747
Reasonable Working Time	0.865-0.898	0.904	0.775	0.880	0.348	0.434

Source: Data analysis results, 2025

Manageable Work Pressure shows indicator loadings of 0.711–0.879, Cronbach's alpha = 0.832, and AVE = 0.638 (sqrtAVE = 0.799). Its maximum inter-construct correlation is 0.154 and maximum HTMT is 0.187, and VIF values (1.759–2.205) are well below common cutoffs. These results support stable measurement, good discriminant validity, and no serious multicollinearity for this construct.

Technology and Vehicle Equipment show loadings of 0.852–0.877, Cronbach's alpha = 0.891, and AVE = 0.753 (sqrtAVE = 0.868). Its maximum correlation with other constructs is 0.192 and the maximum HTMT is 0.218, and VIF values (2.744–3.117) remain within acceptable limits, supporting discriminant validity and no serious multicollinearity. Favourable Work Environment shows loadings of 0.860–0.895, Cronbach's alpha = 0.903, and AVE = 0.775 (sqrtAVE = 0.880), with maximum correlation 0.257 and maximum HTMT 0.322. Although VIF values for this construct are somewhat higher than for others, they remain below 5.

JOB SATISFACTION shows loadings of 0.830-0.866, α = 0.870, and AVE = 0.719 (√AVE = 0.848), with maximum correlation and HTMT identical to HEALTH (0.587 and 0.747, respectively) and VIF from 1.965 to 2.375. This pattern is consistent with theory, which suggests a conceptual link between health and job satisfaction, while Fornell-Larcker and HTMT criteria still support discriminant validity. Finally, REASONABLE WORKING TIME has loadings of 0.865-0.898, α = 0.904, and AVE = 0.775 (√AVE = 0.880). The maximum correlation with other constructs is 0.348, maximum HTMT is 0.434, and VIF values range from 2.804 to 3.134, indicating high reliability, strong convergence, and clear separation. Overall, all constructs have Cronbach's α ≥ 0.708 and AVE ≥ 0.638. For each construct, √AVE exceeds the largest inter-construct correlation, all HTMT values remain below 0.85-0.90, and all VIF values are below 5. These results confirm that the measurement model meets requirements of reliability, convergent validity, and discriminant validity, and that multicollinearity is not a concern. Therefore,

the model is suitable for proceeding to structural model estimation and hypothesis testing.

Assessment of the Structural Model
Structural model results indicate that all six working-condition dimensions are positively and significantly associated with HEALTH. The largest effects are Reward Policy (β = 0.363), Reasonable Working Time (β = 0.333), and Safety and Protection (β = 0.312), followed by Technology and Vehicle Equipment (β = 0.243), Favourable Work Environment (β = 0.223), and Manageable Work Pressure (β = 0.165). HEALTH then shows a strong positive association with JOB SATISFACTION (β = 0.587).

Table 3: Path Coefficients and Effects

Relationship	Path Coefficient (β)	Total Effect on Job Satisfaction
Safety and Protection → Health	0.312	0.183
Manageable Work Pressure → Health	0.165	0.097
Reward Policy → Health	0.363	0.213
Technology and Vehicle Equipment → Health	0.243	0.143
Favourable Work Environment → Health	0.223	0.131
Reasonable Working Time → Health	0.333	0.195
Health → Job Satisfaction	0.587	0.587

Source: Data analysis results, 2025

The results highlight the central role of HEALTH in this model: working-condition dimensions relate to HEALTH, and HEALTH strongly relates to JOB SATISFACTION. The implied indirect effects (working condition → health → job satisfaction) are largest for Reward Policy (0.213), Reasonable Working Time (0.195), and Safety and Protection (0.183), while Manageable Work Pressure shows the smallest indirect effect (0.097). These magnitudes should be interpreted as model-implied associations rather than definitive causal mediation because direct effects from working conditions to job satisfaction were not estimated in the specified model.

Overall, the results provide a practical message: improving drivers' health appears to be a key pathway through which better working conditions are associated with higher job satisfaction. Among the working-condition domains, reward policy, reasonable working time, and safety/protection show the strongest associations with health and therefore the largest implied indirect associations with job satisfaction. This suggests that interventions should prioritize fair and transparent rewards, schedule and recovery management, and safety management, while also improving technology support, work environment, and workload manageability.

Table 4: Explained variance (R²) and model fit

Endogenous Variable	R²	Adjusted R²
Health	0.492	0.482
Job Satisfaction	0.344	0.342
Fit Measure	**Saturated Model**	**Estimated Model**
SRMR	0.049	0.053
d_ULS	1.132	1.316
d_G	0.878	0.889
NFI	0.750	0.748

Source: Data analysis results, 2025

Regarding explanatory power, the model explains a substantial share of variance in both endogenous constructs. Health shows R^2 = 0.492 (adjusted R^2 = 0.482), while Job

Satisfaction shows R^2 = 0.344 (adjusted R^2 = 0.342). These values indicate that the set of working-condition dimensions meaningfully relates to drivers' health, and that health, in

turn, relates strongly to job satisfaction. Global fit indices for PLS-SEM (e.g., SRMR) were acceptable; however, indices such as NFI should be interpreted cautiously and alongside theory, measurement quality, and predictive relevance.

In summary, the structural model provides useful evidence that multiple dimensions of working conditions are associated with drivers' health, and that health is strongly associated with job satisfaction. Future studies can expand the model by adding additional predictors (e.g., leadership, social support, intrinsic motivation) and by incorporating objective indicators (e.g., telematics, shift logs, medical or sleep data) to strengthen external validity and causal interpretation.

All six working-condition dimensions show statistically significant positive associations with HEALTH. The strongest effects are Reward Policy ($\beta = 0.363$), Reasonable Working Time ($\beta = 0.333$), and Safety and Protection ($\beta = 0.312$), followed by Technology and Vehicle Equipment ($\beta = 0.243$), Favourable Work Environment ($\beta = 0.223$), and Manageable Work Pressure ($\beta = 0.165$). In turn, HEALTH strongly predicts JOB SATISFACTION ($\beta = 0.587$).

The indirect effects on Job Satisfaction via Health are also statistically significant. Importantly, because each indirect effect is computed as (working condition → health) × (health → job satisfaction), and the health → job satisfaction coefficient is fixed and positive in this model, the ranking of indirect effects necessarily mirrors the ranking of the direct effects on health. Therefore, this ranking should be interpreted as a descriptive implication of the model rather than as standalone evidence of mediation.

DISCUSSION

The results indicate that HEALTH plays a central role in linking working conditions with job satisfaction in this sample. Conceptually, this is consistent with occupational health models in which working conditions shape physical and mental well-being, and well-being influences

job attitudes. Note that working-condition variables are coded so that higher scores mean more favourable conditions; hence, positive coefficients imply that improving those conditions is associated with better health.

The strong role of REWARD POLICY is also consistent with the ERI theory. ERI theory emphasizes that fair and adequate rewards reduce strain and improve health outcomes (Siegrist, 1996; Dragano et al., 2017). In addition, the strong importance of REASONABLE WORKING TIME in this model matches epidemiological findings that long and irregular schedules worsen sleep, fatigue, and metabolic indicators among long-haul drivers (Apostolopoulos et al., 2013; Hege et al., 2018). Together, these results support the idea that both fair rewards and better-organised working time are key job resources that protect drivers' health.

From a technical perspective, key PLS-SEM diagnostics (measurement reliability/validity, bootstrapped confidence intervals, and global fit indicators such as SRMR) support the stability of the estimated relationships. However, some fit indices (e.g., NFI) may be modest depending on conventional thresholds, so model fit should be evaluated holistically alongside theory, measurement quality, and predictive relevance.

The strong path from HEALTH to JOB SATISFACTION aligns with prior evidence that better physical and mental well-being is associated with more positive job attitudes among drivers and other occupational groups. Within a JD-R interpretation, prolonged strain and poor recovery can erode well-being, which then reduces job satisfaction; conversely, supportive resources and manageable demands can protect health and help sustain satisfaction.

Finally, this study still has some limitations. The cross-sectional design and the use of self-reported data may create common method bias and do not allow strong causal conclusions. Future longitudinal studies that combine survey data with objective indicators, such as sleep measurements,

telematics data, or medical records, would help strengthen the generalisation of the results. Even so, the consistency of the model with core theories and with international Scopus/ISI evidence suggests that the proposed framework is useful. The framework can be applied as a practical tool for planning HR and safety policies for long-haul drivers in Vietnam and similar contexts. In addition, the sample comprises only male drivers (100%), so generalisation to female drivers should be made with caution. Also, missing values were treated using mean substitution; future research could apply multiple imputation or other robust missing-data techniques and re-check the stability of the estimates.

CONCLUSION

This study provides evidence, using PLS-SEM and survey data from 312 long-haul truck drivers in Vietnam, that multiple dimensions of working conditions are associated with drivers' health, and that health is strongly associated with job satisfaction. Among the working-condition domains, Reward Policy, Reasonable Working Time, and Safety and Protection show the largest associations with health and therefore the largest implied indirect associations with job satisfaction. These findings highlight practical priorities for transport companies and regulators: strengthen reward fairness and transparency, manage schedules and recovery opportunities, and improve safety climate and protections, while continuing to invest in supportive technology and a better day-to-day work environment.

Recommendations

Based on these results, several practical recommendations are proposed. The highest priority should be improving the Reward Policy by standardizing salary, allowances, and performance-based bonuses, clarifying calculation rules, and ensuring timely and fair payment. At the same time, reorganizing working hours is urgent. This includes limiting very long shifts, optimizing rest breaks between shifts, controlling overtime hours, and using fatigue warning procedures. The safety and protection aspect also needs continuous reinforcement through regular safety training, building a no-blame culture, giving enough PPE, and monitoring near-miss incidents. For technology and vehicle equipment, investing in telematics, advanced driver-assistance systems (ADAS), condition-based scheduled maintenance, and real-time feedback on driving behaviour will be helpful. The working environment also needs care, such as improving cabin and rest area facilities, reducing vibration, noise, and heat, and making sure drivers have water, nutrition, and simple micro-exercise routines. Finally, managing psychological stress is important by balancing workload, increasing driver autonomy, providing psychological support channels, and allowing anonymous feedback. These interventions should follow a roadmap based on priority level, cost, and impact, and use KPIs related to health and satisfaction to evaluate effectiveness.

Future Research Directions

This study also opens several directions for future development. One important direction is using a longitudinal design (panel) to check causal relationships more carefully and to follow changes in health or satisfaction after interventions, such as adjusting work schedules or improving remuneration. Moreover, adding objective indicators is very important, such as measuring sleep and fatigue with actigraphy, using safety incident records, telematics/ADAS data, and medical records to reduce self-report bias. The theoretical model can also be expanded by including moderating or covariate variables, such as safety leadership, social support, intrinsic motivation, safety culture, or burnout status, to strengthen explanatory power (R^2) for satisfaction. Other studies can conduct comparative analysis between driver groups (by age, tenure, route or shift type, or by company or region) to identify differences in policies. In addition, testing the cost-

effectiveness of specific intervention packages (such as remuneration, scheduling, and technology packages) will help businesses optimize resources. Finally, applying advanced hybrid models (such as PLS-Predict and Multilevel SEM) will be very useful for evaluating real predictive capability and organizational-level effects.

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