Enhancing Road Safety: Insights from Delivery Drivers' Perspectives in Attica Region

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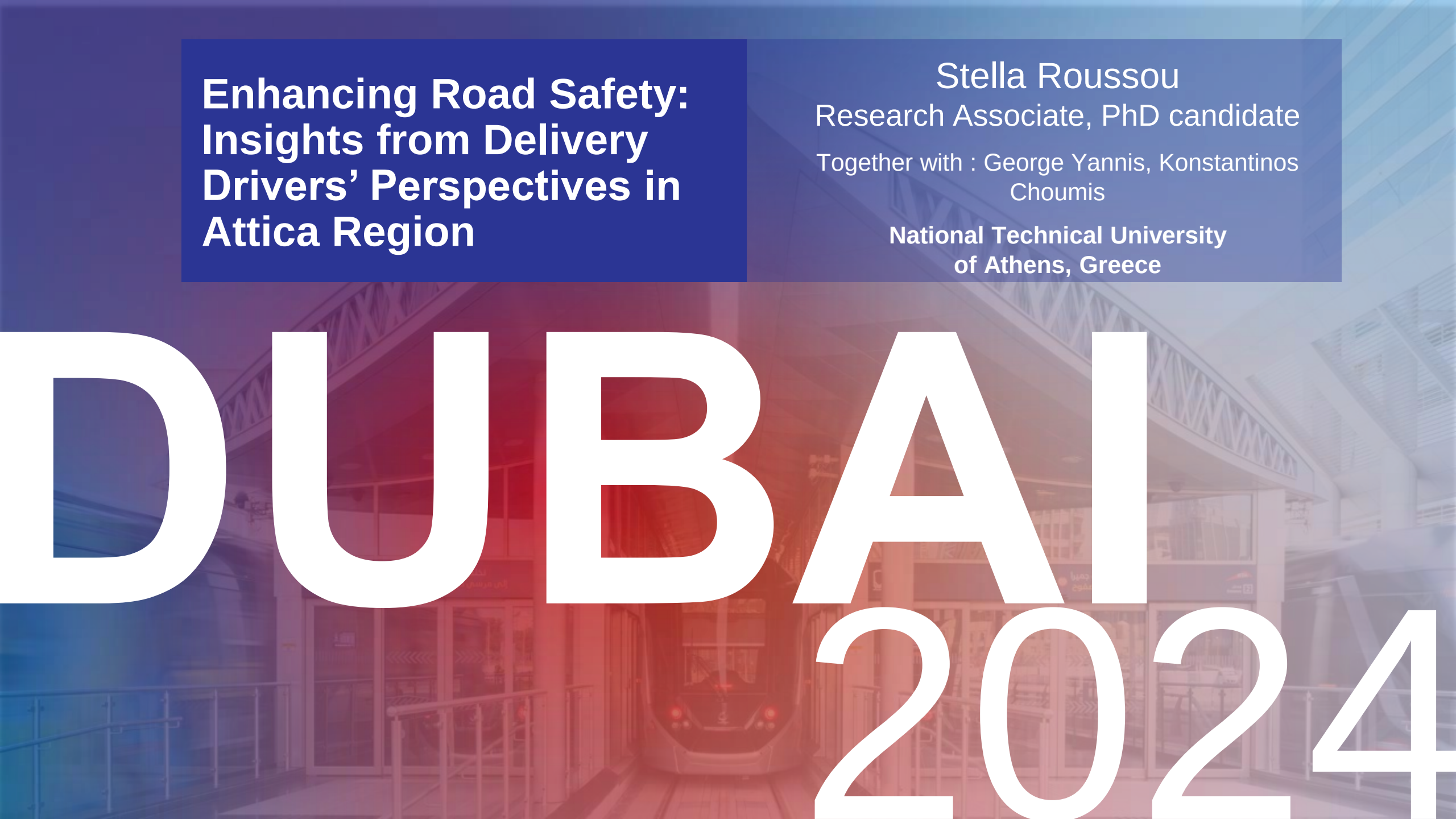

Road Safety for Delivery Drivers in Urban Areas

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Urban Safety Challenges

- High Risk of **traffic crashes**, especially for motorcycle riders
- Navigating through **congested streets** and **adverse conditions**

1/3 motorcycle fatalities occur during work

Drivers' Role in Urban Transportation

- Growing importance with the rise of e-commerce and **food delivery services**
- Delivery drivers face significant **road safety risks** especially in densely populated areas like Attica region.
- Balancing **delivery time pressures** and road safety

Research Objective

- Analyze **drivers' behavior** and choices in risky situations
- Understand the **factors** influencing decisions, such as profit loss, crash risk, and penalties

Outcome

- Provide actionable **recommendations** to improve safety for delivery drivers in urban areas

Research Methodology

Data Collection

- **200 Food Delivery Drivers** surveyed in Attica, Greece
- Drivers responded to hypothetical **scenarios** with varying levels of delivery time, crash risk, and profit loss

Survey Structure

- Driver background (experience, crash history, fines received, etc.)
- Views on Road Safety and Delivery Speed
- Hypothetical Scenarios (careful driving, risky driving, no change)
- Demographics (age, driving experience, etc.)

Distribution Approach

- **Online** via social media for broader reach.
- **Offline** through face-to-face surveys in shops and offices for comprehensive data collection.

Statistical Analyses

Multinomial Logistic Regression

Purpose To model driver choices between three behaviors	Drive Carefully Drive a bit more carefully Make no changes
Key Variables	Delivery time, accident risk, driver's age, number of fines. Helps explain drivers' decision-making in risky scenarios.
Equation	$Y = \beta_0 + \beta_0 * X_1 + \beta_2 * X_2 + \cdots + \beta_\rho * X_\rho + \varepsilon$

Generalized Linear Models (GLMs)

Purpose	To analyze relationships between driver characteristics (e.g., age, experience, fines) and driving behaviors.
Key Variables	Age, experience, fines, helmet use Economic incentives/disincentives and their impact on safety-conscious behavior.
Key Features	Customizable Error Distribution: Allows for non-normal error distributions (e.g., Poisson, binomial). Flexibility: Can handle different types of response variables (binary, count, etc.).

Results from Multinomial Regression Analysis

- Understanding drivers' **preferences** for different driving behaviors under hypothetical scenarios.

Scenarios

- Drivers chose between **three** behaviors in response to variations in:
  - Delivery Time (Pressure to deliver quickly).
  - Crash Risk
  - Profit Loss (Economic impact)

Results

- **High Preference for Cautious Driving**
  - ➢ Drivers strongly favored cautious driving, reflecting concern for safety over other factors
- **Safety vs. Profit**
  - ➢ Drivers prioritized long-term safety benefits over short-term financial gain
- **Age Impact**
  - ➢ Older drivers demonstrated a higher propensity for cautious driving, attributed to greater driving experience and risk awareness
- **Desensitization to Penalties**
  - ➢ Drivers with a history of receiving more fines tend to engage in riskier driving behaviors
  - ➢ Fines alone may not effectively deter risky behaviors in this group, indicating the need for more targeted interventions.

Table 1: *Careful Driving vs No change*

Choice =1	coef	std err	z	P>|z	[0.025	0.975]
const	-40.834	14.582	-2.800	0.005	-69.413	-12.255
Time_norm	23.775	335.512	0.071	0.094	-633.817	681.367
AccidRed_norm	57.262	118.214	0.484	0.063	-174.434	288.957
Profit_norm	28.835	284.166	0.101	0.092	-528.121	585.790
AGE	0.358	5.180	0.069	0.945	-9.795	10.512
TIMES_FINE	-0.165	2.162	-0.076	0.939	-4.402	4.073
STRICT_PENALTIES	0.444	6.676	0.067	0.947	-12.640	13.529

Table 2: *Less careful driving vs No change*

Choice=2	coef	std err	z	P>|z	[0.025	0.975]
const	-7.298	10.580	-0.690	0.490	-28.0350	13.437
Time_norm	13.097	335.511	0.039	0.097	- 644.492	670.686
AccidRed_norm	12.946	117.041	0.111	0.091	- 216.450	242.344
Profit_norm	24.879	284.165	0.088	0.093	- 532.074	581.833
AGE	-0.441	5.176	-0.085	0.932	-10.585	9.703
TIMES_FINE	-0.041	2.159	-0.019	0.985	-4.274	4.191
STRICT_PENALTIES	-0.006	6.671	-0.001	0.999	-13.080	13.068

Results from Generalized Linear Models (GLMs)

Table 3: *Imposing stricter penalties*

	coef	std err	z	P>|z	[0.025	0.975]	VIF
const	-0.184	0.189	-0.973	0.330	-0.553	0.186	13.628
Helmet_Use	0.724	0.144	5.035	0.000	-0.442	1.006	1.070
Moto_Exp	-0.084	0.042	-2.014	0.044	- 0.166	-0.002	1.054
Times_Serious_ Crashes	0.163	0.082	1.986	0.047	0.002	0.323	1.111
Proh_Sign_ Violation	-0.337	0.162	-2.081	0.037	-0.655	-0.020	1.070
Times_Fines	-0.056	0.042	-1.336	0.181	-0.137	0.026	1.104

Table 4: *Fines increase*

	coef	std err	z	P>|z	[0.025	0.975]	VIF
const	0.657	0.155	4.243	0.000	0.354	0.961	8.787
Suit_Use	1.0403	0.120	8.659	0.000	0.805	1.276	1.028
Moto_Exp	-0.166	0.044	-3.795	0.000	-0.253	-0.081	1.109
Times_Fines	0.1042	0.043	2.435	0.015	0.020	0.188	1.100
Times_Crashes	-0.216	0.055	3.962	0.000	-0.323	-0.109	1.127
Red_Light_ Violation	-0.019	0.223	-0.089	0.929	0.4570	0.417	1.029

Table 5: *Camera Use*

	coef	std err	z	P>|z	[0.025	0.975]	VIF
const	1.118	0.272	4.117	0.000	0.586	1.651	19.142
Moto_Exp	-0.090	0.055	-1.652	0.099	-0.197	0.017	1.165
Helmet_Use	0.348	0.164	2.121	0.034	0.027	0.671	1.030
Times_Fines	0.041	0.049	-0.844	0.398	-0.139	0.055	1.044
Work_Time	0.178	0.093	1.920	0.055	-0.004	0.361	1.159
Pass_BV_ Violation	-0.567	0.168	-3.377	0.001	-0.897	-0.238	1.043

Key Factors Influencing Safer Driving Behaviors:

Helmet Use

- Drivers using helmets are more likely to **engage in cautious driving**.

Experience

- Drivers with motorcycle experience tend to exhibit **safer** behaviors.

Serious Crashes

- Drivers involved in serious crashes are more **inclined to adopt cautious practices**.

Prohibited Sign Violations

- Drivers who violated prohibition signs showed **less tendency** to adopt safer behaviors.

Stricter Measures and Fines

- Support for **stricter traffic measures** and **increased fines** correlates with safer driving decisions.

Economic Incentives vs. Safety

- Economic pressures affect decision-making; drivers often weigh **financial incentives against safety considerations.**

Fines and Risky Behavior

- Drivers with more fines are less likely to adjust their driving behavior, indicating **desensitization to penalties**.

Discussion

Overview

- Both the Multinomial Regression and GLM models highlight key factors influencing delivery drivers' behavior.
- **Safety concerns are paramount**, influenced by age, personal experience, and frequency of fines.

Policy Implications

- Positive response to stricter penalties shows potential for **policy interventions** to enhance road safety.
- Insights are valuable for stakeholders aiming to improve traffic safety and driver behavior in urban settings.

Driver Safety vs. Profit

- Drivers **prioritize safety over profit**.
- Showing the importance of policies that reward safe driving and don't force drivers to choose between safety and earnings.

Age and Experience

- Older drivers tend to engage in **safer driving practices**, highlighting the importance of targeted safety training for younger, less experienced drivers.

Future Research Directions

- **Diversity of the Sample**

The study focuses primarily on male drivers aged 25-50, limiting the generalizability. Future studies should include **more female drivers** and broader age ranges.

- **Biases in Self-Reported Data**

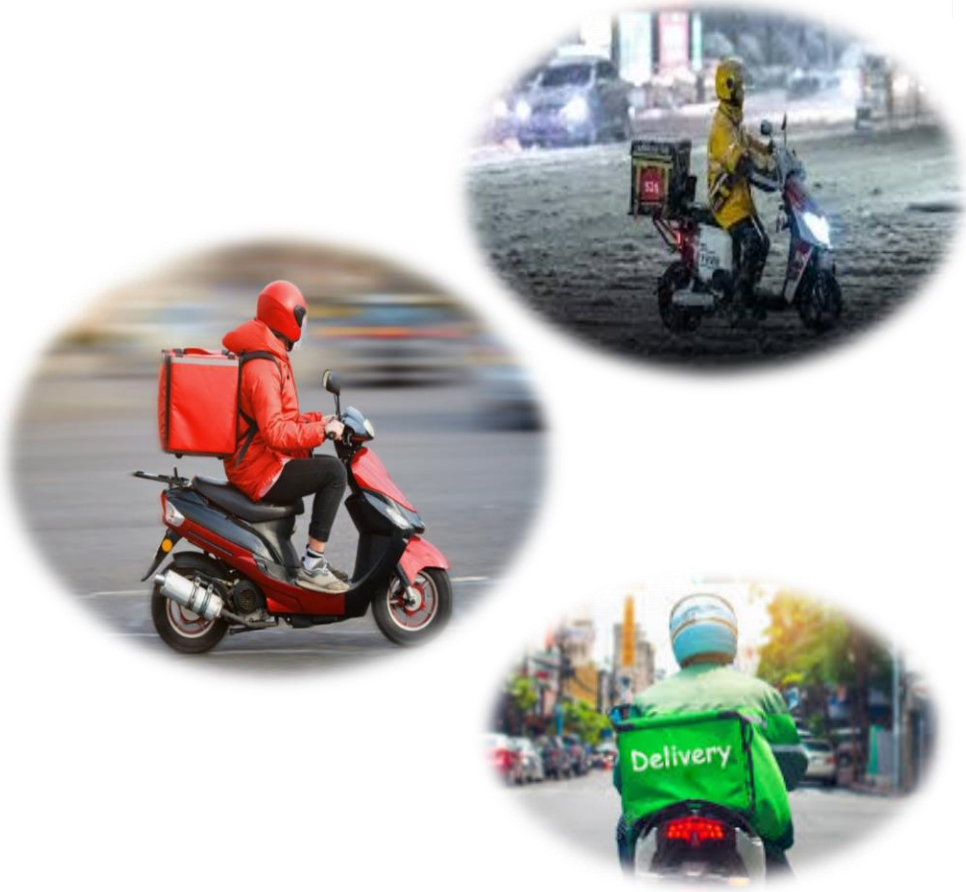
Reliance on self-reported data may introduce biases, suggesting the need for more objective data collection methods.

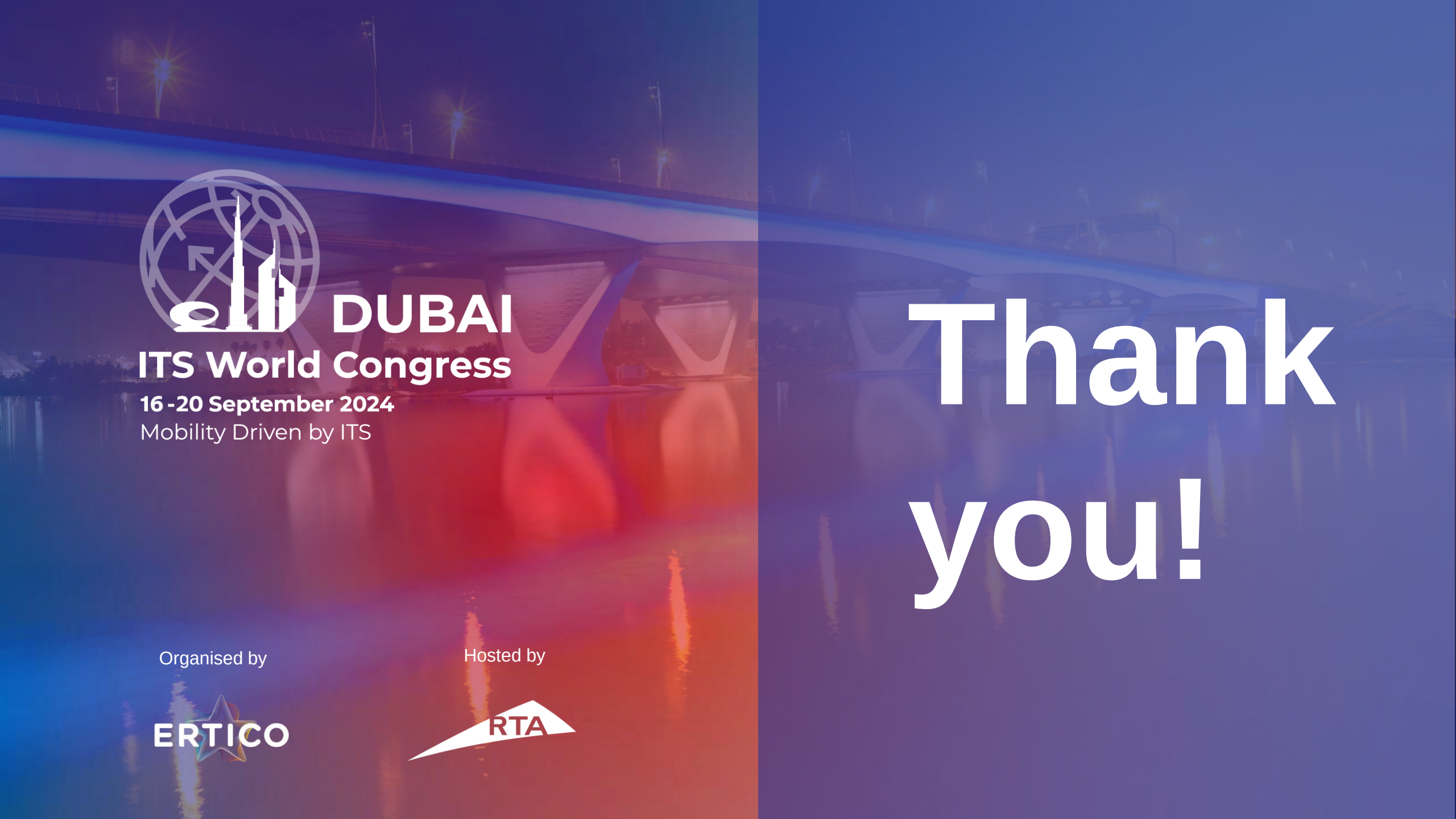
- **Long-Term Studies**

Future research should explore how driver behavior evolves over time, particularly in response to **changes in job conditions**, traffic regulations, and the economy.

- **Technological Impact**

Further study is needed on the effects of **new technologies** (e.g., navigation aids, safety apps) and policy interventions (e.g., stricter laws) on driver safety.

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