Exploring the impact of fuel price on driver harsh behaviour in Greece

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Introduction

- Gasoline prices may impact traffic safety through three key intermediary aspects: travel frequency and distance, choice of transport mode and driving behaviour
- As fuel prices rise, drivers may respond by reducing the number and length of their trips or by combining multiple tasks into a single journey rather than taking separate trips
- Higher fuel costs can prompt a shift away from private car use toward alternative modes of transport, such as Public Transport, carpooling, cycling or walking
- Drivers may adopt more fuel-efficient driving styles in response to elevated fuel prices, such as maintaining lower speeds and avoiding harsh events, which can reduce the likelihood of collisions

Background

- Numerous studies have examined the relationship between fuel prices and driver behaviour, indicating significant behavioural shifts in response to fuel cost changes
- An increase in fuel prices can lead to reductions in fuel volume purchased, lower driving speeds and decreased harsh acceleration/braking events
- Interestingly, 1% rise in fuel prices corresponded to a 0.5% decrease in the number of fatal road crashes, highlighting the moderating effect of fuel costs on travel behaviour and road safety
- Changes in gasoline prices contributed significantly to variations in transit ridership, suggesting that rising fuel costs shape commuters' transportation choices

Objectives

- Investigation of the relationship between fuel prices and key driving behaviour indicators in Greece
- Examination of potential causes of harsh events, such as economic pressure or environmental conditions
- Statistical data on fuel prices and driver behaviour were collected and analysed over a four-year period (2019-2022)

Data Overview

Two primary data sources:

- **Fuel Price Observatory** database
  - average daily retail price of petrol for each region of Greece

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- **Driving behaviour data** exploited via OSeven Telematics
  - average speed, speeding
  - harsh accelerations/brakings
  - mobile phone use while driving
  - duration/distance

Independent Variables	Unit of Measurement	Description
Fuel price	euro (€)/ litre	Gasoline price per litre according to the Fuel Price Observatory
Driving Duration	min	Total driving duration, represents the net driving time
Total distance	km	Total distance travelled in each trip per driver
ha/100kmh	-	Number of harsh accelerations per distance (100 km)
hb/100kmh	-	Number of harsh brakings per distance (100 km)
Speeding	km/h	Exceedance of speed limit
Mobile phone use	sec	Duration in which each driver used their mobile phone during trips

Methodology

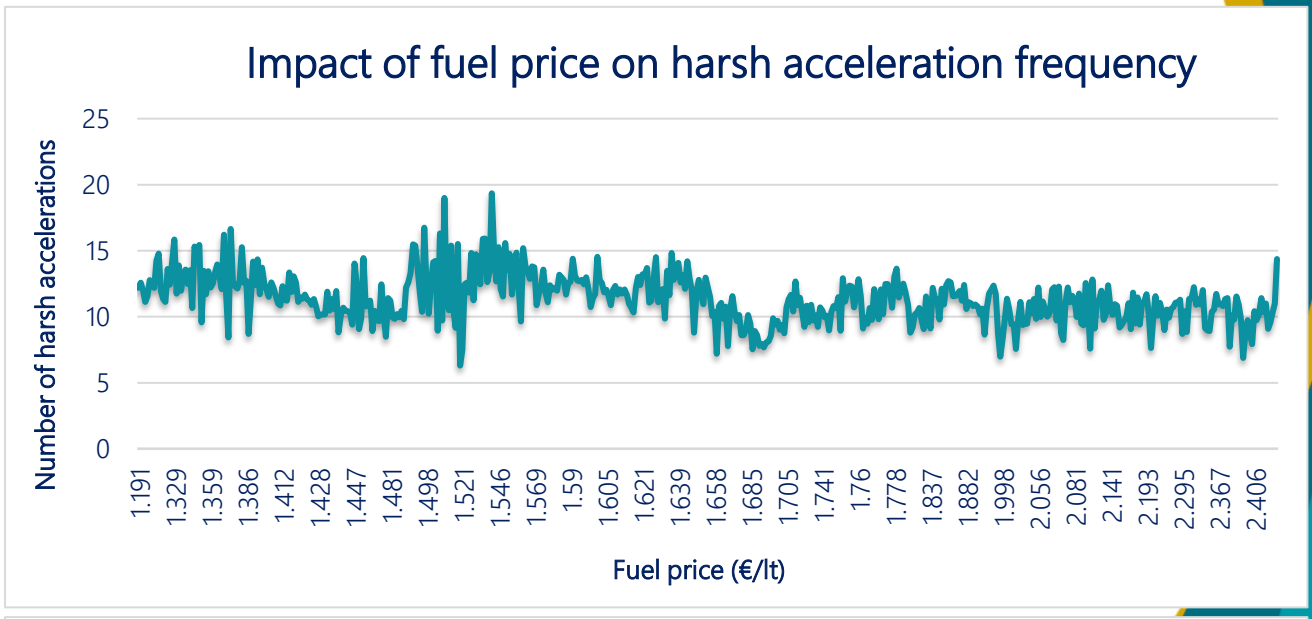
- A regression analysis was employed to evaluate whether key driving characteristics, such as fuel price, average speed, mobile phone use while driving (including calling, texting and browsing), duration and distance could be considered as predictive factors for harsh acceleration and harsh braking events

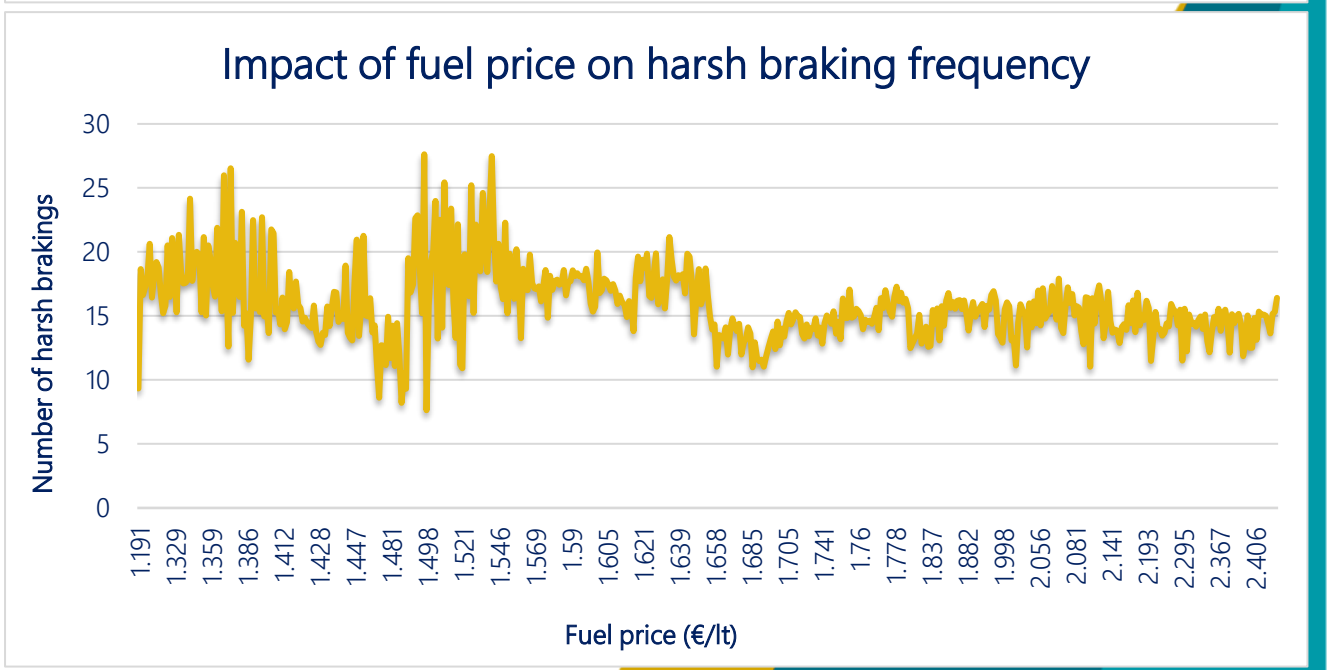
Four linear regression models were developed:

- 2 models predicting harsh acceleration
- 2 models predicting harsh braking

Descriptive Analysis (1/2)

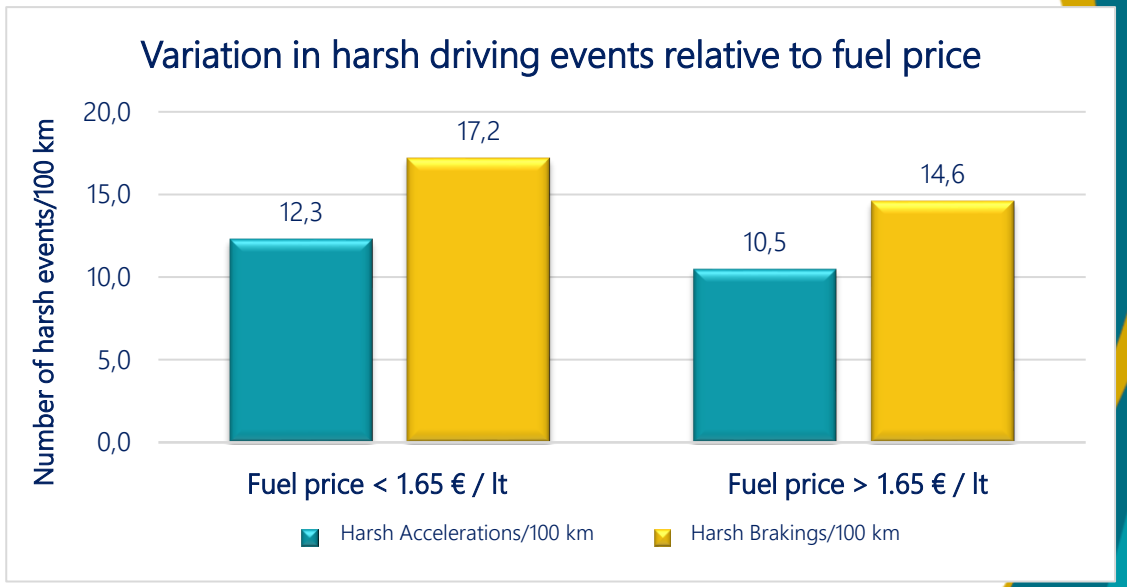
- A general decline in the frequency of harsh acceleration events as fuel prices increase was observed, indicating that increased fuel costs encouraged more cautious and fuel-efficient driving behaviour
- A negative correlation between fuel price and harsh braking behaviour was found, suggesting that higher fuel costs led drivers to adopt less aggressive braking patterns

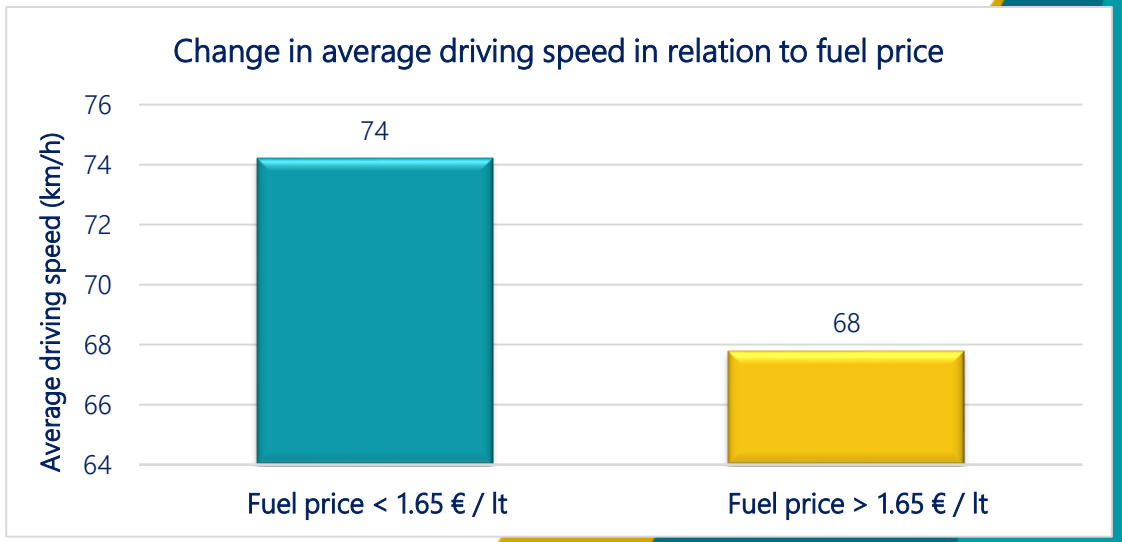




Descriptive Analysis (2/2)

- When fuel prices was below €1.65, the frequency of harsh accelerations and harsh brakings was 12.3 and 17.2 events, respectively. In contrast, when fuel prices exceeded €1.65, these values declined to 10.5 for harsh accelerations and 14.6 for harsh brakings
- This comparison indicated that higher fuel prices were associated with smoother, less aggressive driving behaviour, reinforcing the hypothesis that rising fuel costs can incentivize more cautious and eco-driving styles
- When fuel prices were under €1.65, the average driving speed was recorded at 74 km/h. In contrast, when prices rose above this threshold, the average speed decreased to 68 km/h
- This observed decline in speed suggested that higher fuel prices prompted drivers to adopt a more moderate and fuel-efficient driving style





Regression Analysis

- Fuel price had a significant negative effect on both harsh accelerations and brakings, suggesting that as fuel prices increased, the number of harsh events decreased
- In all models applied, speeding and total distance were positively associated with harsh events, implying that drivers who exceed speed limits and travel longer distances tend to accelerate and brake more aggressively
- Driving duration emerged as the most influential factor, indicating that longer trips were strongly associated with more frequent harsh braking
- Mobile phone use and average speed had smaller but statistically significant positive effects

Independent Variables	Model 1				Model 2				Model 3				Model 4			
	bi	t	ei	ei*	bi	t	ei	ei*	bi	t	ei	ei*	bi	t	ei	ei*
Fuel price	-0.30	-17.20	-0.61	-6.90	-0.19	-13.13	-0.39	1.00	-0.24	-10.45	-0.34	-5.02	-0.15	-6.90	-0.21	-1.45
Average speed	0.00	6.92	0.09	1.00	-	-	-	-	0.00	7.72	0.12	1.81	-	-	-	-
Mobile phone use	0.00	4.40	0.10	1.10	-	-	-	-	0.00	2.75	0.07	1.00	-	-	-	-
Driving duration	0.00	10.72	1.20	13.42	-	-	-	-	0.01	7.97	8.35	21.48	-	-	-	-
Speeding	-	-	-	-	0.13	28.29	0.68	-1.73	-	-	-	-	0.15	22.49	0.56	3.82
Total distance	-	-	-	-	0.01	4.65	14.04	-35.78	-	-	-	-	0.02	6.84	0.15	1.00
R^2	0.448				0.536				0.338				0.434			

Discussion

- Results demonstrated that the increase in fuel prices led to a reduction in harsh events (acceleration or braking)
- It was observed that during periods of increased fuel prices, drivers improved their driving style and were more attentive to the task of driving, performing fewer harsh events and speeding violations
- Interestingly, when fuel prices exceeded €1.65 per litre, harsh events dropped by 15% and average speed declined by 8%, reflecting a behavioural shift toward more cautious and fuel-efficient driving
- Overall, the models consistently showed that fuel price had a significant and negative effect on both harsh acceleration and braking events, suggesting that higher fuel costs promote more moderate and efficient driving behaviour
- Variables such as driving duration, speeding and total distance also played key roles in influencing harsh events

Conclusions

- From a practical perspective, the findings suggested several implications for policy and behaviour change
- Policymakers may consider fuel pricing strategies as a potential tool to promote safer driving behaviour
- Awareness campaigns, enforcement of speed limits and driver training programs can help mitigate risky behaviour and promote smoother and more eco-friendly driving
- Encouraging Public Transport use and expanding eco-driving education could indirectly reduce traffic congestion, crash risk and fuel consumption

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