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COMMERCIAL BUS DRIVER FUEL ECONOMY

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ABSTRACT

Aim: Fuel Economy is the Global Phenomena. World spends much more funds to research on fuel economy. Vehicle manufacturers carry out research on innovative techniques for fuel economy vehicles. This study aims to explore the pressure of driver personal characteristics on fuel economy. Method: study measures the affection on fuel economy caused by driver's personal characteristics. Results: Results of this study conclude Stress, Safety Skills and Environment Factors pressures in fuel economy.

KEYWORDS : Fuel Economy, Vehicle, Drivers, Stress, Institutional Factors, Environmental Factors.

1. INTRODUCTION

The fuel economy (KMPL) of vehicles is the global challenge; fuel economy of the buses has to improve immediately. Many countries have invested huge amounts for the research on fuel economy and trying to get new techniques for fuel economy.

Earlier studies concluded that public transportation is safer than other motorized transportation modes (Chimba et al., 2010; Tse et al., 2006) and buses are among the safest forms of road transportation (Yang et al., 2009). In low and middle-income countries, buses are likely to remain the primary mode of mass transit for the near future (Tiwari, 1994). Buses are the most common form of urban transit. In most transportation scenarios, reliance on buses has a positive impact on air quality because they pollute less per person mile and create less congestion because of their smaller road-use footprint. In addition to these benefits, it usually assumed that buses are among the safest modes of transport available because they are much larger and mass than most other road vehicles. Biomechanics and crash investigation studies confirmed that occupants of buses are at much lower risk

of dying in the event of a crash (Bhalla et al., 2006). However, bus users face risks of road traffic injuries on access trips and buses also are associated with road traffic crashes with other road users (Bhalla et al., 2007; Mohan et al., 2009).

Transit bus companies in many developing countries are cash-strapped (Kojima, 2001). Fuel makes up a relatively large fraction of total bus operating costs, especially when labor and bus costs are low, as in many developing countries (Jacobs, Maunder and Fouracre, 1981). According to the latest reports in India, only 3 out of 55 State Road Transport Undertakings (SRTUs) are making profit. In India, APSRTC Andhra Pradesh State Road Transport corporation were 37 percent of total expenditures in 2009 (APSRTC, 2011). Due to the speedy increase in diesel price in India, SRTU's spend around 50% of its revenue for fuel cost. Over 530000 buses on Indian roads, this consumes annually 81 million bbl of diesel. Indian commercial bus companies have an immediate necessitate improving its fuel economy.

One estimate by the Working Group of Petroleum Sector, 12th Plan and the Society of Indian Automobiles Manufacturers indicates that total transport sector consumption is around 59% of total diesel consumption, of which goods vehicles consume 37.9% of the total consumption of diesel in the economy.

It is well know that buses that are properly tuned and adjusted tend to be cleaner, safer and consume less fuel than poorly maintained buses. Also By proper methodical driving the fuel economy shall be improve hastily.

2. REVIEW OF LITERATURE

It has been well documented that bus driving can be a highly stressful occupation (Bartone, 1989) resulting from high and conflicting demands and lack of control over work pace and driving situations (Evans and Carrere, 1991; Carrere et al., 1991; Evans, 1994).

T.Rangaprasad (1988) in his report stated that the driver-training programme causes substantial in diesel consumption and increase in tyre life. This also resulted in considerable monetary savings to the corporation` due to training program KMPL has now considerably improved in Tamilnadu State Transport Corporation.

Maycock (1995) found that high-mileage (Heavy Goods Vehicle) drivers had a very flat accident–mileage relation.

Johannson (1999) concluded that Eco-Drive training on safety found a significant decrease in fuel consumption and a reduction in costs associated with accidents in a government fleet.

Driving style heavily influences fuel consumption (Nader, 1991; Ericsson, 1999). Moreover, many people can achieve reductions of 20 percent or even more in fuel consumption during training sessions (af Wahlberg, 2002).

Feeling angry while driving should induce poorer driving performance. Drivers recall driving faster when angrier (Arnett, Offer and Fine, 1997; Gidron, Gal and Desevilya, 2003).

Prindle W. R (2000) The most important idea that emerges from this meta-study is that fuel economy is not obtain from just a simple technical fix, but requires senior management attention, good data and metrics, employee participation and an attainable goal with a well-specified technical path to meet the goal.

Ericsson (2001) identified acceleration, deceleration, speed, and gear change behavior as the main indicators of an eco-driving style.

Several driver performance studies have shown not only a decrease in performance, but also an increase in confusion, anxiety and irritability when fatigued (Matthews and Desmond, 2002; Powell et al., 2001; Dinges et al., 1997).

Taubman-Ben-Ari et al. (2004) Dimensions related to driving performance, such as emotions and feelings while driving, and attitudes and values regarding road traffic and other factors.

Karin Brundell-Freij and Eva Ericsson (2005) Vehicle fuel consumption is a complex phenomena due to wide variety of factors such as traffic characteristics, driver characteristics, and road surface characteristics etc. and hence a definite value of fuel consumption from a particular vehicle for a given speed is not expected.

Dorn and Brown (2003) suggested that professional drivers are at a high risk of being involved in road traffic accidents due to their high annual mileage.

Edmunds (2005) found that turning the engine off during each of 10 idle periods lasting two minutes each on a 10-mile course improved mileage by 19%. In addition, using cruise control improves mileage at highway speeds by about 7%. Also found moderate driving yielded, on average, 31% better mileage than aggressive driving.

Sarvareddy (2008) Performance of a bus system get affected by several criteria, such as increased in the number of buses, number of bus stops, and number of passengers, and changes along roadways and in land uses.

Taylor, Deane and Podd (2008) there is Complex relationship between anxiety and driving performance. Moreover, driving performance is dependent on a relatively complex skill set (Taylor et al., 2002, 2008).

APSRTC (2011) A number of papers on energy efficiency strategies, maintenance best practices, fuel efficient driving and improved maintenance technology were collected in this work effort and their findings are summarized. Costs computed for India, where labor costs are low and fuel costs are high, based on cost.

Mr Anjum Parwez, IAS (2012) Managing Director of the BMTC, Fuel savings through clean fleet operations was essential; it also projects the bus corporation in a good light. The Karnataka State Road Transport Corporation (KSRTC) has been able to achieve considerable fuel savings through driver training only and the same should have replicated by other bus fleets.

Proceeding literatures found contributing factors of fuel economy such as, Fatigue, Stress, Driver Violation, Safety Skills, Driver Behavior, Institutional Factors and Environmental Factors. Nevertheless, this study will investigate above all variables and its impact on commercial bus driver's fuel economy. The respondents of this study are commercial bus drivers of Tamilnadu State Transport Corporation Limited.

3. RESEARCH OBJECTIVES:

This study has the following objectives.

- To discover the demographic variables influences on fuel economy among commercial bus drivers.
- To inspect the independent variables pressure on fuel economy.

3.1 Research Hypothesis

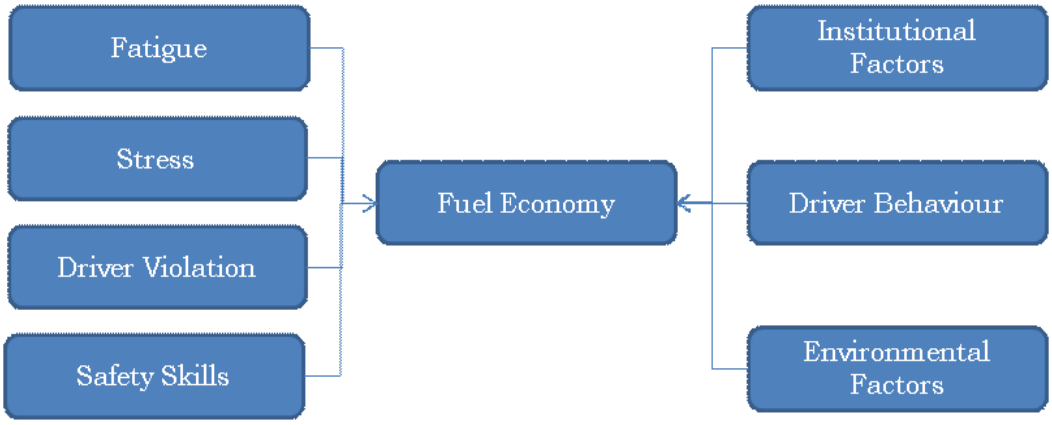
a) Null hypothesis H_0: There is no supported relationship between demographic variables and Fuel Consumption for per Kilometer (KMPL).

b) Null hypothesis H_0: There is no supported relationship between Study Variables and Fuel Consumption for per Kilometer (KMPL).

c) Null hypothesis H_0: There is no sound relationship between Earnings for per Kilometer (EPKM) and Fuel Consumption for per Kilometer (KMPL).

4. MEASUREMENTS:

With the intention to reach the research objectives the following variables preferred to this study, these are Fatigue, Stress, Driver Violation, Safety Skills, Driver Behavior, Institutional Factors and Environmental Factors. The constructed framework of this study as follows.



A well-constructed questionnaire used to this study especially to obtain the high quality answers. Questionnaire has the eight selected variables, which is most appropriate to this study. All the questions subjected to check through split-half (Kalpan and Saccuzo, 2009). All the reliability values of the questions found to be more than 0.82 and all the scales used in the present study qualified the standard for Cronbach's alpha set by Aiken (2003). Therefore, all the questions asked in this present study possessed high reliability. Sample size of this study is 350 out of 1900 drivers.

5. RESULTS

Regression analysis used to test the significance. SPSS 17.0 used to compute the data. Table 5.1 shows that the regression analysis between demographic variables and Fuel Consumption per Kilometer (KMPL). To obtain the stated hypothesis regression analysis computed.

R square=.240 that concludes demographic variables accounts only 24% variations in Fuel Consumption per Kilometer (KMPL). Demographic variables such as, Age and consuming alcohol showed significant relationship with Fuel Consumption per Kilometer (KMPL) (1% significant level). Results confirmed with earlier studies Ball, 1997; Cooper, Tallman, Tuokko & Beattie, 1993; Daigneault, Joly & Frigon, 2002; Chow, 1989; Jovanis, 1989.

While there is no supported relationship between Fuel Consumption per Kilometer (KMPL) and the following demographic variables such as Educational qualification, marital status, No. of children, Monthly Income and Consuming tobacco products. Results confirmed the previous studies Norris et al. (2000).

While computing with job information variables, Driving Experience, Obtaining the heavy driving license and Earnings for per Kilometer have significant relationship with Fuel Consumption per Kilometer (KMPL) (1% significant level). Moreover, there is no supported relationship between Fuel Consumption per Kilometer (KMPL) and the following job information variables such as preferred Brand of vehicle and preference Familiar routes

Table 5.1: Demographic Variables influence by Fuel Consumption for per Kilometer
Model Summary

R	R Square	Adjusted R Square	F	Sig.
.490	.240	.211	8.169	.000

Coefficients

Sl.No	Demographic Variables	B	SE	Beta	t	Sig.
	(Constant)	4.281	.607		7.052	.000
1	Age	.749	.187	.653	4.008**	.000
2	Educational qualification	-.054	.062	-.046	-.876 NS	.382
3	Marital status	-.122	.231	-.029	-.528 NS	.598
4	No. of children	.088	.083	.065	1.060 NS	.290
5	No. of dependents	-.106	.056	-.097	-1.872 NS	.062
6	Monthly Income	-.099	.112	-.093	-.887 NS	.376
7	Consuming tobacco products	.019	.054	.027	.356 NS	.722
8	Consuming alcohol	-.229	.061	-.291	-3.762**	.000
	Job Information					
9	Driving Experience	-.449	.125	-.434	-3.594**	.000
10	Obtaining the heavy driving license	-.293	.106	-.142	-2.760**	.006
11	Brand of vehicle	.113	.117	.048	.962 NS	.337
12	Earnings for per Kilometer	.340	.059	.331	5.718**	.000
13	Familiar route	-.128	.079	-.092	-1.625 NS	.105

Dependent Variable: Fuel Consumption for Per Kilometer
Source: Primary Data ** Significant at 1% NS Not Significant

Table 5.2 shows that the regression analysis between independent variables and Fuel Consumption per Kilometer (KMPL). To obtain the stated hypothesis regression was computed.

R square=0.132 that concludes Study Variables accounts only 13.2% variations in Fuel Consumption per Kilometer (KMPL). Study Variables such as, Stress, Safety Skills and Environment Factor showed significant relationship with Fuel Consumption per Kilometer (KMPL) (1% significant level). Moreover, there is supported relationship found between driver behavior and Fuel Consumption per Kilometer (KMPL) (5% significant level). Similar results found in Arnett, Offer, & Fine, 1997; Gidron, Gal & Desevilya, 2003, Taubman-Ben- Ari et al. 2004; Ericsson, 2001; Dorn and Brown, 2003; Taylor et al., 2002, 2008; Hancock & Scallen, 1999; Chow, 1989; Jovanis, 1989.

While Fatigue, Driver Violation and Institutional factors shown no supported relationship with Fuel Consumption per Kilometer (KMPL).

Table 5.2 Study Variables influence by Fuel Consumption for per Kilometer
Model Summary

R	R Square	Adjusted R Square	F	Sig.
.364	.132	.115	7.457	.000

Coefficients

Sl.no.	Variables	B	SE	Beta	t	Sig.
	(Constant)	2.672	1.663		1.607	.109
1	Fatigue	.009	.019	.032	.462 NS	.644
2	Stress	-.060	.011	-.323	-5.371**	.000
3	Driver Behavior	.056	.023	.437	2.475*	.014
4	Driver Violation	.007	.008	.054	.783 NS	.434
5	Safety Skills	.032	.009	.358	3.644**	.000
6	Institutional Factor	.014	.015	.157	.925 NS	.356
7	Environment Factor	-.035	.011	-.192	-3.176**	.002

Dependent Variable: Fuel Consumption for Per Kilometer
Source: Primary Data ** Significant at 1% * Significant at 5% NS Not Significant

Table 5.3 shows that 44% of drivers reported their KMPL were 6.01 to 6.50 in that 14% of drivers have 20.10 to 25.00 EPKM and 18% of drivers have 25.10 to 30 EPKM.

Drivers belong to 5.51 to 6.00 KMPL and 20.10 to 25.00 EPKM stands 10%. Drivers belong to 5.51 to 6.00 KMPL and 15.10 to 20.00 EPKM stands 8%. Drivers belong to 5.01 to 5.50 KMPL and 20.10 to 25.00 EPKM stands 6%. Six percent drivers reported their KMPL 6.01 to 6.50 and 30.10 to 35.00 EPKM.

Table 5.3 Fuel Consumption for Per Kilometer VS Earnings for per Kilometer Cross-tabulation

		Earnings for per Kilometer						
	Category	Rs 10.10 to 15.00	15.10 to 20.00	20.10 to 25.00	25.10 to 30.00	30.10 to 35.00	Above 35	**Total**
Fuel Consumption for per Kilometer	Below 4.5	0 .0%	7 2.0%	0 .0%	0 .0%	0 .0%	0 .0%	**7 2.0%**
	4.51 to 5.00	0 .0%	7 2.0%	14 4.0%	0 .0%	0 .0%	0 .0%	**21 6.0%**
	5.01 to 5.50	0 .0%	14 4.0%	21 6.0%	7 2.0%	0 .0%	0 .0%	**42 12.0%**
	5.51 to 6.00	7 2.0%	28 8.0%	35 10.0%	14 4.0%	0 .0%	7 2.0%	**91 26.0%**
	6.01 to 6.50	7 2.0%	14 4.0%	49 14.0%	63 18.0%	21 6.0%	0 .0%	**154 44.0%**
	6.51 to 7.00	0 .0%	14 4.0%	0 .0%	7 2.0%	14 4.0%	0 .0%	**35 10.0%**
	Total	**14 4.0%**	**84 24.0%**	**119 34.0%**	**91 26.0%**	**35 10.0%**	**7 2.0%**	**350 100.0%**

Source: Primary Data

Table 5.4 concludes the degree of relationship between Fuel Consumption for Per Kilometer (KMPL) and Earnings for per Kilometer (EPKM) correlation test was computed. Results indicated that there is moderate positive correlation between Fuel Consumption for Per Kilometer (KMPL) and Earnings for per Kilometer (EPKM) (r=.350). Therefore, when Fuel Consumption for Per Kilometer (KMPL) increases then Earnings for per Kilometer (EPKM) increase slightly. Similar results found in

previous studies (Johannson, 1999; APSRTC, 2011; T.Rangaprasad, 1988; Chow, 1989; Jovanis, 1989).

Table 5.4 Relationship between Fuel Consumption for Per Kilometer and Earnings for per Kilometer

Variables	Fuel Consumption for Per Kilometer	Earnings for per Kilometer
Fuel Consumption for Per Kilometer	1 . 350	
Earnings for per Kilometer	**.318(**)** **.000** **350**	1 . 350

Source: Primary Data ** Significant at 1%

CONCLUSION

Professional drivers are often get affected by stress, fatigue, environmental factors and institutional factors. This affection induces drivers to violation behavior. However, results of this study conclude Stress, Safety Skills and Environment Factor only contributed in fuel economy. Mostly Drivers are poorly educate, so special training needs to improve themselves in order to achieve more fuel economy. The driver can improve the image of the organization by stopping the bus at the bus stops smoothly and by picking the intermediate passengers then the revenue to be increased.

To facilitate improve financial viability; STUs were compelled to withdraw operations that involved unprofitable trips, services and routes. Predictably, private operators have also not introduced services on low-density routes because these are not profitable (Ministry of Road Transport and Highways).

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