IMPROVING FUEL ECONOMY IN GHANA:

A Socio-Economic Analysis of Policy Options

By:

Kwesi Asante

Senior Economics Officer

Ministry of Finance

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Outline of Presentation

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1. Introduction

- Global energy demand has been on an increasing trend in recent times – the energy needs of transportation sector is no exception especially for liquid fuel.

- Factors such as the increased need for travel and logistics has fuelled this increased fuel demand.

- However, this heightened demand for fuel has also presented new macroeconomic challenges as national governments have to provide fuel subsidies in times of oil price hikes (Atabani, 2012).

1. Introduction

- There is also a social cost component which usually manifests in cost of treating air pollution related ailments to be paid by society, disruption agriculture activities, destruction of flora and fauna, etc.

- Improving fuel efficiency help reduce oil use without sacrificing the usage of our vehicles.

- Reduced oil use means both fewer CO_2 emissions and a smaller economic impact when oil prices rise, thereby improving both the environment and our economic security (Pizer, 2006).

1. Introduction

- According to Corporate Average Fuel Economy (CAFE) projections for 2017-2025
- Benefits of fuel efficiency is enormous
- GFEI's "50-by-50" target – seeks to reduce GHG emissions from LDVs through a 50% improvement in fuel efficiency globally.

	Amount (US$)
Savings in Fuel cost	7,300
Net Savings (over lifetime of new vehicles)	4,600
Cost of LDVs (satisfy 2025 standards)	< 2000
Annual Savings (improved efficiency)	700*
*can pay for the vehicle's increased price in 3years	

2. Benefit Component (1/2)

The benefit of fuel-economy improvement is more complicated. The benefits of fuel efficiency policies are usually manifested as below:

- **Savings on fuel cost**
- **Health benefits**
  - Reductions in local air pollutants
- **Climate benefits (carbon credit)**
  - Reductions in carbon emissions
- **Oil savings**
  - Including improved energy security
- **Job opportunities**

2. Cost Component (2/2)

- **Direct cost made up of three factors**
  - Inherent production costs
  - Timing of investments (i.e. to recover existing sunk costs)
  - Market risk

- **Declining costs could occur with cumulative production**
  - Huge economies of scale (Lower AC of production)

- **Direct Cost treating RTIs**

- **Loss in fuel tax revenue**

- **Compliance costs**
  - Auto and fuel industries

3. Policy Options (1/1)

Four (4) policy options according to the FEPIT:

- Fuel Economy Target
- CO2 vehicle registration Tax/ Feebate scheme
- CO2 vehicle circulation Tax/ Feebate scheme
- Fuel Tax

	Fuel		Vehicles			
	Fuel Tax	Fuel Tax differentiation	Acquisition Tax	Ownership Tax	Import Restriction	
None	Heavy fuel subsidy	All fuels taxed the same way	no vehicle tax, or vehicle tax not depending on fuel economy			None
Low	5% subsidy to 20% tax	Diesel 5-15% cheaper than gasoline	0-5% of average vehicle price between most and least efficient vehicle		>10 years	Low
Medium	20-50% tax on fuel price	Diesel 15-25% cheaper than gasoline	5-15% of average vehicle price between most and least efficient vehicle		5-9 years	Medium
High	50-100% tax on fuel price	Diesel 25-35% cheaper than gasoline	15-25% of average vehicle price between most and least efficient vehicle		<5 years	High

3. Policy Impacts (1/5)

Option 1: No policy intervention

Option 2: All policies implemented

- Fuel options (fuel tax and fuel and tax differentiation)
- Vehicle options (CO2 vehicle labelling, CO_2-based vehicle registration and CO_2-based vehicle circulation taxes/feebates and Used import restriction)

Option 3: Only vehicle options implemented

Option 4: only fuel policies implemented

Option 1	2005	2025	2050
No Intervention (gCO2/km)	212	164	119
(L/100km)	7.4	7.3	7.2
Option 2			
All policies Implemented (gCO2/km)	212	125	65
(L/100km)	7.4	5.5	3.9
Option 3			
Vehicle Options (gCO2/km)	212	130	66
(L/100km)	7.4	5.97	4.7
Option 4			
Fuel options (gCO2/km)	212	144	92
(L/100km)	7.4	5.8	4.4

3. Policy Impacts (2/5)

Financial Costs for Vehicles in 2005 (Base Year) – No FE policy intervention

- Annual fleet of 1.3 billion vehicles
- Total fuel consumption of **GHC1.4 billion**
- Loss of **GHC41.7 million** in fuel tax revenues (30% fuel cost tax)

	Diesel	Petrol
Average fuel economy (L/100Km)	7.40	7.40
Average fuel price	4.50	4.50
Total amount (GHS/100Km)	33.30	33.30
Amount in GHC/Km	0.33	0.33
Average Daily Km Travelled	200.00	200.00
Number of registered Vehicles	17,569.00	39,705.00
Daily fleet Km travelled	3,513,800.00	7,941,000.00
Annual fleet Km travelled (*365)	1,282,537,000.00	2,898,465,000.00
Estimated Financial Cost (GHC)	**427,084,821.00**	**965,188,845.00**
Gross Total Financial Cost (GHC)	**1,392,273,666.00**	

3. Policy Impacts (3/5)

Financial Benefit of CO_2 Emission Reduction in 2005 (Base year) – No FE policy intervention

- Total annual fleet of **1.2 billion** vehicles emitting **722,595.54 tCO_2**
- FE policy intervention will help prevent this emission and the this carbon credit is valued at **GHC794,855.09**

	Diesel	Petrol
Average CO_2 credit per ton (USD)	1.00	1.00
Exchange Rate ($1 to GHC)	1.10	1.10
Average CO_2 emission (gCO2/km)	186.00	167.00
Average Daily Km travelled	200.00	200.00
Total number of newly registered vehicles	17,569.00	39,705.00
Daily fleet Km travelled	3,513,800.00	7,941,000.00
Annual fleet km travelled (*365 days)	1,282,537,000.00	2,898,465,000.00
Average gCO_2 emitted	238,551,882,000.00	484,043,655,000.00
conversion factor	1,000,000.00	1,000,000.00
Tones emitted	238,551.88	484,043.66
Average carbon credit per ton	1.10	1.10
Estimated Financial Benefit (GHC)	**262,407.07**	**532,448.02**
Gross Total Emission (GHC)	**794,855.09**	

3. Policy Impacts (4/5)

Financial Costs for Vehicles in 2025 - 2050 Year) – All FE policy interventions implemented (fuel and vehicle options)

- Annual fleet of **10 billion vehicles** (2025) and 17 billion (2050)

- Total fuel consumption of **GHC5.5 billion** (2025) and **GHC9.1 billion** (2050)

- 30% Loss in fuel tax revenues

- **GHC164 million** (2025)
- **GHC2.7 billion** (2050)

	2025		2050	
	Diesel	Petrol	Diesel	Petrol
Average fuel economy (L/100km)	12.15	11.66	12.15	11.66
Average fuel price	4.50	4.50	4.50	4.50
Total Amount (GHS/100km)	54.68	52.47	54.68	52.47
Amount in GHS/Km	0.55	0.52	0.55	0.52
Average Daily Km Travelled	200.00	200.00	200.00	200.00
Number of projected registered Vehicles	39,285.00	101,684.00	76,634.00	158,214.00
Daily fleet Km travelled	7,857,000.00	20,336,800.00	15,326,800.00	31,642,800.00
Annual fleet Km travelled (*365)	2,867,805,000.00	7,422,932,000.00	5,594,282,000.00	11,549,622,000.00
Estimated Financial Cost (GHC)	**1,567,972,383.75**	**3,894,812,420.40**	**3,058,673,683.50**	**6,060,086,663.40**
Gross Total Fuel Expenditure	**5,462,784,804.15**		**9,118,760,346.90**	

3. Policy Impacts (5/5)

Financial benefit CO_2 emission reduction in 2025 - 2050 Year) – All FE policy interventions implemented (fuel and vehicle options)

- Annual fleet of **10 billion** vehicles (2025) and **17 billion** (2050)

- Total CO_2 emission of **854,926.88tCO_2** (2025) and **1.8 billiontCO_2** (2050)

- Carbon credit is valued at:

- **GHC3.7 million** (2025)
- **GHC5.1 billion** (2050)

	2025		2050	
	Diesel	Petrol	Diesel	Petrol
Average CO_2 credit per ton (USD)	1.00	1.00	1.00	1.00
Average CO_2 emission (gCO_2/km)	159.69	120.82	159.69	120.82
Average Daily Km travelled	200.00	200.00	200.00	200.00
Total number of newly registered vehicles	39,285.00	101,684.00	76,634.00	158,214.00
Daily fleet Km travelled	7,857,000.00	20,336,800.00	15,326,800.00	31,642,800.00
Annual fleet km travelled (*365)	2,867,805,000.00	7,422,932,000.00	5,594,282,000.00	11,549,622,000.00
Average gCO_2 emitted	457,959,780,450.00	396,967,100,704.40	697,377,855,279.60	496,967,100,704.40
conversion factor	1,000,000.00	1,000,000.00	1,000,000.00	1,000,000.00
Tones emitted	457,959.78	396,967.10	697,377.86	496,967.10
Average carbon credit per ton	4.30	4.30	4.30	4.30
Estimated Financial Benefit (GHC)	**1,969,227.06**	**1,706,958.53**	**2,998,724.78**	**2,136,958.53**
Gross Total Emission (GHC)	**3,676,185.59**		**5,135,683.31**	

4. Cost-Benefit Analysis

Indicator	Decision	
	Accept	Reject
NPV	NPV > 0	NPV < 0
IRR	IRR > Discount Rate	IRR < Discount Rate
B-C Ratio	B-C Ratio > 1	B-C Ratio < 1

	Value ($ Million)
Total Benefits	2507.35
Total Costs	2470.03
NPV	37.32
B-C Ratio	1.02
Discount Rate	10%

5. Recommendations

- Need for comprehensive and harmonised dataset
- GRA and DVLA must build a strong business intelligence to check consistency of entries made by custom and importing agency.
- A comprehensive study with physical tests on used automobiles to estimate more accurate fuel efficiency rates and carbon emissions rates and generate factor.
- The government through MoT should ensure that car franchise in Ghana publish their automobile efficiency rates and carbon emissions.
- MoH/GHS must compile a database on cost of treating respiratory ailments

6. Assumptions

- Assumed the same fuel price for diesel and petrol in 2020 and 2050
- Constant inflation from 2017
- Assumed 2005 exchange rate of $1 to GHC1.1
- 30% of fuel tax goes to central government as tax inflows (based on Uganda's assumption)
- Projected values for 2020 and 2050 were estimated in FEPIT and also adopted from other studies
- Base year: 2005
- Operation period: 20 years
- Constant inflation of 13%
- Real Discount Rate of 10%
- Assumed constant operations cost
- T-bills Rate (91-day) of 23%
- Health benefit adopted from a study on Mexico


Thank
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