Decarbonization of Transport

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One of the fastest-growing emitters of global greenhouse gas (GHG) is road-based transport. This sector is a critical component in the discussion of Nationally Determined Contributions (NDCs) and the overall effort towards decarbonization as a global challenge.

**Relevance of the project**

- **Transport Sector**
  - One of the fastest-growing emitters of global greenhouse gas (GHG)
  - Road-based transport

**Dataset - Household Surveys**

- **National Household Survey**
  - Per Country
  - # Car/Motorcycle
  - Household Expenditure (proxy of Income)

**Growth Curves**

- Gompertz & Logistic
  - Baseline of vehicle fleet growth

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**The George Washington University**

Washington, DC
Malawi 2013

• Three Stages:
  ➔ Accelerated growth
  ➔ Deceleration growth
  ➔ Saturation / Decline
Malawi ~2013, 2016 & 2019

- Three critical points: Starting point; Inflection point; Saturation point.
Car ownership (per 1000 inhabitants) along with Time in Malawi

2013 ~ 2016: 21.2% increase
2016 ~ 2019: 64% increase
2013 ~ 2019: 98% increase
Mexico ~ 2018, 2020

2018 Mexico

- **Acceleration**
- **Deceleration**
- **Saturation**

MMHE = 755

MMHE = 3234

The number of cars (per 1000 inhabitants)

Monthly Household Expenditure in USD (per Capita)

2020 Mexico

- **Acceleration**
- **Deceleration**
- **Saturation**

MMHE = 239

MMHE = 721

MMHE = 2080

Data

Gompertz Fitted

The number of cars (per 1000 inhabitants)

Monthly Household Expenditure in USD (per Capita)
Sensitivity of Car Ownership  Mexico ~ 2018, 2020

Inflection point : Maximum Growth Rate

2018 Mexico

Sensitivity of car ownership to Monthly household expenditure - Mexico 2020

Inflection point MMHE = 755

Inflection point MMHE = 721
Maximum & Saturation Car Ownership

Maximum & Saturation Car Ownership per Country

- 2020 Mexico: Saturation 447, Maximum 506, Average 322
- 2018 Mexico: Saturation 424, Maximum 434, Average 298
- 2018 Nigeria urban: Saturation 159, Maximum 158, Average 49
- 2019 Malawi: Saturation 137, Maximum 125, Average 24
- 2019 Cambodia: Saturation 131, Maximum 82, Average 24
- 2018 Nigeria rural: Saturation 95, Maximum 85, Average 16
- 2015 India: Saturation 62, Maximum 56, Average 8
- 2016 Malawi: Saturation 82, Maximum 78, Average 8
- 2013 Malawi: Saturation 82, Maximum 63, Average 5
- 2015 Ethiopia: Saturation 63, Maximum 53, Average 6

The number of Car (per 1000 inhabitants)
Conclusion

- The Gompertz model was demonstrated to provide a **good fit** with the official country's statistics.

- All these curves have a **point of inflection** that is always at a **fixed proportion of its asymptotic value**.

- An increase in the household income of the poorest centiles does not increase car ownership; the same behavior can be seen in the richest centiles.

- The car ownership takes off at middle income levels (high sensitivity) and this is were when the management plans **must limit the increase in the number of cars** (private car ownership).

- To forecast car ownership, the **Population** and **GDP** need to be considered.
References


Thank you!

Q&A?