

WASHINGTON, DC





Sara Sanchez Shuting Cai

World Bank





# Relevance of the project

One of the fastest-growing emitters of global greenhouse gas (GHG)



Transport Sector



**Road-based transport** 

UNITED NATIONS **PARIS CLIMATE** AGREEMEN SIGNING CEREMONY - 22 APRIL 2016 -

Nationally Determined Contributions (NDCs)



### **Decarbonization as a Global Challenge**



**Baseline of** vehicle fleet growth

# **Dataset - Household Surveys**

National Household



**Per Country** 



# Car/ Motorcycle



Household Expenditure (proxy of Income)



12/6/2022

# Malawi 2013

- Three Stages:
- → Accelerated growth
- → Deceleration growth
- → Saturation / Decline



#### 3 12/6/2022

# Malawi ~2013, 2016 & 2019



• Three critical points: Starting point; Inflection point; Saturation point.



Car ownership (per 1000 inhabitants) along with Time in Malawi



## Mexico ~ 2018, 2020

![](_page_5_Figure_1.jpeg)

WASHINGTON UNIVERSITY WASHINGTON, DC

6 12/6/2022

# Sensitivity of Car Ownership Mexico ~ 2018, 2020

![](_page_6_Figure_1.jpeg)

# Maximum & Saturation Car Ownership

Maximum & Saturation Car Ownership per Country

![](_page_7_Figure_2.jpeg)

THE GEORGE WASHINGTON

UNIVERSITY

WASHINGTON, DC

# 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.

THE GEORGE

# References

- Driscoll, T. (2015, June 15). *Exponential, logistic, and Gompertz Growth*. Exponential, logistic, and Gompertz growth " Chebfun. Retrieved October 30, 2022, from <u>https://www.chebfun.org/examples/applics/Gompertz.html</u>
- Lahoz-Beltra, R. (2021, April 07). *Gompertz Function with R.* Scholarly Community Encyclopedia. <u>https://encyclopedia.pub/entry/626</u>
- Lani, J. (2021, August 11). *Logistic regression*. Statistics Solutions. Retrieved November 2, 2022, from <a href="https://www.statisticssolutions.com/logistic-regression/">https://www.statisticssolutions.com/logistic-regression/</a>
- Rye, C., & Wise, R. (2016, October 21). *45.3 environmental limits to population growth biology*. OpenStax. Retrieved November 4, 2022, from

https://openstax.org/books/biology/pages/45-3-environmental-limits-to-population-growth

Wikimedia Foundation. (2022, October 24). *Logistic function*. Wikipedia. Retrieved October 30, 2022, from <a href="https://en.wikipedia.org/wiki/Logistic\_function">https://en.wikipedia.org/wiki/Logistic\_function</a>

![](_page_10_Picture_0.jpeg)

# Thank you!

![](_page_10_Picture_2.jpeg)

![](_page_10_Picture_3.jpeg)