12.03.2025

Modeling Growth of Developing Economies

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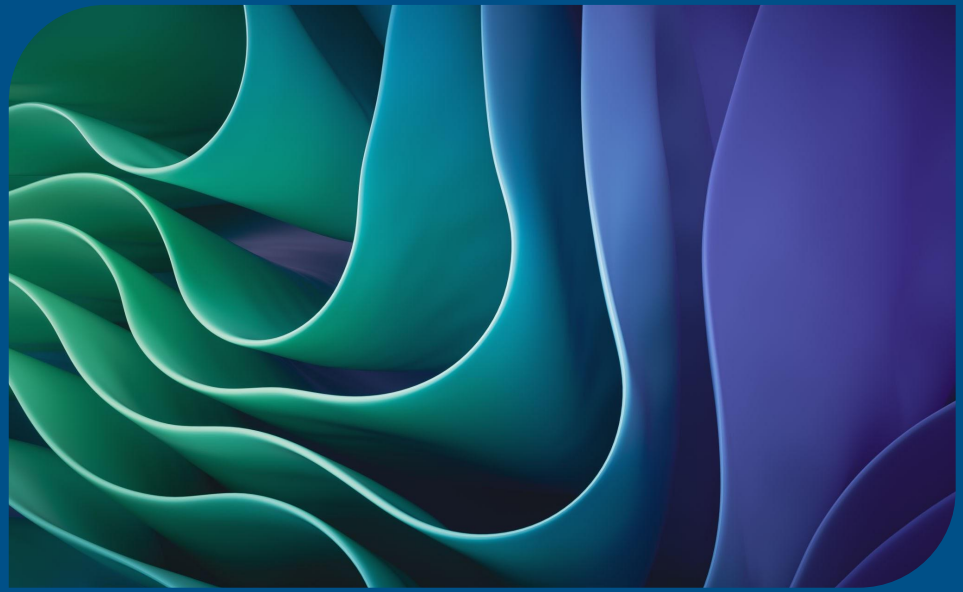


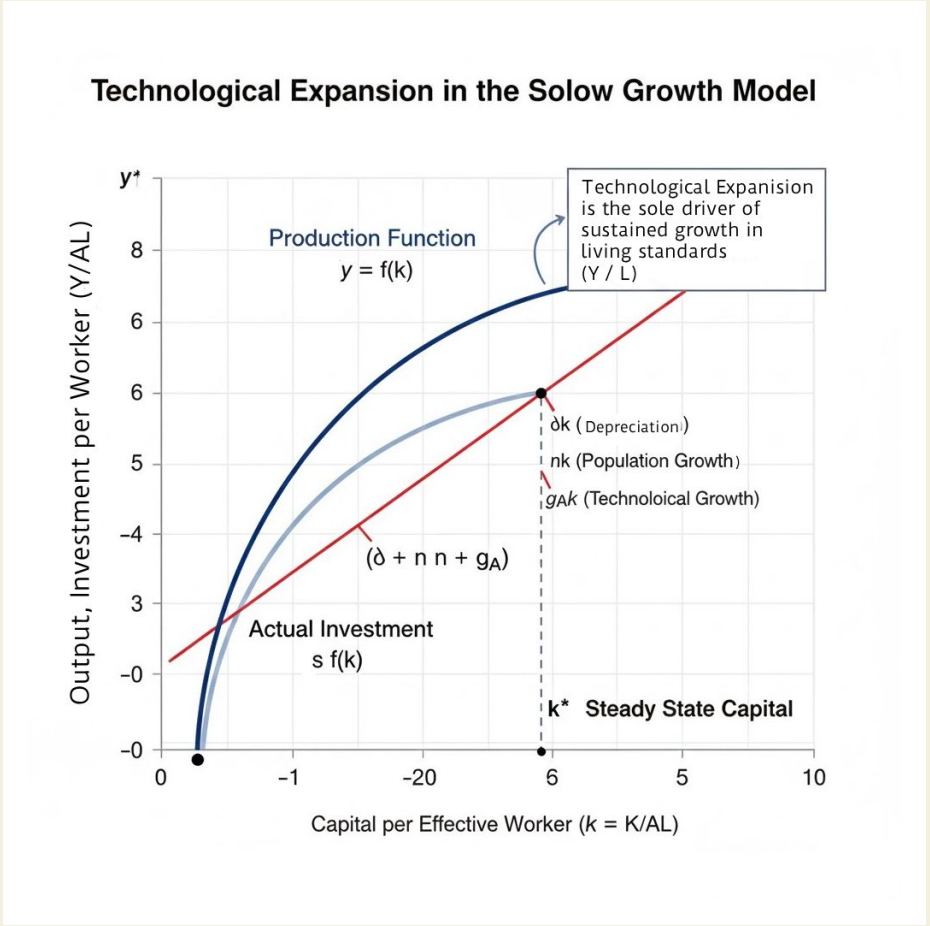
1. Research Question(s)
2. Data Sourcing and Cleaning
3. Model Selection
4. Model Findings
5. Risks and Moving Forward

Research Questions: What are the primary drivers of GDP per capita growth in Emerging Market Economies? Do results from ML experiments agree with Macroeconomic Theory?

Economic Theory Predictions

Traditional Economic Theory, best characterized by the Solow Growth Model(taught in Intermediate Macroeconomic classes at UW), predict that technological expansion is the sole long-run driver of sustained growth in Output per Laborer.

We seek to either verify or reject this model using machine learning.



Our Data

Our data includes a wide range of economic, demographic and political factors. For example, we use GDP, population growth and political instability as variables.

We source our data from the World Bank, Penn World Table and Census.gov.

Methods

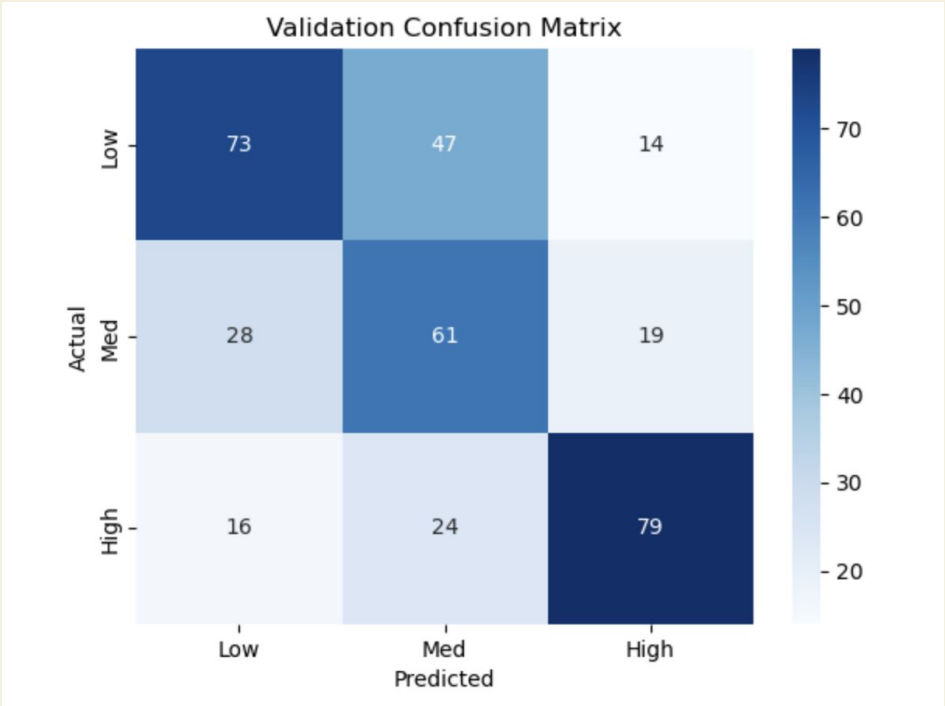
We chose to use a Random Forest algorithm due to the combination of predictive power and ability to gauge feature importance.

Our target variable is Real GDP per Capita.

- Categorized countries into Low, Medium and High growth by tertile.

Model Details:

- Used grid search to tune hyperparameters
- Parameter Info:
  - Number of Estimators: 300
  - Max Depth: 15
  - Minimum samples per leaf: 4
  - Minimum samples per split: 2



Experiment

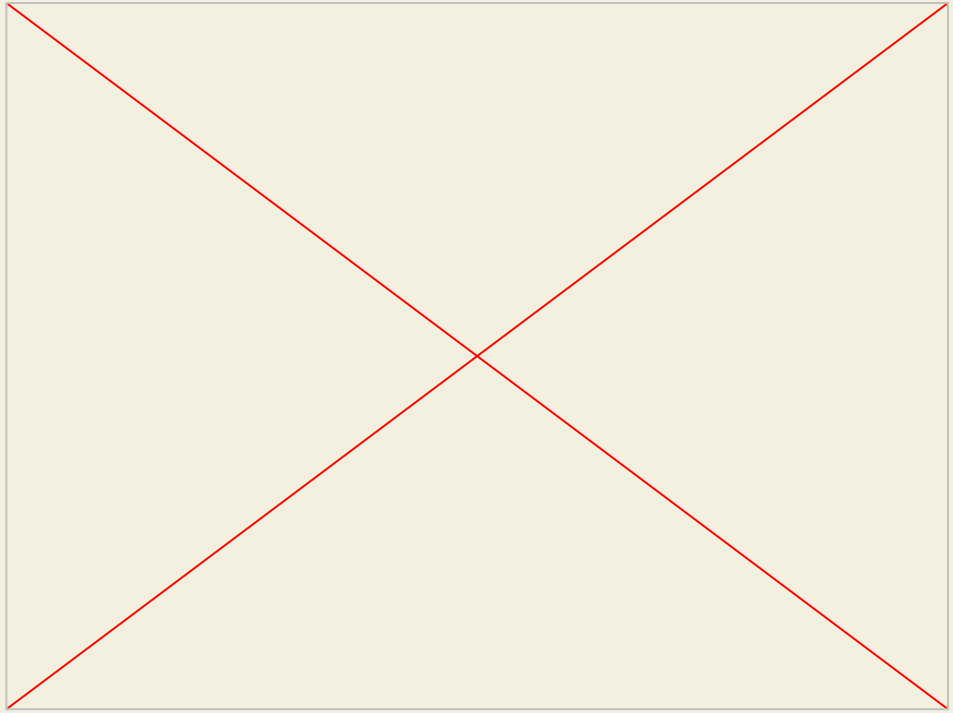
Objective: Evaluate whether ML-identified predictors align with or contradict Solow-model expectations

Procedure: Train Random Forest on country-year features.

Predict next-year growth outcome.

Extract feature importances.

Evaluation Metric: Accuracy of growth-direction classification on validation data (~60%).



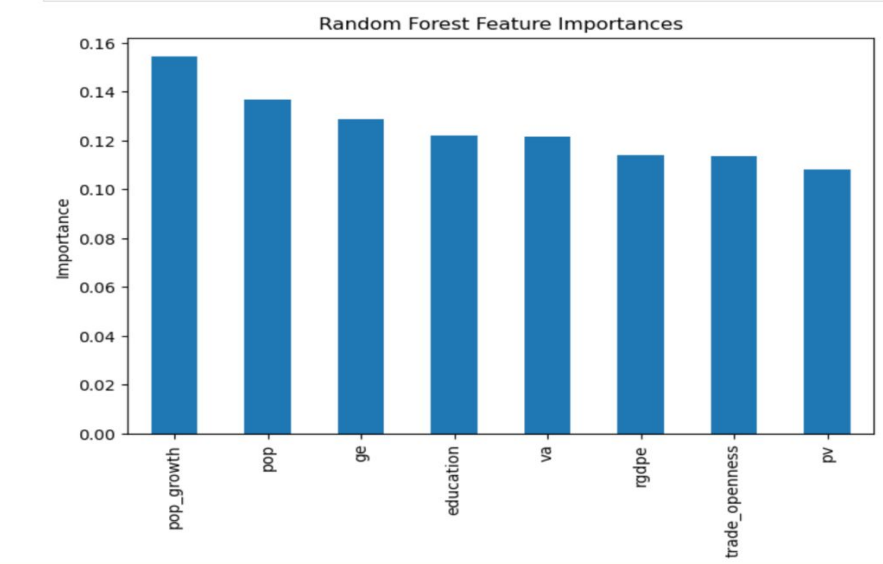
Experiment Findings

Notably, we saw that Government Effectiveness was the third most important predictor of economic growth behind population size and population growth.

This isn't considered in the biggest macroeconomic models!!!

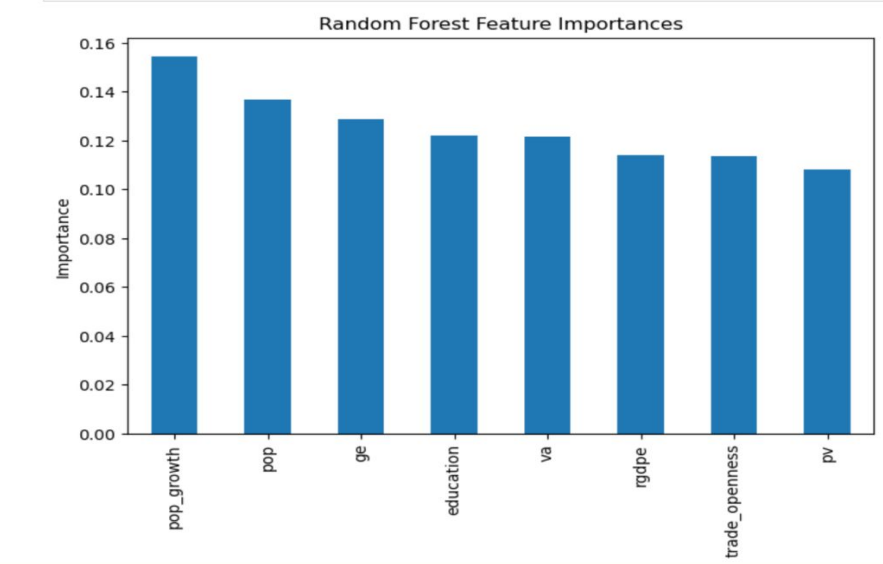
Similarly, education is 4th. Also not considered in any models!!!

Our experiment suggests that the simplified growth models taught in Intermediate Macroeconomics classes don't capture nuances in growth dynamics.



Experiment Findings Cont

- Population and Population growth were important features despite the target variable being per capita
- This is surprising — it's unclear whether population drives per-capita growth or reflects it.



Risks and Moving Forward

While we believe our model to be successful, we would like to point out potential pitfalls and next steps

1. Our target variable(GDP per capita) is very noisy-we need more data to overcome
2. Implement a more robust model(Neural Network) to capture more nuance
3. Seek other methods to discover the role that population size and growth rates plays a role in per capita income.