An Analysis of Long-Term Worldwide Economic Growth Data

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Goals for the Project

What are the most significant factors which influence the growth of a country?

- EX: Trade, labor force, political stability, technological innovation

*Able to be determined through data analysis

What are the best economic indicators of that growth?

- EX: GDP per capita, country health, capital formation

*Not able to be well determined through data analysis

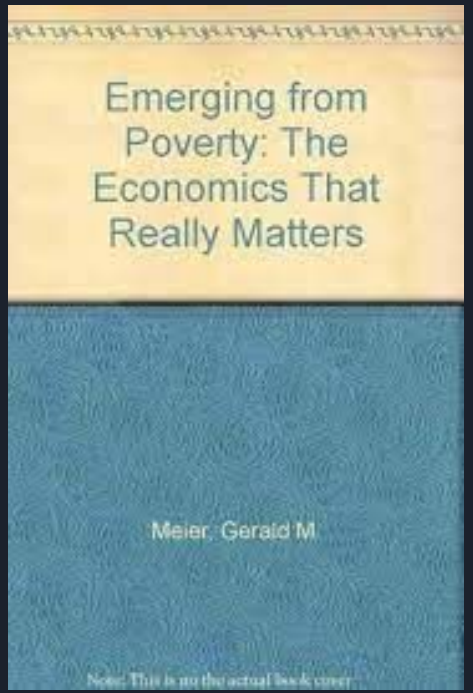
Determining Economic Growth Indicators

*Not easy to be done through my data analysis

- Actual growth is much more complex than any list of a few variables

Emerging from Poverty by Gerald Meier

- His advice was to look more towards improvements of country health, not just increases in Gross National Product (GNP)



Variables Used

Influential Factors

Imports
Exports
Net Exports (Exports-Imports)
Net migration
Labor force, total
Population
Urban population
Rural population

Economic Indicators

Economy Based

GDP Per Capita
GDP per capita (constant LCU)
GDP growth (annual %)
GDP (current LCU)
GDP (constant 2015 US$)
Gross capital formation (% of GDP)
Consumer price index (2010 = 100)
Labor force, total
Population

Country Health

Life expectancy at birth, total (years)
Birth rate, crude (per 1,000 people)
Population ages 0-14 (% of total population)
Death rate, crude (per 1,000 people)

Other

CO2 emissions (kt)

Variables Used

Influential Factors

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*Note: Many of these can be both influencers and indicators (analysis is not causal)

Economic Indicators

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Other
CO2 emissions (kt)

Sourcing the Data

Trade Data: United Nations Department of Economic and Social Affairs

https://unstats.un.org/unsd/trade/data/tables.asp

GDP per Capita, Population Data: University of Groningen Maddison Project

https://www.rug.nl/ggdc/historicaldevelopment/maddison/releases/maddison-project-database-2020

Economy and Health Data: The World Bank World Development Indicators Dataset

https://databank.worldbank.org/reports.aspx?source=2&series=NY.GDP.PCAP.CD&country=#

Data Prep and Processing

- Done in python
- Different dataset formatting and convention
- Very large scale
- Quite difficult

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
33824	T35.A.V.$	T35	Total trad	842	C	United Sta	2022	A	0	202252	1/1/2022	X	Exports	1	Total	0	World
33825	T35.A.V.$	T35	Total trad	842	C	United Sta	2022	A	0	202252	1/1/2022	M	Imports	1	Total	0	World
33826	T35.A.V.$	T35	Total trad	854	C	Burkina Fa	2022	A	0	202252	1/1/2022	M	Imports	1	Total	0	World
33827	T35.A.V.$	T35	Total trad	854	C	Burkina Fa	2022	A	0	202252	1/1/2022	X	Exports	1	Total	0	World
33828	T35.A.V.$	T35	Total trad	858	C	Uruguay	2022	A	0	202252	1/1/2022	X	Exports	1	Total	0	World
33829	T35.A.V.$	T35	Total trad	858	C	Uruguay	2022	A	0	202252	1/1/2022	M	Imports	1	Total	0	World
33830	T35.A.V.$	T35	Total trad	860	C	Uzbekistar	2022	A	0	202252	1/1/2022	M	Imports	1	Total	0	World
33831	T35.A.V.$	T35	Total trad	860	C	Uzbekistar	2022	A	0	202252	1/1/2022	X	Exports	1	Total	0	World
33832	T35.A.V.$	T35	Total trad	862	C	Venezuela	2022	A	0	202252	1/1/2022	X	Exports	1	Total	0	World
33833	T35.A.V.$	T35	Total trad	862	C	Venezuela	2022	A	0	202252	1/1/2022	M	Imports	1	Total	0	World
33834	T35.A.V.$	T35	Total trad	876	C	Wallis Fut.	2022	A	0	202252	1/1/2022	X	Exports	1	Total	0	World
33835	T35.A.V.$	T35	Total trad	876	C	Wallis Fut.	2022	A	0	202252	1/1/2022	M	Imports	1	Total	0	World
33836	T35.A.V.$	T35	Total trad	882	C	Samoa	2022	A	0	202252	1/1/2022	M	Imports	1	Total	0	World
33837	T35.A.V.$	T35	Total trad	882	C	Samoa	2022	A	0	202252	1/1/2022	X	Exports	1	Total	0	World
33838	T35.A.V.$	T35	Total trad	887	C	Yemen	2022	A	0	202252	1/1/2022	M	Imports	1	Total	0	World
33839	T35.A.V.$	T35	Total trad	887	C	Yemen	2022	A	0	202252	1/1/2022	X	Exports	1	Total	0	World
33840	T35.A.V.$	T35	Total trad	892	G	ECOWAS	2022	A	0	202252	1/1/2022	X	Exports	1	Total	0	World
33841	T35.A.V.$	T35	Total trad	892	G	ECOWAS	2022	A	0	202252	1/1/2022	M	Imports	1	Total	0	World
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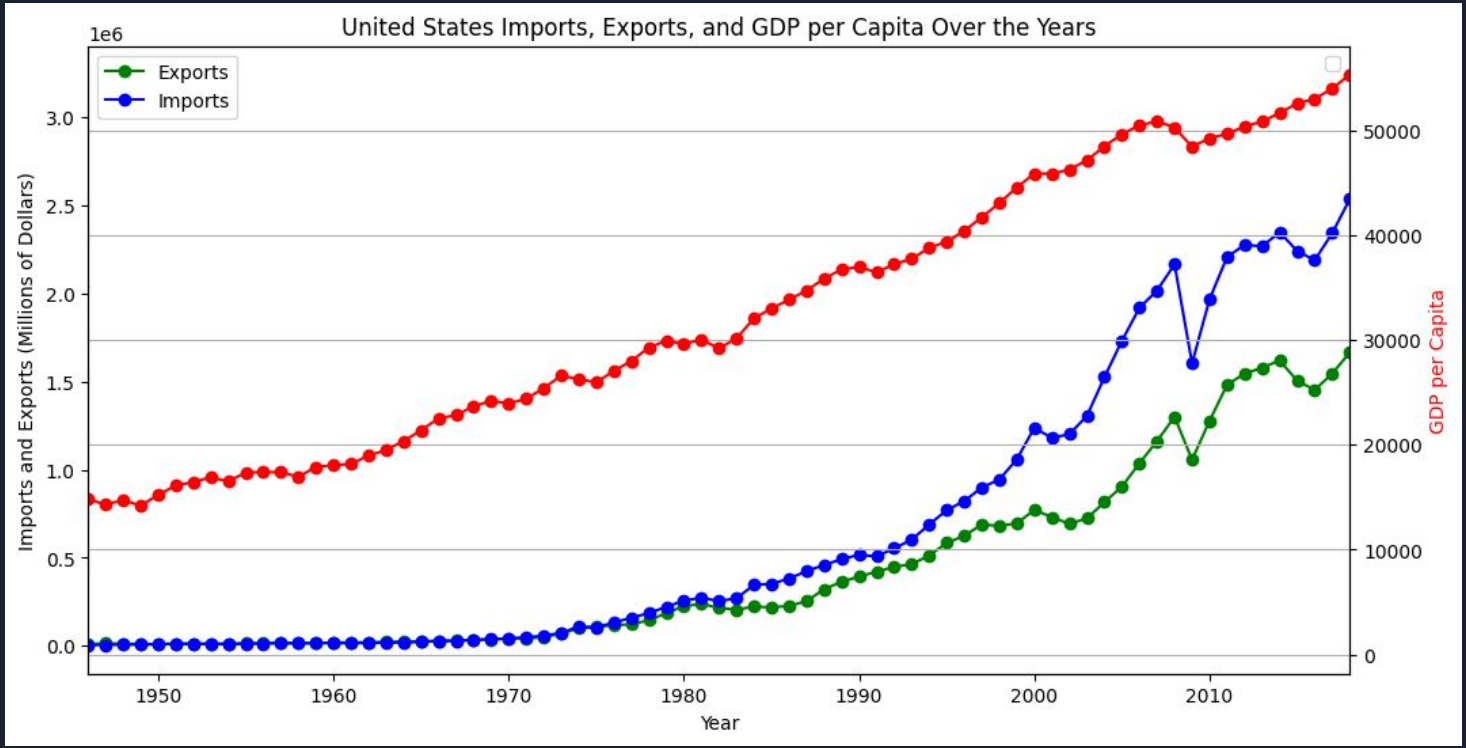
33847	T35.A.V.$	T35	Total trad	907	G	Former US	2022	A	0	202252	1/1/2022	X	Exports	1	Total	0	World

	A	B	C	D	E	F	G	H	I	J
5090	Gross capi	NE.GDI.TC	Cameroor	CMR	..	..	..	..	..	12.53133
5091	Gross capi	NE.GDI.TC	Canada	CAN	..	22.68395	23.25216	23.08031	24.05228	26.4828
5092	Gross capi	NE.GDI.TC	Cayman Is	CYM	..	..	..	..	..	..
5093	Gross capi	NE.GDI.TC	Central Af	CAF	19.63636	21.19205	23.27869	21.76656	22.12644	21.40921
5094	Gross capi	NE.GDI.TC	Chad	TCD	13.57363	14.78004	11.67231	15.12399	14.98532	11.03194
5095	Gross capi	NE.GDI.TC	Channel Is	CHI	..	..	..	..	..	..
5096	Gross capi	NE.GDI.TC	Chile	CHL	14.07684	15.5136	12.73327	15.30432	14.63275	15.45969
5097	Gross capi	NE.GDI.TC	China	CHN	39.58465	22.80526	15.73732	21.76186	24.34744	27.10143
5098	Gross capi	NE.GDI.TC	Colombia	COL	20.25479	20.49257	18.12659	17.65442	17.51405	14.72523
5099	Gross capi	NE.GDI.TC	Comoros	COM	..	..	..	..	..	..
5100	Gross capi	NE.GDI.TC	Congo, De	COD	..	..	..	..	..	..
5101	Gross capi	NE.GDI.TC	Congo, Re	COG	53.18683	64.65345	36.29848	22.74109	20.31056	22.42798

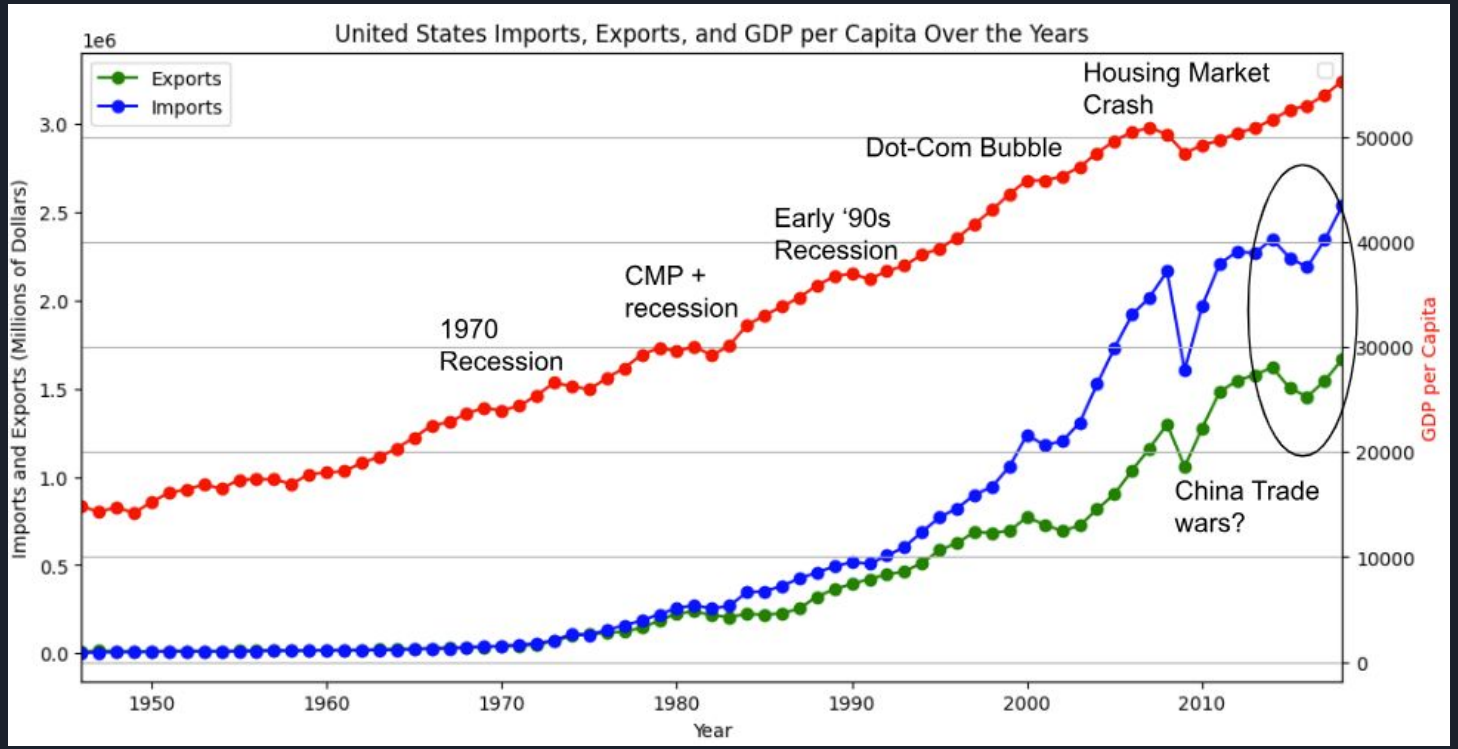
	A	B	C	D	E
1	country	country	year	gdppc	pop
20808	UZB	Uzbekistan	2003	4,845	25,992
20809	UZB	Uzbekistan	2004	5,068	26,268
20810	UZB	Uzbekistan	2005	5,284	26,540
20811	UZB	Uzbekistan	2006	5,535	26,810
20812	UZB	Uzbekistan	2007	5,908	27,079
20813	UZB	Uzbekistan	2008	6,278	27,345
20814	UZB	Uzbekistan	2009	6,618	27,606
20815	UZB	Uzbekistan	2010	7,003	27,866
20816	UZB	Uzbekistan	2011	7,396	28,128
20817	UZB	Uzbekistan	2012	7,928	28,394
20818	UZB	Uzbekistan	2013	8,482	28,661
20819	UZB	Uzbekistan	2014	9,085	28,930
20820	UZB	Uzbekistan	2015	9,720	29,200
20821	UZB	Uzbekistan	2016	10,381	29,473
20822	UZB	Uzbekistan	2017	10,744	29,749
20823	UZB	Uzbekistan	2018	11,220	30,023
20824	VEN	Venezuela (Bolivarian	1800	1,073	
20825	VEN	Venezuela (Bolivarian	1820	968	718
20826	VEN	Venezuela (Bolivarian	1830	1,922	
20827	VEN	Venezuela (Bolivarian	1831	1,897	
20828	VEN	Venezuela (Bolivarian	1832	2,142	
20829	VEN	Venezuela (Bolivarian	1833	2,173	
20830	VEN	Venezuela (Bolivarian	1834	2,195	
20831	VEN	Venezuela (Bolivarian	1835	2,153	
20832	VEN	Venezuela (Bolivarian	1836	2,002	
20833	VEN	Venezuela (Bolivarian	1837	1,884	
20834	VEN	Venezuela (Bolivarian	1838	1,693	
20835	VEN	Venezuela (Bolivarian	1839	1,576	

Notes | Sources | Full data | GDP pc | Population | Regi

United States Imports, Exports, GDPPC



United States Imports, Exports, GDPPC

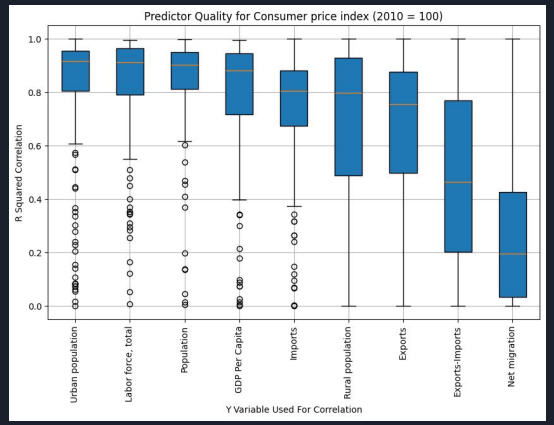


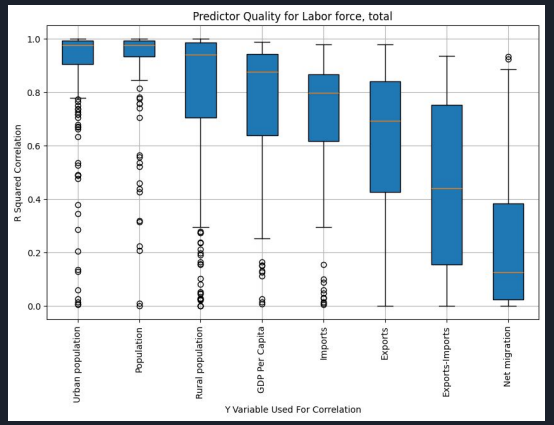
Method for Large Scale Analysis

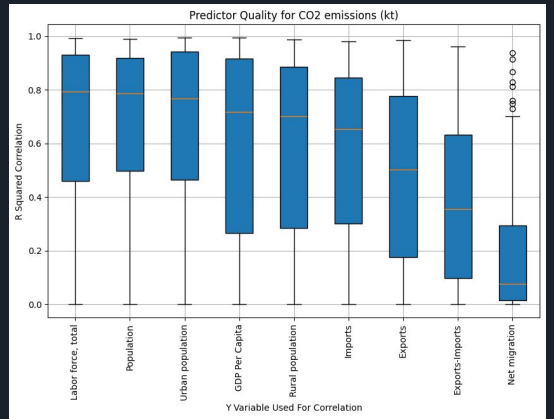
1) Choose indicator (EX: GDP Per Capita)
2) Loop through every influential factor (imports, exports, etc)
3) Loop through every country
4) Determined the R^2 correlation between the two variables
    a) R^2: The proportion of variance in the dependent variable which is predicted by the independent variable
5) Make results into boxplot

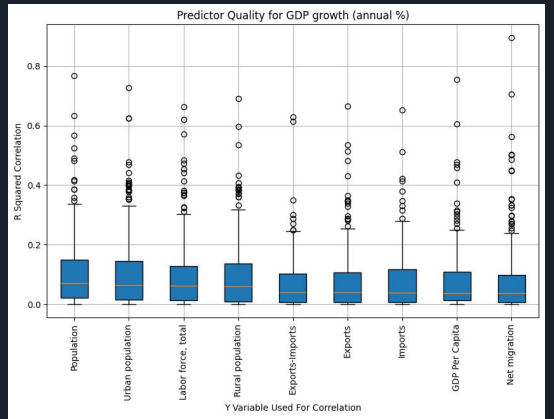
14 indicators * 8 predictors * ≈180 countries * ≈70 years of data

Economy-Based Economic Growth Results



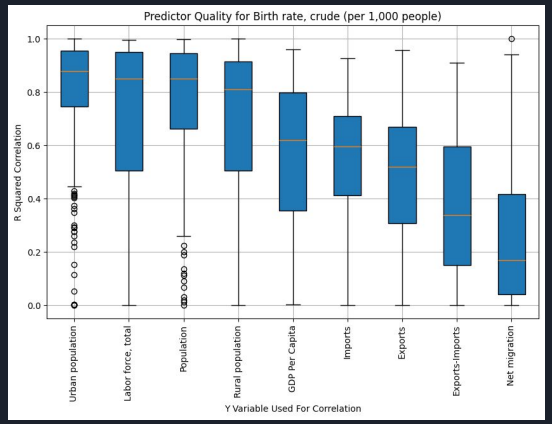


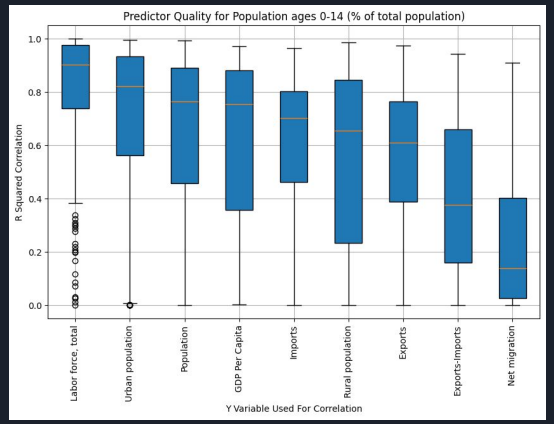


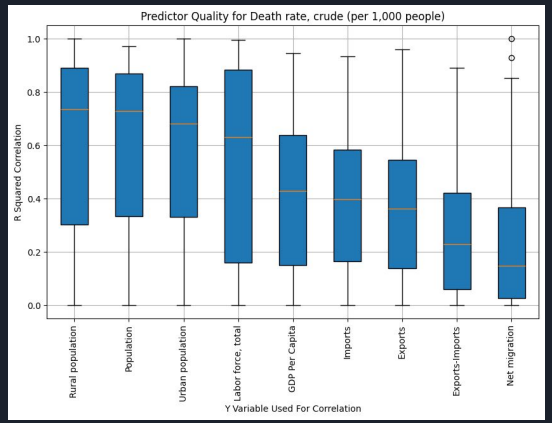


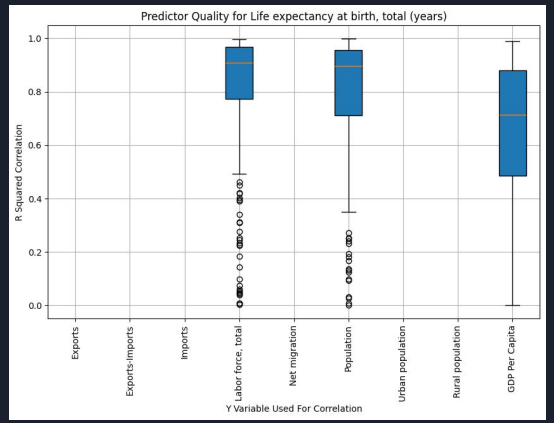
- Population based variables always most highly correlated
- GDPPC always right behind them
- Imports always slightly better than exports

Health-Based Economic Growth Results









- Ignore population based variables
  - Correlation direction matters, not decipherable on large scale

- GDPPC <u>always</u> has highest median R^2 otherwise

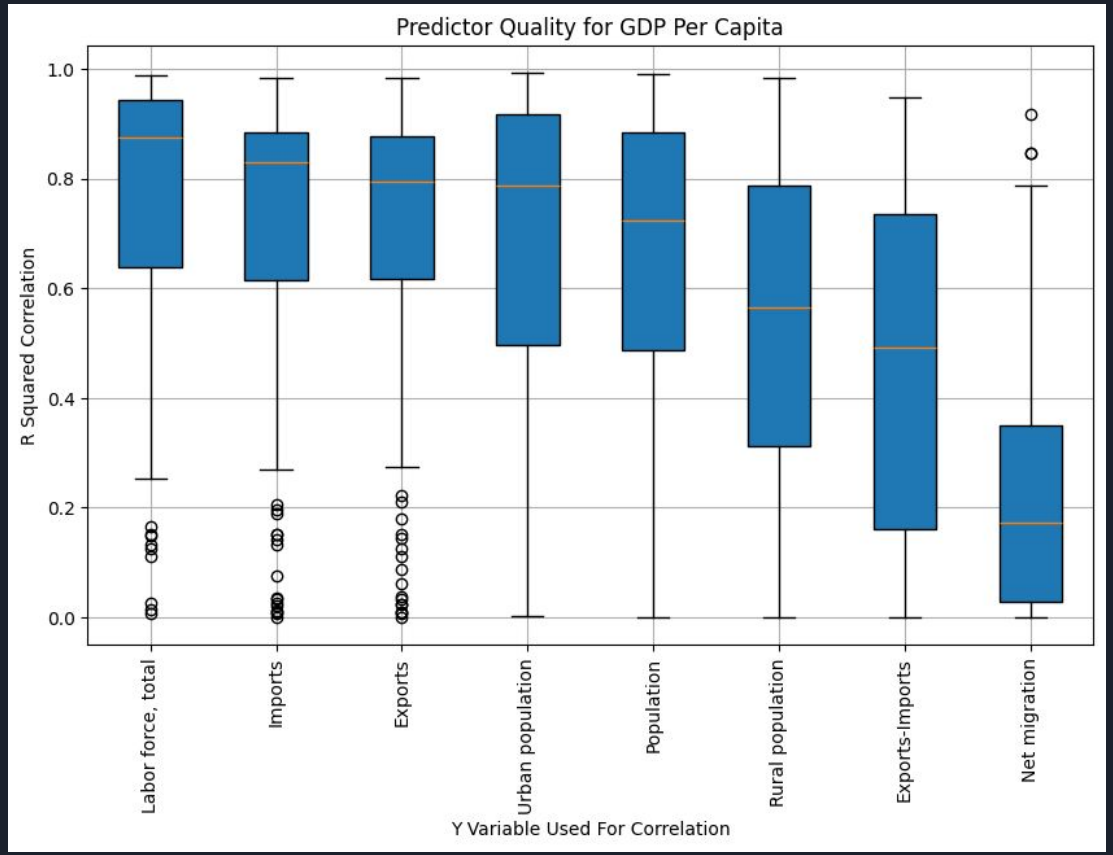
Note of Caution

- R^2 is correlation, not causation

- These correlations are extremely high
  - Gives us confidence in our data
  - But also reminds us that there are many variables at play

- This kind of analysis can help inform policy, but cannot explain the past

Coolest Finding: GDPPC Results



- Labor force ≠ population
- Even more highly correlated than importing and exporting is getting more people employed
- *Very* often higher correlated

Constraints

- Time available given amount of data
- Data conventions and overlap
- Correlation, no causation.
  - Year shift
- Weights not given for greater populated countries
- Correlated but without direction

Thank you