

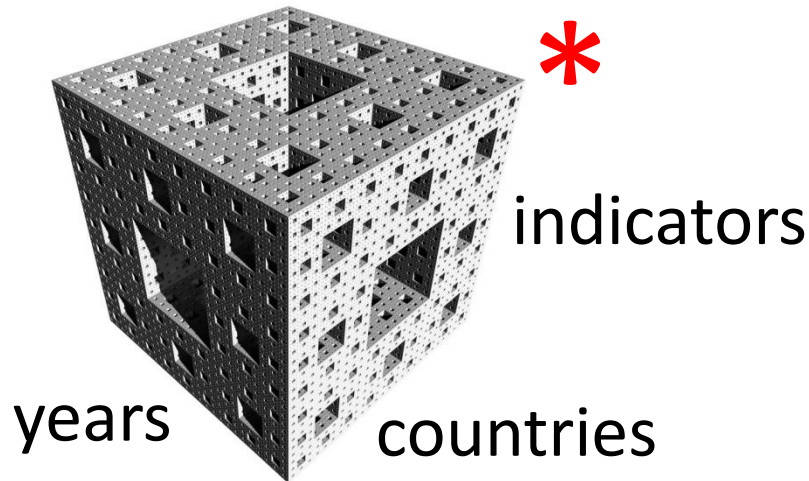
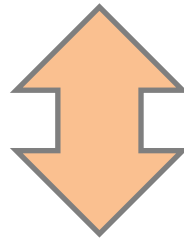
World Development Indicators

Which country will develop more?



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Stefano Moawad
Diana Isaeva

	CountryName	CountryCode	IndicatorName	IndicatorCode	Year	Value
1	Arab World	ARB	Adolescent fertility rate (births per 1,000 women age...	SP.ADO.TFRT	1960	1.335609e+02
2	Arab World	ARB	Age dependency ratio (% of working-age population)	SP.POP.DPND	1960	8.779760e+01
3	Arab World	ARB	Age dependency ratio, old (% of working-age populati...	SP.POP.DPND.OL	1960	6.634579e+00
4	Arab World	ARB	Age dependency ratio, young (% of working-age pop...	SP.POP.DPND.YG	1960	8.102333e+01
5	Arab World	ARB	Arms exports (SIPRI trend indicator values)	MS.MIL.XPRT.KD	1960	3.000000e+06
6	Arab World	ARB	Arms imports (SIPRI trend indicator values)	MS.MIL.MPRT.KD	1960	5.380000e+08
7	Arab World	ARB	Birth rate, crude (per 1,000 people)	SP.DYN.CBRT.IN	1960	4.769789e+01
8	Arab World	ARB	CO2 emissions (kt)	EN.ATM.CO2E.KT	1960	5.956399e+04
	⋮		⋮	⋮		
5656455	Zimbabwe	ZWE	Time required to start a business (days)	IC.REG.DURS	IC.PRP.DURS	9.000000e+01
5656456	Zimbabwe	ZWE	Time to prepare and pay taxes (hours)	IC.TAX.DURS	2015	2.420000e+02
5656457	Zimbabwe	ZWE	Time to resolve insolvency (years)	IC.ISV.DURS	2015	3.300000e+00
5656458	Zimbabwe	ZWE	Total tax rate (% of commercial profits)	IC.TAX.TOTL.CP.ZS	2015	3.280000e+01



*much more irregular

1344 indicators



select the
fullest ones



arrange
into topics



PCA

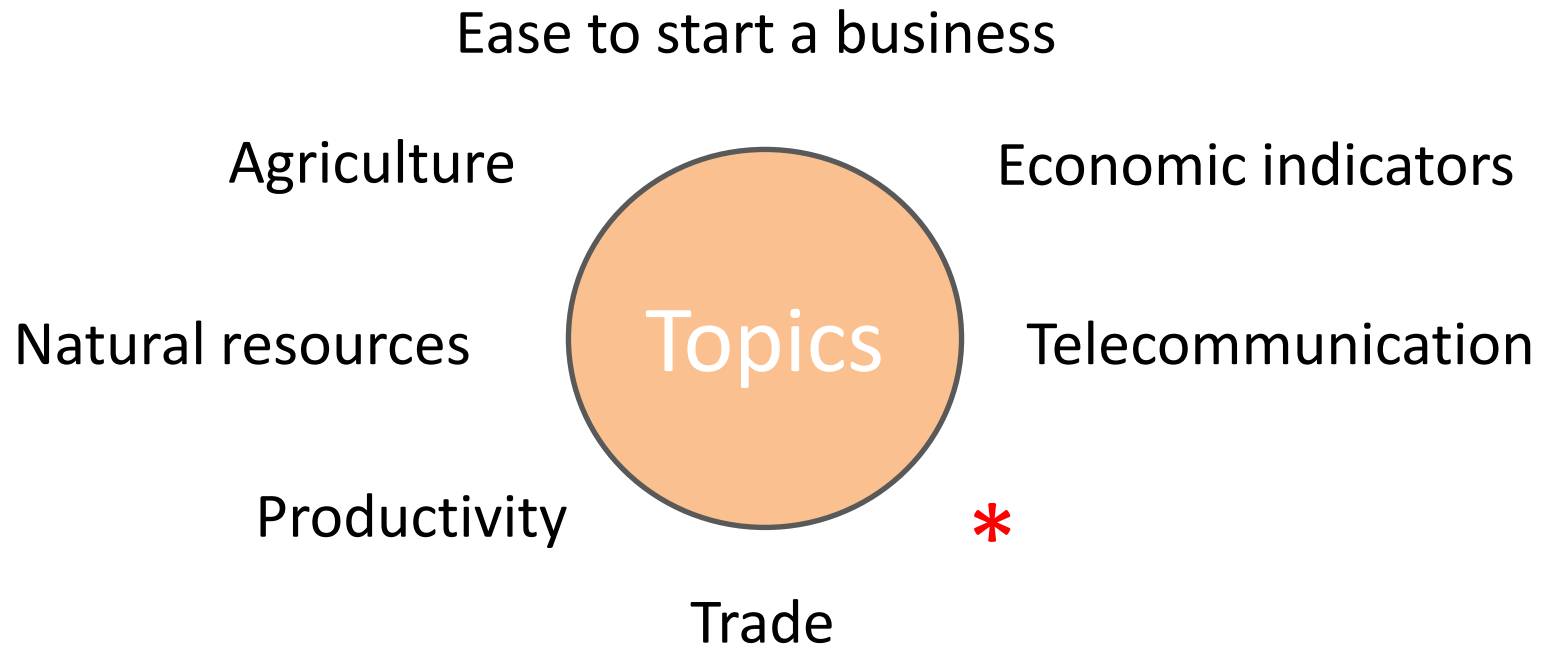


analyze the
main ones



Inference

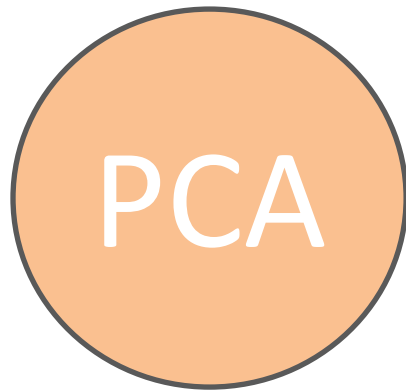




* others may be added



dimensionality
reduction



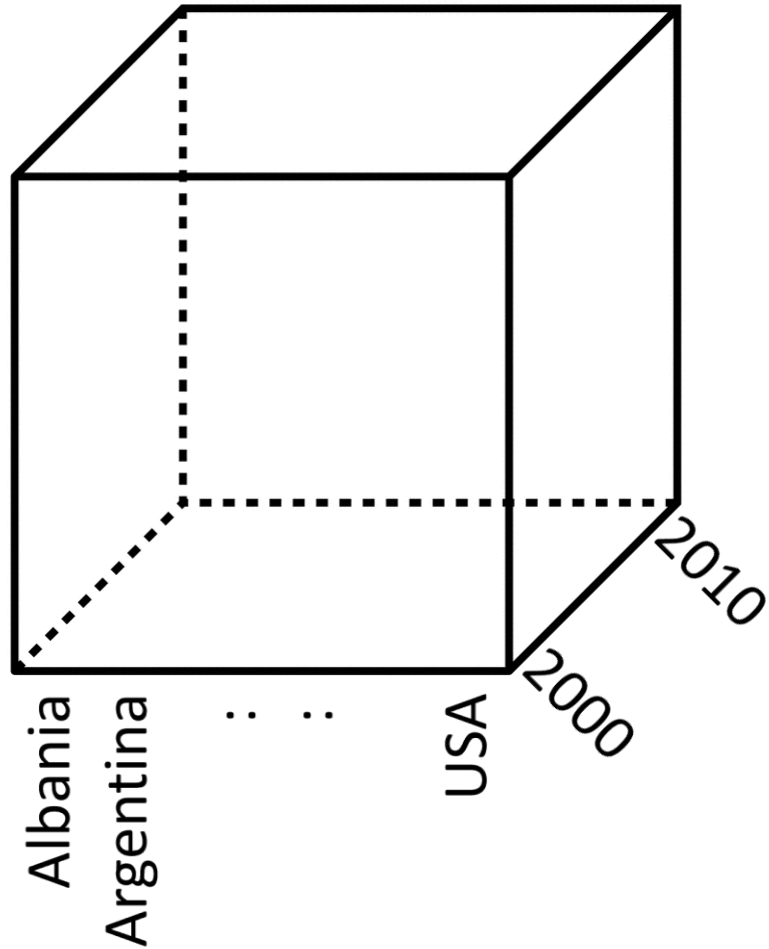
2D representation

identification of
particular behaviours

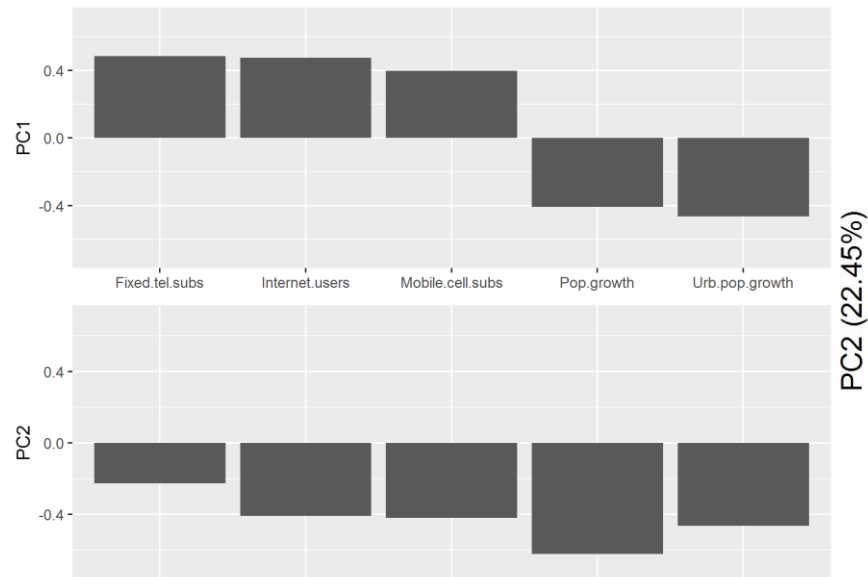


Telecommunications

Population growth
Fixed telephone subs
Mobile cellular subs
Urban population growth
Internet users

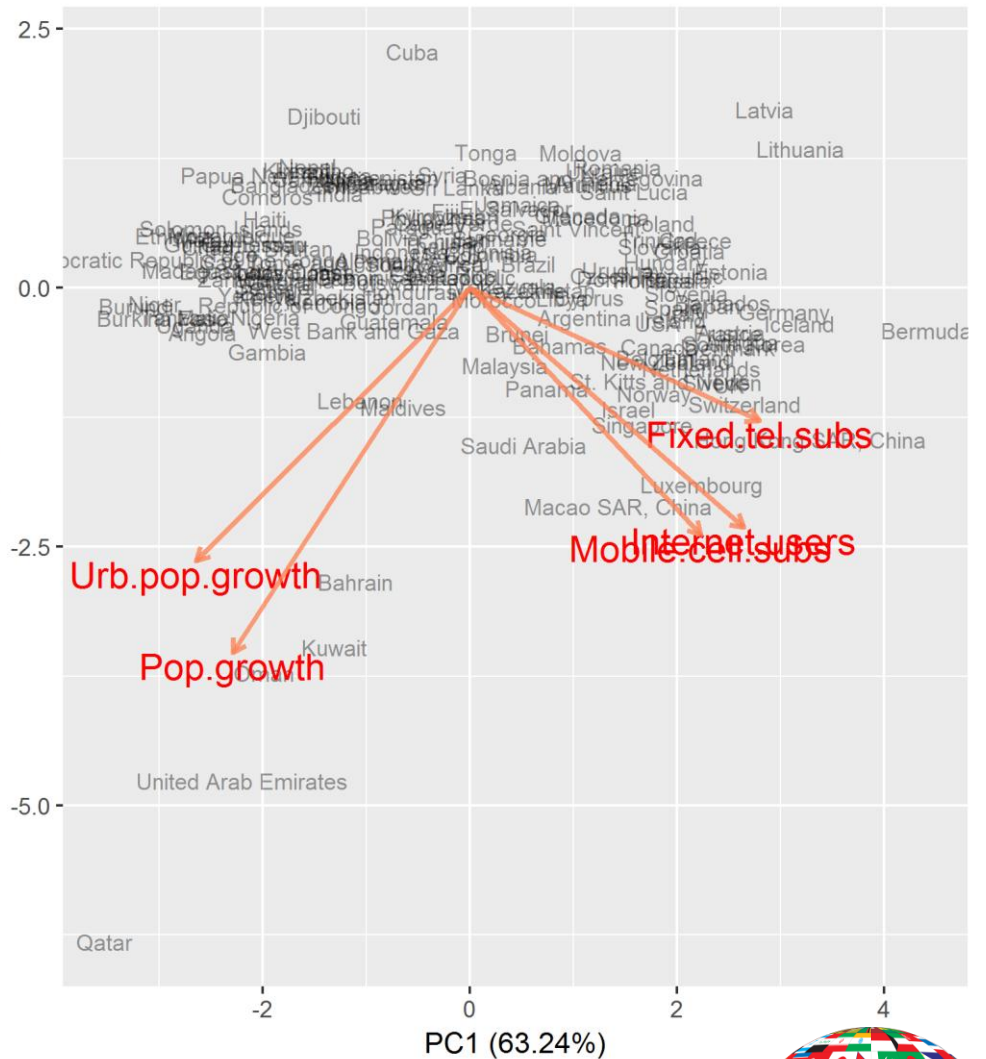


PCA for 2010



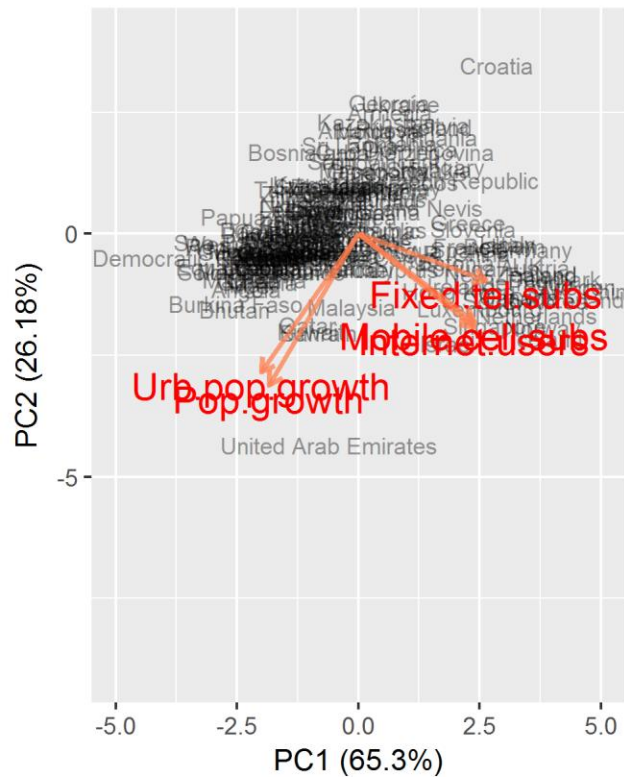
PC2 (22.45%)

2010

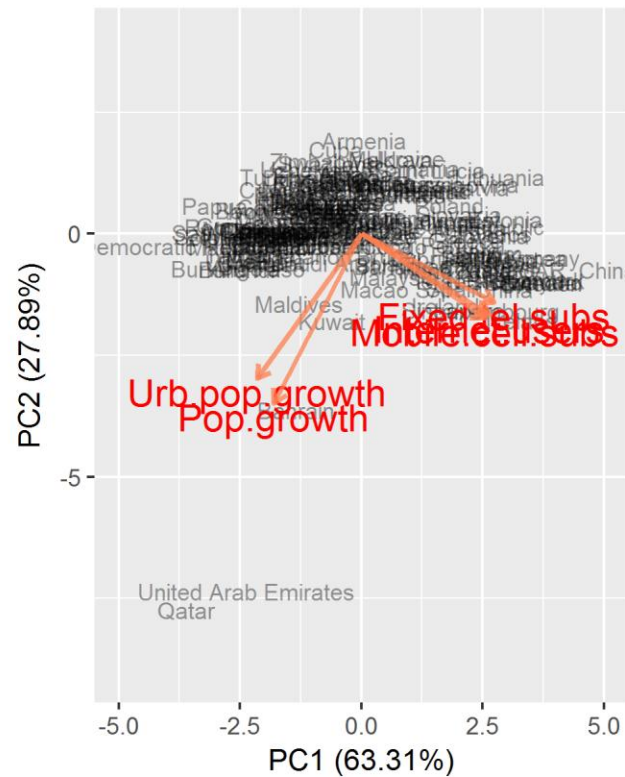


Comparing results 2000-2010

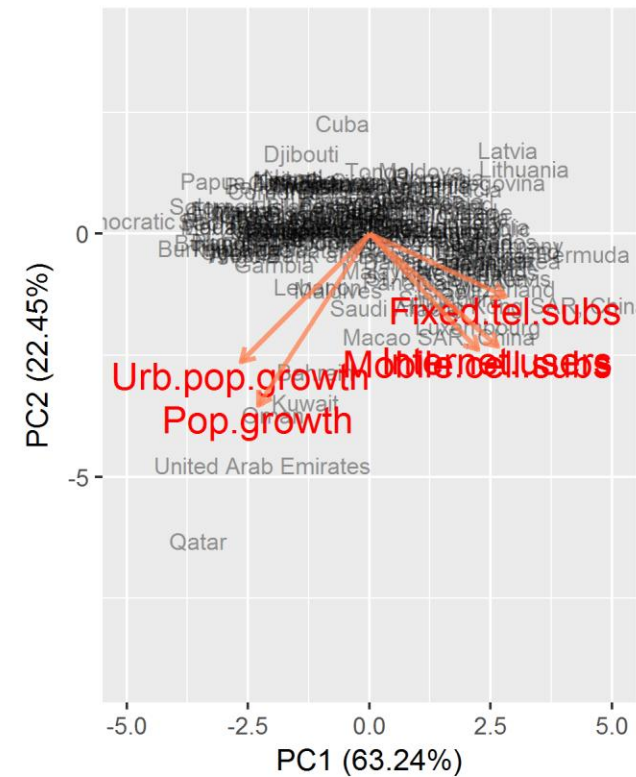
2000



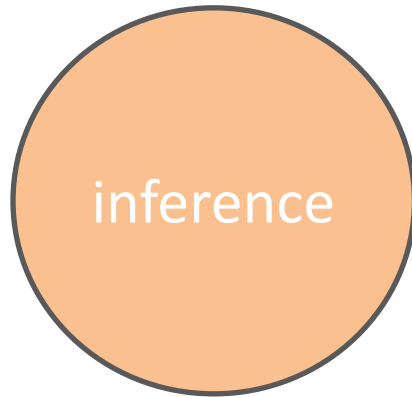
2005



2010



growth



growth during
the 2008 crisis

growth vs Income,
Region, and Year



**The
Economist**

OCTOBER 9TH-15TH 2010

Economist.com

California's great battle
The truth about electric cars
Pakistan in peril
How the music business survives
A life in stained glass

Grow, dammit, grow!

AN 18-PAGE SPECIAL REPORT ON THE WORLD ECONOMY



OCTOBER 9TH - 15TH 2010

Worldwide cover

by **growth** we mean the annual percentage variation of the GDP per capita in local currency.

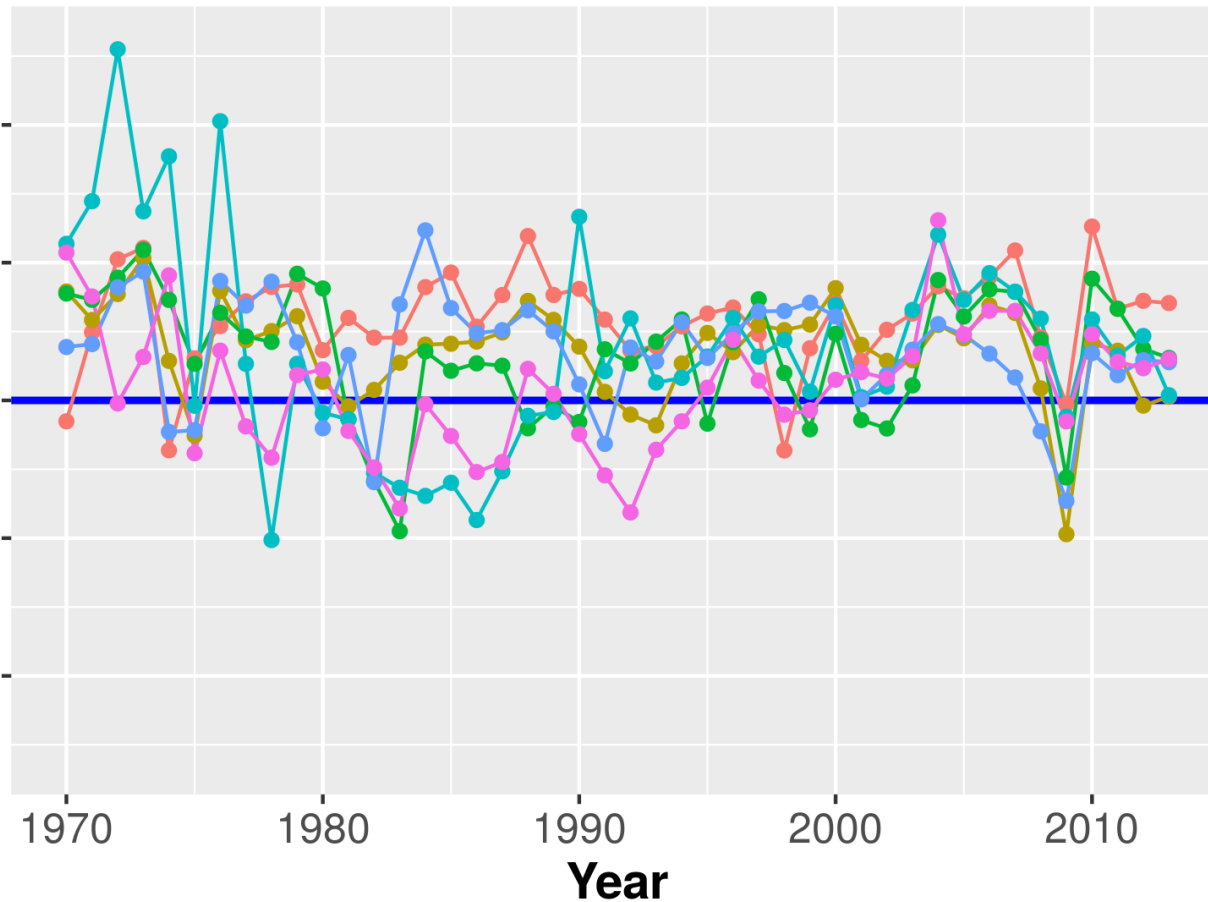
More formally,

$$Growth_t := \frac{GDP_t - GDP_{t-1}}{GDP_{t-1}}$$

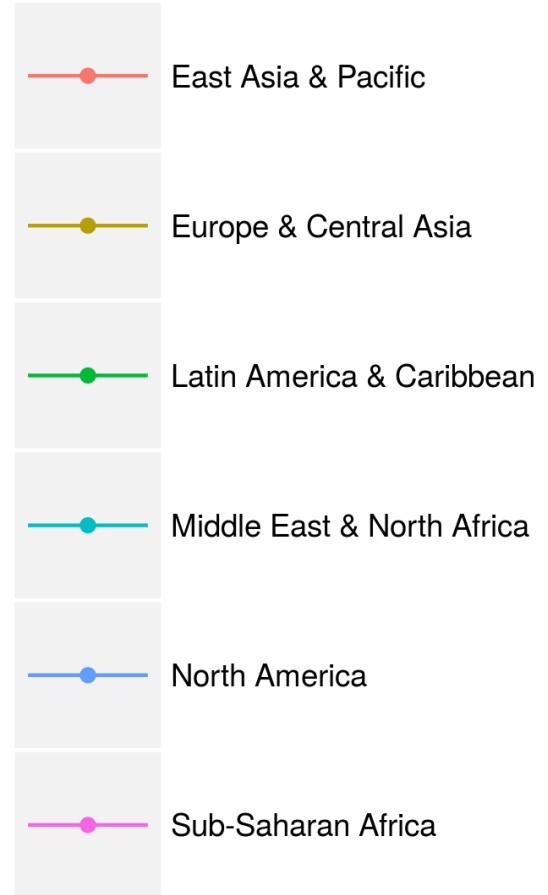
where GDP is the Gross Domestic Product per capita



GDP per capita growth (annual %)



CountryName



☐ Can we say that there was no growth over this time span?

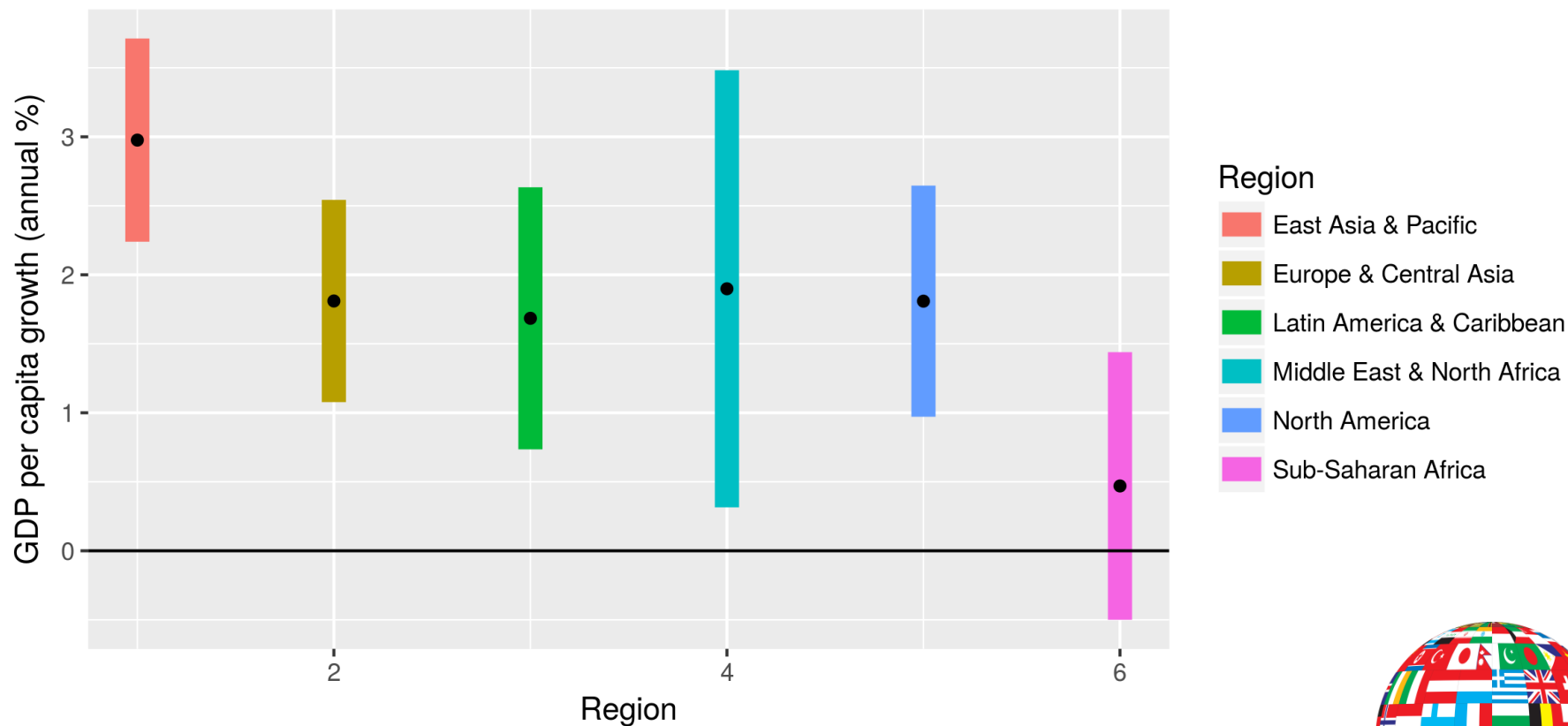
☐ What happened in 2008/2009?



T2 test

$$\begin{cases} H_0 & : \underline{\mu} = \underline{0} \implies \text{no growth over the considered time span} \\ H_A & : \underline{\mu} \neq \underline{0} \end{cases}$$

Bonferroni CI for regions

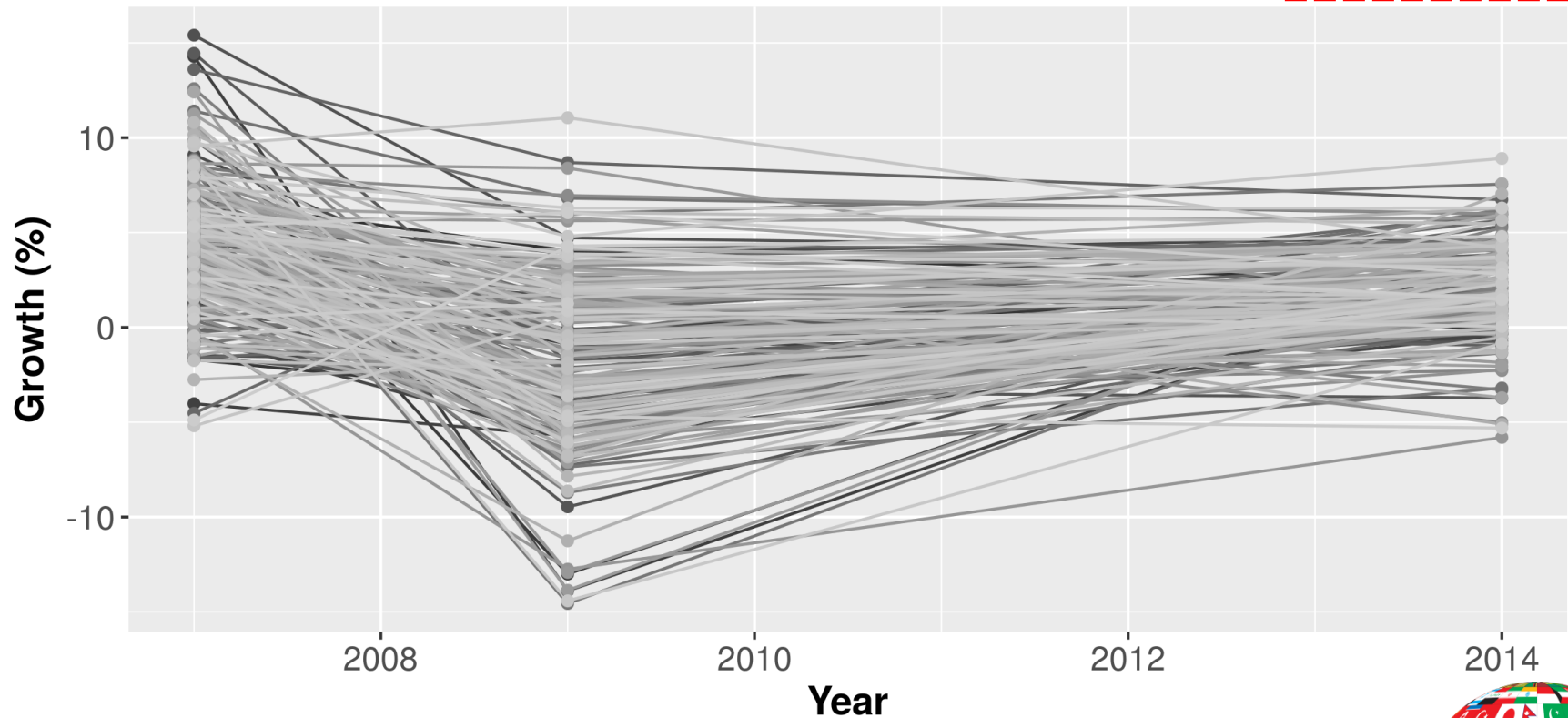


Repeated
measures test

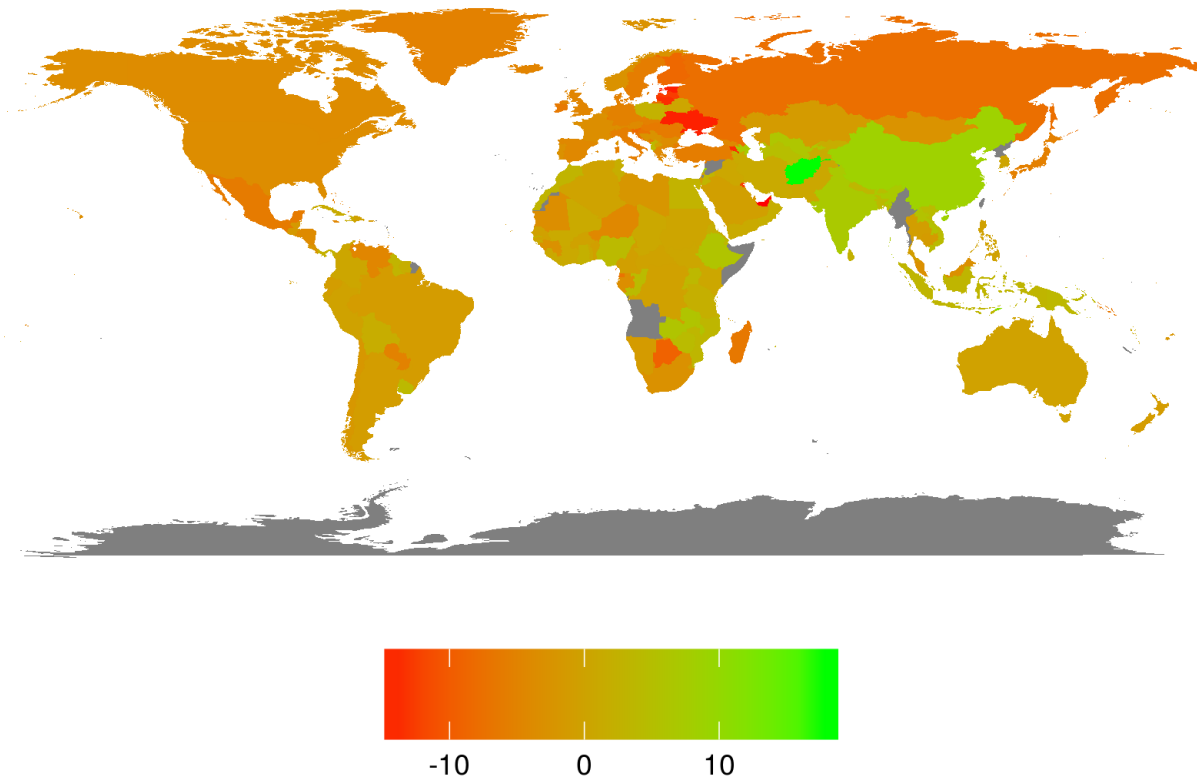
$$\begin{cases} H_0 & : C\boldsymbol{\mu} = \mathbf{0} \implies \mu_1 - \mu_2 = 0 \text{ and } \mu_1 - \mu_3 = 0 \\ H_A & : C\boldsymbol{\mu} \neq \mathbf{0} \end{cases}$$

GDP per capita growth (annual %) during the financial crisis

p.value = 0



GDP per capita growth (annual %) in 2009



- ☐ During an economic crisis does geography play a role?
- ☐ Does an economic crisis strike heavier high-income countries than low-income ones?



ANOVA

two-way

During crisis

Year = [2007, 2009, 2014]

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
fRegion	6	315.58	52.60	4.43	0.0002
Year	2	3362.03	1681.01	141.59	0.0000
fRegion:Year	12	894.73	74.56	6.28	0.0000
Residuals	533	6328.06	11.87		

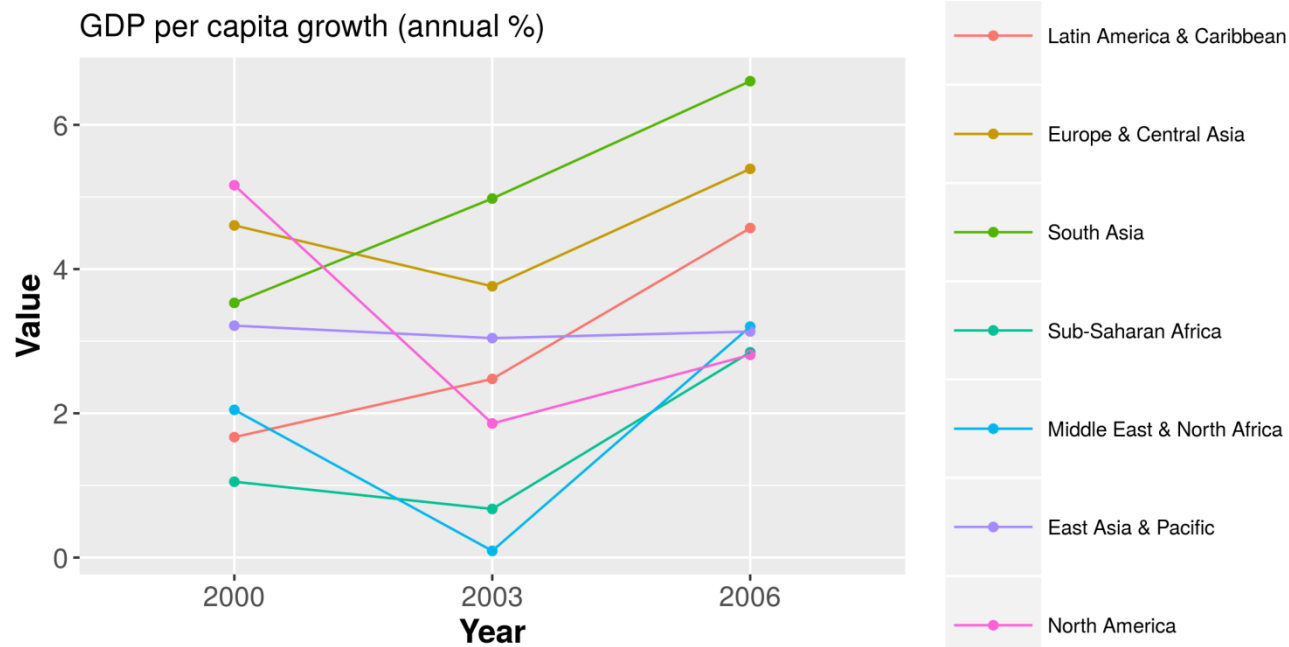
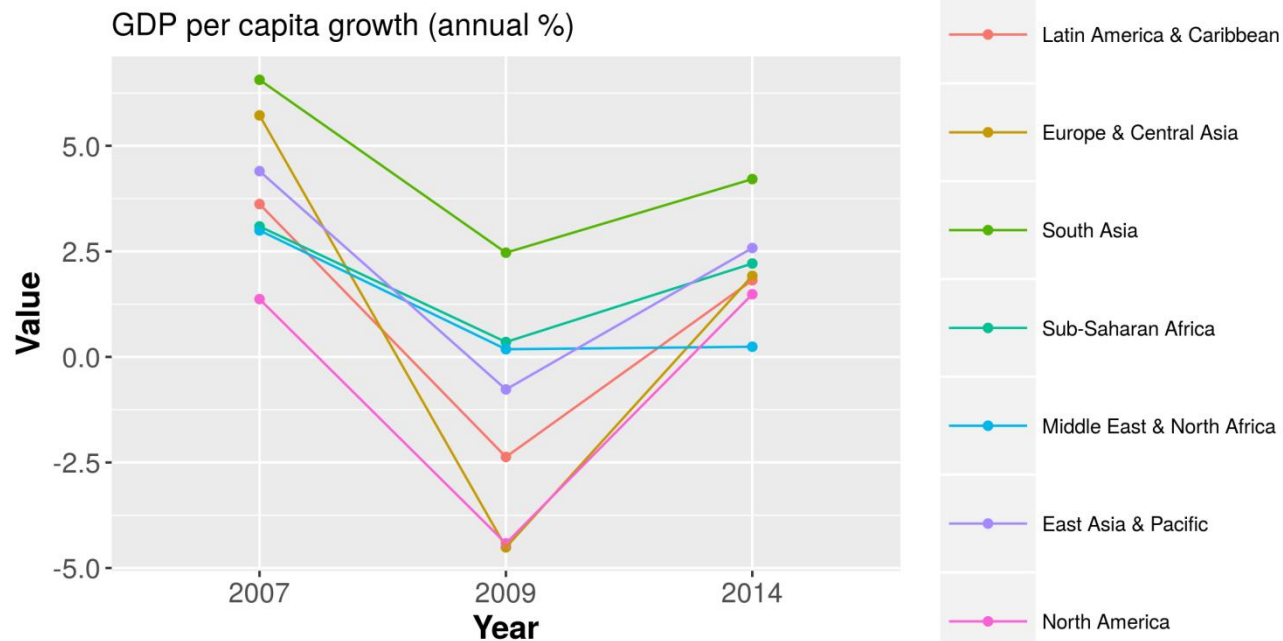
No economic turmoils

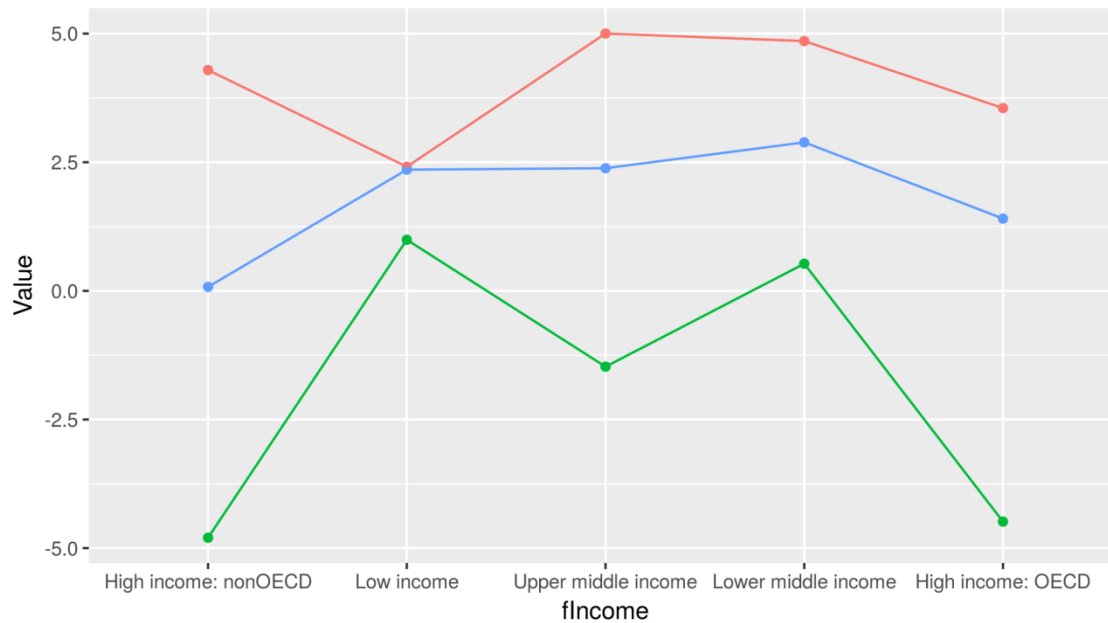
Year = [2000, 2003, 2006]

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
fRegion	6	875.35	145.89	7.37	0.0000
Year	2	317.40	158.70	8.02	0.0004
fRegion:Year	12	171.12	14.26	0.72	0.7318
Residuals	556	11001.81	19.79		



visualize the
interaction





Does
IncomeGroup
affect
Growth?

