The Communication and European Regional Economic Growth:

the Interactive Fixed Effects Approach

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Introduction

Background

European Integration History

- European Coal and Steel Community (1951)
- The Treaties of Rome (1957)
- The Treaty on European Union (Maastricht Treaty, 1992)
- Treaty of Amsterdam (1997), Treaty of Nice (2001) and Treaty of Lisbon (2007)

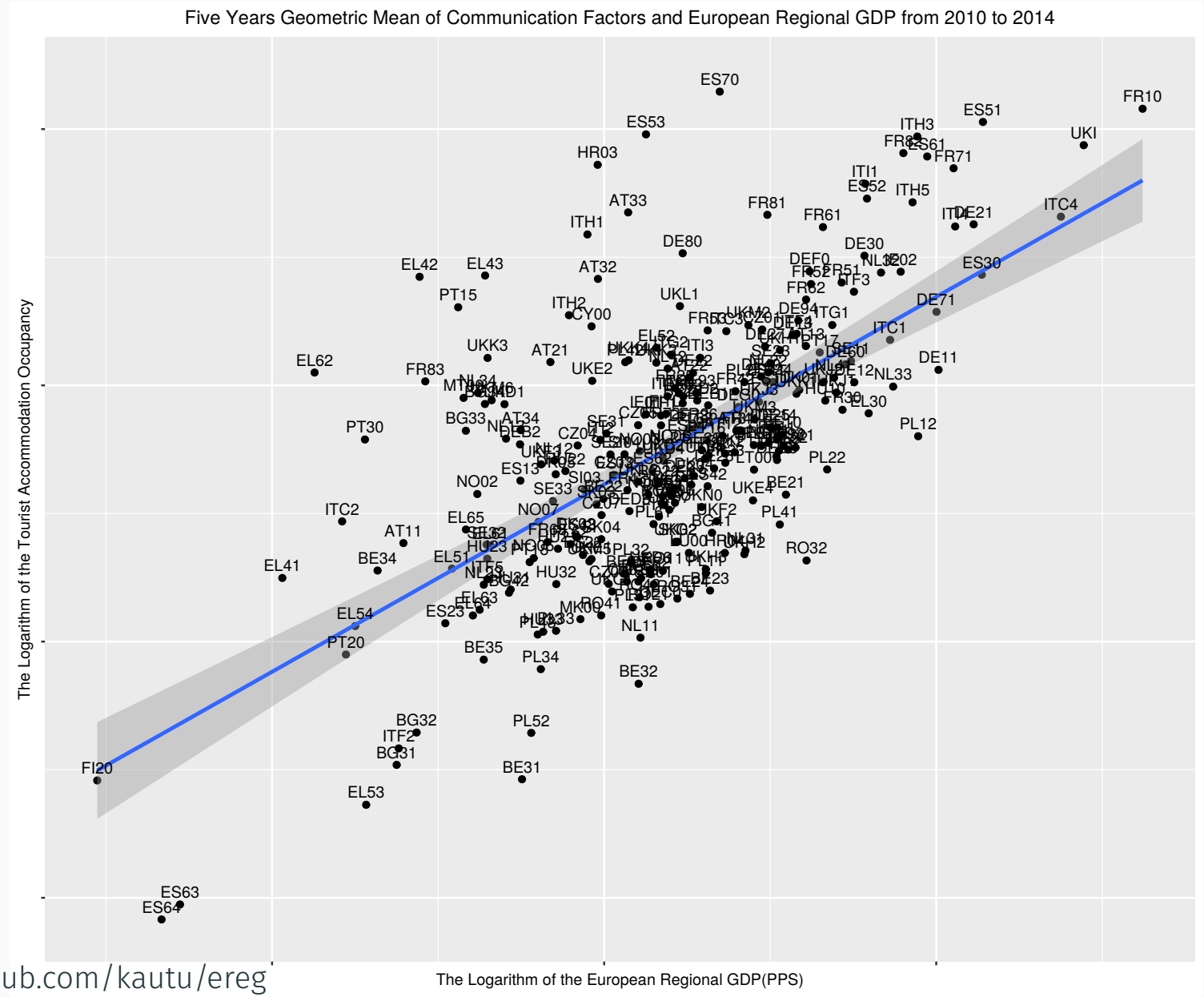
Regional Factor Mobility: partial facts and reality

Factor Accumulation and Refugees Migration

Business Facilitation and Survival Standards

Imbalance everywhere between EU15 and EU28, continuous legislative proposals to consolidate and complement

Communication and European Regional GDP



https://github.com/kautu/ereg

Literature Review

neoclassical growth model

PHYSICAL CAPITAL, POPULATION, HUMAN CAPITAL AND TECHNOLOGY

- **Barro (1991)** education quality of the initial human capital and the initial real per capita GDP in the cross sectional growth approach for 98 countries from 1960 to 1985.
- **Barro and Sala-I-Martin (1992)** the poor regions grow faster than the rich ones in cross sectional convergence study across 48 contiguous states in United States from 1963 to 1986.
- **Barro (2012)** reexamined the iron law of convergence in the international panels including country fixed effects over 10 five-years intervals from 1960-65 to 2005-09.
- **Mankiw, Romer and Weil (1992)** the accumulation of physical capital, higher quality of human capital and higher population growth within the endogenous-growth model framework for 121 countries from 1960 to 1985.

neoclassical growth model

PHYSICAL CAPITAL, POPULATION, HUMAN CAPITAL AND TECHNOLOGY

- **Romer (1986)** endogenous technological change, increasing marginal productivity of knowledge and decreasing marginal productivity of physical capital.
- **Romer (1990)** technological improvement, knowledge translation into market practices and non-rivalry and partial excludability of technology. **Romer (1987)** specialization and variety in production.
- **Aghion and Howitt (1992)** industrial innovations and product obsolescence through Schumpeters process of creative destruction, and **Howitt (1999)** R&D subsidies.
- **Akcigit, Celik and Greenwood (2016)** patent market searching frictions and patent reassignments in United States firm activities.

taxation and mobility

Government taxation and economic policy analysis

- **Rebelo (1991)** the lower economic growth was translated from higher income tax rates and poorer property rights enforcement.

Taxation effects and international mobility of talented migration

- **Kleven, Landais and Saez (2010)** specifically segmenting on European professional football market, and
- **Akcigit, Baslandze and Stantcheva (2016)** particularly highlighting on top superstar patent inventors.

growth survey

Category Growth Determinants

- **Durlauf, Johnson and Temple (2005)** summarized 145 variable regressors of economic growth determinants, categorized into institutional measurement, demographic characteristics, macroeconomics fundamentals, geography endowments and cultural differences.
- **Rockey and Temple (2015)** recently revisited theoretical arguments and empirical analysis of Bayesian Model Averaging, while reviewing the practical methods implemented on identifying economic growth determinants from cross section approaches.

Econometric methodology

PANEL DATA IMPROVEMENTS AND PRACTICAL IMPLEMENTATION

- **Durlauf, Johnson and Temple (2005)** inevitable limitations of the traditional classical panel data approaches.
- **Bai (2009)** identification, consistency and the limiting distribution of the interactive fixed effects estimator in panel data models with large N (the number of units) and large T (the number of time periods).
- **Kneip, Sickles and Song (2012)** proposed a semi-parametric method for arbitrary temporal heterogeneity in panel data models without any explicit restrictions on the temporal pattern of individual patterns, as combining smoothing spline techniques with principal component analysis.
- **Bada and Liebl (2014)** published the compiled R package *phtt* for panel data with general forms of unobservable heterogeneous effects in large dimensions of N and T.

Econometric methodology

Table 1: DETERMINING THE NUMBER OF FACTORS

Bai and Ng (2002)	Panel Criteria
	Bayes Information Criterion
Ahn and Horenstein (2013)	Eigenvalue Ratio
	Growth Ratio
Onatski (2010)	sample covariance eigenvalues

Moon and Weidner (2015) the limiting distribution of the least squares estimator is independent of the number of factors, when it is assumed to be not underestimated in the interactive fixed effects.

Econometric methodology

Group effects estimators

- **Bester and Hansen (2009)** assumed individual specific parameters common across groups at some level when membership grouped on multiple observable variables, but
- **Lin and Ng (2012)** created the pseudo threshold variables to partition the panel data into clustering groups when group membership is unknown.
- **Bonhomme and Manresa (2015)** recently exploited K-Means algorithm for time-varying grouped patterns of unobserved heterogeneity in linear panel data models.

Eurostat Data

Dataset

Statistical Office of the European Union (**Eurostat**).

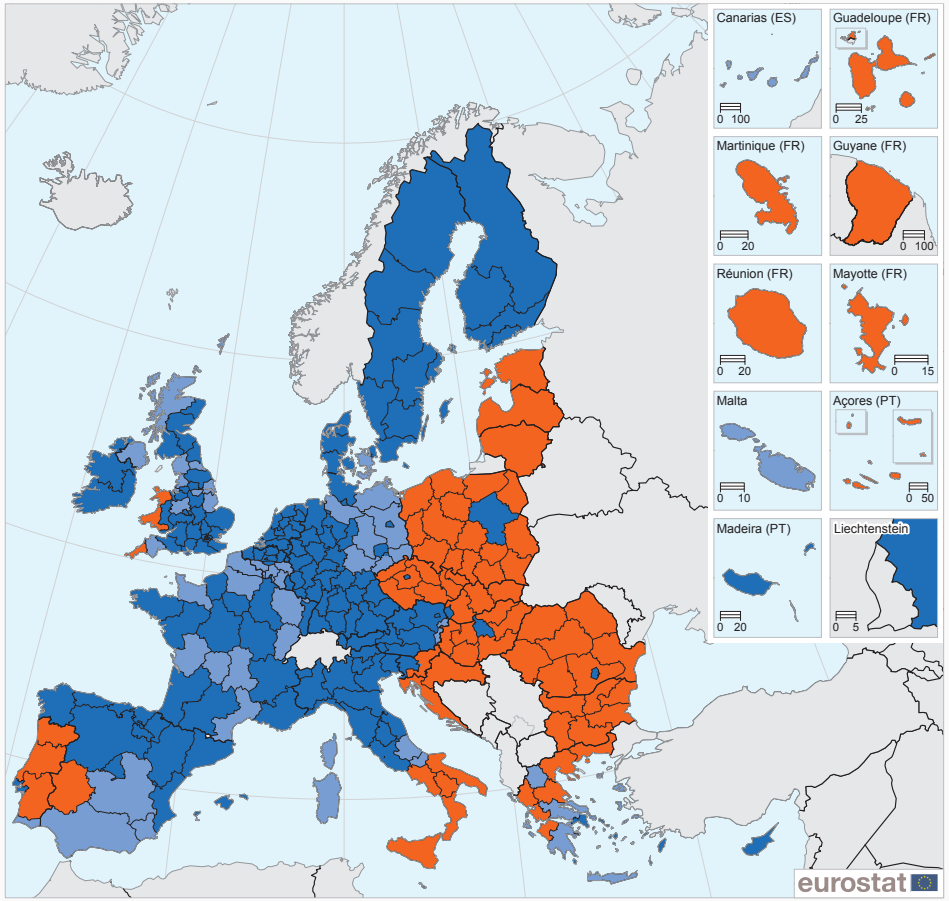
- **268 regions** or 4020 total observations from 2000 to 2014,
- 28 Member States of the EU, and EFTA and candidate countries.

Nomenclature des Units territoriales statistiques classification

- geographical nomenclature subdividing the economic territory of the European Union into regions at three different levels, covering **NUTS** levels 1, 2 and 3, respectively from larger to smaller areas,
- **Population** of NUTS level 2 regions ranges from 800 thousand to 3 million. Administrative Structures in priority.
- **Regulation (EC) No 1059/2003** of the European Parliament and of the Council of 26 May 2003 on the establishment of a common classification of territorial units for statistics.
- **Eurostat Regional Yearbook (2016 edition)** doi: 10.2785/29084

GDP per inhabitant (in PPS), by NUTS 2 regions

Map 1.1: Eligibility of regions for cohesion funds based on gross domestic product (GDP) per inhabitant (in PPS), by NUTS 2 regions, for the programming period 2014–20 (1)
(% of EU-27 average)



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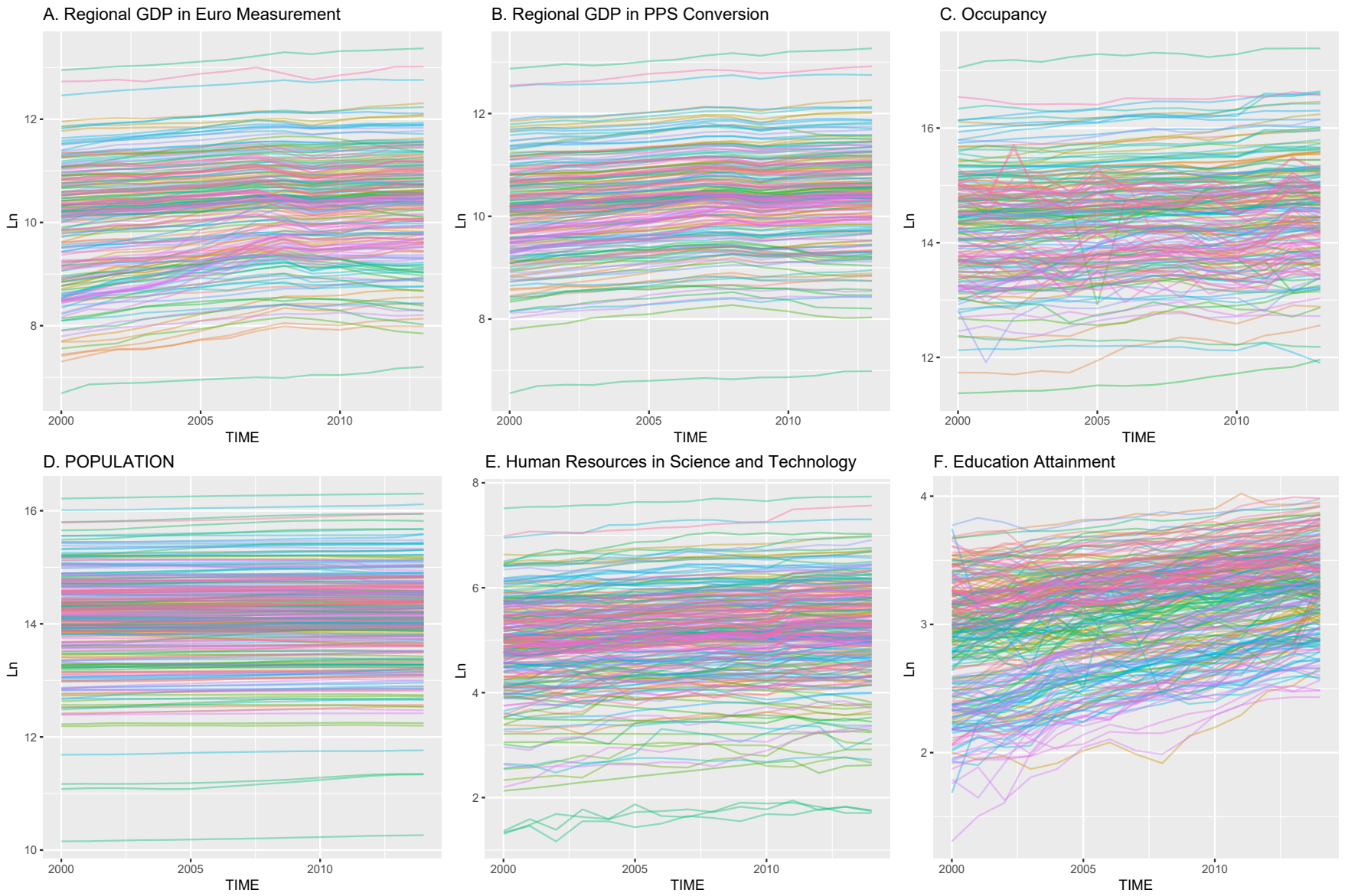

Figure 3: Dependent Variables and Explanatory Variables

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EMPIRICAL STUDY

Model Specification

Solow (1956) Model: constant returns to scale Cobb-Douglas production function, Y is *Output*, K is *Capital*, H is *Human Capital*, A is *Technology*, L is *Employment*.

$$Y_t = K_t^{\alpha} H_t^{\beta} \left(A_t L_t \right)^{1-\alpha-\beta} \tag{1}$$

Assumption: The *Physical Capital* has the free mobility across the regions, and the aggregate sum of Capital remains unchanged in EU, i.e., Investment is adequate and accessed smoothly without any searching frictions.

$$GDP_{it} = Communication_{it}^{\eta} Population_{it}^{\alpha} HRST_{it}^{\beta} EDAT_{it}^{\gamma} \tag{2}$$

European Regional GDP Determinants

Table 2: Communication Factors of European Regional GDP Determinants

	(1)	(2)	(3)	(4)	(5)	(6)
intercept	9.9800 (0.0959)***	10.0000 (0.0814)***	9.9800 (0.0875)***	10.0000 (0.0766)***	9.9800 (0.0875)***	10.0000 (0.0766)***
ln **Arrival**	0.1960 (0.0060)**	0.1640 (0.0051)**				
ln **Occupancy**			0.0206 (0.0059)***	0.0190 (0.0052)**		
ln **Capacity**					0.0206 (0.0059)***	0.0169 (0.0052)**
interactive	none	two-ways	none	two-ways	none	two-ways
dimensions	4	3	4	3	4	3
observation	2842	2842	2842	2842	2842	2842
R^2	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999

Standard errors of coefficients are presented under the parentheses below.
The significance level: *** <0.001, ** 0.001, * 0.05.

The Traditional GDP Determinants

Table 3: Alternative Factors of European Regional GDP Determinants

Measurement	EURO	EURO	PPS	PPS
intercept	11.9000	7.7800	20.6000	17.2000
	(2.6300)***	(1.9700)***	(1.9000)***	(1.3900)***
ln **Population**	-0.1480	0.1630	-0.7570	-0.5040
	(0.1860)	(0.1400)	(0.1350)***	(0.0984)***
ln **HRST**	0.0021	-0.0181	0.0276	0.0113
	(0.0145)	(0.0113)	(0.0106)**	(0.0082)
ln **EDAT**	0.0044	0.0349	-0.0329	-0.0148
	(0.0154)	(0.0118)**	(0.0112)**	(0.0085)
ln **Occupancy**	0.0178	0.0049	0.0194	0.0126
	(0.0068)**	(0.0052)	(0.0049)***	(0.0038)***
interactive	individual	two-ways	individual	two-ways
dimensions	3	4	3	4
observation	4020	4020	4020	4020
R^2	0.9990	0.9999	0.9999	0.9999

Conclusion

Empirical Results

Positive Interaction

- European Regional Economic Growth might be motivated from Communication (Arrival, Occupancy, and Capacity).
- Communication (Arrival, Occupancy, and Capacity) might be separately generated from the economic activities.

Facilitation Effects as Catalyst of Communication Power

- **Business** Relationship (Exhibition, Trade Fair and Congress)
- Science, Technology and **Academic** Research (Conferences, Seminars and Workshops)
- Entertainment (Sports, Music and Events)

Fading Driven Power of Traditional Determinants

- Population and Education in European Regions after millennium

Category Growth Determinants

Table 4: Sala-i-Martin, Doppelhofer and Miller (2004)

Macroeconomics	Institutional	Geography	Demographic	Cultural
Investment Price	Years Open 1950-94	Tropical Area	Primary Schooling	East Asian
GDP in 1960 (log)	Openness 1965-74	African Dummy	Popu Density Coastal	Confucian
Fraction GDP in Mining	Political Rights	Latin American	Malaria Prevalence	Muslim
Gov. Consumption Share	European Dummy	Spanish Colony	Life Expectancy	Buddhist
Real Exchange Rate Distortions	Outward Orientation	Population In Tropics	Population Density	Ethnolinguistic
Government Share of GDP	Civil Liberties	Air Distance to Big Cities	Higher Education	Foreign Language
Primary Exports 1970	Revolutions and Coups	Absolute Latitude	Fraction Hindus	Protestants
Public Investment Share	British Colony Dummy	Landlocked Country	Population under 15	Catholic
Nominal Government GDP Share	Defense Spending Share	Land Navigable Water	Fertility in 1960s	Colony
Hydrocarbon Deposits in 1993	Socialist Dummy	Land Area	Population Over 65	Religion
Terms of Trade Growth	English Speaking Population	Tropical Climate Zone	Population in 1960	Orthodox
Public Education Spending Share	Oil Producing Country		Population Growth	
Size of Economy	Timing of Independence		Interior Density	
Average Inflation 1960-90	Spent in War 1960-90			
Square of Inflation 1960-90	Capitalism			
Terms of Trade Ranking	War Participation 1960-90			

Periodization in the Changing World

business cycles and Development Phases

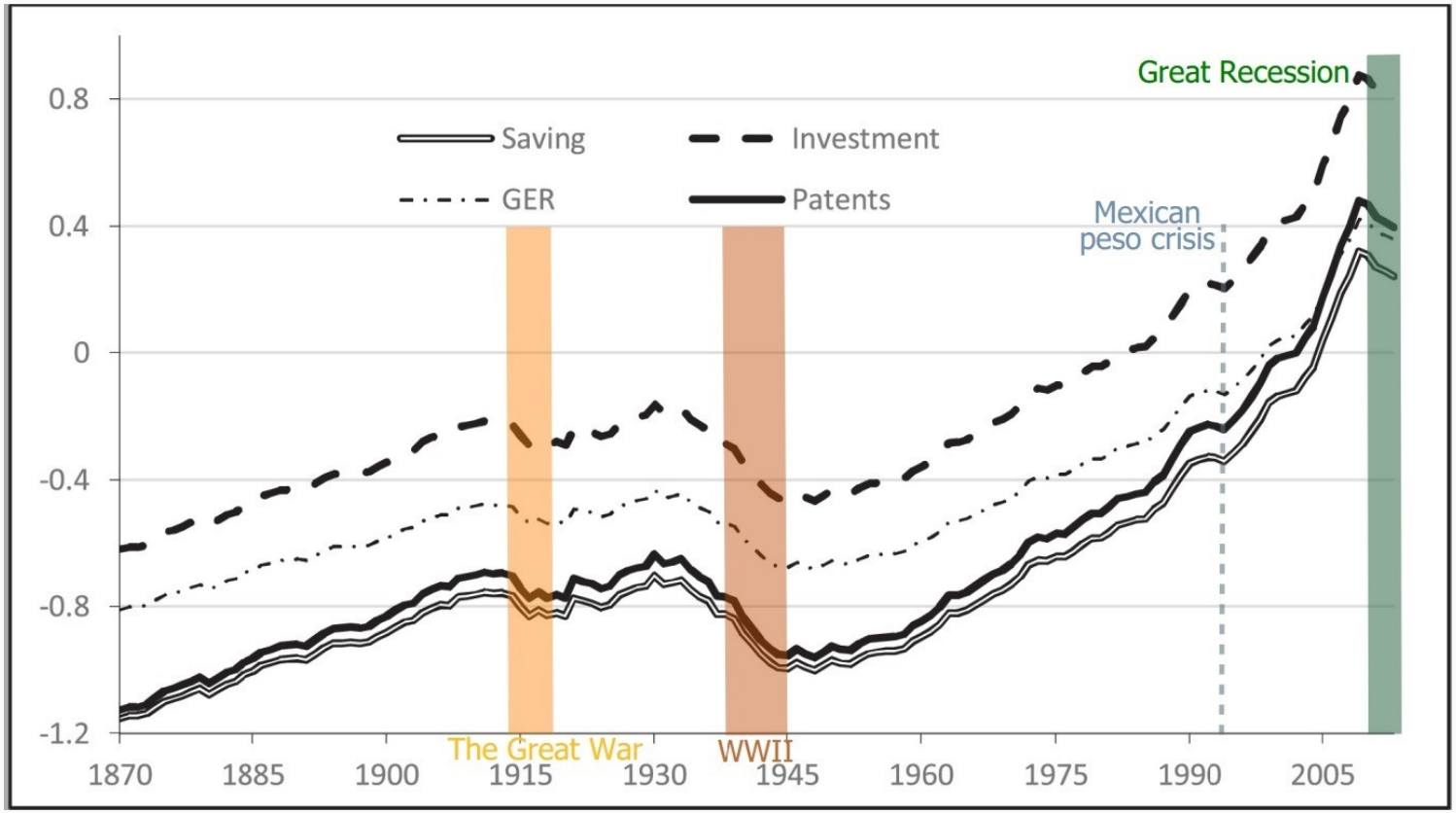

Figure 4: Semi-elasticities of outcome variables with respect to inequality, 21 OECD Countries, 1870-2011. **Madsen, Islam and Doucouliagos (2018)** Figure 3.

Young Generation

The richness of economic activities, the purity of growth, and the symmetry of methodology. [1]

[1] 

Questions?

Variables

Sometimes, it is useful to add slides at the end of your presentation to refer to during audience questions.

The best way to do this is to include the `appendixnumberbeamer` package in your preamble and call `\appendix` before your backup slides.

METROPOLIS will automatically turn off slide numbering and progress bars for slides in the appendix.

References i

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