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How does the level of income inequality affect GDP per capita growth in countries?

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1. Introduction

The aim of this work is to empirically analyze the macroeconomic relationship between income inequality, that is expressed by Gini coefficient and economic performance across countries, measured by GDP per capita growth rate. The central question we address is: What is the relationship between a nation's income inequality and its GDP per capita growth rate? The existing literature on this topic has largely followed two distinct approaches.

The first, seminal approach is attributed to Simon Kuznets (1955) [1]. It posits that the level of economic development is a key driver of inequality within a country. This relationship is theorized to be non-linear, taking the form of an inverted U-shape (the "Kuznets curve"). In the initial stages of development, industrialization and resource concentration tend to increase inequality, which may be necessary to stimulate investment and capital accumulation. In later stages, mechanisms such as the expansion of education and progressive taxation lead to a reduction in inequality, resulting in a positive correlation between advanced development and greater equality.

The second, and more recent, approach reverses this causality. It examines whether the established level of inequality in a society itself influences subsequent economic growth. Our study aligns with the second approach. It treats income inequality as an independent variable and investigates its impact on the dependent variables: per capita GDP growth.

The ambiguity of this relationship is precisely what makes the topic appealing for independent empirical research. Beyond its academic appeal, the question carries profound policy significance. Income inequality is widely recognized as a defining macroeconomic challenge of our time, which makes this investigation relevant and timely.

2. Literature review

Research on the relationship between economic inequality and economic growth has a long history, demonstrating significant evolution in methodology and findings. A review of key empirical studies allows us to identify several stages in understanding this issue.

The first wave of major empirical studies (1990s – early 2000s) using cross-country data primarily found a **negative** relationship between inequality and subsequent economic growth. The works of Persson and Tabellini (1991) [2], Alesina and Rodrik

(1994) [3], Perotti (1995) [4], and Deininger and Squire (1998) [5], using various measures of inequality (income quintile shares, Gini coefficient), consistently found a statistically significant negative correlation. These results supported theoretical arguments that high inequality undermines institutions, increases social instability, and reduces investment in human capital, thereby slowing growth.

However, by the late 1990s, studies emerged that challenged the universality of this conclusion. The work of Li and Zou (1998) [6] and Forbes (2000) [7] on updated samples using panel data found a **positive short-term** relationship between inequality and growth. This revived alternative theories suggesting that inequality promotes the accumulation of savings and investment among the wealthy. Further research revealed that the relationship **might not be linear** but is associated in an **inverted-U pattern**. For example, Banerjee and Duflo (2003) [8] showed that any changes in inequality (both increases and decreases) were associated with slower growth, suggesting nonlinear effects.

The next step was the introduction of moderators, primarily the **level of economic development**, into the analysis. The works of Pagano (2004) [9] and Barro (2008) [10] empirically confirmed the Kuznets hypothesis in a dynamic context: the relationship between inequality and growth proved to be **different for rich and poor countries**. In poor countries, a negative relationship persisted, while in rich countries, it was positive or neutral. This indicates that the effect of inequality is mediated by institutional quality and the stage of development.

The most comprehensive and modern synthesis of these conflicting findings was proposed in the extensive study by Grijalva (2011) [11], covering about 100 countries over the period 1950-2007. The author showed that the relationship changes fundamentally **depending on the period considered**. In the short and medium term (5-10 years), an inverted U-shaped relationship was discovered. This means that a moderate level of inequality can be associated with higher growth rates, while both very low and very high inequality are linked to lower growth. This nonlinear effect helps explain the contradictions between earlier studies examining different periods. In the long term, Grijalva's results confirmed the findings of Barro (2008), showing that the ultimate relationship depends on a country's level of development. This created a coherent picture: short-term nonlinear effects transform over time into a stable long-term pattern determined by the country's context.

The later study was conducted by J. Assa [12] deepens the analysis of the inequality-growth link by using an updated dataset for the period 1998–2008 and applying both OLS and 2SLS estimation models to account for potential endogeneity. Both the smaller sample with OLS and the larger sample with 2SLS showed a clear negative relationship. The effect was also stronger for developing countries in both cases. This aligned with the first wave of major empirical studies findings of a negative effect of inequality in poor countries, however, in contrast to later results

(Barro, 2008) [10], Assa did not find a statistically significant positive effect of inequality on growth in developed countries. In addition, the study demonstrated that the presence or absence of democracy has no significant impact on either the growth rate or the relationship between inequality and growth, supporting the idea that pressure for redistribution arises in both democratic and non-democratic regimes. The summary table of key empirical results is presented in Appendix (*Table 1*).

Our study aims to empirically test the relationship between economic inequality and subsequent economic performance over a precisely defined **medium-term horizon of 15 years.** Second, we incorporate the finding, emphasized by both Barro (2008) [10] and Assa [12], that the relationship is likely **conditional** on a country's level of development. We explicitly test for this **heterogeneity** by introducing a dummy variable that can be an empirical boundary, distinguishing countries based on their level of economic development within our sample.

The problem of the inequality-growth link is *compounded* by the fundamental methodological difficulties inherent in *growth econometrics* as a field (Durlauf et al., 2005) [13]. First, there is the problem of **model uncertainty**. With lots of potential determinants of growth identified in the literature, the choice of control variables in any given regression is often arbitrary. The significance of the inequality coefficient has been shown to be highly sensitive to this choice, potentially explaining why different studies, using different sets of controls, arrive at opposite conclusions. Second, the **problem of endogeneity** is key, as the causal relationship between growth and explanatory variables (including also inequality) is likely bidirectional and may also be driven by omitted factors. Finally, the **conditionality of the effect** found in the literature (different signs for rich and poor countries, for example) directly points to the problem of parameter heterogeneity - the assumption of a universal effect of independent variables for all countries is unrealistic.

3. Research methods

In the model that aims to reveal the relationship between economic growth and inequality the potential presence of **reverse causality** also occurs. As mentioned in the introduction, economic theory suggests the causality may be reversed: a country's level of GDP can itself shape the level of inequality within it. This dynamic is described by the Kuznets curve hypothesis. This violates the fundamental regression assumption that explanatory variables are uncorrelated with the error term. To address this, the literature suggests two main strategies. The **first** and theoretically ideal solution is to find a valid **instrumental variable** - an exogenous factor that affects inequality, but has no direct effect on growth. For example, Easterly (2006) [14] proposes using a historical geographic variable: the ratio of land suitable for wheat versus sugarcane cultivation. The logic is that sugarcane historically required large-scale plantation systems, which fostered greater initial inequality. However, while this instrument may explain inequality in developing agrarian economies, it lacks relevance for modern, diversified OECD economies. The difficulty of finding a universally strong and credible instrument for advanced economies makes this approach impractical here. Therefore, the authors usually adopt the **second**, more pragmatic solution and we follow exactly this approach: **using the lagged value of the Gini coefficient** as the regressor.

The next issue is that the Gini coefficient exhibits **high short-term inertia**, showing **minimal variation** from year to year within a given country. However, when data is aggregated into longer intervals, such as 15-year periods, more significant structural shifts in inequality become apparent (Appendix *Figure 1*). Therefore, our decision was to use the panel data.

Firstly, data will be structured by **three 15-year periods** for each country observation. The dependent variable is the **geometric average annual real per capita GDP** calculated thrice: over 1980-1994, 1995-2009 and 2010-2024 periods. The following formula for geometric average was used: $CAGR = (\frac{Y_{1994}}{Y_{1980}})^{\frac{1}{14}} - 1.$ This metric is considered more appropriate because it accurately captures the compounding effect of growth over time, providing a single, comparable rate of change even when year-on-year growth rates fluctuate between positive and negative values. At the same time, all other independent variables (including Gini coefficient) are measured as of the year immediately preceding this 15-year window (1980, 1995, 2010 respectively), using **lagged** explanatory factors. This temporal sequence, where the independent variables are observed before the economic outcome they are intended to explain, helps lessen reverse causality, suggesting that the fundamental factors influence subsequent economic performance rather than the reverse.

4. Collection and description of data

Our selection of control variables was partially based on the established literature on economic growth and the economy intuition.

First, **education** is a consistently critical factor across all research on inequality and growth, as it directly influences human capital accumulation, productivity, and innovative capacity. Researchers have employed various education variables. For example, robustness analysis by Sala-i-Martin et al. (2004) [15] identified primary education enrollment as a strong predictor, Baro set upper-level (secondary) school attainment, Grijalva (2011) used average year of schooling. In our study, we opted for the **tertiary enrollment ratio**. We consider this a more informative and potent measure for our analysis, as tertiary education is more closely linked to advanced skill formation, technological adoption, and long-run growth potential, especially relevant when examining medium- and long-term horizons.

Second, **institutional** quality is a fundamental moderator of the inequality-growth relationship, a point strongly emphasized by Barro (2008). The quality of institutions determines whether inequality fuels destructive rent-seeking and instability or incentivizes productive investment. Following Barro's approach, we include the **Rule of Law index.**

Finally, we introduce **the share of urban population** as an additional **structural** control variable. While not explicitly highlighted in the core inequality studies we reviewed, urbanization is a well-established driver of aggregate productivity and economic growth and may tightly be linked with inequality.

The dataset for this research was compiled from **three** reputable sources: World Bank Open Data [16], World Inequality Database [17] and Baro and Lee Educational Attainment Dataset [18]. The share of urbanisation population along with the rule of law index were collected from the World Bank, which offers extensively documented and standardized macroeconomic indicators. The interest variable of Gini coefficient was gathered from the World Inequality Database, hence it provides full country-level coverage while in the World Bank inequality data was collected with a lot of gaps. Both institutions are leading providers of official, internationally comparable statistics, and their methodologies are designed for robust cross-country analysis. Utilizing data from these sources guarantees a high degree of reliability, consistency, and comparability across the countries and time periods included in this study, which is a fundamental prerequisite for the integrity of the subsequent empirical analysis.

The problem with lots of gaps in the World Bank also occurred with the education variable, therefore, we relied on the Barro-Lee Educational Attainment Dataset. It is a seminal academic resource providing standardized measures of educational attainment for populations globally from 1950 onward. Its reliability stems from its creation by leading economists Robert Barro and Jong-Wha Lee, its peer-reviewed methodology documented in top economics journals, and its specific design to address the critical issue of missing data in raw sources like the World Bank. Their methodology combines demographic consistency checks, interpolation between known data points, and the use of machine learning techniques to construct complete and comparable annual time series for educational attainment across countries.

By merging data from the World Bank World Development Indicators (WDI) and the World Inequality Database (WID), we succeeded in assembling a nearly complete dataset for our core variables: GDP per capita, Gini coefficient, urbanization rate, and rule of law. For these metrics, only a negligible number of countries had missing observations, and the sample consisted of 176 countries.

The principal and binding constraint on our final balanced panel was the education variable. Despite sourcing from the established Barro and Lee (2013) Educational Attainment dataset, the tertiary education enrollment ratio contained significant gaps for numerous countries and after intersection, the overlapping subset consisted of 105 countries with a complete set of observations for all required indicators and periods.

To ensure that the data adequately and comprehensively reflects the diversity of countries, we performed a two-tier representativeness assessment using the classification framework provided by the World Bank.

Overall, the sample covers **105 out of 217 countries** (48.4%), with proportional inclusion across both **regional** and **income** classifications. This structured approach confirms that the data reflect a broad and meaningful spectrum of countries, minimizing regional or economic bias and supporting the robustness of subsequent analyses.

First, we disaggregated the data by geographical region (East Asia & Pacific, Europe & Central Asia, Latin America & Caribbean, Middle East & North Africa, North America, South Asia, and Sub-Saharan Africa). This allowed us to evaluate coverage across different parts of the world. The representation rate varies by region, the lowest rate being 32% for East Asia & Pacific. This lower rate is primarily driven by the numerous small island nations in the Pacific. For many of these countries, the specific data required for this research is not available. North America also has a low representation rate (33%) but because the absolute number of countries there is small, it will not significantly impact the results. Other regions have representation rates above 47%, which, considering the overall representation rate, implies that overall the data is relatively balanced.

Second, we analyzed representativeness by income level (High, Upper-middle, Lower-middle, and Low income), again following World Bank categories. This ensures that economic diversity is captured in the sample. Representation rates are relatively balanced across income groups, ranging from 44.8% in High-income countries to 56.0% in Low-income countries. The overall table with representative rate is placed in Appendix (*Table 3*).

The research question examines *how inequality is associated with the economic performance of the country*, which is measured in GDP per capita [19]. It is expressed in constant 2015 dollars, adjusted for purchasing power parity to ensure cross-country comparability and GDP per capita geometric average growth rate is taken as the **dependent variable**. The **interest variable** is the Gini coefficient [17], a standard measure of income inequality that is defined as discrepancy in the income distribution within a particular country. The coefficient varies from 0 to 1. To be more precise, the higher the Gini coefficient is (closer to 1), the higher the level of inequality is.

To isolate this relationship from other confounding factors, it is essential to specify a robust econometric model that incorporates a set of control variables, thereby mitigating the risk of omitted variable bias.

We have identified the following proxy variables that serve as essential control variables in our regression, taking in account that control variables should be the determinants of Y (output per capita) and should be correlated with the regressor X (Gini coefficient):

1) *Tertiary enrollment ratio[18]*

Tertiary enrollment ratio measures the proportion of the relevant age group enrolled in this stage of education. The variable is considered as a proxy for human capital, which is supposed to be a fundamental driver of long-term development that affects productivity, innovation, and technology adoption. Without it, the model would suffer from omitted variable bias: if more educated societies tend to have both lower inequality and higher output, the estimated correlation between dependent and independent variables, likely exaggerating the negative effect. Therefore, including this parameter allows isolating the net effect of inequality from the influence of human capital, ensuring the robustness of our estimates and maintaining comparability with the established literature that we have already mentioned.

2) *Rule of Law [19]*

The Rule of Law indicator measures the level of confidence in and adherence to societal rules, including the quality of contract enforcement, property rights, police, and courts. The parameter places a country on a scale from 0 (lowest) to 1 (highest) relative to all others.

A strong rule of law establishes a theoretical link with both economic output and income distribution. On the one hand, it fosters economic growth by guaranteeing property rights, enforcing contracts, and reducing uncertainty for investors. This stable institutional environment encourages both domestic and foreign investment in physical and human capital, which is a direct channel for increasing GDP per capita. On the other hand, the rule of law is intrinsically linked to income inequality. Weak legal institutions often enable corruption and rent-seeking, allowing elites to capture economic benefits and concentrate wealth, thereby increasing inequality. Conversely, a strong, impartial legal system can help mitigate inequality by ensuring equal access to opportunity and justice, and by supporting the effective implementation of progressive taxation and social transfers.

3) *Urbanization rate [20]*

Cities generate powerful agglomeration economies, which reduce transaction costs, facilitate knowledge spillovers and create specialized labor markets. This concentration of economic activity fosters higher productivity in both industrial and service sectors.

The inequality and urbanization rate also exhibit a correlation, although this relationship is probably not straightforward. At the early stages, urbanization may increase inequality. A wage gap grows between skilled city workers and unskilled migrants, and rising urban rents enrich property owners. At the later stage, urbanization can decrease inequality. Labor markets mature, social mobility increases and governments implement better social support and redistribution policies.

4) *OECD [21]*

This variable is a dummy that indicates whether a country is a member of The Organisation for Economic Co-operation and Development or not.
OECD membership serves as a proxy for a country's level of advanced economic development, institutional maturity, and integration into the global regulatory and trade system. Economies within the OECD are typically characterized by higher innovation capacity, stronger property rights, and more stable political and macroeconomic environments, which collectively support sustained GDP growth.
The relationship between OECD membership and inequality can also be significant. Within OECD nations higher average GDP per capita is typically associated with more comprehensive social transfers, progressive taxation, and mature labor markets, which tend to moderate inequality.

5. Hypotheses

The primary objective of this study is to estimate the **medium-term correlation** between income inequality and gdp per capita growth rate. Whereas the prior literature suggests both positive and negative linear effects, more recent evidence points to a **non-linear relationship**.Thereby, we are willing to check that the effect of inequality on GDP per capita growth rate follows an **inverted U-shaped pattern** over a 15-year horizon. We expect that both *very low* and *very high* levels of inequality are associated with **lower economic growth**, whereas a ***moderate level*** of inequality may be associated with **higher** GDP per capita **growth rate**, *holding* *the other factors constant.* This hypothesis will be tested by including both the Gini coefficient and the squared Gini in the regression model.

The second hypothesis introduces a critical nuance: the economic effect of income inequality is not absolute, but is contingent upon the quality of a country's institutional framework. We propose that the rule of law, which is the proxy of institutions, mitigates the potential negative consequences of high inequality. A robust rule of law is expected to secure property rights and limit distortionary redistribution. Consequently, in such an environment, the harmful impact of inequality on GDP per capita growth rate should be mitigated. We will test this by including an interaction term between the Gini coefficient and a Rule of law. We anticipate the coefficient on this interaction term to be positive and statistically significant, indicating that higher institutional quality weakens the negative relationship between inequality and economic performance.

The third hypothesis extends this analysis by examining whether the inequality-growth relationship itself differs between developed and developing economies. We propose that in developed (OECD) countries, higher inequality may have a positive or neutral influence on growth. This is because mature economies may benefit from the high savings and investment rates of the wealthy in contexts of secure property rights and developed financial markets. Conversely, in developing (non-OECD) countries, we expect a negative or non-linear (inverted U-shaped) relationship, where very high inequality hinders growth by limiting human capital accumulation, fueling social instability, and constraining aggregate demand.

To sum up, the following hypotheses will be tested:

1) The relationship between the Gini coefficient and GDP per capita growth rate is non-linear, following an inverted U-shape over a 15-year period.
2) The effect of income inequality on GDP per capita growth is moderated by institutional quality, with a stronger rule of law mitigating the adverse economic consequences of inequality.
3) The effect of income inequality on economic growth differs based on a country's level of development

6. Descriptive statistics

Our empirical analysis is based on an unbalanced panel of data from 105 countries over three 15-year periods (1980-1994, 1995-2009, 2010-2024). The imbalance is caused by missing observations for some variables in certain years.

Table 4 provides summary descriptive statistics for all key variables. The dependent variable is the average annual growth rate of GDP per capita (geometric mean), calculated for each 15-year period. Its average value is 1.0% with a standard deviation of 2.5%, which indicates a significant variation in economic trajectories between countries. The minimum value (-13.7%) corresponds to deep economic crises, while the maximum (13.5%) corresponds to periods of intense "catching—up growth".

Table 4. Descriptive statistics

	Mean	SD	Min	Max	N
GDP growth (annual)	0.010	0.025	-0.137	0.135	315
Log GDP per capita	9.445	1.052	6.323	11.792	315
Gini coefficient (0-1)	0.555	0.119	0.181	0.833	315
Urbanization rate (share)	0.555	0.234	0.061	1.000	315
Education enrollment (share)	0.235	0.225	0.000	0.950	315
Rule of Law (0-1)	0.554	0.315	0.028	0.999	315

Economic development shows significant differences in different countries and over time. GDP per capita ranges from $928.24 to $133915.01, with an average of $23141.73 and a standard deviation of $23495.46.(Table 2b, in Appendix)
The distribution of logarithmic GDP per capita the average value is 9.445, the standard deviation is 1.052, and the range is from 6.323 to 11.792.

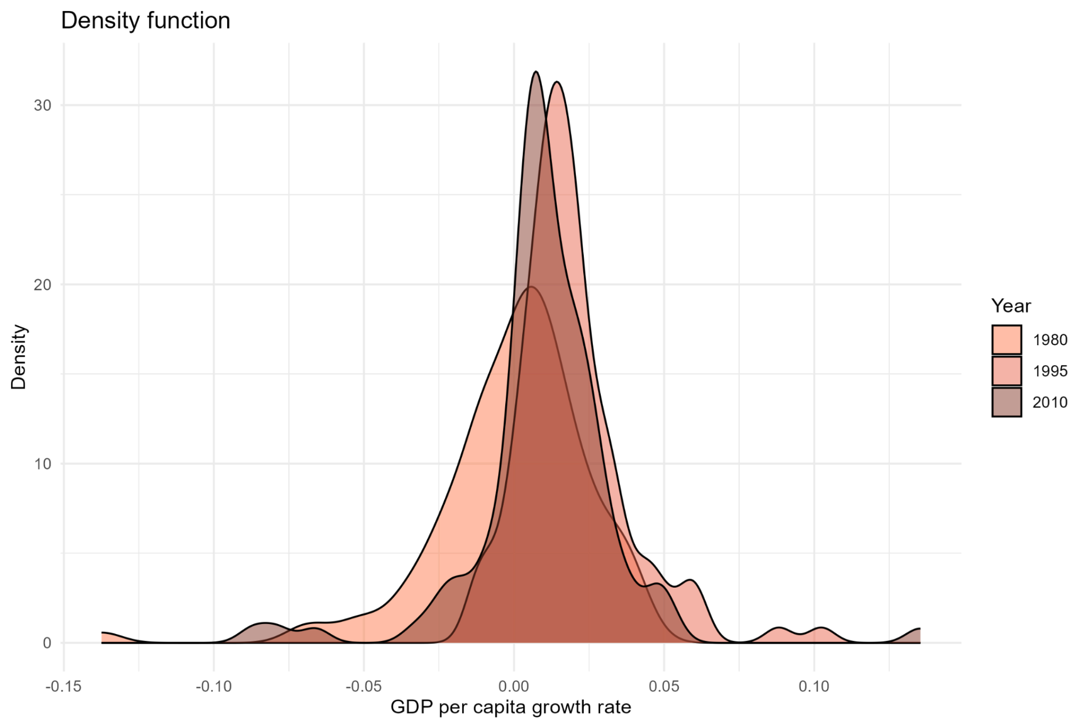


Figure 2

Income inequality, measured by the Gini coefficient, demonstrates moderate variation with values from 0.181 to 0.833 (mean = 0.555, SD = 0.119). Most countries cluster in the 0.45-0.65 range, indicating generally high but variable inequality levels across nations.

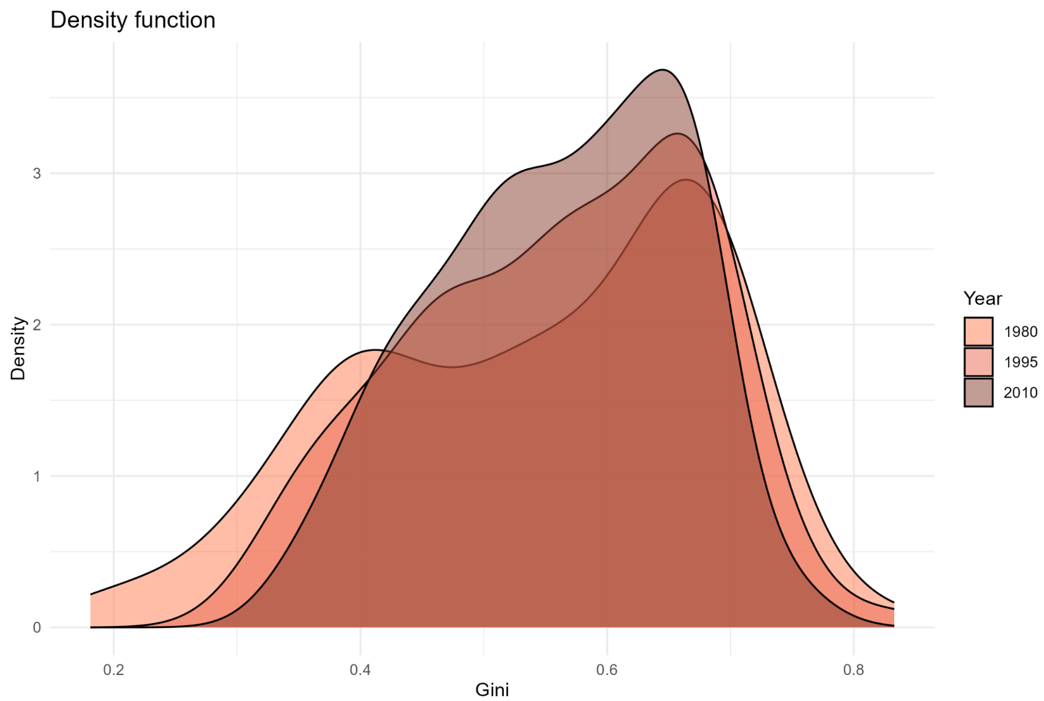


Figure 3

The key variations in the data reflect structural differences between countries. Urbanization shows a moderate spread, which is consistent with the global trend of urban population growth. The greatest variability is observed in the indicators of institutional quality and accumulation of human capital: The rule of law index varies across the scale from 0 to 1, and the proportion of the population with higher education ranges from almost zero to 95%. These differences highlight the significant institutional and educational heterogeneity between countries, which must be taken into account when analyzing the relationship between inequality and growth.

Table 5a. Statistics by year , Mean

year	growth	ln_gdp	gini	urban	educ	law
1980	-0.000	9.343	0.543	0.485	0.117	0.513
1995	0.019	9.351	0.561	0.591	0.207	0.568
2010	0.010	9.640	0.561	0.591	0.380	0.581

Table 5b.Statistics by year, SD

year	growth	ln_gdp	gini	urban	educ	law
1980	0.026	1.025	0.142	0.239	0.103	0.320
1995	0.019	1.090	0.114	0.225	0.186	0.317
2010	0.025	1.021	0.097	0.224	0.267	0.308

Tables 3a and 3b show the evolution of key indicators over the three analyzed periods. The following trends are observed:

Economic growth: The highest growth rates were recorded in the period 1995-2009 (average 1.9%), which coincides with the global economic recovery before the 2008 financial crisis. The period 1980-1994 was characterized by stagnation (average growth was close to zero), which was explained by the consequences of the oil crises, the debt crisis in developing countries and the transition processes in post-socialist economies. In the period 2010-2024, the average growth recovered to 1.0%, but the variation between countries increased (SD = 2.5%).

Inequality: The Gini coefficient demonstrates relative stability over all three periods (averages: 0.543, 0.561, 0.561). At the same time, the standard deviation is decreasing from 0.142 in 1980 to 0.097 in 2010, which may indicate a certain convergence of inequality levels between countries.

Education: There has been a steady increase in the proportion of the population with higher education, from 11.7% in 1980 to 38.0% in 2010. This trend reflects the global expansion of higher education and increased investment in human capital.

Institutions: The Rule of Law Index has consistently improved, from 0.513 in 1980 to 0.581 in 2010 (an increase of 13.3%). This is in line with the global trend of strengthening formal institutions, especially in developing countries.

Figure 4 shows the preliminary relationship between the level of inequality (the Gini coefficient at the beginning of the period) and subsequent economic growth (the average annual growth rate of GDP per capita over 15 years). In all three periods, a nonlinear relationship is observed, approaching an inverted U-shaped curve. This visually confirms the first hypothesis about the nonlinear nature of the relationship between inequality and growth.

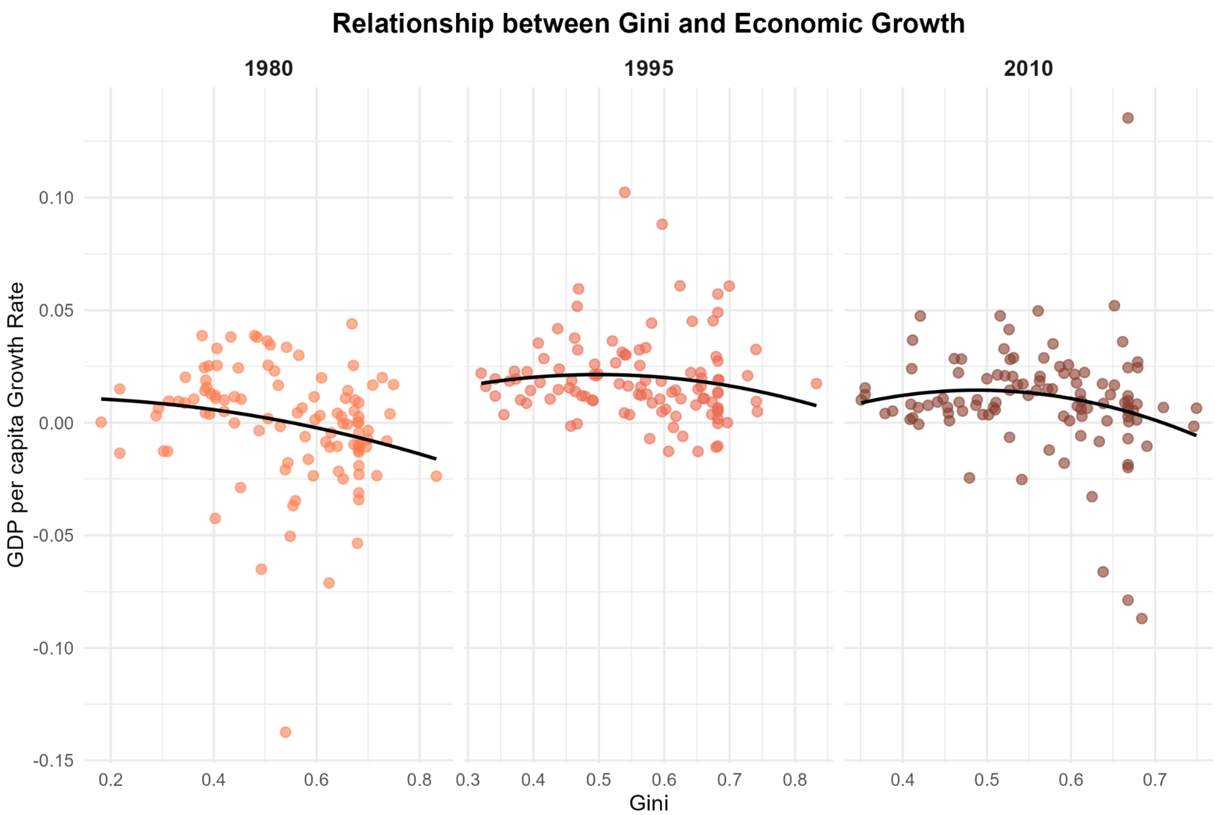


Figure 4

Correlation analysis (Figure 6) reveals stable relationships between key variables. The strongest positive correlations are observed between the logarithm of GDP and urbanization (0.80), as well as between the logarithm of GDP and the level of education (0.67). This confirms the expected structural connections: more developed economies are characterized by a high proportion of the urban population and accumulated human capital. There is also a significant positive correlation between the logarithm of GDP and the rule of law (0.61).

The negative correlations show a consistent pattern: the logarithm of GDP is negatively correlated with the Gini coefficient (-0.43), confirming the basic premise that higher levels of development are associated with lower income inequality. Similarly, the rule of law shows a negative correlation with inequality (-0.45), pointing to the role of institutions in smoothing distributional imbalances. It is important to note that in the data, the relationship between the Gini coefficient and the level of education also becomes negative (-0.34), which is consistent with theoretical ideas about education as a factor in reducing inequality.

Relative to economic growth, there is a weak positive relationship with the rule of law (0.15), while the correlation with inequality remains negative (-0.13). This is consistent with the hypothesis that institutional quality contributes to long-term growth, while high inequality may constrain it. The correlation between the initial level of GDP and subsequent growth is slightly negative (-0.12)The observed negative relationship between the level of GDP and growth dynamics reflects a well-known phenomenon in the literature: developing countries often show accelerated growth compared to developed ones, since they can use already created technologies, attract foreign investment, and optimize the institutional environment without going through all the stages of innovative development on their own.

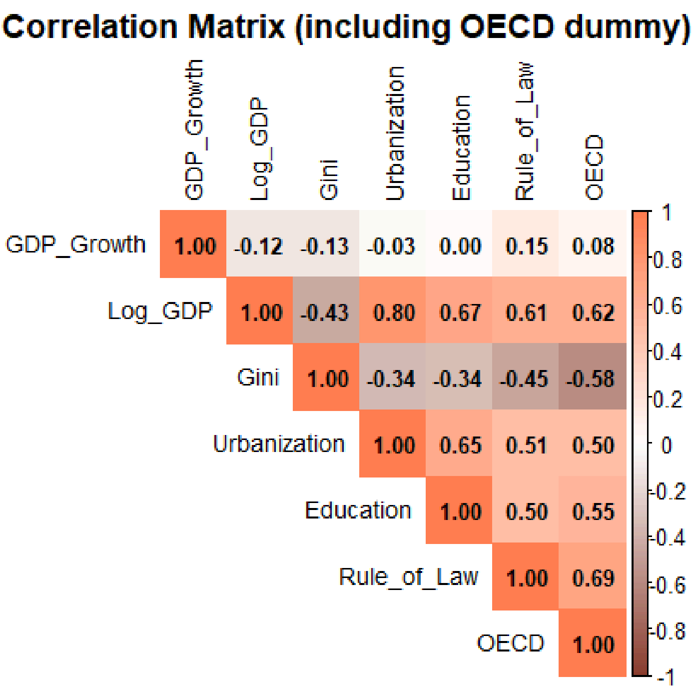


Figure 5

The correlation matrix reveals that OECD membership serves as a strong proxy for a country's development level, showing high positive correlations with log GDP per capita (0.62), rule of law (0.69), educational attainment (0.55), and urbanization (0.50), while being negatively correlated with income inequality (-0.58). However, its direct correlation with economic growth is weak (0.08).

In the main description (Table 2), the OECD variable is not represented because it is a binary variable for which standard descriptive statistics (mean, standard deviation) have limited interpretation.
However, additional analysis shows the dynamics of membership:
1980: 23 OECD member countries
1995: 27 countries
2010: 26 countries

Comparing coefficients of variation reveals a clear hierarchy in cross-country heterogeneity:
GDP growth shows extreme variance (CV > 2.5), followed by educational attainment (CV = 0.96) and the rule of law (CV = 0.57), while urbanization and the Gini index show relatively stable patterns between countries (CV = 0.21-0.42).The full calculations are presented in the Appendix (Table 5).

7. Formulation and justification of the model or models

Panel regression model can be implemented in a such way to examine the relationship between income inequality and economic performance across countries:

$$Growth_{it} = \alpha_i + \lambda_t + \beta_1 \times Gini_{it} + \beta_2 \times Gini^2_{it} + \beta_3 \times ln(GDP_{it-1}) + \beta_4 \times Educ_{it} + \beta_5 \times Urb_{it} +$$

$$+ \beta_6 \times Urb^2_{it} + \beta_7 \times Law_{it} + \beta_8 \times (Gini_{it} \times Law_{it}) + \varepsilon_{it}$$

$where\ \alpha_i\ -\ fixed\ country\ effects;\ \lambda_t\ -\ time - fixed\ effects;\ \varepsilon_{it} -\ error\ term$

The linear term of the Gini variable captures the direct linear effect on the growth rate whereas quadratic term tests for the *non-linear* relationships *(Appendix Figure 4)*. IInitial development level (level taken in the beginning of each of three periods) controls for *conditional convergence* (poor countries typically grow faster). Education serves as a proxy for human capital accumulation. In the dotplot it seems that the correlation between tertiary enrollment ratio and GDP per capita growth rate is uncertain. In 1980 the concave functional form can be seen, in 1995 there is the presence of a hyperbolic relationship while in 2010 the linear relationship is revealed *(Appendix Figure 6)*. We decided to add a linear relationship into the model. The rule of law measures institutional quality and in the picture it seems that there is a linear relationship between two variables *(Appendix Figure 7).* In addition, we want to add an interaction term in order to test whether this quality moderate the inequality-growth relationship. The rate of urbanization has also a polynomial form. Urbanization initially boosts economic growth through agglomeration economies. Concentration of skilled workers enables knowledge spillovers, better labor market matching, and more efficient infrastructure use. However, later diseconomies of scale may begin to dominate: congestion, skyrocketing housing costs, overcrowded public services, and increased social problems. The figure also reveals some nonlinearity, therefore, we add urbanisation and quadratic urbanisation into the model *(Appendix Figure 8).*

Fixed country effects control for unobserved time-invariant heterogeneity across countries (cultural, historical, geographical factors). The presence of these effects mitigate omitted variable bias from factors correlated with country-specific characteristics. Time fixed effects control for common macroeconomic shocks (global crises, commodity price fluctuations, technological changes) and account for period-specific effects that influence all countries simultaneously.

8. Empirical results

Four different regressions were conducted. The first was the ordinary pooled regression where all data was taken as if cross-sectional. The last free included fixed effects of year, country and both of them. All models include controls for: initial income level (ln_gdp), institutional quality (law), urbanization (urban), education (educ). The specification tests for both linear and quadratic effects of inequality, as well as an interaction between inequality and institutional quality.

Table 7. Regression analysis results.

	Pooled	**FE: year**	**FE: country**	**FE: year, country**
(Intercept)	0.072*			
	(0.030)			
Gini	0.127*	0.040	0.315***	0.149
	(0.053)	(0.057)	(0.081)	(0.090)
Gini^2	-0.133***	-0.059	-0.254**	-0.081
	(0.057)	(0.064)	(0.091)	(0.105)
ln(GDP)	-0.013***	-0.009**	-0.050***	-0.051***

	(0.003)	(0.003)	(0.011)	(0.011)
Law power	0.040*	0.039*	0.027	0.037
	(0.018)	(0.019)	(0.030)	(0.033)
Urbanization rate	0.053+	0.023	0.221***	0.072
	(0.031)	(0.033)	(0.065)	(0.076)
Urbanisation rate^2	-0.032	-0.017	-0.130*	-0.092+
	(0.022)	(0.024)	(0.054)	(0.052)
Education	0.005	-0.007	0.020	-0.017
	(0.008)	(0.010)	(0.013)	(0.016)
Gini * Law power	-0.026	-0.029	-0.008	-0.038
	(0.034)	(0.035)	(0.058)	(0.066)
Num.Obs.	315	315	315	315
R2	0.141	0.223	0.594	0.649
R2 Adj.	0.118	0.198	0.369	0.448
R2 Within		0.128	0.372	0.368
R2 Within Adj.		0.108	0.351	0.343
AIC	-1469.4	-1497.3	-1497.6	-1539.1
BIC	-1435.6	-1456.0	-1073.6	-1107.6
RMSE	0.02	0.02	0.02	0.01
Std.Errors	Heteroskedasticity-robust	by: country	by: country	by: country
FE: year		X		X
FE: country			X	X

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

In all 4 regressions the form of Gini and GDP growth **relationship is U-shaped.** However the **significance of Gini coefficients** was found only in the *pooled* and *country fixed effect* models. In the pooled OLS model (Model 1), we observe a statistically significant inverted U-shaped pattern: the linear term for the Gini coefficient is positive ($\beta = 0.127$, $p < 0.05$) while the quadratic term is negative ($\beta = -0.133$, $p < 0.05$). This suggests that moderate levels of inequality may be associated with higher growth rates, while both very low and very high inequality correlate with lower growth. This finding partially supports our **first hypothesis** regarding a non-linear relationship. However, the statistical significance of this pattern diminishes when we account for temporal heterogeneity. In the *year fixed effects* model (Model 2), both coefficients become statistically insignificant, indicating that global time trends may explain some of the apparent correlation observed in the pooled specification.

When we control for *country-specific time-invariant* characteristics in the country fixed effects model (Model 3), the inverted U-shaped relationship reappears with even greater statistical strength ($\beta_{gini} = 0.315$, $p < 0.001$; $\beta_{gini^2} = -0.254$, $p < 0.01$). This suggests that within-country variations in inequality over time follow a non-linear pattern with economic performance. However, in the most rigorous *two-way fixed effects model* (Model 4), which accounts for both country-specific and time-specific unobserved heterogeneity, the coefficients for inequality become **statistically insignificant**, though they maintain the same inverted U-shaped sign pattern. This sensitivity to model specification indicates that the relationship between inequality and growth is **not universally robust** and may depend on unobserved factors that vary across both countries and time periods.

A consistently **strong and statistically significant** finding across all four model specifications is conditional **β-convergence.** The coefficient for initial GDP per capita (ln_gdp) is *negative and highly significant* in every model. This provides robust evidence that poorer countries tend to grow faster than richer ones when controlling for other factors, supporting a fundamental prediction of neoclassical growth theory.

The effects of **control** variables demonstrate considerable **sensitivity** to model specification. **Urbanization** shows a complex relationship with growth. In the most basic pooled model, urbanization has a *positive linear* effect ($\beta = 0.053$, $p < 0.1$) but with a *negative quadratic term* suggesting diminishing returns. In the country fixed effects model, this relationship becomes much stronger ($\beta = 0.221$, $p < 0.001$) with a significant negative quadratic term ($\beta = -0.130$, $p < 0.05$), indicating that within countries, increasing urbanization initially accelerates growth but eventually reaches a point of diminishing returns, possibly due to congestion effects or diseconomies of scale.

Institutional quality, measured by the Rule of Law index, shows *positive* but varying effects. In pooled and year FE models*, better institutions are associated with higher growth* ($\beta = 0.040$, $p < 0.05$; $\beta = 0.039$, $p < 0.05$ respectively). However, in models with country fixed effects, this relationship becomes *statistically insignificant,* suggesting that cross-country differences in institutional quality matter more for growth than within-country improvements over time, or that institutional quality changes slowly relative to our 15-year periods.

Educational attainment, measured by tertiary enrollment rates, shows surprisingly *weak and inconsistent* effects across specifications. The coefficients are small and statistically insignificant in all models except for a marginally negative effect in the two-way FE model ($\beta = -0.017$, $p > 0.1$). This counterintuitive finding may reflect measurement issues, multicollinearity with other variables, or the possibility that tertiary education's benefits for growth manifest with longer lags than captured in our 15-year framework.

Our **second hypothesis** proposed that institutional quality would *moderate the relationship between inequality and growth*, with stronger rule of law mitigating negative effects of inequality with positive coefficient expected. However, the interaction term between the Gini coefficient and the Rule of Law index is *consistently negative* across all specifications but *never reaches statistical significance* at conventional levels. This suggests that while there may be a tendency for better institutions to weaken any positive association between inequality and growth (or strengthen a negative one), this moderating effect is not robustly identified in our data. The lack of statistical significance persists even in a two-way fixed effects model, indicating that our empirical approach **does not provide strong evidence** for institutional quality serving as a systematic moderator of the inequality-growth relationship within the context of our 15-year timeframe.

The **third hypothesis** was aimed to test whether there is a difference in the relationship between developed and developing countries. We can check it by building a slightly new model. To examine this, we introduced an interaction term between the Gini coefficient and a time-varying OECD membership dummy variable, which serves as a proxy for a country's development status. A table of interaction term coefficients in each of 4 models was built. This reversal indicates that while cross-sectional (pooled model) comparisons might suggest a slightly more positive link between inequality and growth in richer countries, the within-country evidence provides different results: when countries become OECD members, the effect of inequality on growth weakens or becomes more negative. OECD membership itself shows no significant direct effect on growth. The third hypothesis with OECS as a measure of the countries' development **has not been proved.**

Table 8. Interaction table result.

	Pooled	FE: year	FE: country	FE: both
(Intercept)	0.070*			
	(0.031)			
gini	0.123*	0.034	0.312***	0.138
	(0.053)	(0.058)	(0.082)	(0.094)
I(I(gini^2))	-0.123*	-0.043	-0.261**	-0.086
	(0.062)	(0.067)	(0.094)	(0.109)
ln_gdp	-0.013***	-0.009**	-0.050***	-0.051***
	(0.004)	(0.003)	(0.012)	(0.011)
law	0.054	0.061+	0.006	0.004
	(0.034)	(0.033)	(0.040)	(0.038)
urban	0.053+	0.023	0.219**	0.067
	(0.031)	(0.033)	(0.065)	(0.076)
I(I(urban^2))	-0.033	-0.018	-0.129*	-0.089+
	(0.022)	(0.023)	(0.054)	(0.053)
educ	0.005	-0.006	0.021+	-0.017
	(0.008)	(0.010)	(0.013)	(0.016)
oecd	-0.012	-0.020	0.020	0.033
	(0.017)	(0.016)	(0.020)	(0.020)
gini × law	-0.049	-0.064	0.027	0.019
	(0.056)	(0.055)	(0.075)	(0.075)
gini × oecd	0.022	0.035	-0.045	-0.071+
	(0.027)	(0.027)	(0.034)	(0.039)

Num.Obs.	315	315	315	315
R2	0.141	0.225	0.595	0.652
R2 Adj.	0.113	0.194	0.365	0.447
R2 Within		0.132	0.391	0.374
R2 Within Adj.		0.103	0.360	0.342
AIC	-1465.6	-1494.0	-1494.6	-1537.8
BIC	-1424.4	-1445.2	-1063.1	-1098.7
RMSE	0.02	0.02	0.02	0.01
Std.Errors	Heteroskedasticity-robust	by: country	by: country	by: country
FE: year		X		X
FE: country			X	X

p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

9. Critical analysis of the results. Limitations of the study

The model's low explanatory power, as indicated by metrics such as the adjusted R^2, suggests it captures only a fraction of the variation in GDP per capita growth. This is, in part, a reflection of the inherent complexity of modeling macroeconomic growth, a challenge well-documented in the literature. Consequently, while this study employs advanced econometric techniques, its findings must be interpreted within the context of the fundamental methodological limitations that characterize this field of research.

Despite using lagged independent variables, establishing strict correlation remains challenging. GDP per capita itself can influence inequality (for example, through skill-biased technological change), institutional quality, and urbanization patterns, creating a problem of **reverse causalit**y. The fixed effects model with lagging declines, but does not fully eliminate this problem as residual correlation between the error term and regressors is possible, if there are unobserved dynamic factors.

An important challenge in growth regressions is **omitted variable bias**. While we include key controls informed by theory: initial income, human capital (education), institutional quality, and urbanization, the list of potential growth determinants is vast. Factors such as financial development, trade openness, natural resource dependence, demographic structure, and political instability are also critical. Their omission could bias our estimate of inequality's effect if they are correlated with both the Gini coefficient and growth. The problem of model uncertainty, as highlighted by Durlauf et al. (2005), can be evident in our own results: the significance and the sign of some control variables (like education) fluctuate across specifications. This suggests that our chosen set of controls, while justified, may not fully isolate the net effect of inequality, and different model specifications could yield different conclusions.

Although the World Inequality Database (WID) provides superior coverage, the Gini coefficient remains an **imperfect** summary **measure**. It can mask differences in inequality within the top and bottom of the distribution. Furthermore, national methodologies for calculating disposable income can vary, affecting cross-country comparability. Some of the variables can be **measured** within the countries **differently**. For example, the Rule of Law index, while a standard proxy, is often based on expert surveys and perception data, which can be subjective and slow to reflect actual institutional changes.

Testing our third hypothesis, we used OECD membership as a time-varying proxy for developed status. This is a convenient but not robust instrument. The economic and institutional heterogeneity within the OECD (for example,, comparing Turkey to Luxembourg) and within the non-OECD group Singapore versus Chad) is immense. This aggregation likely muddles the analysis of development-based heterogeneity. The weak and inconsistent interaction term (gini × oecd) may reflect not the absence of a differential effect, but the inadequacy of the OECD dummy to capture the relevant thresholds of institutional and economic development that condition the inequality-growth relationship.

Our final panel consists of 105 countries, constrained primarily by data availability for tertiary enrollment. While our representativeness checks show a reasonably balanced sample across regions and incomes, the sample is **inevitably biased** towards countries with more **established statistical systems**. The findings may not be fully generalizable to the most fragile states or those with chronic data gaps, which are often among the poorest and most unequal.

10. Conclusion

The empirical analysis conducted across 105 countries over three 15-year periods yields nuanced insights into the relationship between income inequality and economic growth. The findings offer partial support for the hypothesis of a non-linear, inverted U-shaped relationship between inequality and growth, as evidenced in pooled and country fixed-effects specifications. However, this pattern loses statistical significance when both country and time fixed effects are accounted for, indicating that the observed relationship is sensitive to unobserved heterogeneity and may not be a universal empirical regularity. The hypothesis that institutional quality, measured by the rule of law, moderates the inequality-growth link is not substantiated by the data, as the interaction term remained statistically insignificant across all models. Similarly, the expectation that the effect of inequality on growth differs between developed and developing economies receives limited support, with interaction terms involving OECD membership showing weak and inconsistent significance.

The **sensitivity** of the results to model specification suggests that underlying country-specific and time-specific factors play a critical role in mediating this relationship. The lack of robust moderation effects from either institutional quality or development status points to the need for more refined theoretical frameworks and empirical strategies in future research.

To advance understanding in this domain, several avenues for future research are proposed. First, addressing **endogeneity concerns** more rigorously through instrumental variable approaches or dynamic panel models, such as System GMM, could **enhance causal inference**.

Second, refining the measurement of key constructs is essential. Future studies could incorporate **alternative measures of inequality**, such as top income shares or wealth distribution indicators, to capture different dimensions of economic disparity. **Disaggregating institutional quality** into specific components such as property rights enforcement, corruption control, or judicial independence may reveal more precise mechanisms. Similarly, human capital could be assessed through cognitive skill measures or educational quality metrics rather than enrollment rates alone.

Third, **exploring heterogeneity** more deeply is warranted. Investigating regional, cultural, or historical moderators such as social trust, ethnic diversity, or colonial legacy could identify contextual factors that shape the inequality-growth link. Employing machine learning techniques, like causal forests, may help detect heterogeneous treatment effects across different country subgroups.

Finally, integrating political economy dimensions could enrich the analysis. Examining how political regimes, electoral systems, and interest group dynamics influence the relationship between inequality and growth would provide a more holistic understanding. The role of redistributive policies, such as progressive taxation and social transfers, as potential mediators also merits further investigation.

11. Team members' contributions

Arina Mingazova: Conceptualization of the research question, overall project coordination, development of the introduction, observation of literature review, introduce research methods, construct analytical visualizations.

Aleksandra Borozdina: Conceptualization of the research question, development of description of the data, hypotheses, and limitations sections, and creation of the defense presentation.

Fedor Tarasov: Conceptualization of the research question, econometric models construction and interpretation of results.

Ilia Samoilenko: Conceptualization of the research question, development and specification of econometric models.

Yulia Chenkova: Conceptualization of the research question, investigation and selection of databases, data work and identification of relevant variables for analysis.

Yulianna Gallyamova: Conceptualization of the research question, preparation of the descriptive statistics section and construction of analytical visualizations.

12. References

[1] Kuznets, S. 1955. Economic Growth and Income Inequality. The American Economic Review, Vol. 45, Issue 1, 1-28. http://www.jstor.org/stable/1811581

[2] Persson, T., and G. Tabellini. 1991. Is inequality harmful for growth? Theory and evidence. NBER Working Paper No. 3599. http://www.nber.org/papers/w3599

[3] Alesina, A., and D. Rodrik. 1994. Distributive Politics and Economic Growth. The Quarterly Journal of Economics, Vol. 109, No. 2, 465-490. http://qje.oxfordjournals.org/content/109/2/465.short

[4] Perotti, R. 1995. Growth, Income Distribution and Democracy: What the Data Say. Columbia University, 1994-95 Discussion Paper Series, No. 757. https://www.google.it/search?q=Growth%2C+Income+Distribution+and+Democracy&oq=Growth%2C+Income+Distribution+and+Democracy&aqs=chrome..69i57j69i61j0l4.179j0j4&sourceid=chrome&espv=210&es_sm=93&ie=UTF-8

[5] Deininger, K., and L. Squire. 1996. A New Data Set Measuring Income Inequality. The World Bank Economic Review, Vol. 10, No. 3 (Sep., 1996), 565-591. http://www.jstor.org/stable/3990058

[6] Li, H., and H. Zou. 1998. Income Inequality is not Harmful for Growth: Theory and Evidence. Review of Development Economics, 318-334. http://onlinelibrary.wiley.com/doi/10.1111/1467-9361.00045/abstract

[7] Forbes, K. J. 2000. A Reassessment of the Relationship Between Inequality and Growth. The American Economic Review, Vol. 90, No. 4, 869-887. http://www.jstor.org/stable/117312

[8] Banerjee, A. V., and E. Duflo. 2003. Inequality and Growth: What Can the Data Say? Journal of Economic Growth, 8, 267-299.
http://link.springer.com/article/10.1023%2FA%3A1026205114860

[9] Pagano, P. 2004. An empirical investigation of the relationship between inequality and growth. Banca d'Italia, Temi di discussione del Serivzio Studi. No. 536.
http://www.uib.es/congres/ecopub/ecineq/papers/199pagano.pdf

[10] Barro, R. J. (2008). Inequality and growth revisited. ADB Working Paper Series on Regional Economic Integration, 11. Asian Development Bank.
http://ideas.repec.org/p/ris/adbrei/0011.html

[11] Grijalva, D. F. (2011). Inequality and economic growth: Bridging the short-run and the long-run [Conference paper]. Center for the Study of Democracy, University of California, Irvine.http://www.democracy.uci.edu/files/democracy/docs/conferences/grad/2011/Diego%20-%20Inequality%20and%20growth%20CSD.pdf

[12] Assa, J. (2012). Inequality and growth re-examined. Technology and Investment, 3(1), 1–6. https://www.scirp.org/journal/PaperInformation?paperID=17405

[13] Durlauf, S. N., Johnson, P. A., & Temple, J. R. W. (2005). Growth econometrics. In P. Aghion & S. N. Durlauf (Eds.), Handbook of economic growth (Vol. 1A, pp. 555–677). North-Holland. https://research-information.bris.ac.uk/en/publications/growth-econometrics/

[14] Easterly, W. (2006). Inequality does cause underdevelopment: Insights from a new instrument. Journal of Development Economics, 84(2), 755–776.
https://doi.org/10.1016/j.jdeveco.2006.11.002

[15] Sala-i Martin, X., G. Doppelhofer, and R. I. Miller. 2004. "Determinants of Long-Term Growth: A Bayesian Averaging of Classical Estimates (BACE) Approach." *American Economic Review*, Vol. 94, No. 4 (Sep., 2004), 813–835.

[16] World Bank DataBank: The World Bank. World Development Indicators [Data set]. https://data.worldbank.org/

[17] World Inequality Lab. World Inequality Database. https://wid.world/

[18] Barro, R. J., & Lee, J.-W. (2021). *Barro-Lee Educational Attainment Dataset (2021 September Update)* [Data set]. http://barrolee.com

[19] The World Bank. (2025). GDP per capita (constant 2015 US$) [Data set]. World Development Indicators.
https://data360.worldbank.org/en/indicator/WB_WDI_NY_GDP_PCAP_KD

[20] The World Bank. (2025). Rule of law index [Data set]. World Development Indicators.
https://data360.worldbank.org/en/indicator/VDEM_CORE_V2X_RULE

[21] The World Bank. (2025). Urban population (% of total population) [Data set]. World Development Indicators. https://data360.worldbank.org/en/indicator/WB_WDI_SP_URB_TOTL_IN_ZS

[22] OECD. Home. OECD.org. https://www.oecd.org/en.html

13. Appendix

Table 1. Variables, descriptions and Data sources

Type	Variables	Descriptions	Data source
Outcome	GDP per capita (used for calculating growth rate)	GDP per capita in constant 2015 dollars	World Bank
Interest predictor	Gini coefficient	Gini index of disposable income, measuring income inequality and varying from 0 to 1	WID
Control predictor	Tertiary enrollment ratio	Tertiary enrollment ratio measures the proportion of the relevant age group enrolled in this stage of education	Barro-Lee Educational Attainment Dataset
	Urbanization rate	Urban population as percentage of total population	World Bank
	Rule of Law Index	Varies between 0 and 1 and measures confidence in contract enforcement, property rights, and legal institutions	World Bank
	OECD	Indicates membership in OECD	Official OECD website

Table 2. Noticeable papers on inequality and growth relationship

Authors	Variables	Estimation	Results
Barro (2008)	- Dependent variable: Growth rate of real per capita GDP over 10-year periods - Initial log(per capita GDP) - Gini * log(per capita GDP) Control variables: - 1 / (life expectancy at age one) (health proxy) - Male upper-level (secondary+) school attainment - Openness variable - Growth rate of the terms of trade - Rule-of-law indicator - log(total fertility rate) - Investment-to-GDP ratio	3SLS estimation with lagged values as instruments to address potential endogeneity	Overall negative, but with interaction term for poor countries the effect is negative and significant and the effect becomes positive as country's GDP rises
Diego Grijalva (2011)	- Dependent variable: Average annual growth of real GDP for particular period depending on considered timeframe - Gini coefficient (inequality) at the end of the previous period - Quadratic Gini - Interaction term: Gini and initial GDP level - Log of initial real GDP per capita Control variables:	Fixed effects and Random Effects Difference-GMM (Arellano–Bond, 1991) System-GMM (Arellano–Bove, 1995;Blundell–Bond, 1998) with Windmeijer correction Restricted System-GMM (collapsed	In short term the U-shape relationship, inequality boosts growth up to a point, then harms it In medium run the effect the same but it is weaker In the long run the relationship is linear, conditional on income. In poor

	- Average years of secondary schooling, male population aged 25+ - Average years of secondary schooling, female population aged 25+ - Price level of investment (relative to U.S.) – proxy for market distortions - Country and period fixed effects	instruments, limited lags) to address instrument proliferation Cross-sectional OLS for the very long run (37 years)	countries: inequality hurts growth. In rich countries: inequality helps growth In the very long run higher inequality is associated with lower growth
Jacob Assa (2012)	- Dependent variable: geometric average growth rate of GDP per capita between 1998-2008 - GINI around 1998 - initial GDP per capita in 1998 - primary education enrollment in the school year 1998/99 - two dummy variables: for stage of development and for democracy	OLS for Gini up to 1998 and 2SLS for Gini between 1998 and 2005 using school enrollment as instrumental variable	Inequality negatively affects subsequent economic growth, particularly in developing countries, while no evidence that inequality boosts growth in advanced economies, also no mitigating effect from democracy

Figure 1

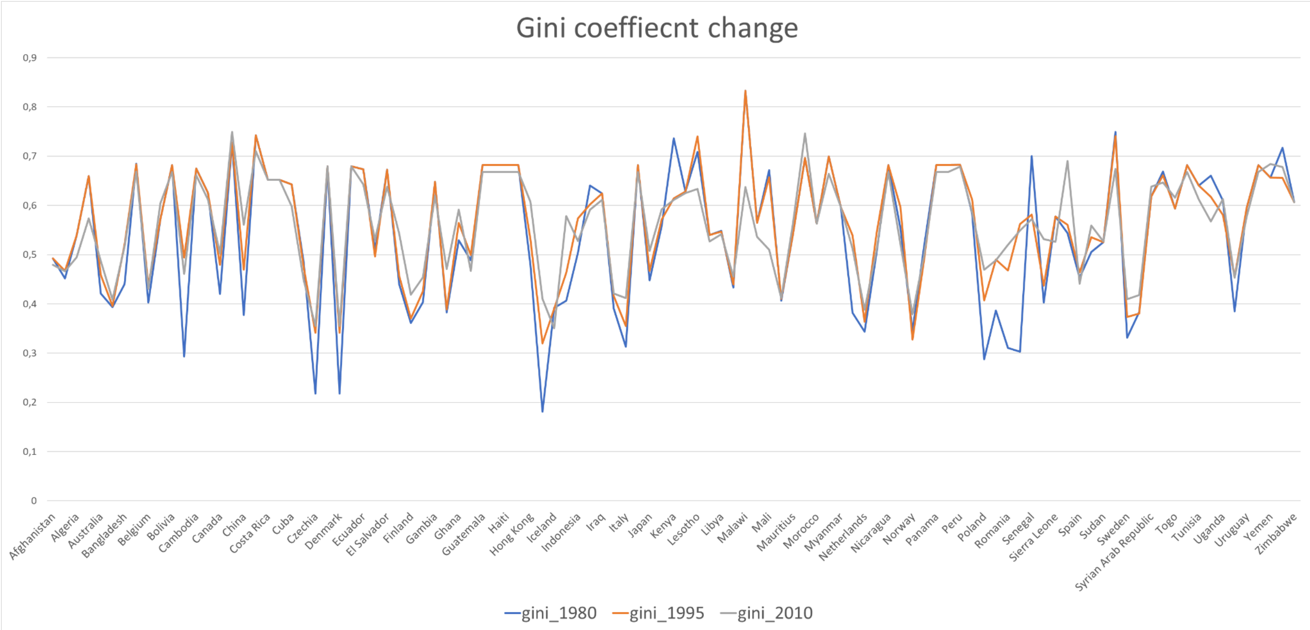


Table 3. Representation rates

Region	Total	Present	Representation rate
East Asia & Pacific	37	12	0,324324
Europe & Central Asia	58	28	0,482759
Latin America & Caribbean	42	23	0,547619
Middle East & North Africa	23	14	0,608696
North America	3	1	0,333333
South Asia	6	4	0,666667
Sub-Saharan Africa	48	23	0,479167
Income	Total	Present	Representation rate
High income	87	39	0,448276
Upper middle income	55	25	0,454545

Lower middle income	50	27	0,54
Low income	25	14	0,56
Total	217	105	0,483871

Table 4. Descriptive statistics

	Mean	SD	Min	Max	N
GDP growth (annual)	0.010	0.025	-0.137	0.135	315
Log GDP per capita	9.445	1.052	6.323	11.792	315
Gini coefficient (0-1)	0.555	0.119	0.181	0.833	315
Urbanization rate (share)	0.555	0.234	0.061	1.000	315
Education enrollment (share)	0.235	0.225	0.000	0.950	315
Rule of Law (0-1)	0.554	0.315	0.028	0.999	315

Figure 2

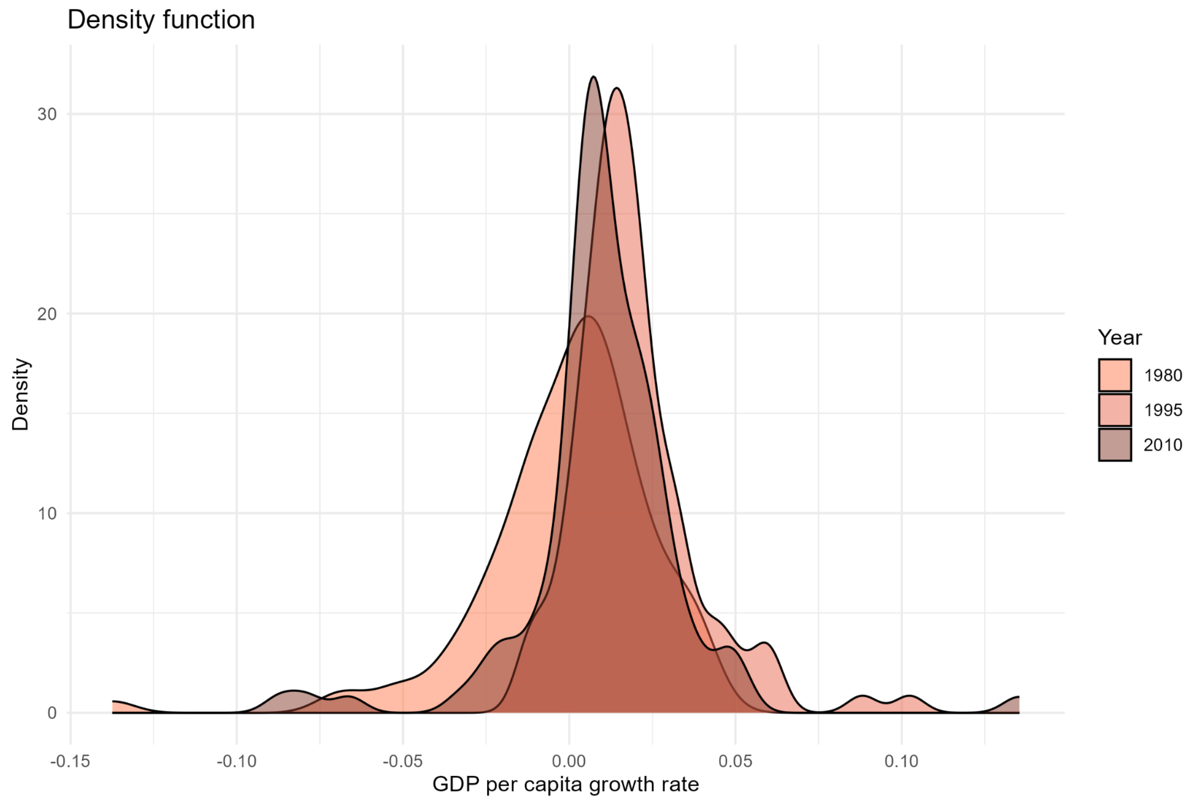


Figure 3

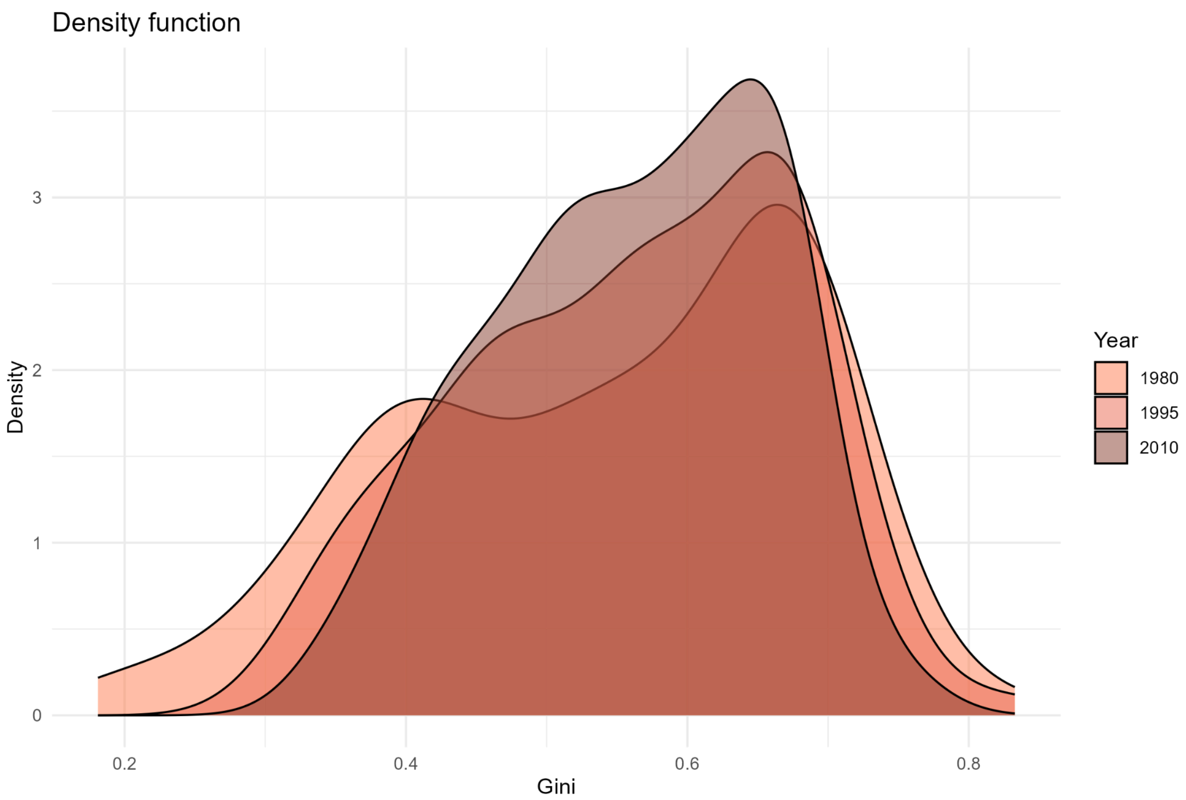


Figure 4

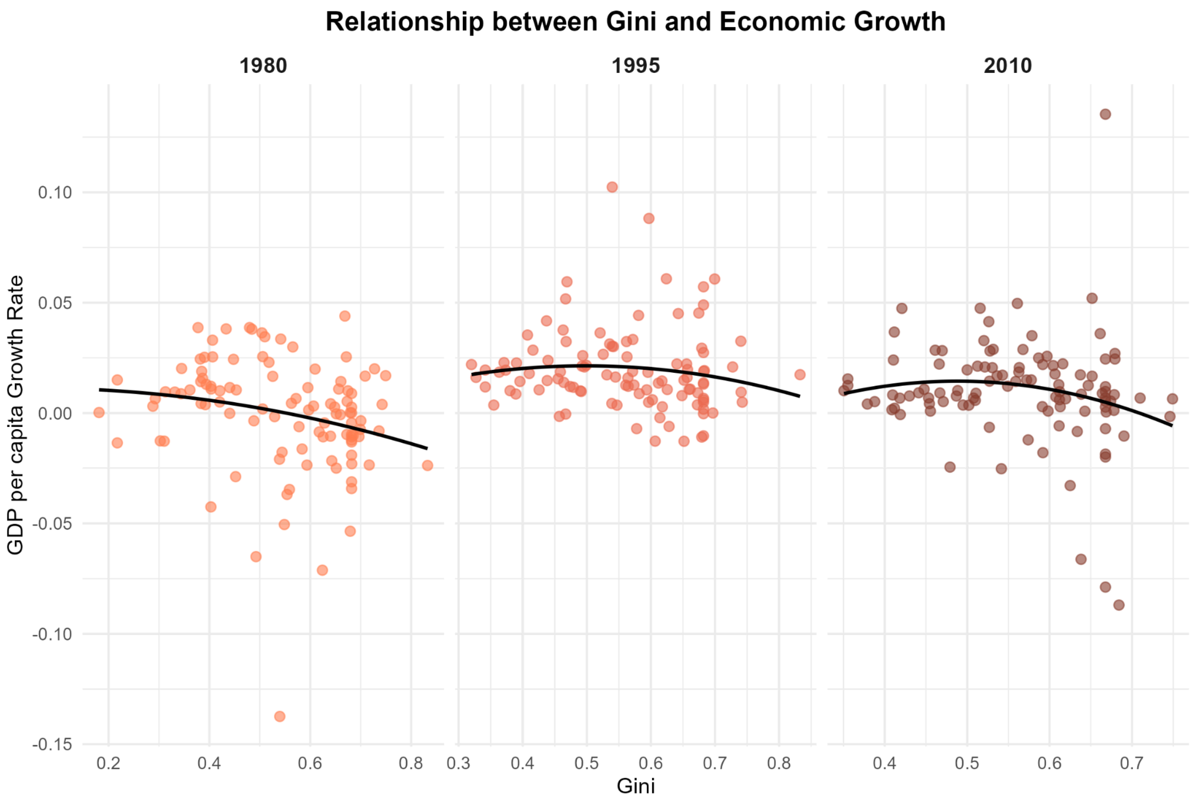


Table 5a. Statistics by year , Mean

year	growth	ln_gdp	gini	urban	educ	law
1980	-0.000	9.343	0.543	0.485	0.117	0.513
1995	0.019	9.351	0.561	0.591	0.207	0.568
2010	0.010	9.640	0.561	0.591	0.380	0.581

Table 5b.Statistics by year, SD

year	growth	ln_gdp	gini	urban	educ	law
1980	0.026	1.025	0.142	0.239	0.103	0.320
1995	0.019	1.090	0.114	0.225	0.186	0.317
2010	0.025	1.021	0.097	0.224	0.267	0.308

Table 6. Descriptive statistics with coefficients of variation

Variable	**Mean**	**SD**	**CV**
GDP Growth	0.965	2.466	2.556
Log GDP	9.445	1.052	0.111
Gini	0.555	0.119	0.215
Urbanization	0.555	0.234	0.422
Education	0.235	0.225	0.958
Rule of Law	0.554	0.315	0.569

Figure 5

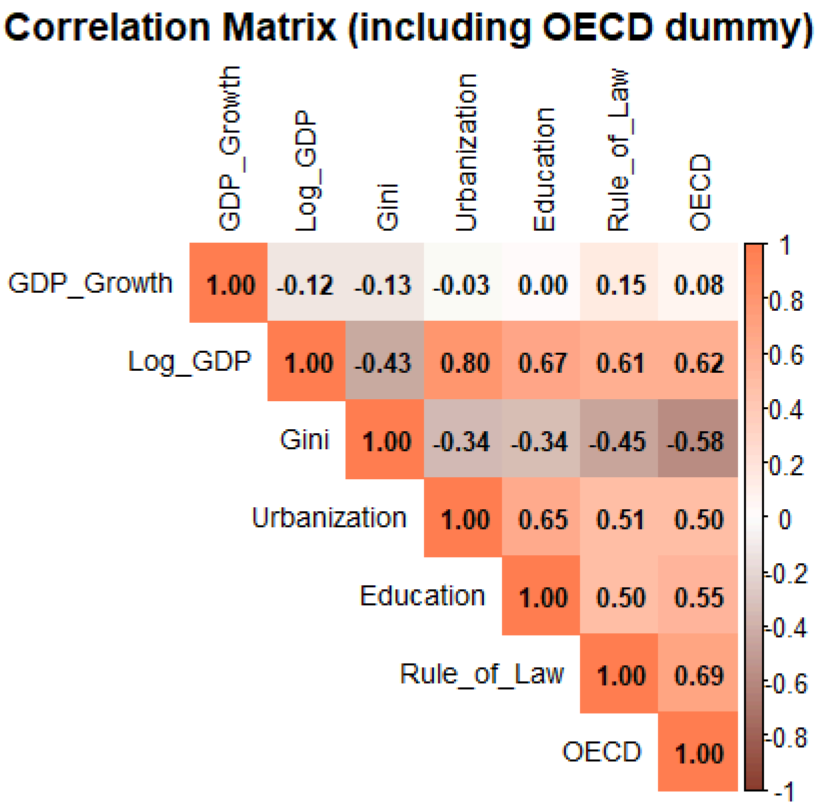

Correlation Matrix (including OECD dummy)
GDP_Growth
Log_GDP
Gini
Urbanization
Education
Rule_of_Law
OECD
1.00
-0.12
-0.13
-0.03
0.00
0.15
0.08
1.00
-0.43
0.80
0.67
0.61
0.62
1.00
-0.34
-0.34
-0.45
-0.58
1.00
0.65
0.51
0.50
1.00
0.50
0.55
1.00
0.69
1.00

Figure 6

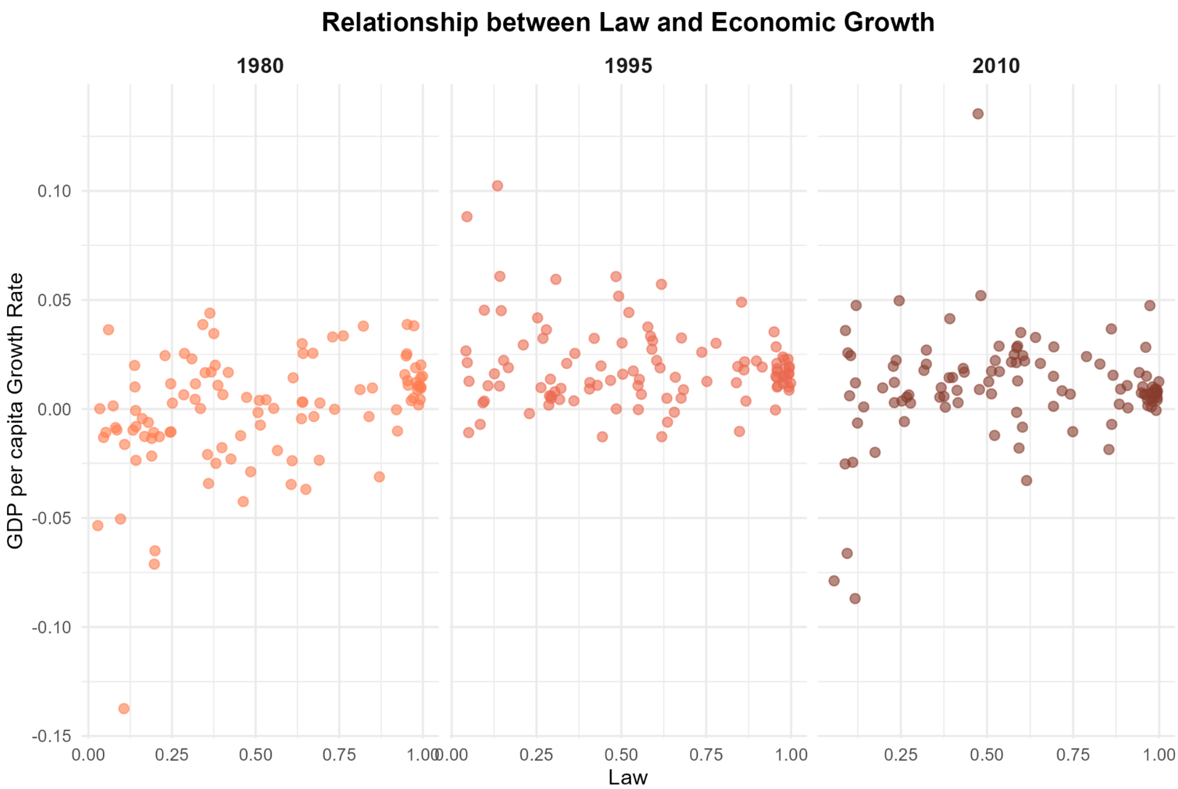

Relationship between Law and Economic Growth
1980
1995
2010
GDP per capita Growth Rate
Law

Figure 7

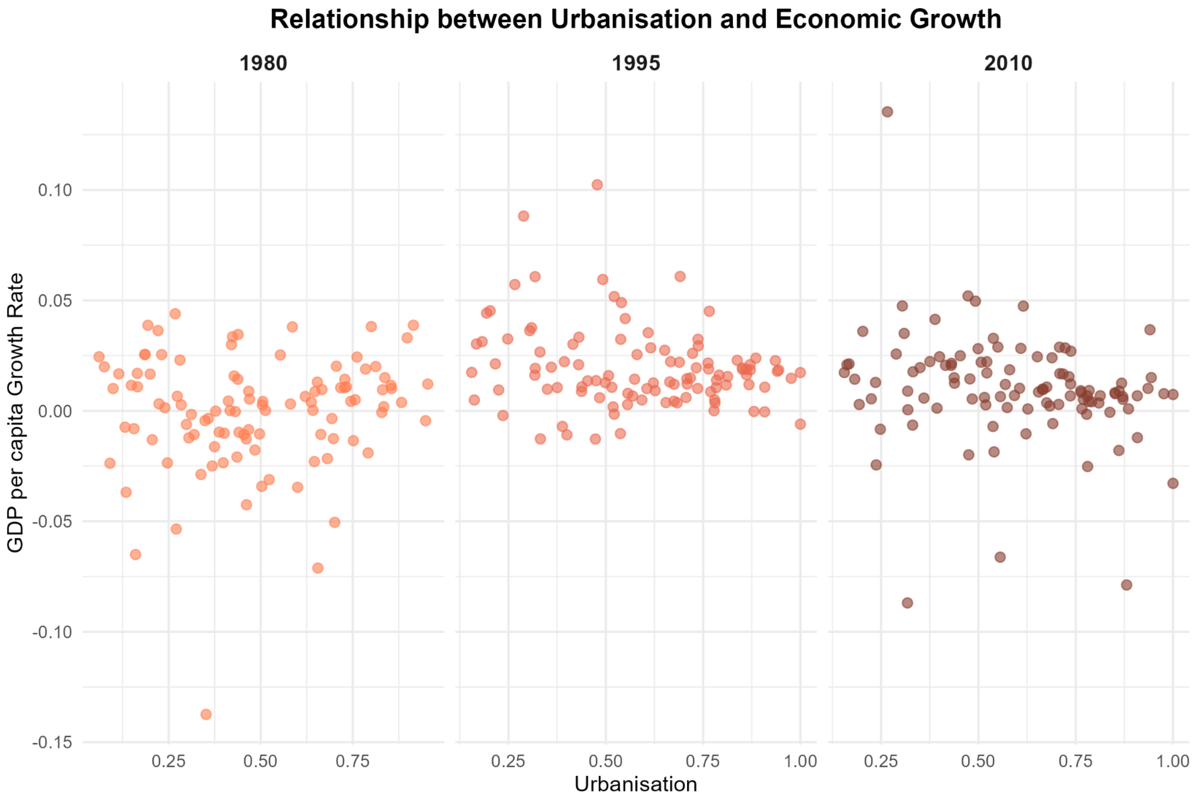
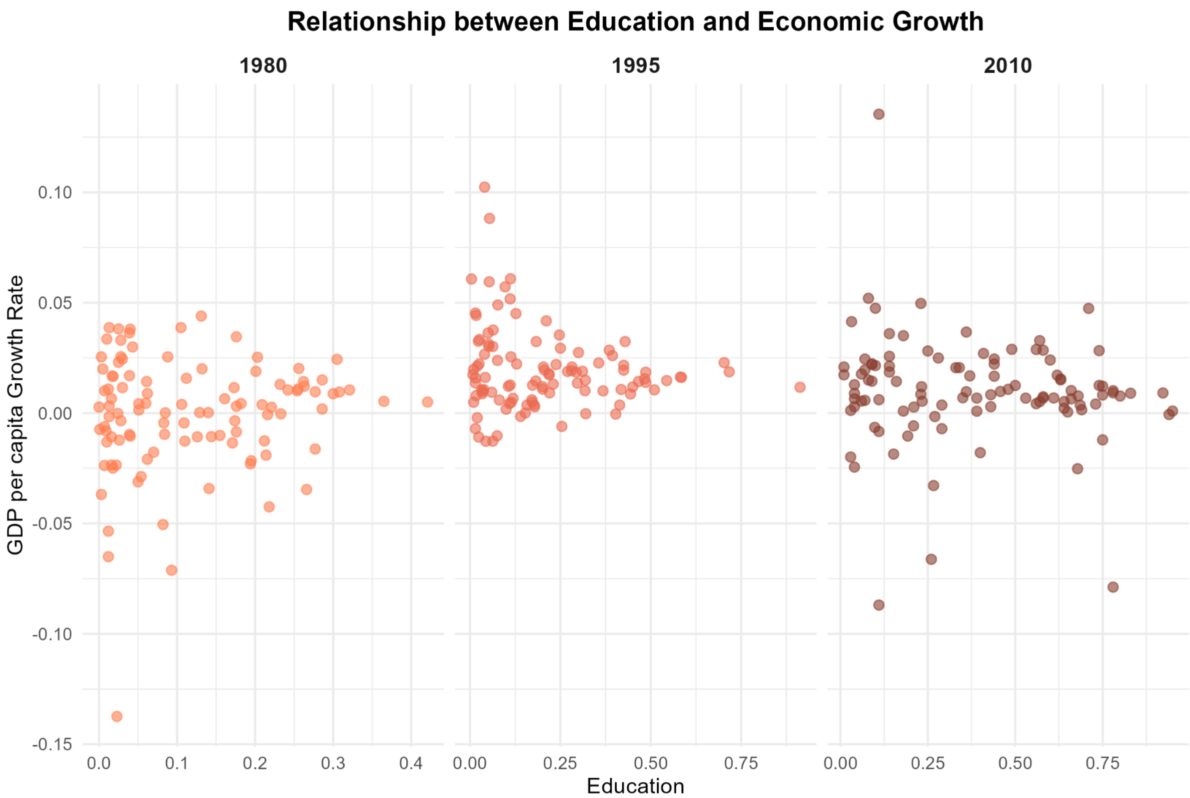


Figure 8



Link to the whole google folder with dataset, code and presentation:
https://drive.google.com/drive/folders/1hkgGuhuz4LpqJl9zbDaQ6Dl7ksgIqEdK