Investment, Inequality and Openness:
A Cross-Country Analysis

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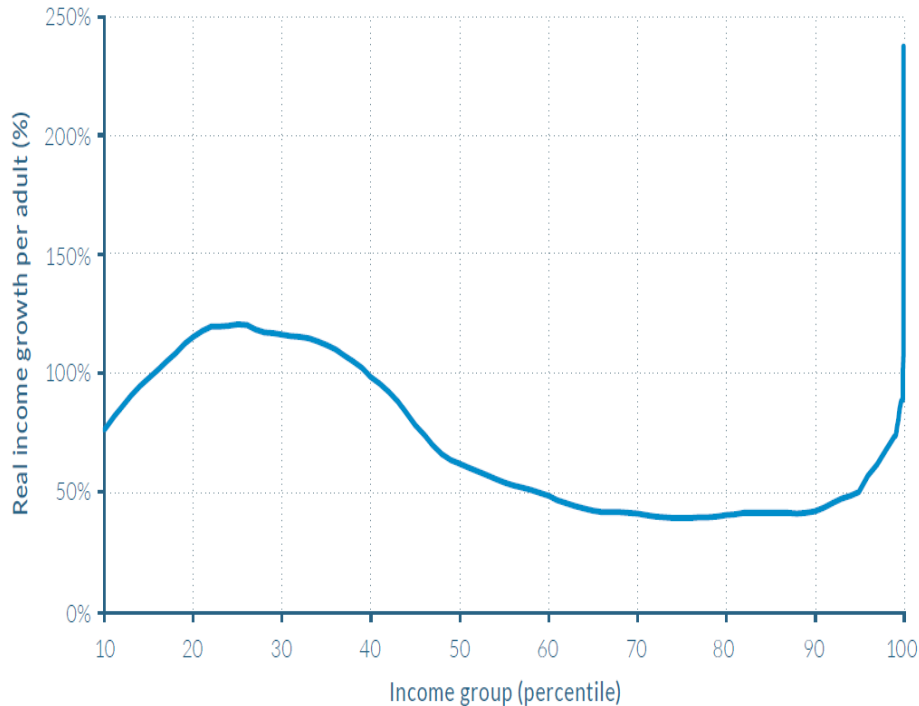
RIDGE 2018

Agenda

1. Motivation. Stylized facts.

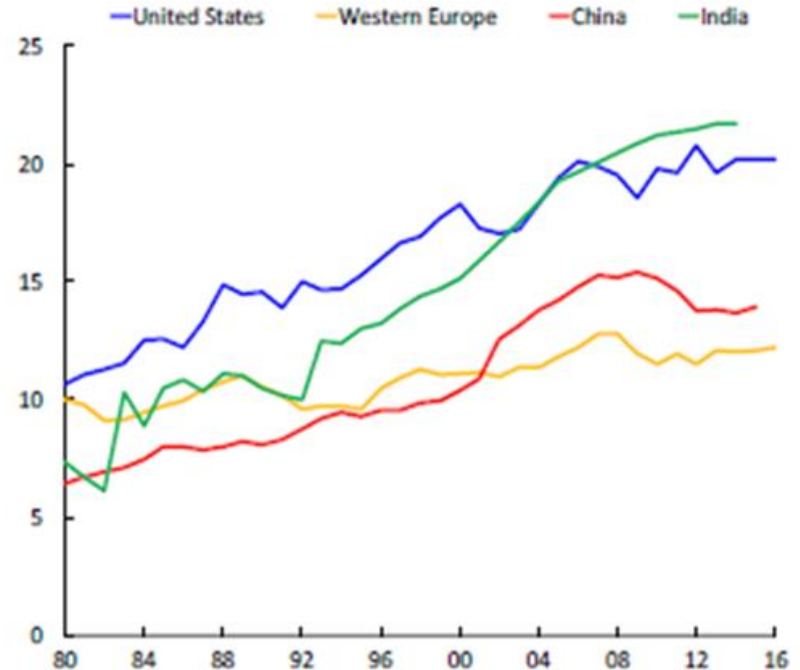**The increase of inequality** in the last decades together with its **role in the last financial crisis**

Total income growth by percentile across all world regions, 1980–2016: Scaled by population

Top 1% income share

Source: WID.world (2017). See wir2018.wid.world for data series and notes.

1. Motivation. Stylized facts.

The heterogeneous state of inequality: Gini coefficient
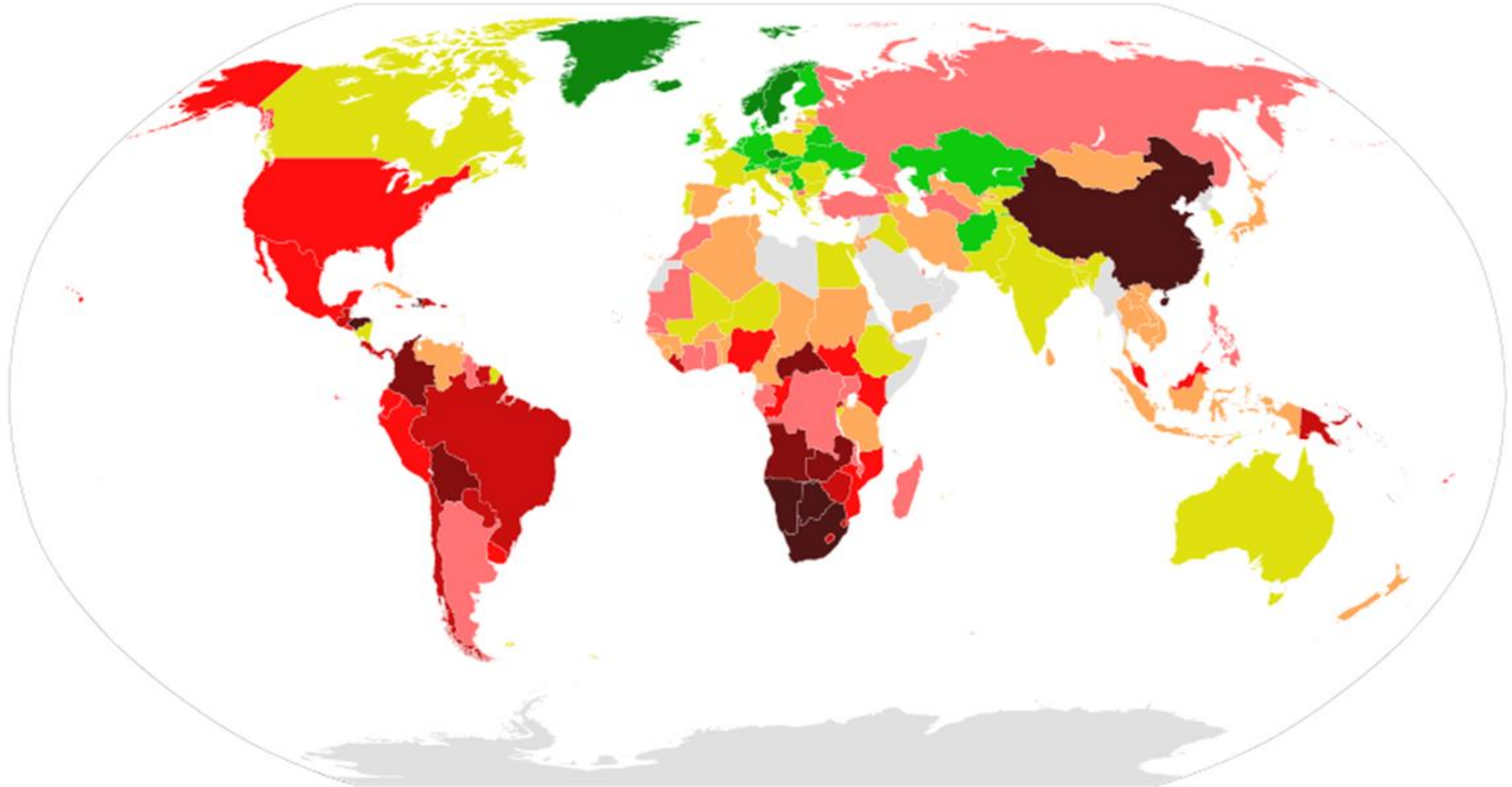
1. Motivation. Stylized facts.

Simultaneously, Total global Investment (INV/GDP) **has grown,**

in **Advanced Economies' (ADV)** fall from 18.5% in 70s to 14.5% up to 2015

while in **Developing countries' (DEV**) has grown from 2.6% to 11.53%

➢ **Period of secular stagnation** caused by the insufficiency of aggregate demand (Summers, 2015)

➢ Generalized **process of trade and financial opening.**
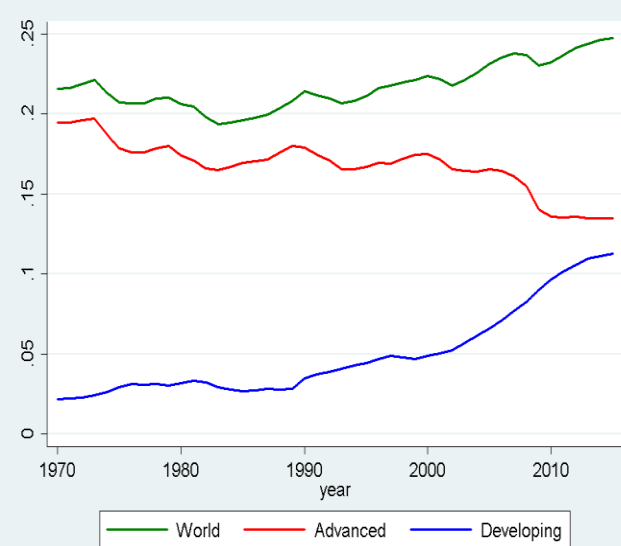
Gross Fixed Capital Formation (% GDP)   **Trade Openness, (X + M)/GDP**   **Capital Account Openness (Chinn-Ito Index)**

Note: Simple averages. Source: WDI
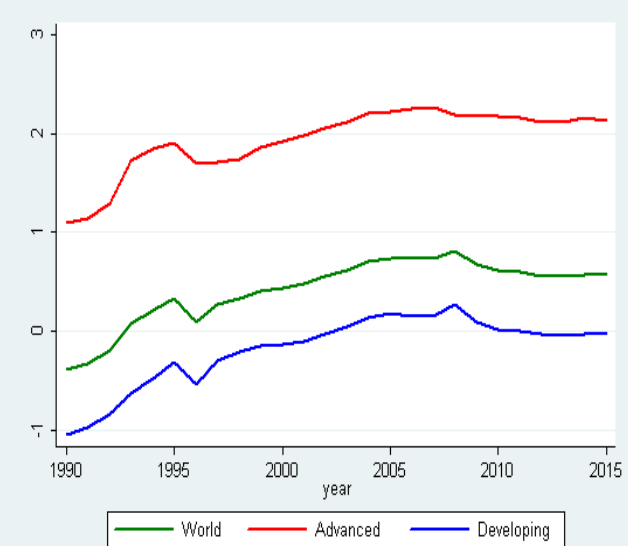
2. Inequality and growth.

➢ Kuznets (1955): inverted U between GDPpc and inequality

   ○ Fields (2001) most studies that use panel data do not find consistent evidence about the Kuznets curve: *cross-country phenomenon*

The existing evidence suggests that <u>inequality</u> affects growth

➢ Stiglitz (1997); Galor and Zeira (1993)

➢ Decreasing returns (Aghion and Howitt, 1998)

➢ Alesina and Rodrik (1994) Easterly (2007) suggests a **negative** long-term **link**
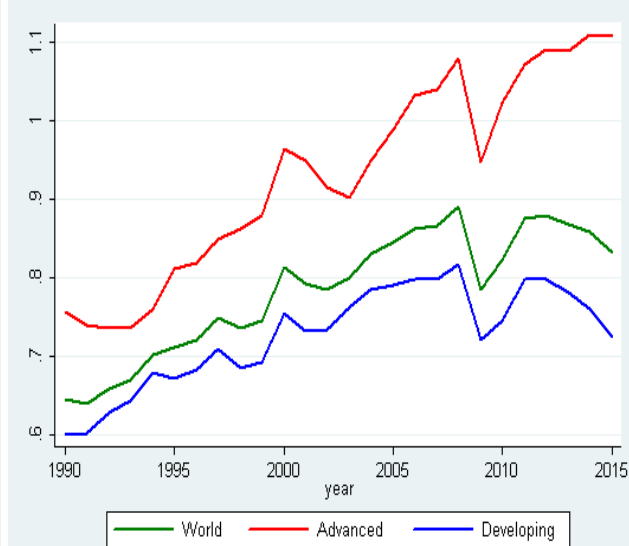
➢ Dominicis et al. (2008) perform a meta-analysis of 407 linear regressions:

   in 2/3 the relationship is negative

➢ Ostry et al. (2014) from IMF d**o not find direct effects of the redistribution**

     toward the lowest deciles on growth

Gini Index

Greatest inequality

Kuznets Curve

Degree of development
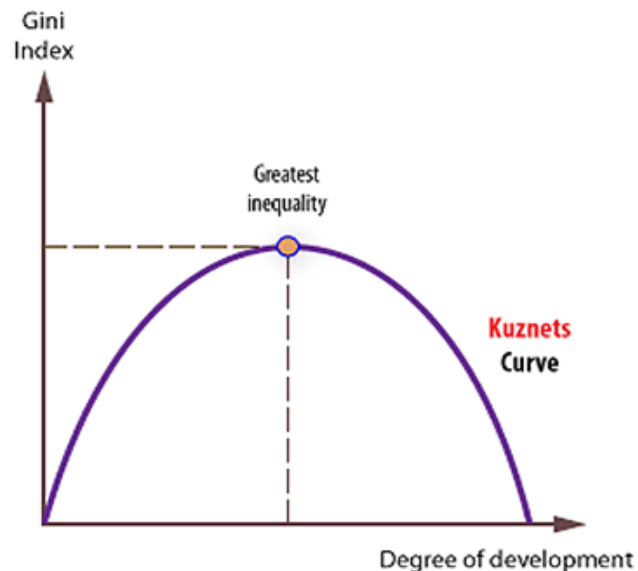
2. Inequality and growth. What role for investment

But there is much less evidence of what the mechanisms are through which inequality affects growth.

"Later studies have deviated from the desirable examination of the channels through which inequality may affect growth, and restricted their attention to the reduced form relationship between inequality and growth."

Galor (2011, p. 32)

There are some channel through which inequality may affects growth.
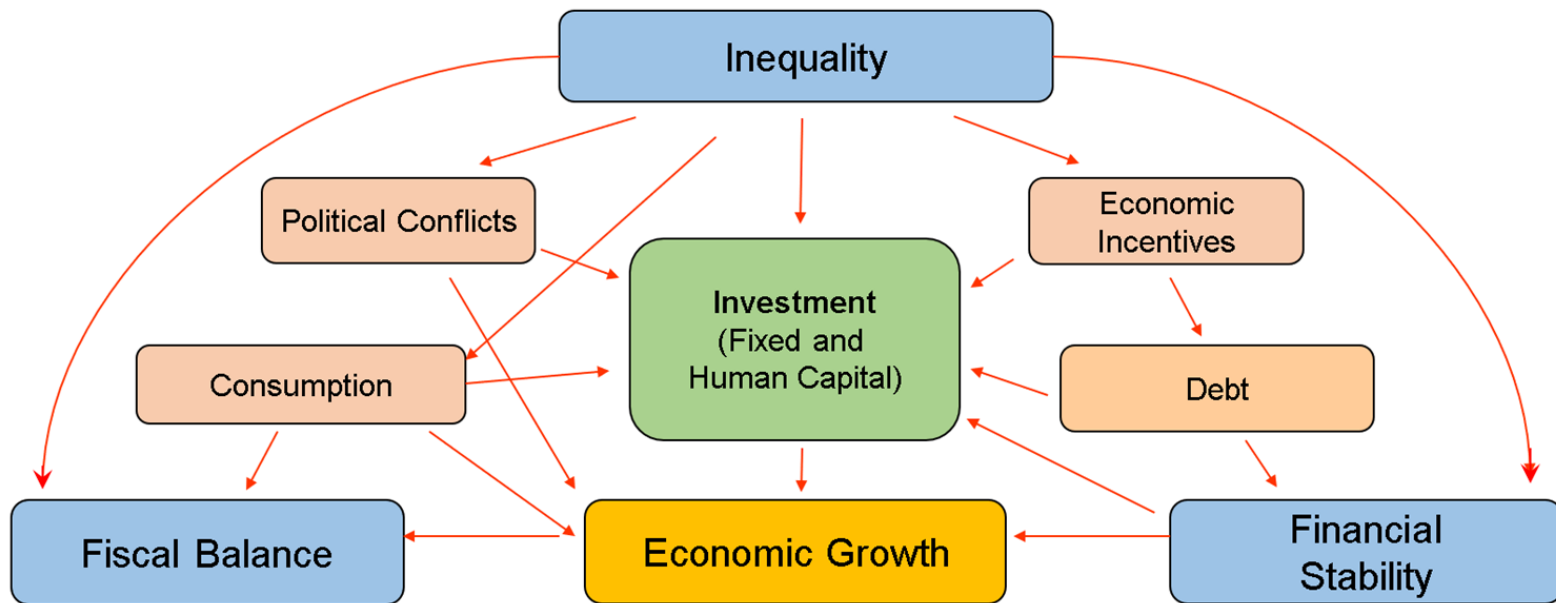
Own's elaboration.

2.1 The determinants of the Investment. Is inequality one of them?

➢ **Gross Fixed Capital Formation (WLOG, *INV*) is a fundamental determinant of growth**

    Barro, 1991; Barro and Lee, 1994; Sachs and Warner, 1995; Barro, 1996;

    DeLong and Summers, 1993; Sala-i-Martin, 1997; Levine and Renelt, 1992

➢ **Traditional literature of determinants of investment (*INV*) do not take into account inequality**

  ○ IMF (2005, 2016): an analysis of Current Account (*CA)*, Saving (*S*) and *INV* that do not consider inequality.

  ○ Recent works also ignore the role of inequality: Pelgrin et al. (2002), Combey (2016), Cavallo and Pedemonte (2015).

➢ **Some exceptions**

  ○ Galor and Zeira (1993) present a model with imperfections in the credit market and indivisibilities in *INV*:

                an increase in inequality affects <u>per capita growth</u> *negatively* in middle and high-income countries and

    ***positively* in poor countries, in short and long term.**

  ○ Aghion and Howitt (1998): a model with diminishing returns and financial constraints: **inequality negatively affects investment and growth**

2.1 The determinants of the Investment. Is inequality one of them?

The impact of inequality on growth that would be channeled through *INV*:

Inequality

Microeconomic incentive	Aggregate Demand
Savings and financing	Political economy

Investment
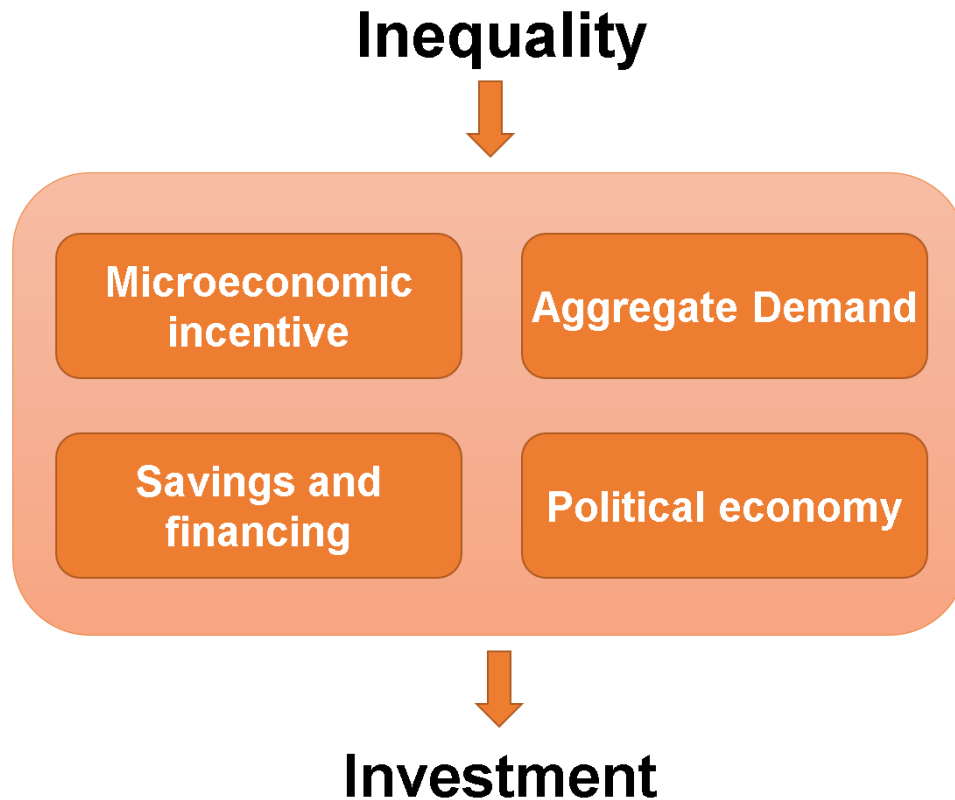
Additionally, there could be interactions

	Neoclassical	Alternative
Microeconomic Incentive	❏ Trade-off between allocative efficiency and equity ❏ Inequality **is an incentive** for less well-off individuals to increase their effort ❏ Income redistribution or distort incentives can redirected *INV* to less productive sectors or not realized (Mirrless, 1971; Becker, 1977; Friedman and Friedman, 1979; Okun, 1975)	Growing inequality **disincentives** *INV* in human and physical capital (intergenerational mobility, competition and innovation) due to unequal access to opportunities (Perotti, 1996; Aghion et al., 1999)
Aggregate Demand and the cost of capital	Output is the result of firms' decisions regarding the stock of capital (*K*) that is combined with other inputs, so the **cost of *K* plays a central role**.	❏ *INV* is more correlated with output (Shapiro, 1986). ❏ Insufficient demand discourages *INV* ❏ Post-Keynesians: growth is influenced differently by income distribution, depending on demand regime: *wage-led* or *profit-led*
Savings and Financing (1)	❏ **Complete and perfect markets**, the financing is not a problem	❏ **Financial restrictions:** capital accumulation will be lower. Aghion and Howitt (1998)

Savings and Financing (2)	■ If higher deciles have a **greater marg propensity to save**, then **regressive redistribution would increase *S.*** ■ Theory of **consumption cascades** explains why this may not happen (Duesemberry, 1949) ■ But, the "Veblen effect" is applicable in countries with enough financial depth (Rajan, 2010; Frank et al., 2014)

Savings and Financing (3): openness	○ In **closed economies**, *INV* is strongly influenced by domestic *S.*
	
	    ■ (Feldstein and Horioka, 1980) find that countries with low S have low INV ==> low financial integration
	
	    ■ However, since the 90s the KA openness erases the correlation between *S* and *INV*
	
	○ Schmidt-Hebbel and Serven (2000): inequality is not correlated with *S.*
	
	○ Bofinger and Scheuermeyer (2016) in a panel of 29 ADV countries find a non-monotonic link

Political Economy	➢ Perception that a **society is unequal and unjust can affect *INV* and growth**: ○ **increases** sensitivity against political structure **and reduces political and social stability** ○ **incentivizes** tax evasion, corruption and rent-seeking activities / and perception of legal insecurity ○ reduces consensus to **accommodate macroeconomic shocks** increasing macro volatility (Rodrik, 1999). ➢ **Investment and Endogenous fiscal cycle** (Persson and Tabellini, 1994; Alesina and Rodrik, 1994) growing inequality encourage demand for **higher taxes on profits, physical and human capital** ➢ Stiglitz (2012) "inequality increases the **lobbying power of favored sectors** to protect their privileges and distorts investment decisions

2.2 Linear or non linear relationship

Most of the <u>growth</u> literature focuses on linear-type estimates

- ➢ Banerjee and Duflo (2003)
  - ○ **Criticize Barro (2000) and Forbes (2000): results as a "statistical artifact" because they impose linear constraints that are inconsistent with the theory and the evidence regarding how inequality operates.**
  - ○ Find an "inverted U" so increases or reductions in inequality are accompanied by decreases in growth

- ➢ Benhabib (2003): increases in inequality from low levels generate positive incentives for <u>growth</u>, but very high inequality encourages rent-seeking behavior and reduce growth

2.2 Linear or non linear relationship
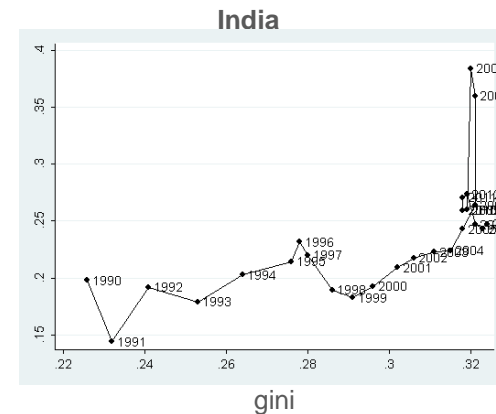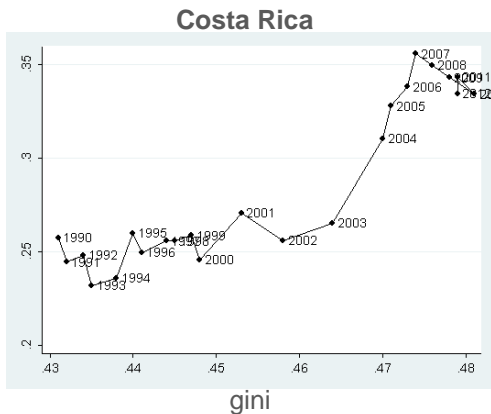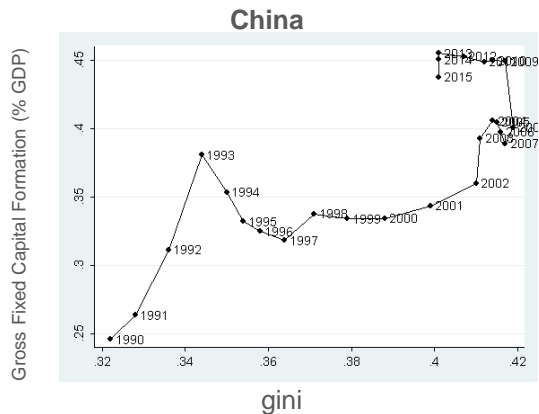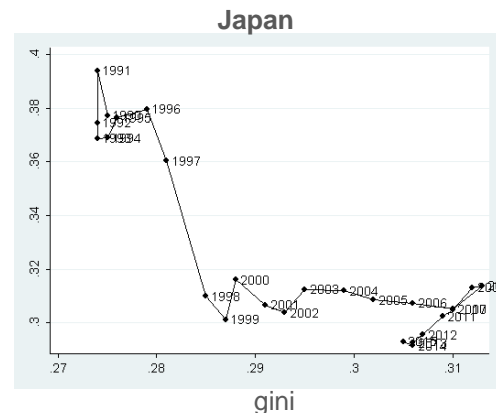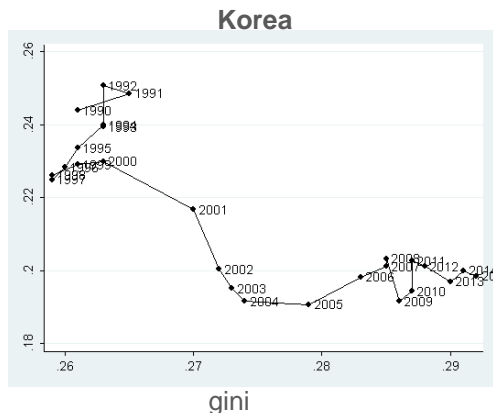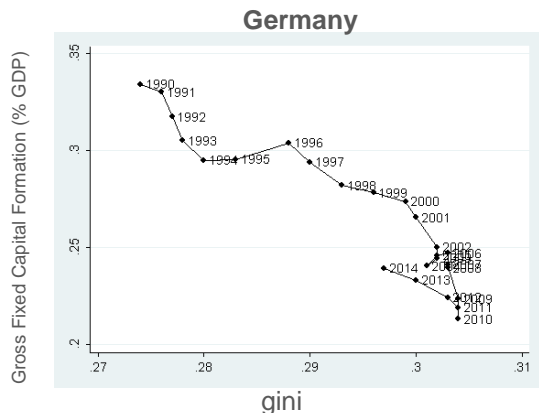
2.2 Linear or non linear relationship
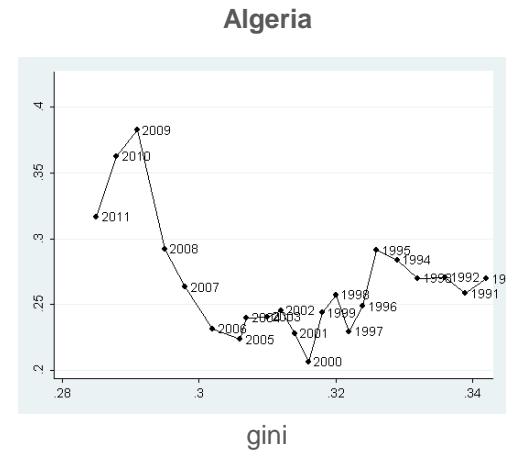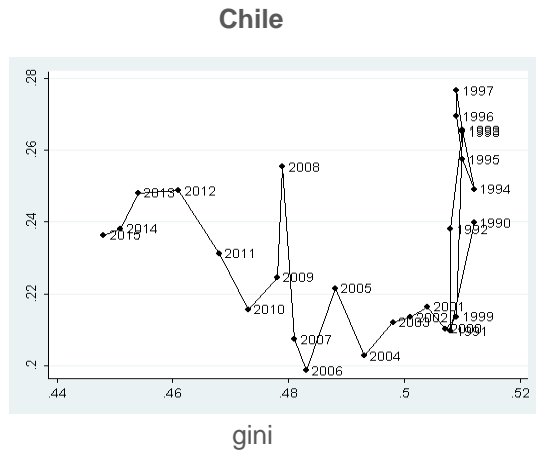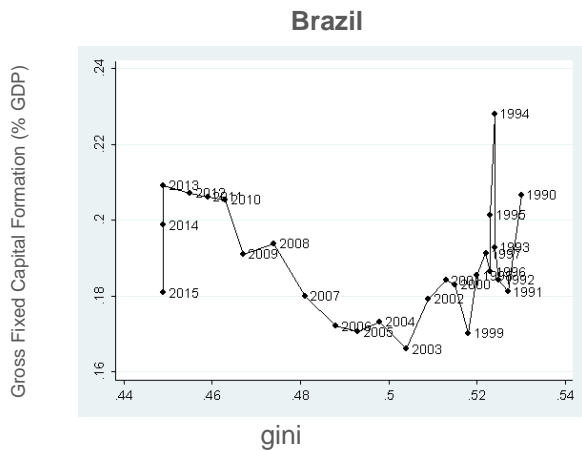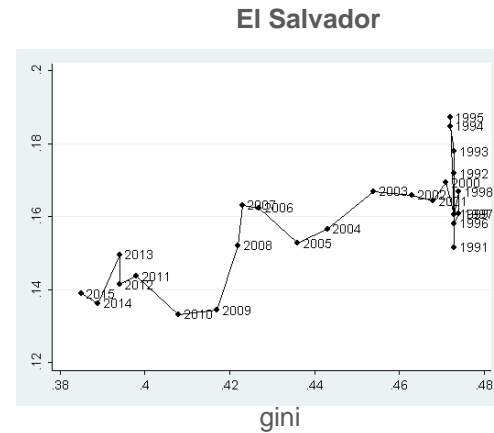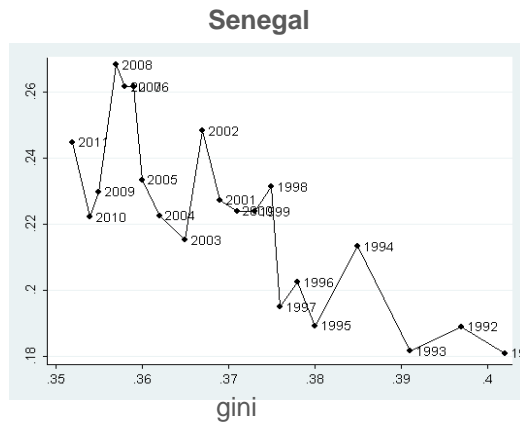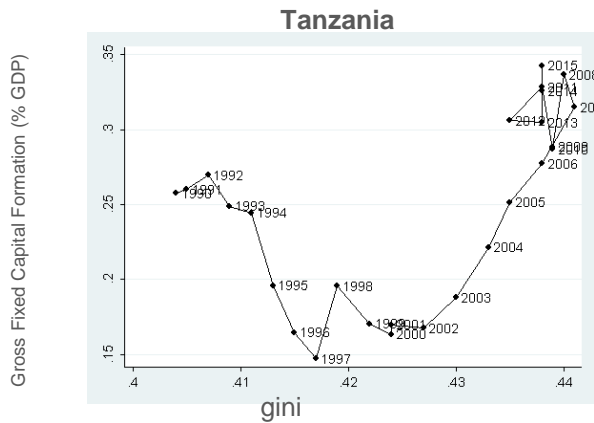
2.3 The determinants of the Investment. Is inequality one of them?

➢ In sum, a survey of the literature shows that there are very few works that:

   i) **link inequality with *INV*** measured as gross fixed capital formation (*GFCF*);

   ii) control by a **wide set of variables contrasting different theoretical approaches**

   iii) have a **broad sample of countries** that includes ADV and DEV countries;

   iv) test for a possible **nonlinear relationship.**

➢ Our empirical model is nurtured by three sources:

   i) The **traditional literature on *INV*** focused on the role of the cost of *K* and growth

   ii) The experience in the analysis of the **relationship between inequality and growth.**

   iii) The literature that analyzes ***INV* together with *S* as parts of the *CA***

3. Methodology and Econometric Strategy

The main objective:

$$GFCF_{i,t} = f(gini_{i,t}, X_{i,t}, \varepsilon_{it})$$

➢ The econometric analysis **faces several sources of potential biases**
   - **strong inertia** that characterizes the *GFCF*
   - **moderate variation** of both the GFCF and of the key explanatory variable (*gini*)
   - **endogeneity**
➢ Based on a panel of 95 countries (**25 ADV and 70 EME)** over **26 years from 1990 to 2015**
   the **semiparametric specification** is:

$$y_{i,t} = \gamma y_{i,t-1} + h(gini_{i,t}) + x'_{i,t}\delta + \eta_i + \mu_t + \varepsilon_{it}$$

where: y(i,t) is the gross fixed capital formation (% GDP)

η_i is a fixed effect per country; μ_t is a time fixed effect; and ε(i,t) the unobservable error term.

h(Gini) **is an unknown function**

x(i,t) is a vector of control variables

3. Methodology and Econometric Strategy

Baltagi and Li's (2002) series semiparametric fixed-effects regression estimator

Local polynomial smooth

kernel = epanechnikov, degree = 4, bandwidth = .15, pwidth = .23
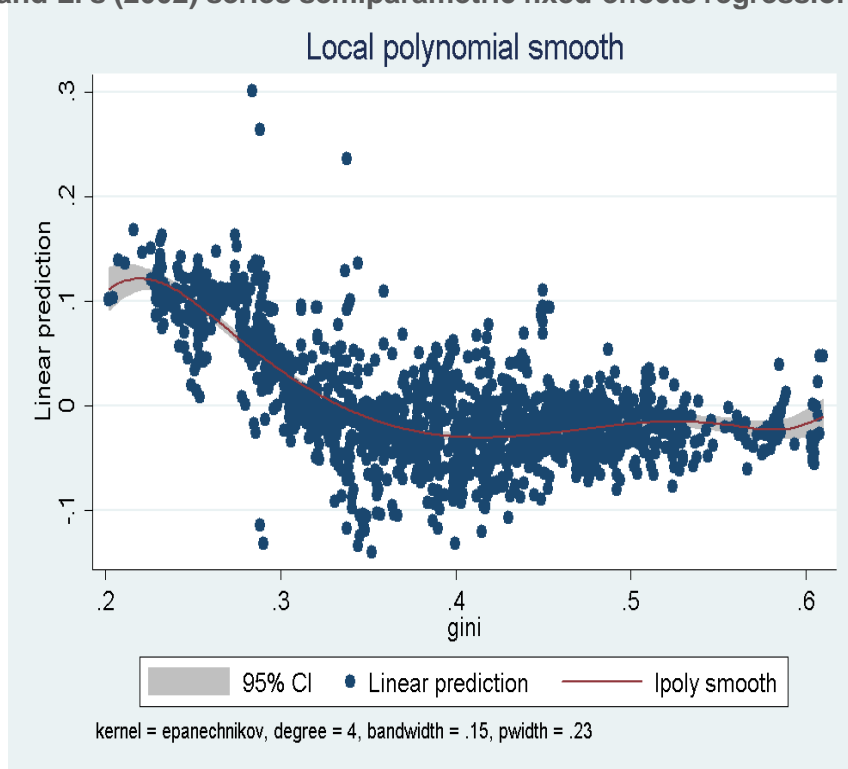
A polynomial of degree two seems a reasonable approximation

3. Methodology and Econometric Strategy

The baseline specification is:

$$y_{i,t} = \gamma y_{i,t-1} + \beta_1 gini_{i,t} + \beta_2 gini^2_{i,t} + x'_{i,t}\delta + \eta_i + \mu_t + \varepsilon_{it} \qquad (1)$$

- ➢ Six **estimation methodologies are considered:** trade-off between different types of biases.
    - ○ POLS (Pooled OLS), LSDV (FE), PDOLS (Dynamic POLS), DLSDV (Dynamic FE),
        DLSDVC (Corrected Dynamic FE, i.e Kiviet), SGMM (system GMM)
- ➢ **We consider that the most appropriate estimators are DLSDVC and SGMM**
    - ○ While both provide consistent and unbiased estimates,
        the first is relatively more efficient but it does not address the potential endogeneity problems.
- ➢ **Robustness controls**
    - ○ **Multiple imputation estimates**
    - ○ **Subsamples:** ADV vs EME

3. Methodology and Econometric Strategy

The vector of control variables includes:

Domestic variables:

- the output gap;

- the five-years output growth forecast

- the relative product;

- the real interest rate

- the credit to the private sector (% GDP)

- fiscal policy (fiscal balance % GDP)

- Inflation rate (CPI index)

- the terms of trade

- real effective exchange rate (REER) misalignment

International integration:

- trade openness (sum of exports and imports over GDP)

- financial openness index (Chinn and Ito, 2006)

- the stock of net external assets (NFA):

3. Results

Table 3. Regression. Reduced model.

	(1) OLS GFCF	(2) LSDV GFCF	(3) DOLS GFCF	(4) DLSDV GFCF	(5) KIV GFCF	(6) SGMM GFCF
Gini	-0.989***	-2.763***	-0.162**	-0.577	-0.567*	-0.747*
	(0.167)	(0.706)	(0.0762)	(0.419)	(0.336)	(0.430)
Gini squared	1.134***	3.306***	0.186**	0.654	0.652*	0.946*
	(0.206)	(0.762)	(0.0933)	(0.337)	(0.337)	(0.564)
Gross Fixed Capital Formation (-1)			0.885***	0.756***	0.757***	0.832***
			(0.0208)	(0.0371)	(0.0166)	(0.0449)
Output Gap	1.669***	1.350***	0.217	0.569*	0.584***	0.144
	(0.611)	(0.506)	(0.290)	(0.328)	(0.00146)	(0.631)
Growth Forecast	1.823***	0.936***	0.370***	0.525***	0.531***	0.745***
	(0.191)	(0.197)	(0.0955)	(0.125)	(0.0964)	(0.197)
Relative GDP	0.171***	0.519***	0.0116	-0.0207	-0.0277	0.0231
	(0.0255)	(0.151)	(0.0132)	(0.0852)	(0.0421)	(0.0693)
Fiscal Balance	0.0468	0.0232	0.0156	0.0276	0.0272*	0.183***
	(0.0423)	(0.0514)	(0.0173)	(0.0323)	(0.0160)	(0.0601)
Credit to Private Sector	0.0111**	0.0237**	-0.00113	0.00111	0.00103***	-0.00166
	(0.00481)	(0.0119)	(0.00252)	(0.00838)	(0.000169)	(0.00697)
Inflation Rate	-0.0423***	-0.0128	-0.0294***	-0.0311***	-0.0314***	-0.0395***
	(0.0149)	(0.0102)	(0.0104)	(0.00994)	(0.00566)	(0.0125)
Real Interest Rate	-0.0511***	-0.0176	-0.0121	-0.00897	-0.00878	0.0187
	(0.0157)	(0.0143)	(0.00765)	(0.0116)	(0.00629)	(0.0193)
Terms of Trade	0.0183***	0.0275***	-0.00157	0.00278	0.00296	0.00268
	(0.00533)	(0.00674)	(0.00256)	(0.00445)	(0.00953)	(0.00388)
REER's Misalignment	0.0443*	0.0238	0.00933	0.00754	0.00738***	-0.0365**
	(0.0235)	(0.0147)	(0.0117)	(0.0109)	(0.00279)	(0.0177)
Constant	0.122**	0.163	0.0555**	0.168		0.117
	(0.0508)	(0.173)	(0.0240)	(0.105)		(0.0979)
Observations	1,377	1,377	1,356	1,356	1,356	1,356
Number of id	95	95	95	95	95	95

Table 2. Regression. Full model. [15]

	(1) OLS GFCF	(2) LSDV GFCF	(3) DOLS GFCF	(4) DLSDV GFCF	(5) KIV GFCF	(6) SGMM GFCF
Gini	-0.998***	-2.844***	-0.185**	-0.647	-0.626***	-0.705*
	(0.168)	(0.713)	(0.0780)	(0.423)	(0.190)	(0.360)
Gini squared	1.103***	3.410***	0.202**	0.753*	0.746***	0.869*
	(0.207)	(0.772)	(0.0952)	(0.455)	(0.202)	(0.478)
Gross Fixed Capital Formation (-1)			0.877***	0.740***	0.741***	0.841***
			(0.0212)	(0.0385)	(0.0351)	(0.0414)
Output Gap	1.967***	1.329***	0.299	0.626*	0.621***	-0.0437
	(0.631)	(0.499)	(0.299)	(0.327)	(0.129)	(0.637)
Growth Forecast	1.681***	0.879***	0.357***	0.522***	0.523***	0.699***
	(0.188)	(0.201)	(0.101)	(0.126)	(0.0487)	(0.211)
Relative GDP	0.144***	0.635***	0.00594	-0.00106	0.0117	0.0291
	(0.0291)	(0.142)	(0.0139)	(0.0846)	(0.0127)	(0.0578)
Fiscal Balance	0.00308	0.0225	0.0146	0.0293	0.0299***	0.150**
	(0.0421)	(0.0513)	(0.0182)	(0.0325)	(0.00890)	(0.0675)
Credit to Private Sector	0.0140***	0.0230*	-0.000794	0.00375	0.00360	0.00297
	(0.00484)	(0.0122)	(0.00253)	(0.00784)	(0.00222)	(0.00600)
Inflation Rate	-0.0408***	-0.0132	-0.0304***	-0.0341***	-0.0346***	-0.0419***
	(0.0154)	(0.0103)	(0.0109)	(0.0101)	(0.00653)	(0.0112)
Real Interest Rate	-0.0424**	-0.0175	-0.0152*	-0.00686	-0.00749	0.0199
	(0.0170)	(0.0147)	(0.00860)	(0.0124)	(0.0132)	(0.0230)
Trade Openness	0.00298	0.0269**	-0.00183	0.0236***	0.0256***	-0.00903
	(0.00349)	(0.0129)	(0.00164)	(0.00727)	(0.00847)	(0.0112)
Capital Account Openness	-0.00175	0.00471***	-6.46e-05	0.00146	0.00138	-0.000733
	(0.00134)	(0.00166)	(0.000583)	(0.00108)	(0.00175)	(0.00189)
Net Foreign Assets Position	0.0415***	0.0104	0.0117**	0.0237**	0.0251***	0.0313**
	(0.00901)	(0.0138)	(0.00489)	(0.00933)	(0.000506)	(0.0157)
Terms of Trade	0.0150***	0.0342***	-0.00244	0.00695	0.00663*	0.00158
	(0.00561)	(0.00696)	(0.00271)	(0.00461)	(0.00359)	(0.00493)
REER's Misalignment	0.0532**	0.0352**	0.00924	0.0167	0.0177	-0.0318
	(0.0241)	(0.0151)	(0.0119)	(0.0111)	(0.0238)	(0.0255)
Constant	0.172***	0.0249	0.0630***	0.122		0.101
	(0.0530)	(0.170)	(0.0232)	(0.108)		(0.0778)
Observations	1,330	1,330	1,311	1,311	1,311	1,311
Number of id	95	95	95	95	95	95

3. Results

	(1) OLS GFCF	(2) LSDV GFCF	(3) DOLS GFCF	(4) DLSDV GFCF	(5) KIV GFCF	(6) SGMM GFCF
Gini	-0.998***	-2.844***	-0.185**	-0.647	-0.626***	-0.705*
	(0.168)	(0.713)	(0.0780)	(0.423)	(0.190)	(0.360)
Gini squared	1.103***	3.410***	0.202**	0.753*	0.746***	0.869*
	(0.207)	(0.772)	(0.0952)	(0.455)	(0.202)	(0.478)
Gross Fixed Capital Formation (-1)			0.877***	0.740***	0.741***	0.841***
			(0.0212)	(0.0385)	(0.0351)	(0.0414)
Extreme Point (SLM Test)	0.452	0.417	0.458	0.430	0.420	0.395
p-value (SLM Test)	0.000	0.000	0.064	0.079	0.001	0.065

Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

➢ **Ignoring the inertia in the GFCF would lead to biased and inconsistent estimates**
  ○ A consistent estimate of the autoregressive coefficient should be in the range determined by the PDOLS and D-LSDV

➢ The estimated linear and quadratic coefficients of the Gini are significant: **U-shaped.**

➢ **This implies that the impact of inequality on investment is conditional on the initial level of inequality**.

➢ The Sasabuchi-Lind-Mehlum (SLM) test confirms the **statistical significance of the nonlinear relationship.**

➢ **The turning point is around a Gini of 0.40 - 0.45**

3. Results

The control variables exhibit the expected signs.

	(4) DLSDV GFCF	(5) KIV GFCF	(6) SGMM GFCF		(4) DLSDV GFCF	(5) KIV GFCF	(6) SGMM GFCF
Output Gap	0.626*	0.621***	-0.0437	Trade Openness	0.0236***	0.0256***	-0.00903
	(0.327)	(0.129)	(0.637)		(0.00727)	(0.00847)	(0.0112)
Growth Forecast	0.522***	0.523***	0.699***	Capital Account Openness	0.00146	0.00138	-0.000733
	(0.126)	(0.0487)	(0.211)		(0.00108)	(0.00175)	(0.00189)
Relative GDP	-0.00106	0.0117	0.0291	Net Foreign Assets Position	0.0237**	0.0251***	0.0313**
	(0.0846)	(0.0127)	(0.0578)		(0.00933)	(0.000506)	(0.0157)
Fiscal Balance	0.0293	0.0299***	0.150**	Terms of Trade	0.00695	0.00663*	0.00158
	(0.0325)	(0.00890)	(0.0675)		(0.00461)	(0.00359)	(0.00493)
Credit to Private Sector	0.00375	0.00360	0.00297	REER's Misalignment	0.0167	0.0177	-0.0318
	(0.00784)	(0.00222)	(0.00600)		(0.0111)	(0.0238)	(0.0255)
Inflation Rate	-0.0341***	-0.0346***	-0.0419***	Constant	0.122		0.101
	(0.0101)	(0.00653)	(0.0112)		(0.108)		(0.0778)
Real Interest Rate	-0.00686	-0.00749	0.0199	Observations	1,311	1,311	1,311
	(0.0124)	(0.0132)	(0.0230)	Number of id	95	95	95

Robust standard errors in parentheses.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$.

3. Results. Non-linear scheme and interactions

Based on (1):

$$E[y|x] = \hat{\beta}_1 gini + \hat{\beta}_2 \, gini^2 + c$$

where c is a constant that includes the effects of the other explanatory variables at a given point.

The partial derivative (3) shows the marginal effect of the Gini coefficient on the E[y/x], ceteris paribus.

$$\frac{\partial E[y|x]}{\partial gini} = \hat{\beta}_1 + 2\,\hat{\beta}_2\,gini \qquad (3)$$
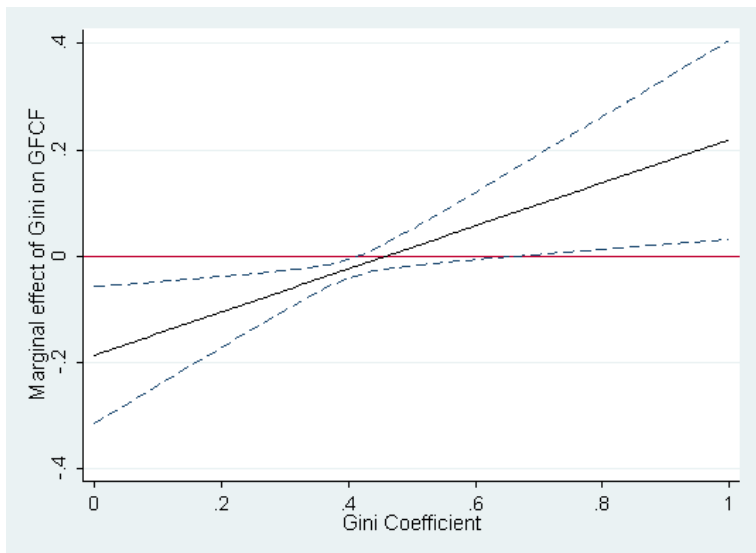
Conditional Marg. Effect of Gini (90 percent CIs)
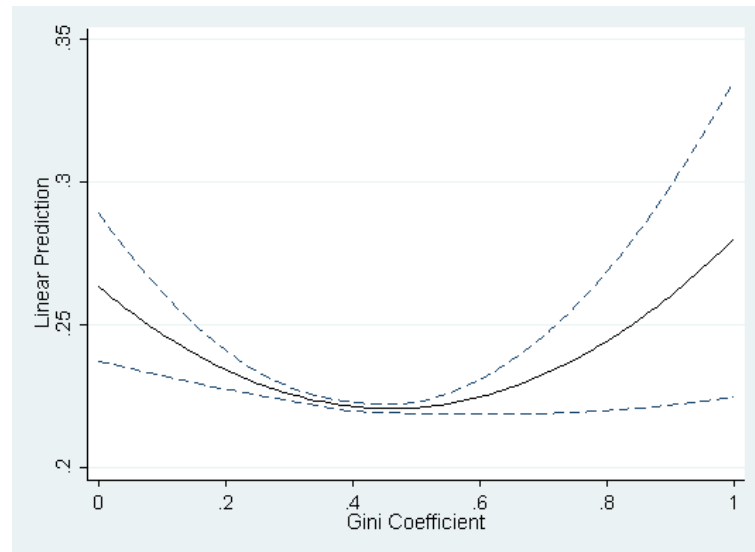
Adjusted Prediction of GFCF (90 percent CIs)

3. Results. Robustness Tests: multiple imputation technique

Repeated regressions are run for the 100 Gini imputations and then results are pooled. The estimated coefficients and the standard errors are adjusted for the variability between the imputations

➢ **The effect of inequality remains highly significant and the locations of the turning points almost unchanged.**

	OLS	LSDV	OLS	DLSDV
	GFCF	GFCF	GFCF	GFCF
Gini	-0.865***	-1.994***	-0.153**	-0.446
	(0.148)	(0.603)	(0.0679)	(0.377)
Gini squared	0.946***	2.242***	0.168**	0.479
	(0.183)	(0.661)	(0.0842)	(0.415)
Gross Fixed Capital Formation (-1)			0.890***	0.742***
			(0.0169)	(0.0334)
Extreme Point (SLM Test)	0.438	0.444	0.474	0.538
p-value (SLM Test)	0.000	0.089	0.015	0.380

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

3. Robustness Tests. Subsamples

➤ The sub-samples confirm the assessments made for the whole sample replicating the U-shape.

	(1) Advanced GFCF	(2) Developing GFCF
Gini	-2.795**	-0.492***
	(1.109)	(0.0684)
Gini squared	4.037*	0.660***
	(2.292)	(0.167)
Gross Fixed Capital Formation (-1)	0.540***	0.724***
	(0.110)	(0.0341)

➤ For ADV and EME, most of the coeff have the same signs than in the complete sample

○ The **credit-to-GDP, NFA and and RER miss** are only significant and **positive in the ADV**

○ While **TOT and trade and financial openness** are significant and positive only **in EME countries**

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

4. Conclusions and policy implications (1)

➢ Robust evidence that **inequality is a significant determinant of *INV*** and

   this is a non-linear relationship "U-shaped"

➢ Increases in inequality could have opposite effects according to its initial level:

   ○ reduces *INV* and productivity and growth in countries with moderate and low
     initial inequality.

   ○ increases *INV* in countries with high inequality

➢ **INV is one transmission channel of the impact of inequality on growth**,
   which complements the literature that emphasizes the human capital channel.

   ○ Future theoretical models should take this specific channel into account.

➢ Regarding the classic determinants, variables connected with aggregate
   demand have a greater significance than those related to the cost of IVN

➢ Regarding the literature of CA determinants, this evidences the importance of
   inequality on INV, supplementing the findings of previous studies that shows the
   inequality's effect on the S channel.
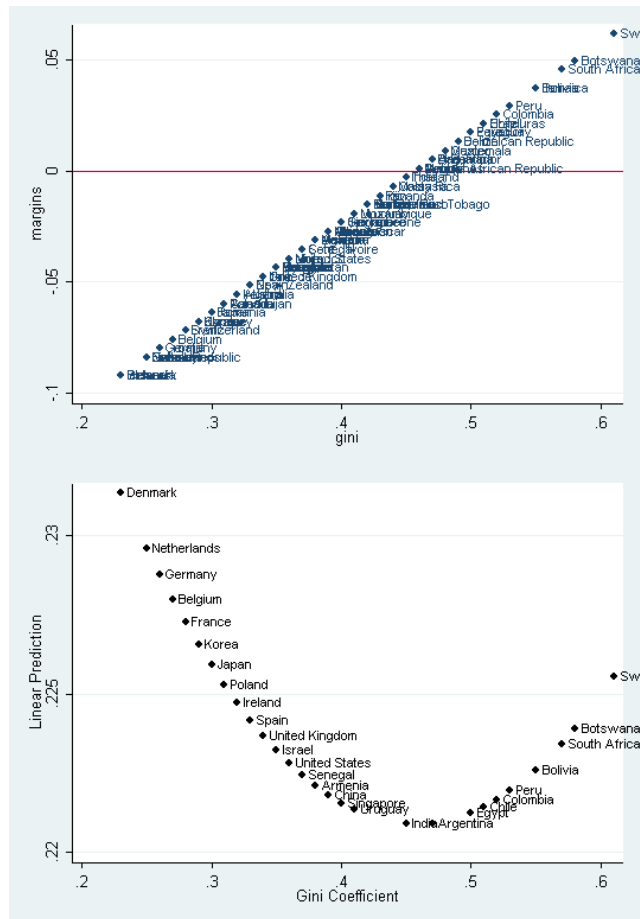
Prediction of GFCF (for values of gini in 2000)

4. Conclusions and policy implications (2)

Possible explanations and further investigation:

Political economy reasons

➢ **in low-inequality countries like Europe or NA: higher inequality was associated with low or not increases in GDPpc, reductions in wage share, lower real W, strong pressures to increase tax or subsidies**

➢ **in high-inequality countries like China, India: higher inequality was associated with high increases in GDPpc, reductions in wage share, higer real W, low pressures to increases tax or subsidies**

Aggregate demand reasons

➢ "*wage-led*" **regimes** predominate in low-inequality countries (advanced or middle-income): the increase in inequality has among its main determinants the reduction in the wage share.
  ○ **process of wage stagnation increase inequality, thus generating lower *INV*,**

➢ "*profit-led*" **regimes** predominate in economies with high inequality
  ○so, **greater inequality due to a wage reduction increases profits and the *S* available to expand *INV***

4. Conclusions and policy implications (3)

Open economies with high inequality could fall into a high-growth with high-inequality trap

● For example, **if growth is based on exporting** *commodities intensive in natural-resources* **or** *low-wages* **and does not require a growing domestic market**, there would be **no endogenous dynamic connecting domestic market and investor**´s benefits

● **The more integrated (in trade and finance) the country,**
    the more likely this strategy is sustainable

● **To move a country from one equilibrium to another (**on the other side of the turning point) **a "big push" can be necessary to change the productive model toward one that requires less inequality to invest and growth.**

"[T]he main question is not whether an economy is wage-led or profit-led in a given period,
but whether inequality can be reduced without adversely affecting growth,
and even increasing it, through a judicious combination of policy induced changes"

Amitava Krishna Dutt (2017, p.180)

Thank you!

WDI Meta Data:

Gross fixed capital formation (formerly gross domestic fixed investment) includes land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. According to the 1993 SNA, net acquisitions of valuables are also considered capital formation.

1. Motivation

There is an important correlation among different measures of inequality and income distribution.
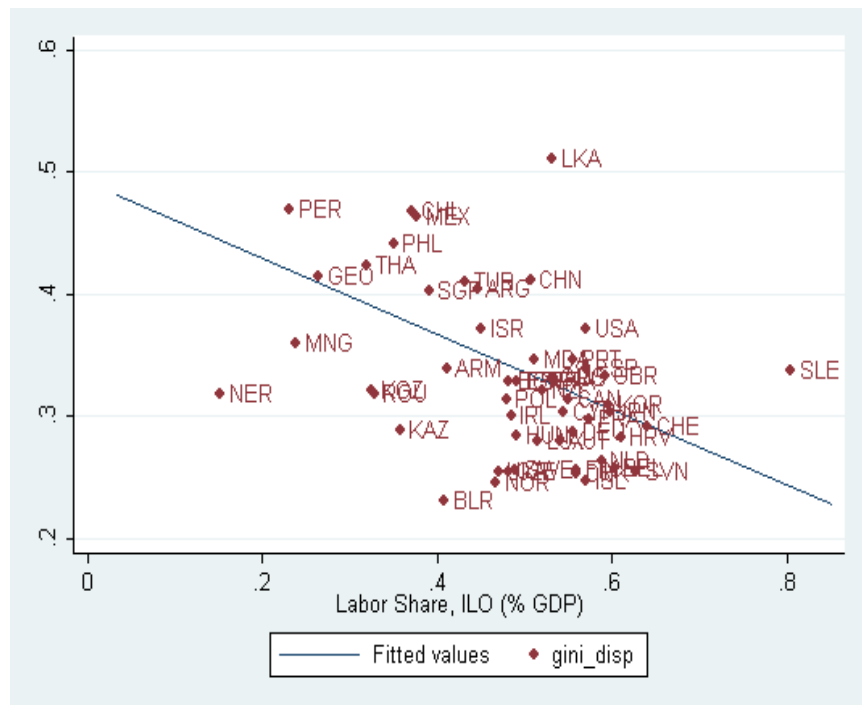
Gini vs Wage Share, 2010.

Source: ILO and SWIID.
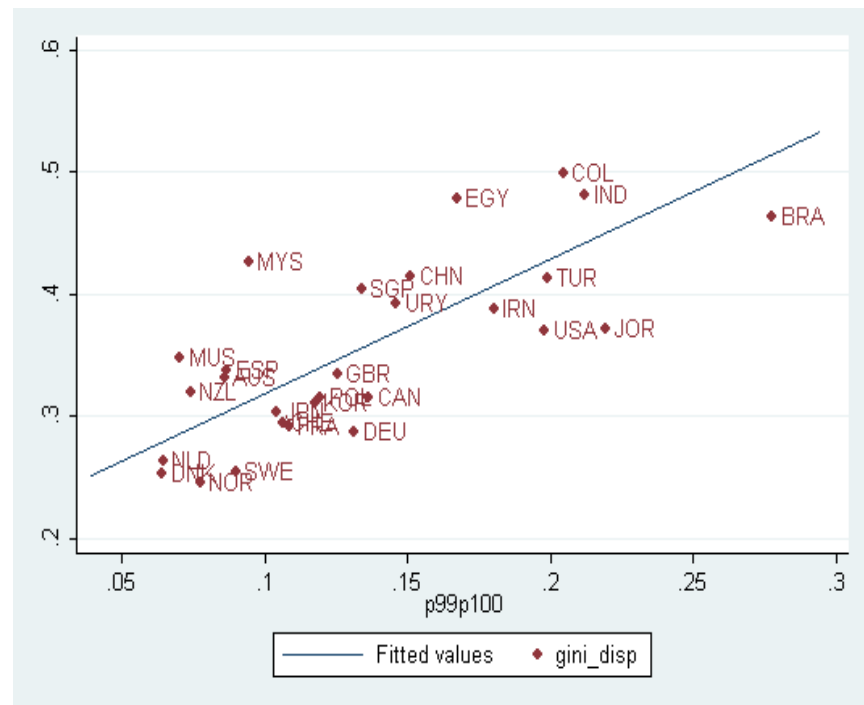
Gini vs TOP 1%, 2010.

Source: WDI and SWIID.

5. Future Research En esto estamos avanzando nosotros

- Cuantiles condicionales:
  - La literatura tradicional (inclusive este paper) se concentró en ver la relación entre desigualdad y crecimiento (GFCF) como un patrón promedio, es decir, como una única relación que describiría el comportamiento de un país o región promedio, en ausencia de otras perturbaciones.
  - Sin embargo, es interesante ampliar la visión hacia otros aspectos.
  - Por ejemplo, estudio de **cuantiles condicionales** argumentando que la interacción de la inversión (variable dependiente) con factores inobservables hace que el nivel de inversión de una región determine el sendero de la misma en las etapas subsiguientes.

A.4 Prueba de hipótesis sobre la forma de U invertida

Este test es propuesto por Lind y Mehlum (2010) y es una forma apropiada para testear si relación paramétrica estimada a través de una regresión tiene o no forma de U invertida. A diferencia del test explicado en A.1 en donde se evalúa las ganancias del ajuste de una versión paramétrica para la relación entre la desigualdad y el crecimiento económico, este test evalúa el comportamiento de la función en los extremos del intervalo sobre el soporte de la variable explicativa de interés, en este caso el logaritmo del ingreso per cápita.

Utilizando la ecuación (1), las hipótesis del test son las siguientes:

$$H_0: \quad \beta_1 + 2\beta_2 y_L \leq 0 \quad \vee \quad \beta_1 + 2\beta_2 y_H \geq 0$$
$$H_1: \quad \beta_1 + 2\beta_2 y_L > 0 \quad \wedge \quad \beta_1 + 2\beta_2 y_H < 0$$

donde y_L es el logaritmo del ingreso per capita de la región más pobre y_H es el de la región más rica de la muestra. Intuitivamente, el test evalúa la derivada primera en ambos entremos del soporte de la muestra de ingresos. La hipótesis nula plantea la existencia de una relación entre la desigualdad y el crecimiento que puede ser monótona o bien con forma de U; por el contrario, bajo la hipótesis alternativa la relación es estrictamente una U invertida. Para más detalles sobre los estadísticos de prueba y la inferencia ver Lind y Mehlum (2010).

2.1 The determinants of the Investment. Is inequality one of them?

Inequality

Microeconomic incentive

Neoclassical models
(Mirrless, 1971; Becker, 1977; Friedman and Friedman, 1979)

- Trade-off: efficiency vs equity
- Inequality as an incentive for less well-off individuals to increase their effort.
- Redistribute income or distort incentives can lead to investments being directed to less productive sectors or not being realized (Okun, 1975).

(Perotti, 1996; Aghion, Caroli, and Garcia-Peñalosa, 1999)

- Growing inequality is a disincentive due to unequal access to opportunities.
- In countries with high income inequality, intergenerational mobility may be lower (Citi, 2017)

Aggregate Demand

In contrast with Neoclassical models investment is more correlated with output than with the cost of capital (Shapiro, 1986)

- Given that insufficient demand discourages investment via the accelerating effect, redistribution to sectors with a high propensity to consume would stimulate investment in the short term (Blecker, 2016).
- Insufficient demand can make unattainable the critical level necessary for certain types of investment.
- Inequality plays a major role in the phenomenon called secular stagnation (Summers, 2015; Krugman, 2012).
- Post-Keynesians suggest that growth is influenced differently by income distribution, depending on whether the country has a regime that is *wage-led or profit-led* (Stockhammer and Wildauer, 2015)

Savings and financing

- **Neoclassical model:** with perfect markets, the financing is not a problem.
- However, when the poorest strata do not have the capacity to invest capital accumulation will be lower than under the assumption of complete financial markets.

In closed economies, investment is strongly influenced by domestic savings.

- If higher deciles have a greater marginal propensity to save, then a change in the income distribution favorable to them would increase savings and thus the financing available for investment.
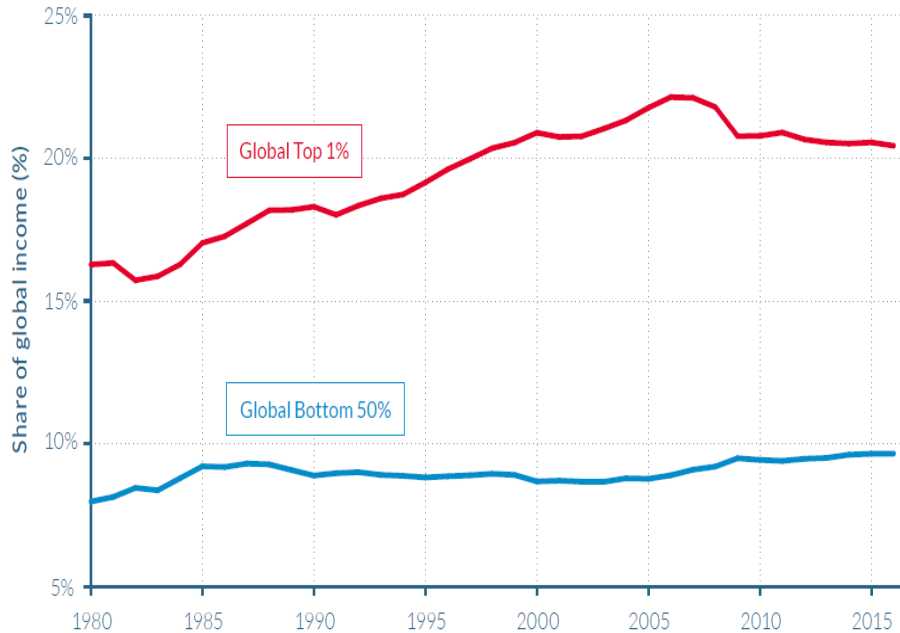- But the theory of *consumption cascades* explains why there is no direct negative link between greater inequality and greater aggregate saving (Duesemberry, 1949).
- Recent studies have shown that since the 90s the capital account openness erases the correlation between savings and investment (Feldstein and Horioka, 1980) at the national level.

Political economy

The perception that a society is unequal can encourage:

- greater political sensitivity against the current structure
- greater tax evasion and corruption
- lower perception of legal security for investments
- greater searches for rent-seeking activities

"endogenous fiscal cycle" (Persson and Tabellini, 1994; Alesina and Rodrik, 1994) the perceived inequality stimulates:

- pressures for higher levels of taxes on business profits, physical capital or property (and even on the returns of human capital).
- political and socioeconomic reactions that generate uncertainty and political and social instability (Alesina and Perotti, 1996)
- the lack of consensus to face macroeconomic shocks and cushion the business cycle, which increases macroeconomic volatility (Rodrik, 1999).

Stiglitz (2012) points out that inequality increases the lobbying power of favored sectors to protect their privileges.

Gross Fixed Capital Formation

Additionally, these aspects can interact with each other.

1. Motivation

**The increase of inequality** in the last decades, together with its **role in the last financial crisis**

Global Bottom 50% and Top 1% income shares, 1980-2016

Source: WID.world (2017). See wir2018.wid.world for data series and notes.

In 2016, 22% of global income was received by the Top 1% against 10% for the Bottom 50%. In 1980, 16% of global income was received by the Top 1% against 8% for the Bottom 50%.

Total income growth by percentile across all world regions, 1980-2016: Scaled by population
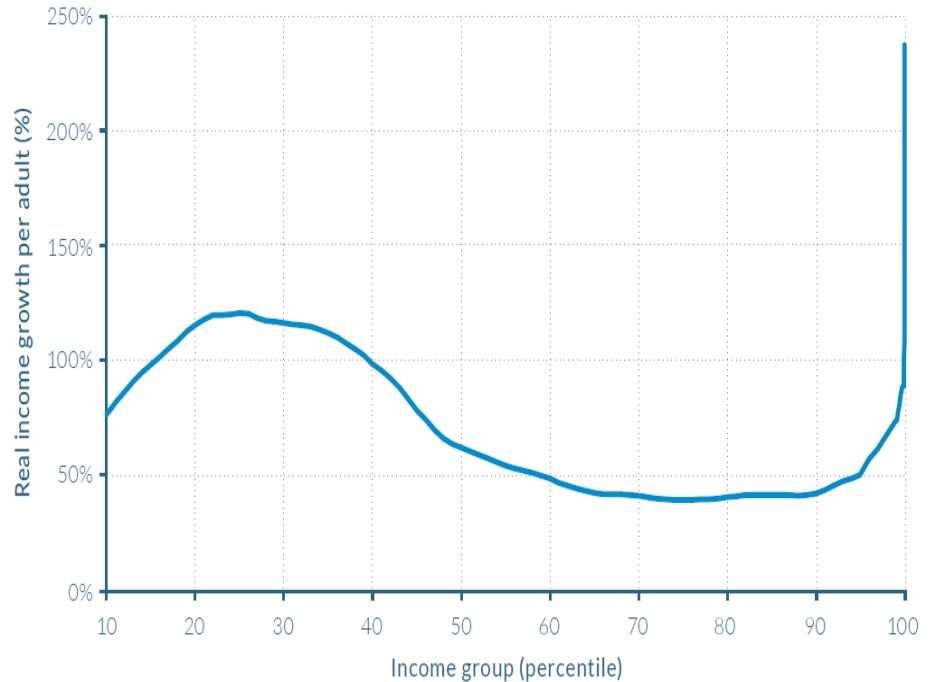
Source: WID.world (2017). See wir2018.wid.world for data series and notes.

Note: This graph is scaled by population size, meaning that the distance between different points on the x-axis is proportional to the size of the population of the corresponding income group. Income estimates account for differences in the cost of living between countries. Values are net of inflation.

1. Motivation

The interest in inequality has returned to the **domestic economic policy debate and to international policy discussion**. *"[A] declining labour income share* **can limit household consumption and reduce overall aggregate demand** *[..]. These negative consumption effects can in turn* **weaken investment***, as firms do not see new strong sources of demand. The resulting negative effect on global demand may* limit exports and **reduce overall economic growth.***"*

ILO, IMF, OECD and WB (2015), prepared for the leaders of the G20.

Income Inequality and Intergenerational Earnings Immobility
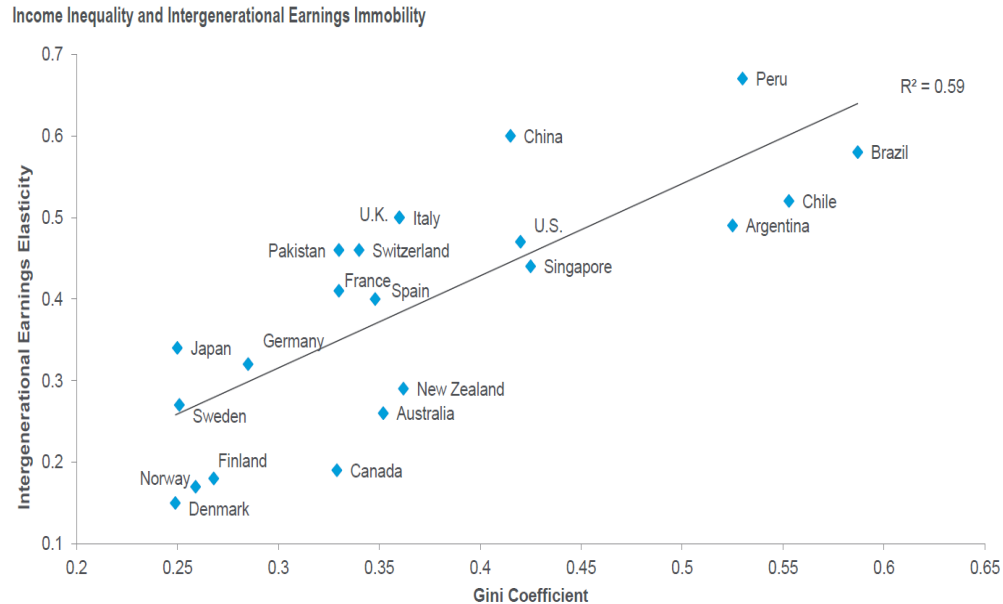
3. Methodology and Econometric Strategy

➢ **Alternative 1:** static model (POLS or FE)

    ○ biased and inconsistent estimates due to the omission of the dynamic component.

➢ **Alternative 2:** PDOLS (ignoring the individual heterogeneity).

    ○ autoregressive coefficient will be biased up due to the bias of omitted variables or heterogeneity resulting from the possible correlation between the individual effects in the error term and the regressors, affecting the consistency of the estimates (Hsiao, 1986).

➢ **Alternative 3:** DLSDV (i.e. dynamic FE)

    ○ autoregressive coefficient will be biased down since the transformation of the lagged dependent variable, $(y_{i,t-1} - \bar{y})$, is correlated with the transformed error term, $(\varepsilon_{it} - \bar{\varepsilon}_i)$ Nikell (1981).

    ○ This bias arises due to the inevitable correlation between $y_{i,t-1}$ and η_i and may even be exacerbated by the potential correlation between other regressors and the error term, affecting the consistency of both D-LSDV and PDOLS.

3. Methodology and Econometric Strategy

➢ **Alternative 4:** Anderson and Hsiao (1981): remove the individual effect and use internal instruments (yit-2)

$$y_{i,t} - y_{i,t-1} = \gamma(y_{i,t-1} - y_{i,t-2}) + (x_{i,t} - x_{i,t-1})'\beta + (\varepsilon_{i,t} - \varepsilon_{i,t-1})$$

is a special case within the generalized method of moments (GMM) estimators (Hansen, 1982).

GMM estimators (Arellano and Bond, 1991) are superior for at least two reasons: **1) they gain efficiency by using as instruments all available lags of the right side variables; 2) they control for potential endogeneity of other variables different from y_it-1**

➢ **Alternative 5:** GMM in First Differences (Arellano and Bond, 1991)
  + use lagged levels as instruments
  + allows to control for endogeneity of other variables than y_it-1 .
  - weak instruments: when the dependent variable presents high persistence, lagged levels are weak instruments (small sample bias (Blundell and Bond, 1998))
➢ **Alternative 6:** System GMM (Arellano and Bover, 1995; Blundell and Bond, 1998)
  + adds to the difference equation instrumented with lagged levels a level equation instrumented with lagged differences
  + deals better with the problem of weak instruments.
  + allows to control for endogeneity of other variables than y_it-1 .
➢ **Alternative 7:** DLSDV-C (Kiviet, 1995)
  + gains efficiency in comparison with GMM estimators
  - treat as exogenous all other regressors apart from y_it-1

2.1 Linear or non linear relationship