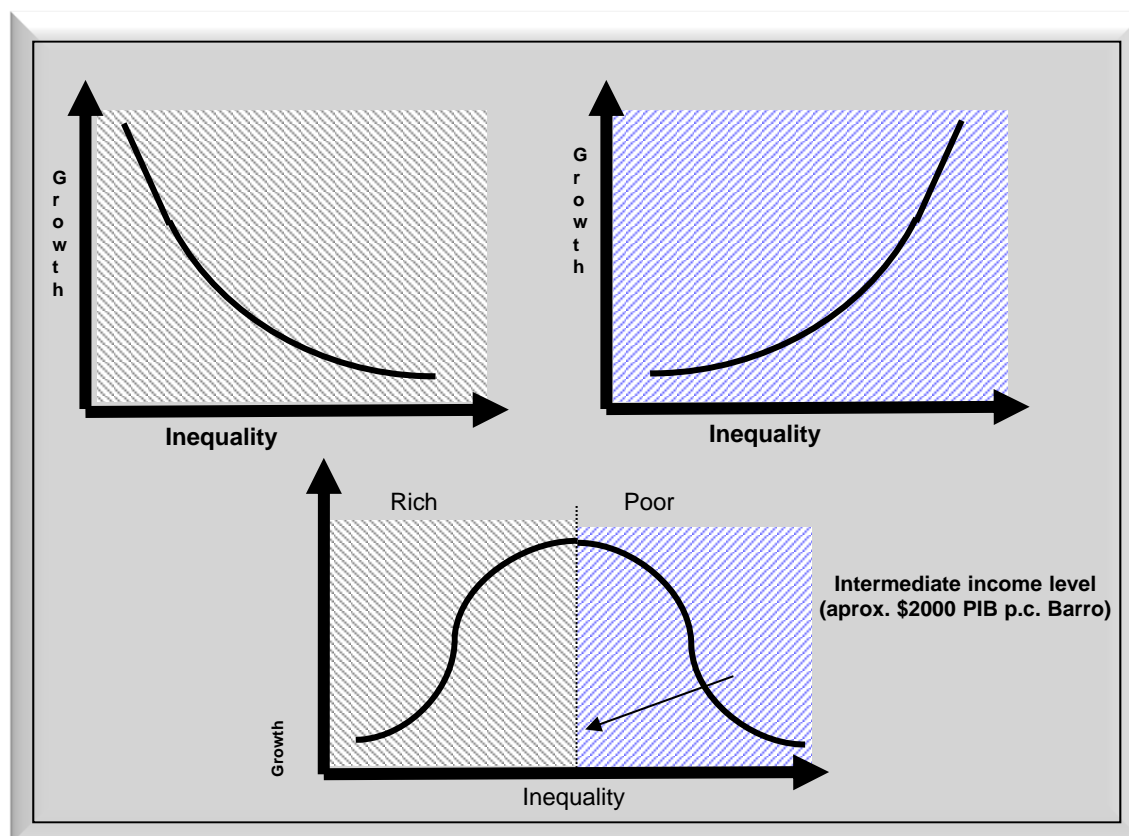## Introduction

The debate

During the last three decades there has been an ongoing debate over the empirical relationship between income inequality and economic growth.

The three main positions on this debate are the following:

Most relevant empirical studies

A negative relationship:

(Alesina and Rodrik, 1994; Clarke, 1995; Perotti, 1993; Alesina and Perotti, 1994; Persson and Tabellini, 1994; Perotti, 1996; Kremer and Chen, 2002; Castelló and Doménech, 2002; De la Croix & Doepke (2003), Josten, 2003; Ahituv and Moav, 2003; Viaene and Zilcha, 2003; Josten, 2004; Castelló-Climent, 2004; Knowles, 2005; Davis, 2007 and Pede et al., 2009).

A positive relationship:

(Partridge, 1997; Li and Zou, 1998; Forbes, 2000; Castelló-Climent, 2004; Nahum, 2005).
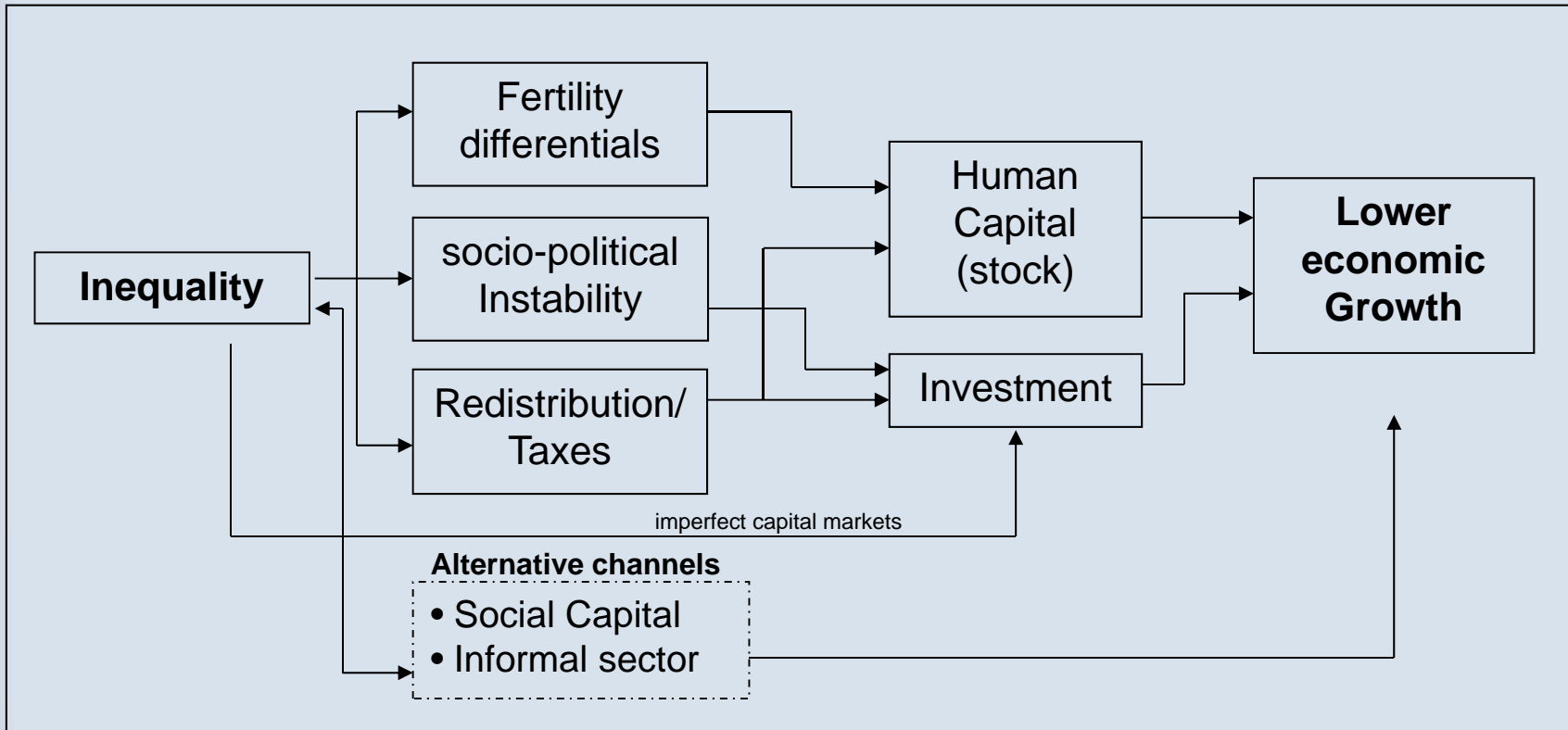
A non linear relationship:

(Barro, 2000; Banerjee and Duflo, 2003; Pagano, 2004; Voitchovsky, 2005; Bengoa and Sanchez-Robles, 2005; Barro, 2008; Castello-Climent, 2010).
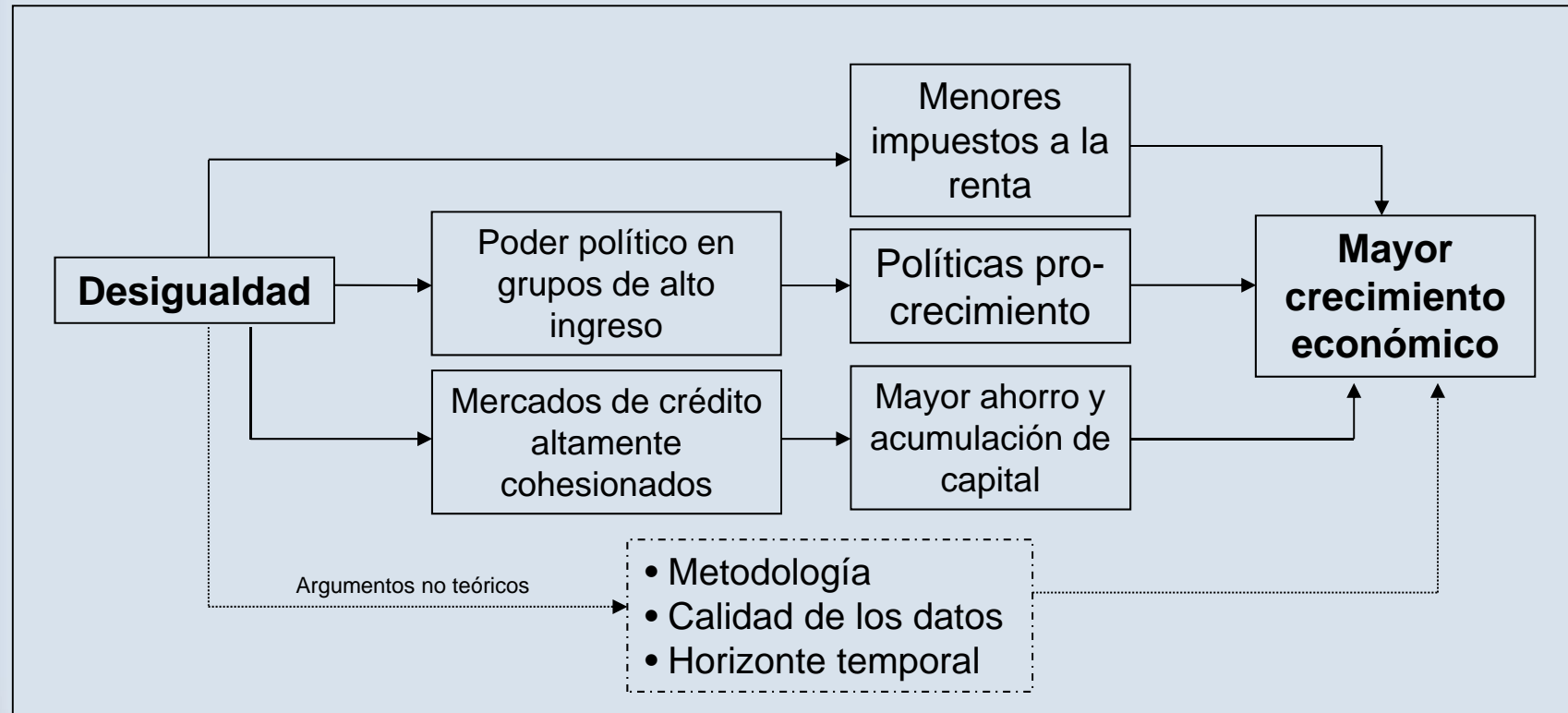
However: More than 100 studies have been made on this thopic

Transmission mechanisms in the negative relationship (Conventional Consensus View)

Transmision mechanisms for the positive relationship between inequality and growth

Income determined non linear relationship between inequality and growth

GDP (vertical axis)

Inequality (horizontal axis)

Rich countries

Poor countries

Income

Barro (2000) = $2,000 US (year1985 dollarss)

Barro (2008) = $11,900 US (year2000 dollars)
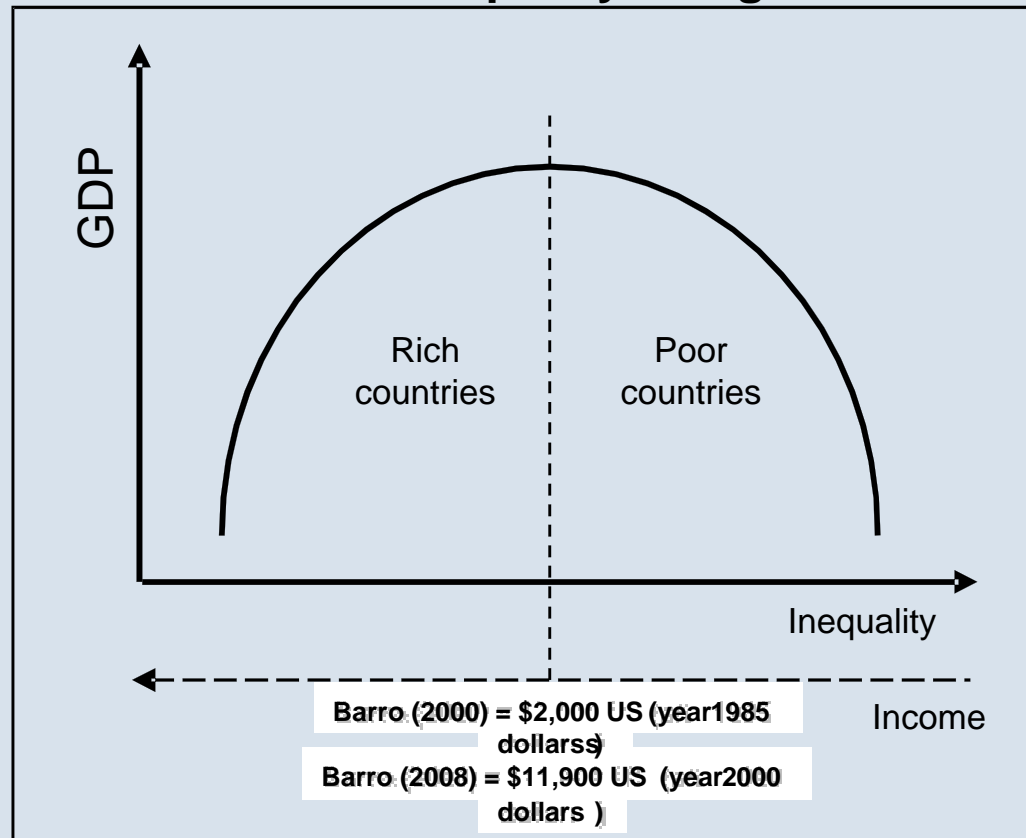
Main transmission mechanisms of the inequality-growth relationship

- **Political economy argument.**

  Income inequality generates redistributive policies that generate economic distortions and lower growth.

- **Wealth effect argument.**

  Under the assumption of under developed credit markets and minimum income traps, higher inequality generates a bigger amount of population without access to credit for education or productive activities.

- **Socio-political instability mechanism.**

  In places with higher inequality there will be more social discontent and political instability, this generates an amount of resources to deviate from potentially productive activities and discourages FDI, thus affecting economic growth.

- **Fertility – Human capital effect.**

  Higher inequality generates fertility differentials between different income brackets. This situation lowers in the long run the stock of human capital and negatively affects economic growth.

The current situation

- There is no consensus on the three main propositions of the debate (negative relationship, positive and non linear).

- The income dependent non-linear relationship could conciliate the different positions, but considering the income level as the main determinant of the inequality-growth relationship implies assuming too many things that may not occur.

- The debate is moving from theoretical to methodological grounds.

Thought

To ask if income inequality is good or bad for growth requires an answer with a linear behavior or at least with a constant sign. It also implies the assumption that the effects of income inequality will be the same regardless of its magnitude.

If we agree that income inequality is natural and even necessary n the context of a market economy, then the question should be the following:

How much inequality is desirable for a country?

This research proposes a reformulation of the initial question *¿Is income inequality good or bad for economic growth?*, as a first step to find a generalized solution and in order to establish new research questions on the following sense:

Should we expect a single type of effect from income inequality to economic growth?
Is it acceptable to expect the same effect on economic growth of every inequality level?

This way we could reach the following fundamental questions:

¿How much income inequality could be bad/good for economic growth?
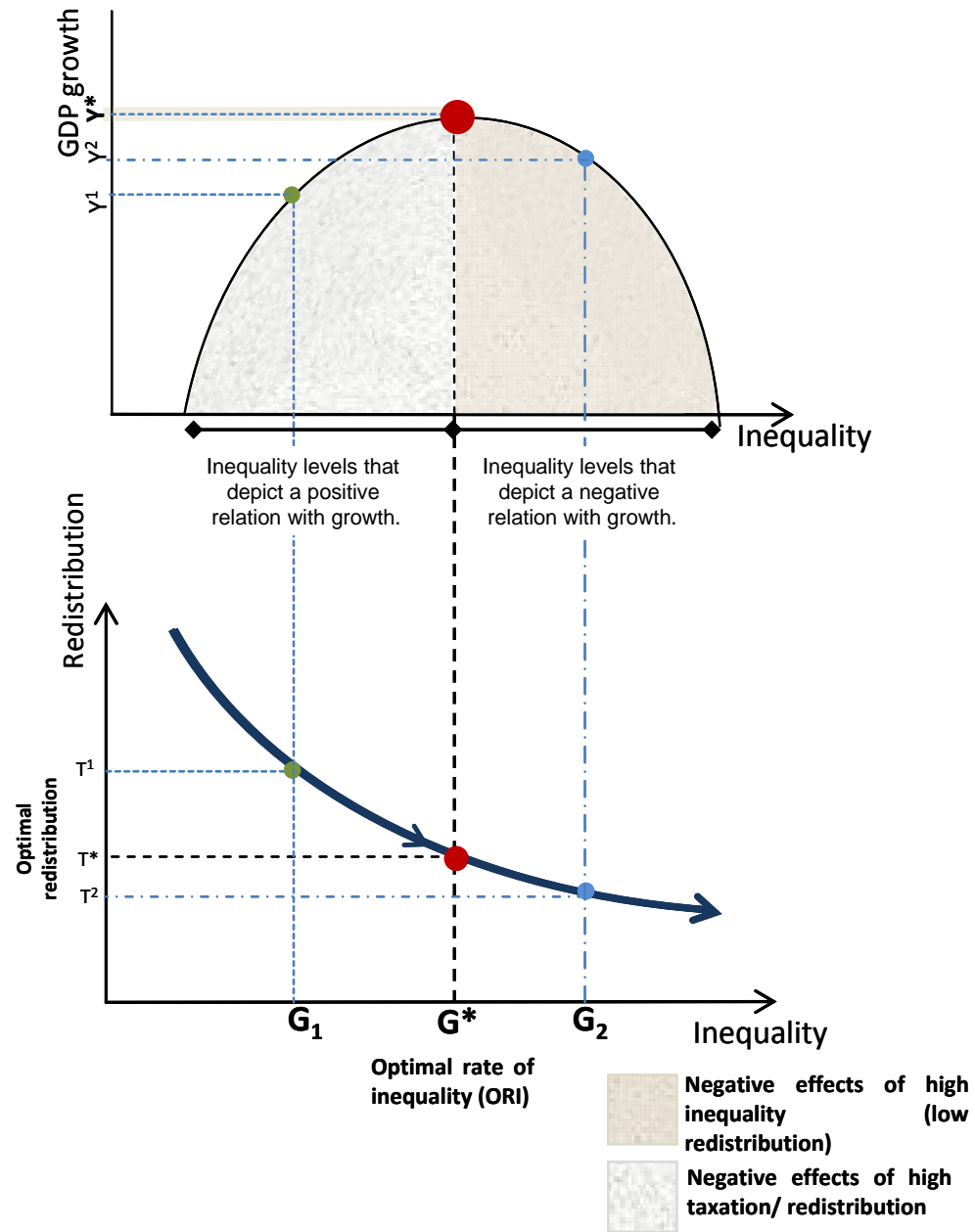
How much inequality is desirable for a country?

Focalized redistribution as a development strategy: Inequality and economic growth optimization

1. **Theoretical model**

2. **Empirical study based on panel data (138 countries) over fourty years(1960-2000).**

3. **Alternative test based on the Kuznets curve.**

4. **Bibliometric study**

The model — Jorge A. Charles Coll

Main elements of the model

1. There is a tradeoff between the negative effects of high inequality (and low redistribution) and the negative effects of too much redistribution (and high taxation) on economic performance.

2. High levels of inequality affect directly and indirectly the determinants of growth through its effects on investment, human capital, fertility and other variables that distort the potential of the economy.

3. High levels of redistribution and the associated tax rates exert a negative effect on economic growth by discouraging economic agents to pursue productive activities, by limiting the accumulation of productive capital, by restraining investment due to elevated taxation and by preventing individuals from the appropriation of the returns of their productive activities.

4. The economy tends to the concentration of income and higher levels of inequality (Sen 1992). In this sense, constant redistribution is needed in order to maintain or reduce the levels of inequality in the economy.

Three possible scenarios

1. An economy with high levels of inequality and low redistribution that affect negatively the growth rate (y^2 in upper part of Figure).

2. An economy with low levels of inequality and high redistribution and taxation that affect negatively the growth rate (y^1 in upper part of Figure).

3. An economy with a level of inequality and redistribution in which both effects (the negative of high inequality and the negative of high redistribution) are minimized and the economic performance is released from any distortion to its growth potential. We will call this the optimal rate of inequality (ORI). At this level, the growth rate of the economy will be maximized in comparison to any other level of inequality (y^* in upper part of Figure).

1. An econom... ...ution that affect nega...

2. An econom... ...ution and taxation th... ...er part of Figure).

3. An econom... ...hich both effects (the... ...e of high redistributio... ...mance is released fro... ...ll this the optimal rat... ...ate of the economy w... ...level of inequality (...
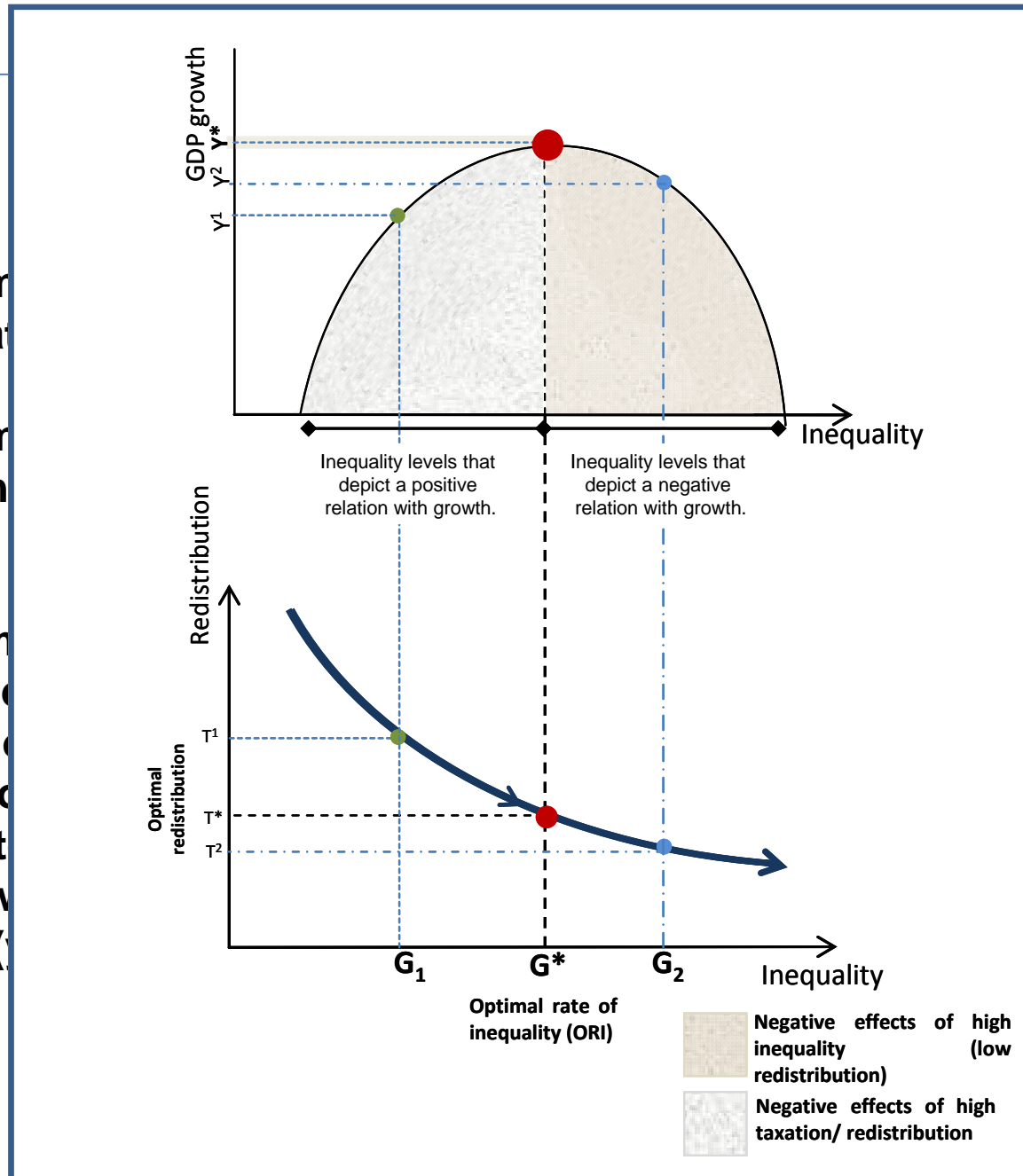
Marginal Efficiency of Redistribution (MER)

En In this model, redistribution is defined ambiguously as the process of gathering resources (taxation) and allocating them at the lowest brackets of income (redistributive expenditure).

More efficient tax and redistributive systems will result in a higher MER, this is, a higher elasticity in the effects on inequality levels as a response to a change on redistribution.
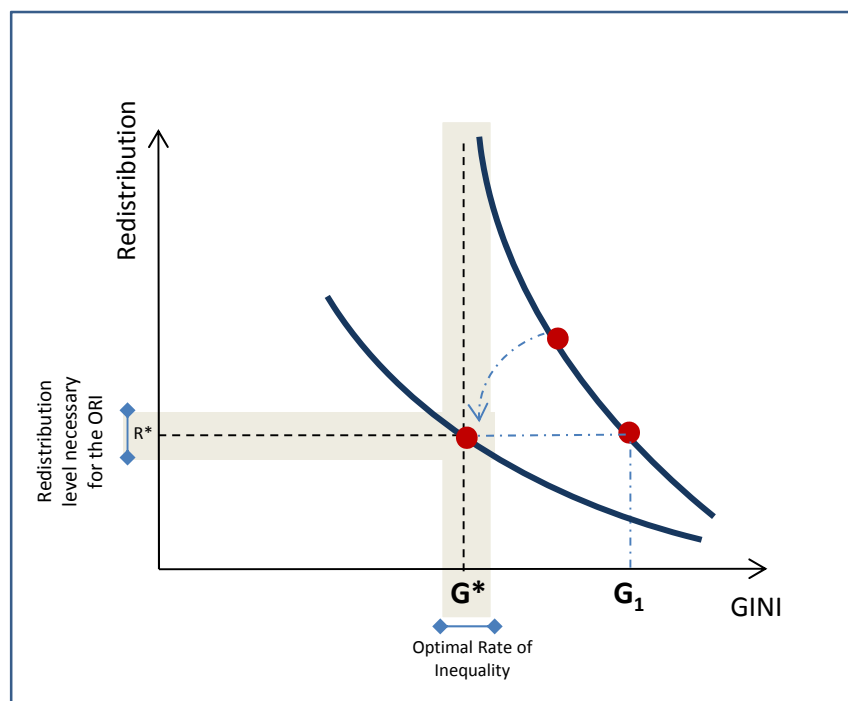
As an economy increases the MER, it will be easier to reach the optimal rate of inequality because less redistributive effort will be necessary to achieve significant changes in the level of income inequality.

La validity of this arguments would explain the following situations faced by countries in their redistributive efforts:

- The reason why different countries have different levels of inequality at similar levels of redistribution.

- The reason why some countries with similar levels of inequality have different levels of redistribution and taxation.

- The reason why some countries have to apply more intense redistributive policies than others in order to reduce inequality in depth.

The inequality trap
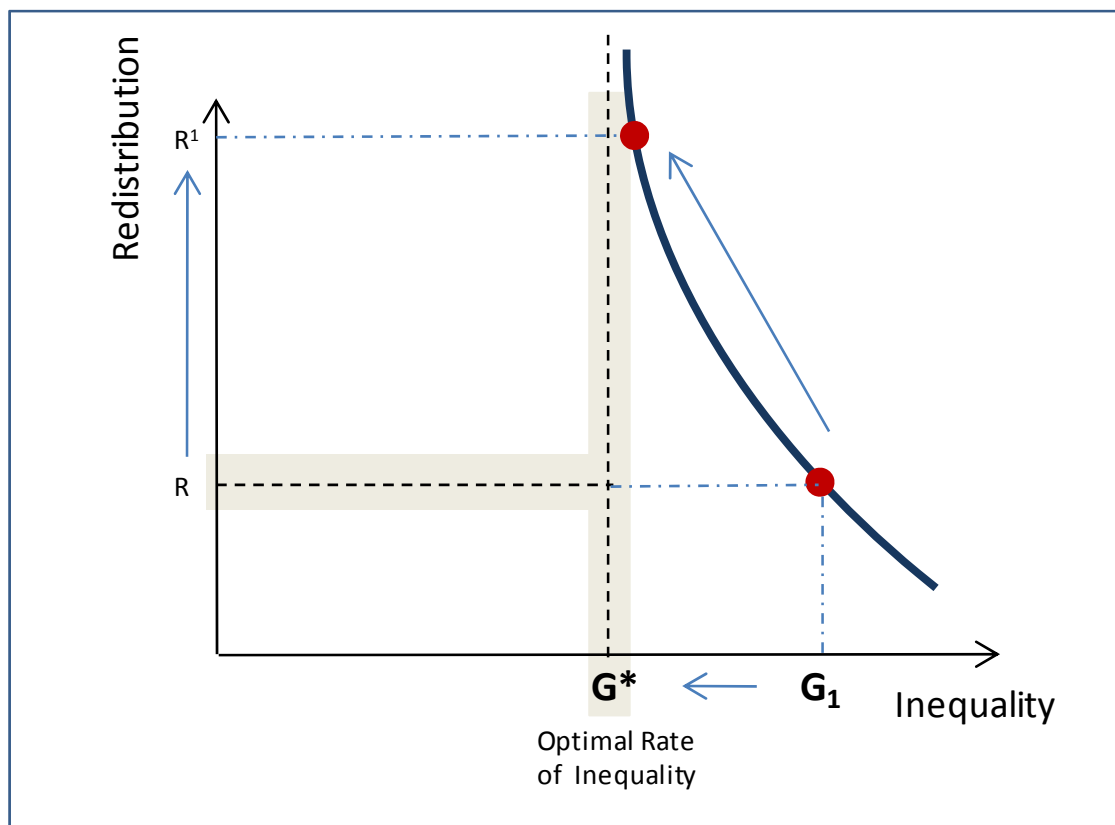
In a worst case scenario in which there is a country with a very low marginal efficiency of redistribution and a highly underdeveloped tax system, the economy would find itself facing an inequality trap in which any effort to reach the ORI would be insufficient. The level of redistribution needed to reach the optimum will be too high to be achieved and it would mean additional distortions to the economy.

Empirical evidence

Propositions:

1. The existence of a negative relationship between redistribution and inequality.

2. The existence of a non linear relationship between inequality and growth, with a negative relationship at high levels of inequality that attenuates as inequality is reduced, until it turns positive at low levels of inequality.

3. The existence of a level of inequality that maximizes the growth rate of the economy.

Empirical test:

- Countries

- 40 years (1960 - 2000)

- Estimations in:

  - Three stage least squares (3SLS),
  - Seemingly unrelated regression (SUR)
  - System GMM

Results

1. A negative and statistically significat relationship between redistribution and income inequality (measured by the Gini) is confirmed.

Table 2. Redistribution vs. Inequality

Variables / Equations	Complete sample				
	1	**2**	**3**	**4**	**5**
Redistribution	**-143.73**	**-168.96**	**-110.35**	**-123.71**	**-123.55**
	(0.0006)	(0.0000)	(0.0033)	(0.0053)	(0.0032)
Dummy: Latin America			**10.98**		**7.31**
			(0.000)		(0.0001)
Dummy: Asia			**4.78**		
			(0.0498)		
Dummy: Household vs. Individual				**9.63**	**6.42**
				(0.0000)	(0.0004)
Dummy: Gross or net income				**-10.28**	**-6.77**
				(0.0000)	(0.0019)
Dummy: Income or expenditure data				**-9.19**	**-8.53**
				(0.0005)	(0.0003)
Dummy: Development of tax (revenue) system		**-3.77**			
		(0.0164)			
Dummy: Marginal efficiency of redistribution		**-5.64**			
		(0.0004)			

2. After segmenting the sample between countries with high and low marginal efficiency of redistribution it was found that in countries with high MER redistribution has a significantly stronger effect on reducing income inequality than in countries with lower MER.

Additionally, the same estimation was performed with the segment of countries with a more developed tax system and it was confirmed that they perform better in reducing income inequality than on the complete sample, with higher negative coefficients.

Table 3. Redistribution vs. Inequality: segmented sample

Variables / Equations	High Marginal efficiency of redistribution			Low Marginal efficiency of redistribution		
	1	2	3	4	5	6
Redistribution	-214.35	-130.39	-115.35	-136.1	-106.24	-112.35
	(0.0000)	(0.0125)	(0.0323)	(0.0054)	(0.0628)	(0.0351)
Dummy: Household vs. Individual		13.19	12.3		12.54	9.93
		(0.0000)	(0.0000)		(0.0000)	(0.0000)
Dummy: Gross or net income		-6.11	-9.88		-4.73	-10.45
		(0.004)	(0.0001)		(0.0335)	(0.0001)
Dummy: Income or expenditure data			-11.9			-9.62
			(0.0004)			(0.0009)

Table 4. Redistribution vs. Inequality: segmented sample

Variables / Equations	Highly developed tax system			
	1	2	3	4
Redistribution	-242.07	-162.11	-186.85	-182.29
	(0.0003)	(0.0072)	(0.0048)	(0.0025)
Dummy: Latin America		11.18		7.01
		(0.0000)		(0.0003)
Dummy: Asia		6.64		
		(0.0968)		
Dummy: Household vs. Individual			9.09	7.31
			(0.0001)	(0.0001)
Dummy: Gross or net income			-8.43	-5.06
			(0.0002)	(0.009)
Dummy: Income or expenditure data			-10.28	-7.67
			(0.0002)	(0.0006)

2. After segmenting the sample between countries with high and low marginal efficiency of redistribution, it was found that in countries with high MER redistribu... ...he inequality than in c...

Additionally, ... of countries with a more ... ...rform better in reducing ... with higher negative co...

Table 3. Red...

				segmented sample
	Hi			oped tax system
			3	4
Variables / Equations	1			
Redistribution	-214.		-186.85	-182.29
	(0.00		(0.0048)	(0.0025)
Dummy: Household vs. Individual				7.01
				(0.0003)
Dummy: Gross or net income			9.09	7.31
			(0.0001)	(0.0001)
Dummy: Income or expenditure data			-8.43	-5.06
			(0.0002)	(0.009)
Dummy: Income or expenditure data			-10.28	-7.67
			(0.0002)	(0.0006)

Figure labels: Redistribution level necessary for the ORI — R* — G* — G₁ — GINI — Optimal Rate of Inequality

3. By estimating a first set of growth regressions in 3SLS it was confirmed the existence of a non linear (hump shaped) relationship between income inequality and economic growth, finding the maximum at 0.39 measured by the Gini coefficient.

Equation 7 adds an interaction term between inequality measured by the Gini coefficient and redistribution. The results provide additional evidence of a non linear relationship, confirming that at low levels of redistribution the relationship between inequality and growth is negative but as redistribution increases the relationship will attenuate and will eventually turn positive when reaching a level of redistribution equivalent to approximately 6 % of GDP.

Equations 1 and 2 test for the overall effects of inequality over growth. The results are consistent with the fact that that the sample as a whole is located predominantly in the negative spectrum of the relationship between inequality and growth. In this case, lowering inequality from a Gini level of .40 to .39 would increase the GDP per capita growth rate in 1.73%.

Table 6. Inequality and growth relationship (3SLS estimation)

Variables / Equations	1	2	3	4	5	6	7*
Gini	-0.04	-0.02	0.22	0.23	0.23	0.022	-0.06
	(0.0341	(0.0502)	(0.0076)	(0.0045)	(0.0044)	(0.0074)	(0.003)
Gini^2			-0.002	-0.003	-0.003	-0.003	
			(0.003	0.0022)	(0.002)	(0.0023)	
Log(per capita GDP)	-1.56	-1.48	-1.19	-1.39	-1.002	-1.11	-1.68
	(0.0000	(0.0000)	(0.0000)	(0.0000)	(0.0001)	(0.0000)	(0.0000)
Log(Total fertility rate)	-1.67	-1.51	-1.61	-1.59	-1.27	-1.5	-2.07
	(0.0253	(0.0153)	(0.0151	(0.0179)	(0.0515)	(0.0212)	(0.0062)
1 / life expectancy at birth	-166.11	-153.32	-89.58	-88.4	-108.5	-70.76	
	(0.0736	(0.0183)	(0.1618	(0.2087)	(0.1086)	(0.2889)	
Investment ratio	7.89	4.46	6.12	8.52	5.78	6.63	9.37
	(0.0023	(0.0419)	(0.0038	(0.0001)	(0.0043)	(0.0013)	(0.0017)
Political instability variable	0.0086	0.01					0.007
	(0.0015	(0.0005)					(0.0092)
PPPI (Price level of investment)		0.001			-0.005	-0.002	
		(0.3748)			(0.1993)	(0.5218)	
Secondary and tertiary school attainment		0.12					
		(0.3748)					
Dummy: developed tax revenue system				0.19			
				(0.4231)			
Dummy: Latin America				-0.28	-0.64		
				(0.3241)	(0.0181)		
Gini x Redistribution							0.52
							(0.006)

5. A final set of equations performed in System GMM further confirm the non linearity and finds the ORI at a similar level than in the previous estimations, at a Gini value of 0.40.

Table 7. Inequality and growth relationship (System GMM)

Variables / Equations	1	2	3	4	5*	6
Intercept	**20.9**	**16.50**	**15.50**	**17.00**	**16.95**	**17.72**
	(0.0020)	(0.0050)	(0.0080)	(0.0020)	(0.0000)	(0.0010)
Inequality	**0.31**	**0.35**	**0.40**	**0.34**	**0.40**	**0.32**
	(0.049)	(0.0430)	(0.01)	(0.052)	(0.001)	(0.008)
Inequality^2	**-0.003**	**-0.003**	**-0.004**	**-0.003**	**-0.004**	**-0.004**
	(0.0700)	(0.0790)	(0.0200)	(0.0820)	(0.0020)	(0.0110)
Ln (per capita GDP)	-2.06	-2.07	-2.11	-2.04	-2.36	-2.12
	(0.0010)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Investment ratio	1.27		2.28		4.30	
	(0.7340)		(0.544)		(0.158)	
Ln (Total fertility rate)	-4.71	-5.05	-4.73	-5.00	-4.43	-2.69
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Secondary and tertiary school attainment		0.37	0.40	0.30		
		(0.1870)	(0.1580)	(0.2810)		
Life expectancy	-169.96	17.61				-193.47
	(0.2040)	(0.886)				(0.088)
Male secondary school enrollment					2.86	3.45
					(0.001)	(0.0000)
AR(2) test	0.771	0.998	0.952	0.936	0.614	0.781
Hansen J test	0.25	0.554	0.525	0.388	0.603	0.708
Diff Hansen	0.89	0.99	0.985	0.974	0.729	0.88
Wald Chi2	65.49	80.85	64.72	64.03	73.07	88.49
Prob. Chi2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Bibliometric study

- Comparison of the most influential studies in the relationship between income inequality and economic growth.

- Eleven data sets of cross country income inequality.

- Classification of each dataset in groups according to the composition of the sample in terms of the predominant inequality level (low, medium high).

Bibliometric study

Objetive

To verify if the arguments of the proposed framework can explain the divergences in results of the most influential empirical studies of the inequality-growth debate.

Table 7. Bibliometric study results

Author	Year	Relation	Methodology	High GINI	Medium GINI	Low GINI
Alesina and Rodik	1991	Negative	OLS, 2SLS	**51%**	23%	26%
Alesina and Perotti	1993	Negative	2SLS	**56%**	20%	24%
Persson and Tabellini	1994	Negative	OLS / 2SLS0	**42%**	27%	31%
Castelló and Doménech	2002	Negative	N/A	**58%**	18%	24%
De la Croix and Doepke	2003	Negative	GMM	**62%**	19%	19%
Garbis Iradian	2005	Negative	GMM and OLS	**41%**	27%	32%
Stephen Knowles	2005	Negative	N/A	**53%, 69%**	12%, 26%	35%, 5%
Robert J. Barro	2008	Negative (with full sample)	GMM	**50%**	21%	29%
Li & Zou	1998	Positive	Fixed effects & Random Effects	**39%**	**13%**	**48%**
Kristin J. Forbes	2000	Positive	Arellano & Bond differential GMM	**35%**	**20%**	**45%**
Amparo Castelló-Climent	2004	Positive	OLS, fixed effects, random eff. Differential-GMM, System-GMM	**37%**	**21%**	**41%**

Bibliometric Study Results

1. Studies in which the dataset was predominantly composed of countries with high income inequality levels displayed, in all cases, results in which the sign of the relationship turned out to be negative.

2. Studies in which the dataset was predominantly composed of countries with low inequality levels, presented results in which the sign of the relationship turned to be positive.

Derived from the previous results it can be assumed that studies in which the relationship turned to be insignificant should have sample composition with the following characteristics:

a. A sample of countries with symmetrical inequality levels at both sides of the non linear relationship that cancel each other and turn the results statistically insignificant.

b. A sample of countries with inequality levels at both sides of the non linear relationship that average around the ORI level.

So far

1. The results of the empirical study provide cross country evidence and confirmed the validity of the model.

2. Countries with inequality levels below a Gini index of inequality of 0.39 depict a positive relationship in their inequality and growth relationship. Accordingly, economies with income inequality above that level have a negative relationship with growth, meaning that more inequality affects negatively the growth performance of the economy.

3. The overall relationship turned to be negative, consistently with other studies that employed similar datasets, as the result of having the majority of the observations in the negative range of the relationship.

4. These results also evidence the existence of an ORI, situated at the breakpoint inequality level of 0.39, in which growth rates are maximized, in relation to the negative effects of different inequality levels.

Current stage of study

Fundamentally, the underlying argument in my model, by which a certain level of inequality is assumed to be natural or necessary in any market economy is based on a justice principle in which all individuals expect to receive proportional returns to their effort (marginal productivity).

However, in practice, the returns on effort are not proportional across individuals because persons in different contexts may develop different marginal productivities derived not from effort, but from differentials in previous conditions that determined their future productivity.

Differentials in opportunities at an early stage of life represent a second source of income inequality that affects in a negative way the first source of inequality.

This way, there are two sources of inequality, the one derived from the effort and productivity of individuals and the one that comes from the inequality of opportunities that individuals face according to the context in which they are born.

Current gathering data for testing the following

Research question?

Which role does the inequality of opportunity play in my proposal of a non linear relationship between income inequality and growth?

Propositions to test:

- Redistributive efforts oriented to reduce the different types of inequality of opportunity such as access to education and health are more effective than income redistribution (time horizon?)
- Inequality of opportunity is positively linked to Income inequality and negatively linked to economic growth.
- Once we control for the measures of inequality of opportunity, the squared Gini looses significance.
- There is a high degree of correlation between the squared Gini and the measure for inequality of opportunity.
- Inequality of opportunity might explain the excess of inequality (not probable) or part of the mechanism by which an economy tends to income concentration.