Brazil and China: two growth models?

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Abstract

In this paper we look at two emerging economies, Brazil and China, and propose an evaluation of their recent development in terms of growth performance and the evolution of income inequality. Our analysis therefore seems to be related to the well known Kuznets-curve and theory. The latter, however, populates an inequality-growth plane with countries' average-valued coordinates and draws far fetching predictions that have been repeatedly questioned. In the same *K-plane* we introduce the dual notion (based upon coordinates that are bi-variate time series) of (a population of) growth models. Accordingly, we re-interpret the comparative histories of these two emerging economies to show how Kuznets' traditional approach does not capture recent relevant phenomena characterizing such countries, and perhaps others as well: namely, the presence of at least two distinct growth models, one prevailing in China for most of its recent history, the other associated with Brazil. Descriptive statistics and Cointegration analysis corroborate such results. Our research is meant also to begin to rationalize various attempts to interpret such phenomena as of the so called East Asian Miracle countries, and the Middle Income trap. In fact, our analysis runs against the backdrop of the extensive literature on the relationship between income inequality and growth/development, so that a review, albeit brief, is in order.

Key Words: Economic Growth; Income Inequality; Time Series Analysis.

JEL Classification: C23; D3; O11; O40.

1 Introduction

After a lengthy and on the whole inconclusive debate, research has started to look for supplementary variables to explain the all pervasive evidence of *divergence* in per capita income, among developed countries and between them and LDCs (and more recently emerging economies). An extensive literature has blossomed on the causality relationship between inequality (however, measured) and economic performance (as measured by say per capita GDP). Relatedly, the debate has merged with a debate on the threat of the so-called Middle Income Trap (in particular in relation to some of the emerging economies, China and Brazil). Within a framework of cross-country empirics, we have seen also the (re-) discovery of (often time-honored) theories positing the existence of such a functional relation. Among such rediscoveries, one is Kuznets' curve (1955) with its associated dynamical hypothesis and prediction, an interesting relation that can be interpreted to describe a *causal* association that can reverse at the (high or low) level of a country's development. The shared attitude has basically been one of rejection of the very existence (or the "end", Palma (2011)) of a K-curve constructed from cross-country analysis.

In this paper, we take an alternative time series approach to study the evolution of per capita GDP (levels and growth rates) versus income inequality in two emerging economies, China and Brazil (a companion paper by Risso et al.,(2013)examines México). Accordingly, for each country, we construct, analyze and compare the qualitative behavior of curves in the K-plane, i.e. a plane with (per capita GDP, inequality index) on the coordinate axes. Obviously, such curves are not true Kuznets curves, due to their time series origins, though we can call them *Kuznets-like*. Descriptive statistics is discussed, also against the backdrop of the dynamic hypothesis implicit in Kuznets theory and the discussion provoked by it (in particular e.g. Stiglitz (1996), more recently Palma, (2011**)).** An econometric exercise shows, then, that in both countries pc GDP and income inequality stand in a co-integrated, long-term relationship. However, in China such relationship is positive (like in Risso and Carrera, 2012) while in Brazil it is negative. Moreover, while VAR Granger causal relationships indicate that China's economic growth "predetermines" or "Grange-causes" income inequality (*perhaps, one could say á la Kuznets);* in Brazil the causal relationship seems to be reversed. This suggests a re-interpretation of the two countries' experience, where

the key notion distinguishes between *two growth models*, a fast growth with income concentration, "investment" supported model (prevailing in China till recently) and a moderate growth with income redistribution, "consumption" supported model (of Brazil).

The paper is organized as follows. Subsection 1.1 (still part of the introduction)briefly surveys related literature. Section 2 carries out an econometric exercise to discuss empirical evidence on the existence of stable long-run relationships between inequality and growth of the type implied by cointegration and Granger causality. Section 3 looks at stylized facts of Brazil and China development in *the K(utznets)-plane*, introducing the notion of growth models. Section 4 draws some conclusions.

1.1 The literature: a brief review

In recent years, considerable efforts have been spent on understanding the differential growth experience of the various countries, also in the hunt for the *perfect policy recipe* to success. Especially emerging (and some LDCs) economies have been scrutinized with the viewpoint and tools of growth (rather than development) theories.Whether a growth goal is compatible or even achievable through redistributing or else letting wealth and income concentrating is an open debate, the more so in these days of fundamental unbalances. The growth process creates new resources as well as modifies their distribution, changes relative prices, factor rewards and agents' factor endowments, changes that are bound to directly distributional impact. This was very clear to the theorists of economic development seeking its explanations and consequences in major structural changes. Ever since Kuznets and Lewis, theoretical constructs about the effects of performance onto income distribution focused on several basic mechanisms. In a bold generalization from limited cross country evidence, Kuznets (1955) maintained that an increase in inequality is an inevitable association of certain phases ("stages") of the development process –that is– distributional inequality would increase as the economy progresses from an agrarian to an industrial structure, to decline only later on, when that change is accomplished and a country has entered the club of the rich or developed ones[1]. Kuznets' theory of structural change through stages of development came to be discussed within the growth literature and soon later within the empirics of cross-country convergence. In fact, alreadynot much later, Okun (1960)

[1]Where a better distribution was expected to be associated with further growth, another prediction that recent history has proved not to be necessarily founded.

proposed a different, more growth oriented interpretation: pursuing equality would reduce total output by reducing incentives to work, save and invest and through the "leaky bucket" of wasteful government efforts to redistribute. Inequality is healthier for fast growth.

As seen by the recent literature, the issue can be summed up in a single question: is growth that causes inequality, or else can income inequality be its engine? Stated in such terms, we have to inquire about the *direction* and the *sign* (not, just the value) of a causality relation. The related, extensive literature produced opposite, often controversial contributions. In contrast to the development approach focusing on change, those more recent contributions originating from the growth and convergence debate, have been searching for a stable, unidirectional relation between those variables, generally through the same cross country approach.

At least three strands of such literature interest our exercise hereafter, and can be briefly reviewed[2]. The first one posits a relation *from* inequality *to* growth, with variants. It has *classic* theoretical ancestors in the British classics but goes down to the Keynesian theory of Kaldor-Pasinetti: an income eschewed distribution favoring profit earners enhances growth because wealthier individuals have a higher propensity to save. Thence, higher income concentration would lead to higher aggregate savings and thus to faster capital accumulation-driven growth[3]. In more recent times, the same view of the causal relation is expressed by e.g. Alesina and Rodrik (1994), Perotti (1994, 1996), Deininger and Squire (1998). Persson and Tabellini, (1994), Forbes (2000), Arjano etal. (2001).Banerjee and Duflo (2003) find that when growth(or changes in growth) is regressed non-parametrically on changes in inequality, the relationshipis an inverted U-shape. There is also a non-linear relationship between past inequality and themagnitudes of changes in inequality.

With Kuznets these contributions not share, however, neither the interpretation (other variables being brought in, e.g. democracy etc.) nor the expected *sign*: a decreasing relationship replacing an increasing one, from inequality to growth.

Some such contributions cautiously introduce qualifications, often in terms similar to the stages of development theories. E.g. in Persson and Tabellini (1994), it is at the beginning of a longer-term period that higher inequality is linked to poorer growth

[2]Shin (2002) offers an exhaustive review and an *eclectic* theoretical model.

[3]Here,tt may be worth to remember, that such conception crucially relies on the idea that it is capital accumulation that drives growth, an idea only partially shared by the neoclassical approach which adds to it technological progress as the productivity driver for the long run.

performance. Similarly, in Berg and Ostry (2012) high levels of income inequality may damage long term growth (by amplifying the potential for financial crisis, discouraging investment with political instability, making it difficult for governments to take hard choices such as raising taxes or cutting public expenditure in the face of shocks, and/or finally discouraging investments in education and health by the disadvantaged). In Banjeree and Duflo (2003), changes in inequality in either direction would be followed by lower growth later.

In an effort to put some order, Barro (2000) classifies theories of inequality *to* growth into four categories, as they rely on: credit-market imperfections due to asymmetric information and the absence of legal institutions, the amount of redistribution programs, sociopolitical unrest and possible differences in saving rates among different income classes.

The second strand of literature we refer to, is more explicitly dynamic and inverts the variables' roles: seeing causality from the (rate of growth of) pc GDP *to* inequality, it however, preserves the idea of the function being decreasing. Resources generated by growth need not be concentrated but can be used for redistribution, directly and/or indirectly. Thus, high growth can be associated with (and be accompanied by, through adequate policies) diminishing income disparities. This is the mechanism behind the Miracle of the East Asian countries, as recounted by J. Stiglitz (1996). This experience would show that development need not be characterized by increases in inequalities, but actually it could lead and be sustained by the opposite phenomenon. If we were to put it within the framework of a proper Kuznets curve, Stiglitz' analysis seems to posit the *existence of a downward-sloping arm* over a stretch of low income for some development countries[4]. Along such an arm, a self feeding or feedback mechanism would have been tat work: once initialized the virtuous circle, growth feeds (positively) into income distribution and the latter further supports (through domestic market expansion, and households long term investment in human capital and the like) present and *future growth*, generating a path of sustained expansion.

There are, here, three ideas worth calling attention to, for later use:

i. Successfully developing (i.e. initially, low-income) countries may run their path along a *downward* sloping inequality/growth relation. (Among them, emerging

[4]This seems to be implied also by certain remarks of Barro (2000) and especially Shin (2011), where low income countriesare compared with high income ones (USA, France), both showing high income concentration. This seems to imply the existence also of an anti-K or a U curve.

economies may qualify.) Is this the arm of an inverted K-curve, or does indicate a distinct phenomenon?

ii. As for the EAM countries, with a feedback mechanism at work, no one-way relation can be defined,

iii. the feedback takes place because the mechanism works over time or inter-temporally, thus ensuring sustainability of the expansion path.

There is, therefore, a relation with the Kuznets' dynamical hypothesis (if not with the same name curve): for, like such hypothesis, it implies a nonlinearity that other growth theories do not have.

This discussion leads us to the third stand of analysis relevant for our work, on the existence of a proper Kuznets curve constructed from observed locations in the K-plane of countries at a given point of time. As already noted, the general attitude seems to be one of rejection of the very existence of one such a curve. Still, the reference periodically re-surfaces, showing the strong appeal of the idea. The reasons of rejections are various: whether because a (significant) turning point is difficult or impossible to estimate, or because the curve has simply disappeared (if it ever existed). Or, finally, because it is a dubious statistical construct, whose weakness descends from the implicit and unwarranted assumption of a common cross-country structure. Thus, while we do not want to address the issue of the existence of a proper Kuznets curve (our curves are in fact, *Kuznets'-like*), our choice of countries and comparison with the existing literature lead us to mention it from time to time, as a sort of benchmark.

In the next section, we will go on to a cointegration (and causality) analysis to corroborate out interpretation of the existence of two distinct models of growth.

2 An econometric exercise

The database used hereafter, for China as well as for Brazil is:

1. GDP per capita (in constant 2005 U.S. dollars PPP) from the Penn World table 8.0 (Feenstra et al., 2013).
2. Income inequality, measured by the Gini index. From the *Standardized World Income Inequality Database*, Version 4 by Frederick Solt (2011), Southern Illinois University. From this database we use the variable list, called *gini_net*,

which is an estimate of Gini index of inequality in equalized (square root scale) household disposable income, using Luxembourg Income Study data as the standard.

In fact, though the relevant empirical literature provides insights on whether and how inequality may affect growth (or be affected by it), still it suffers from the known limitations inherent to standard cross-country and panel regressions, its relying on the implicit assumption of a common economic structure across countries (Herzer and Vollmer, 2012). Tentative empirical *verifications* through "growth regressions", with inequality variables on the right hand side, have yielded ambiguous, or even contradictory results. Altogether similar problems arose as with the Kuznets curve.

We then decide to perform a cointegration analysis focusing on individual country (i.e. China and Brazil, separately) in order to avoid the aforementioned problems. [5].

Our aim is to test whether there is a formal long-term relationship between economic growth and income inequality, using cointegration techniques (Johansen, 1995, 1998; Joselius, 2006). In a cointegration analysis it is known that a cointegrated VAR setting avoids and/or deals better with the typical problems (parameter heterogeneity, omitted variable bias and endogeneity) from which suffers the standard cross country approach in the econometric analysis of economic growth (see Gobbin and Rayp (2008)).

As we look for results in terms of elasticity, we apply natural logarithms to the GDP per capita and Gini index series, named *LnGDP* and *LnGini*, respectively.

The estimation analysis was done following six steps. First, we establish the order of integration for both (*Ln*) GDP per capita and Gini index and we show that both series are I(1). Second, we find out the optimum lag structure using Akaike Information Criteria (AIC). Third, we perform Johansen's (1988) procedure to test for the long run relationship (i.e. cointegration) between them. Fourth, we conduct the Toda-Yamamoto Granger causality test, to examine whether there is causal relationship between the two variables and the direction. Fifth, we apply the Dynamic Ordinary Least Squares (DOLS) estimation methodology by Stock and Watson (1993). This method is a robust single equation approach that corrects for regressors endogeneity by the inclusion of

[5]Gobbin and Rayp (2008) show that a cointegrated VAR setting avoids and/or deals better with the typical problems (parameter heterogeneity, omitted variable bias and endogeneity) from which suffers the econometric analysis of economic growth.

leads and lags of the regressors' first differences, and finally, we verify for the stationarity of the residuals of regressions in order to make sure our estimated models do not generate a spurious regression (Choi et. al., 2008, p. 327).

2.1 Unit root tests and lag length selection

A preliminary step to investigate the link between income inequality and GDP, is testing for the order of integration of variables. While – in perfect theory – income inequality is bounded above and below and cannot be nonstationary, in a short-time span it may look like that. Testing for the presence of a unit root it is therefore important, and one should use a regression that mimics the actual data-generating process (Gobbin and Rayp (2008)). Since we do not actually know the real data-generating process, we apply the Phillips-Perron (PP) test that is a non-parametric modification to the standard Dickey-Fuller t-statistic to account for serial correlation by using the Newey-West (1987) heteroskedasticity and autocorrelation consistent covariance matrix estimator.

Table 1 reports the results of the PP unit root testin levels and differences of the two variables involved in the regression, *LnGDP* and *LnGini*.

Table I. PP Unit Root Tests.

	Brazil				**China**			
Variable (in Level)	***lnGDP***		***lnGini***		***lnGDP***		***lnGini***	
	Adj.t-stat	*p-value*	*Adj.t-stat*	*p-value*	*Adj.t-stat*	*p-value*	*Adj.t-stat*	*p-value*
Trend & intercept	-1.65116	0.7468	-2.513603	0.3197	-1.530213	0.7953	-1.680601	0.734
Intercept	-0.822609	0.7976	-2.217562	0.2047	0.430599	0.9809	-0.745528	0.8194
None	1.613193	0.9709	-1.454428	0.1333	4.99283	1	1.247385	0.9421
Variable (1st difference)	***ΔlnGDP***		***ΔlnGini***		***ΔlnGDP***		***ΔlnGini***	
	Adj.t-stat	*p-value*	*Adj.t-stat*	*p-value*	*Adj.t-stat*	*p-value*	*Adj.t-stat*	*p-value*
Trend & intercept	-2.722096	0.2359	-7.666823	0.000*	-3.273441	0.091***	-2.785699	0.2136
Intercept	-2.838594	0.06***	-6.128736	0.000*	-3.301422	0.024**	-2.88077	0.060**
None	-2.94029	0.004*	-6.125438	0.000*	-1.751705	0.075***	-2.429833	0.017**

Note: Δ means 1st difference of the variable. Phillips-Perron test (PP): null hypothesis is unit root. * Null hypothesis rejected at 1%. ** Null hypothesis rejected at 5%. *** Null hypothesis rejected at 10%.
Source: Own elaboration.

Table I indicates that the natural logarithm of GDP per capita and natural logarithm of Gini index are non-stationary in their respective levels. After first differencing the

variable, however, the null hypothesis of a unit root in the PP tests is rejected for both series and therefore we can conclude that two variables are integrated of order one, I(1).
In order to choose the most appropriate VAR model for the two countries, we perform the Akaike Information criteria (AIC), which shows that the optimal lag length of a VAR for China is 5, and for Brazil 7.

2.2 Testing for cointegration.

As a third step, we test for cointegration between *LnGDP* and *LnGini* using Hansen (1992) cointegration test (table II). When two variables are indeed I(1), testing for cointegration is a compulsory step, in order to verify whether there exists a long run relationship between them. Regressing an I(1) variable over another I(1) variable in the absence of cointegration makes the estimated coefficient statistically significant, but the estimated residuals are not stationary and the regression is called "spurious", because the statistical procedure infers (erroneously) a causal direct connection, when in fact there is not.
When cointegration holds, however, the same regression produces "superconsistent" estimates and standard statistical techniques can be used, as the residuals generated by that regression are stationary.
Hansen (1992) cointegration test generalizes previous tests to allow the constant vary with time, and tests whether the intercept is stationary. Since the alternative hypothesis of a random walk in the intercept is identical to *no cointegration*, the test statistic reported below is a test of the null of cointegration against the alternative of no cointegration.

Table II. Cointegration Test - Hansen Parameter Instability

Brazil

Series: LNGDP - LNGINI. Null hypothesis: Series are cointegrated				
Lc statistic	Stochastic Trends (m)	Deterministic Trends (k)	Excluded Trends (p2)	Prob.*
0.09644	1	0	0	>0.2

China

Series: LNGDP - LNGINI. Null hypothesis: Series are cointegrated				
Lc statistic	Stochastic Trends (m)	Deterministic Trends (k)	Excluded Trends (p2)	Prob.*
0.02699	1	0	0	>0.2

*Hansen (1992) Lc(m2=1, k=0) p-values, where m2=m-p2 is the number of stochastic trends in the asymptotic distribution.
Source: Own Elaboration.

Results show that the null hypothesis (of cointegration) cannot be rejected because Hansen's Lc statistic is significant at 20 percent, and moreover the parameters are stable, i.e. we find no evidence of unstable relationship between the variables (GDP per capita and Gini index) for both countries, Brazil and China.

2.3 Testing for causality

Cointegration, by itself, implies causality in at least one direction. The standard testing procedure for causality (i.e. Granger-causality test), is basically concerned with prediction, and not with *causality* in the strict philosophical sense. It is, therefore, connected to explanation, which demands an understanding of the underlying economic structure (i.e. "structural causality").

The dynamic Granger causality can be captured from the VAR model. However, since the variables are integrated, the application of the standard Granger causality test is invalid. Toda and Yamamoto (1995) suggest therefore an alternative procedure. When the variables are integrated, they propose to estimate a VAR model (the equations of the VAR can also be estimated separately) with ($k+d_{max}$) lags, where k is the standard optimal number of lags and d_{max} is the maximal order of integration that occurs in the process.

Once the VAR is estimated, we test that the coefficients of the first k lags of the dependent variable was simultaneously null.

In our dataset, Phillips-Perron test for unit root shows that both *LnGPD* and *LnGini* are I(1) for both countries, so d_{max}=1. Akaike lag length selection criteria instead suggests – as an optimal lag structure of a VAR – 5 for China and 7 for Brazil, and therefore the equations estimated to test for causality using Toda and Yamamoto (1995) procedure are – for each country - the following:

$$LnGDP = \gamma_0 + \sum_{i=1}^{n+1} \sigma_i LnGini_{t-i} + \sum_{i=1}^{n+1} \rho_i LnGDP_{t-i} + \varepsilon_t$$

$$LnGini = \gamma_0 + \sum_{i=1}^{n+1} \gamma_i LnGDP_{t-i} + \sum_{i=1}^{n+1} \rho_i LnGini_{t-i} + \varepsilon_t$$

Where $n=5$ for China and $n=7$ for Brazil, and the standard errors are robust according

to Newey and West (1987) to facilitate a valid inference.

The null hypothesis that *LnGini* does not Granger-cause *LnGDP* is:

$$H_0 : \sigma_1 = \sigma_2 = \ldots = \sigma_n = 0$$

While the null that *LnGDP* does not Granger-cause *LnGini* is:

$$H_0 : \gamma_1 = \gamma_2 = \ldots = \gamma_n = 0$$

Those hypotheses are tested using the Wald test. However, Toda and Yamamoto (1995) assert that Wald and LR tests are asymptotically equivalent in the present situation. Table III shows the results for both countries, Brazil and China, respectively.

Table III. Granger Causality Test (by Toda & Yamamoto)

Brazil

Dependent variable: *LnGDP*			
	Chi-sq	df	Prob.
LnGINI	**32.0497**	**7**	**0.0000***
Dependent variable: *LnGini*			
	Chi-sq	df	Prob.
LnGDP	8.6951	7	0.2753

China

Dependent variable: *LnGDP*			
	Chi-sq	df	Prob.
LnGINI	2.07793	5	0.8383
Dependent variable: *LnGini*			
	Chi-sq	df	Prob.
LnGDP	**10.9123**	**5**	**0.0531*****

Notes: df means degree of freedom. * Rejection of the null hypothesis at 1%. ** Rejection of the null hypothesis at 5%. ***Rejection of the null hypothesis at 10%.
Source: Own elaboration.

Table III shows that:

- For China, causality is unidirectional, going from *LnGDP* to *LnGini*. Hence, we are allowed to say that economic growth is causing (in the sense of Granger) income inequality.
- For Brazil, causality is also unidirectional, but goes from *LnGini* to *LnGDP*. That is, in Brazil, income inequality causes economic growth in the sense of Granger.

2.4Cointegrating equation

When variables are cointegrated, standard OLS-type procedures produce consistent estimates and therefore are allowed to carry on the analysis. Due to the fact that causality tests performed in the previous section suggest, in both countries, unidirectionality of the effects (specifically, *LnGini* Granger-causes *LnGDP* in Brazil, and *LnGDP* Granger-causes *LnGini* in China and not viceversa), we decide to use a Dynamic Ordinary Least Squares (DOLS) procedure by Stock and Watson (1993), which is a single equation regression estimation which includes leads and lags of the differentiated independent variable so as to make its stochastic error term independent of all past observation (serial correlation) and eliminate the bias of simultaneity within a sample (endogeneity, see Montalvo, 1995).

We therefore estimate two distinct equations, one for Brazil and the other for China, as follows:

$$\ln GDP_t = \beta_0 + \beta_1 trend + \beta_2 trend^2 + \beta_3 \ln Gini_t + \sum_{i=0}^{7} \varphi_i \Delta \ln Gini_t + \varepsilon_t$$

for Brazil where we have included two deterministic variables, trend e quadratic trend, and,

$$\ln Gini_t = \beta_0 + \beta_1 \ln GDP_t + \sum_{i=-2}^{5} \varphi_i \Delta \ln GDP_t + \varepsilon_t$$

for China.

The equation for Brazil includes, in addition to the standard covariates, a linear and a quadratic trend. This because we detected a long-term movement of *lnGDP* that *lnGini* and *ΔlnGini* have not been accounted for, which is moreover nonlinear, and this nonlinearity is detected by the quadratic term. The inclusion of a trend is a simplified way to capture the effect of an omitted variable bias, which is reasonable to assume in

this equation, since economic growth does not depend exclusively on variations of income inequality.

Such an effect was not detected for China, and therefore a standard DOLS model was estimated.

Despite in presence of unilateral direction of causality the exclusion of leads in the dynamic OLS regression produces better estimators in terms of mean squared error (Hayakawa and Kurozumi, 2008), for China we included two leads to guarantee stationarity of residuals.

Table IV. Dynamic Least Squares (DOLS).
Brazil

Dependent variable: *LnGDP* Cointegrating equation deterministics: Intercept, TREND, TREND^2 Fixed leads and lags specification (lead=0, lag=7)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LnGini	-13.34172	1.41728	-9.41	0.000
Intercept	59.00851	5.450209	10.83	0.000
TREND	.2863449	.0207356	13.81	0.000
TREND^2	-.0076621	.0006278	-12.20	0.000
R^2-adjusted	0.9883			

Table V. Dynamic Least Squares (DOLS).
China

Dependent Variable: *LnGini* Cointegrating equation deterministics: Intercept Fixed leads and lags specification (lead=2, lag=5)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LnGDP	0.5426794	0.2363498	2.3	0.039
Intercept	-.5325115	1.675147	-0.32	0.756
R^2-adjusted	0.8130			

Source: Own elaboration

Table IV and table V shows the results of the estimation for the equations for Brazil and China, respectively.

Results for Brazil indicate that there is a negative long-run relationship between Brazilian the GDP per capita and its Gini index of income inequality. The result indicates that 1 per cent increase in Gini index would cause a 13.3% decrease in the Brazilian GDP per capita.

As already mentioned before, the coefficients for the variable trend and trend2 are, respectively, positive and negative, indicating that once Gini index (and its

differentiated lags) has been accounted for, there is still a trend for GDP. The marginal effect of the variable trend is indeed positive until 1997, and negative thereafter[6], which indicates that on average, GDP grows more with time than income inequality until 1998 (included), and that GDP grows less with time than income inequality after 1998.

Estimation results for China (table V) indicate fairly clearly that, in China there is a positive long-run relationship between GDP per capita and the Gini index. These results indicate that a 1 per cent increase in GDP per capita causes a 0.54 per cent increase in the Chinese Gini index of income inequality.

2.4.1 Testing for stationarity of the residuals

In order to assess a valid inference and not spurious regressions, stationarity of residuals from the DOLS cointegrating regression is checked for both countries.

We used the Augmented Dickey Fuller test to verify whether the residuals of the regressions are stationary, and in particular we estimated the following equation:

$$\Delta\varepsilon_t = \alpha + \gamma_0\varepsilon_{t-1} + \sum_{i=1}^{n}\Delta\varepsilon_{t-i} + \omega_t$$

Where n is equal to five for China, and seven for Brazil. The null hypothesis of the Augmented Dickey fuller test is that residuals are integrated, so a Z-statistics with a p-value smaller than 0.10 means a rejection (at 10%) of the null of nonstationary.

Table VI reports the Z-statistics of these tests.

Table VI. ADF Test for residuals
H_0: series are integrated

Brazil		**China**	
Z-Stat	*Prob.*	*Z-Stat*	*Prob.*
-1.994	0.0514	-1.396	0.0964

Source: Own elaboration

Table VI shows that residuals from the cointegrating regressions of Brazil and China are found to be stationary, thus the cointegrating regressions are not spurious, because they produce stationary residuals.

[6]The marginal effect of trend on GDP, say, the derivative of GDP with respect to trend, is computed by summing the estimated coefficient for trend to 2*trend*the estimated coefficient for trend squared. It is then possible to compute the marginal effect of trend at each level of trend, which goes from 1 (1980) to 30 (2009). This marginal effect changes sign between a level of trend of 18 and 19, which corresponds to years 1998 and 1999.

3 Brazil and China: two different (*models*/strategies for) economic growth?

After a host of cross-country analyses, a closer look at certain case studies may be useful for a deeper understanding of thedistributional implications and their evolution, of growth. It is in this spirit that a different sort of exercise is being carried out, where we comparatively examine, through the history window afforded by time series, the experiences of China and Brazil: two countries that have been chosen also for they rose from low-[7] to the rank of middle income countries over the stretch of time 1980-2009, our most recent available data.

Economic expansion has made it possible to reduce the numbers of those living in extreme poverty both in Brazil and in China, though with different degrees of success[8]. Redistribution policies undertaken alongside the development process may help to modify potentially adverse distributional effects of growth, and even to speed up such a process, as we have seen the point in the EAM countries. They took places at different points of the time in the two economies, and their impact was different, too.

3.1 China

China's success in reducing poverty has been significant, however, it has not been accompanied by a reduction in household's income inequality. That, on the contrary, inequality has been on a steady increase, is a consequence of the very reforms undertaken since early 1980 to boost economic growth[9].

A land reform took place with the distribution to farmers of plots of land with the obligation of devoting a quota of the output to the state, but with the possibility to keep any excess for personal use or for selling. It is this reform and the associated policies that are esteemed to have had the greatest impact on poverty reduction (Ravallion and Chen, 2007). Chaudhuri and Ravallion (2006) pointed out that the initial reforms that ignited growth in China involved giving stronger incentives to farmers. But, it possibly

[7] Or *left hand side* of a Kuznets curve's turning point, if that were to exist.

[8]Generally speaking, economic growth is supposed to be associated with poverty reduction, through the tricle down effect. However, such relation is not so clear cut: for example, Ferreira, Leite and Ravallion (2010) show how Brazil's poverty dynamics reflects both the slow growth and a low growth elasticity of poverty reduction.

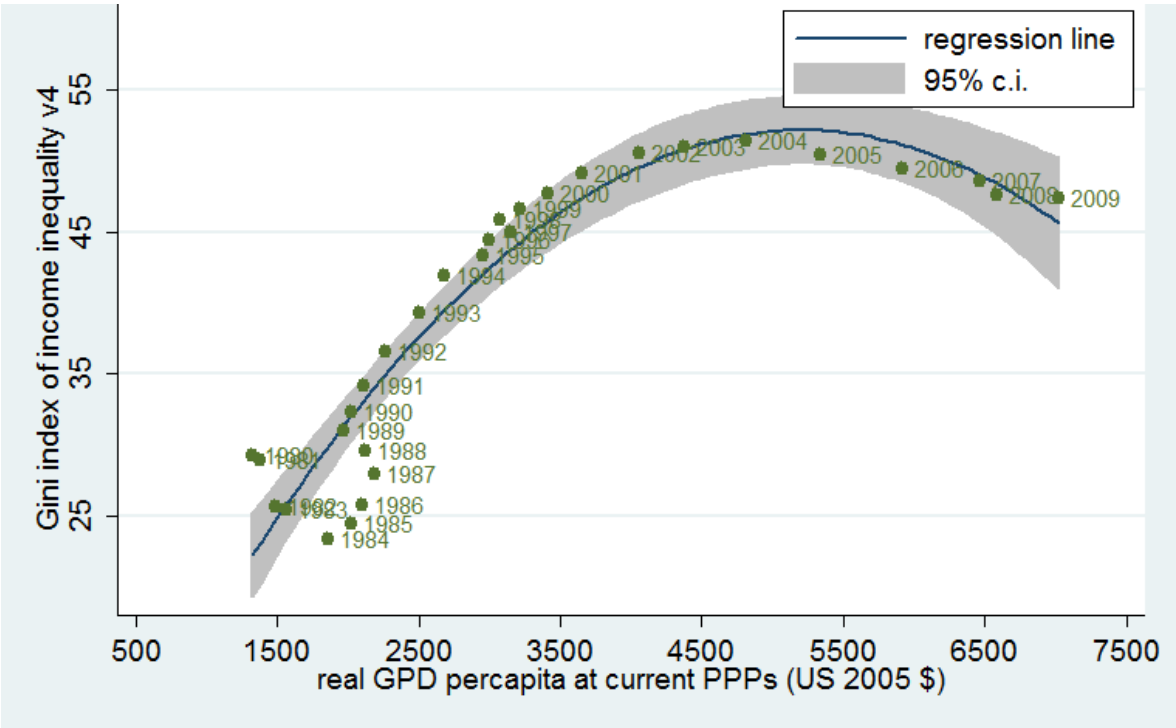
[9]Reforms were done in four major areas: trade liberalization, exchange rate (partial) liberalization and devaluation, promotion of FDI and FIE (foreign invested enterprises), and accession to the WTO.

led to some increased inter-farmer inequality, and efforts to somehow resist this component of inequality would likely have been counter productive.

Instead, the increase in *household's income inequality* can be attributed to the industrial policies, which led to resource concentration through measures favouring large (private as well as state-owned) firms. In brief, such policies introduced subsidies on the prices for key inputs (energy, utility and land), weak (or weakly enforced) regulation, especially as far as environmental impacts, favorable treatment in accessing to finance, especially for large enterprise, and finally restrictions on labor movements (Ravallion, 2009).

Figure 1 plots the country's time series for pc GDP in PPP (constant 2005 USD), and income inequality in the K-plane, showing also a quadratic fit. In this vein, Song et al. (2011) develop a growth model consistent with China's economic transition: high output growth, sustained returns on capital, reallocation within the manufacturing sector, and a large trade surplus. As in Figure 1, it shows that the relationship between economic growth and inequality is increasing at least until around 2004-5, to reverse afterwards, a pattern somewhat reminiscent of the structural dynamics predicted by Kuznets theory.

Figure 1. Gini index of income inequality *vs* per capita GDP. CHINA: 1980 – 2009.



Source: Own elaboration.

From the figure, the effects can be seen of the fact that China initiated in 1980 and proceeded boldly ever since on the road of economic reforms bringing about major structural changes and creating for most part of its recent history an export-led fast growth relying on large labor shifts from low-productivity agriculture to higher-productivity industry. After a timid beginning (as early as the 1970s), where the immediate effect was a lowering of inequality together with growth in per capita GDP, the further expansion path conjugates growth with a steady increase of inequality. High growth has been generating substantial social costs: in anticipation of the new 2011 Plan and probably as a delayed effect of the 1992 one (launched by Den Xiao Ping), both correcting for a larger domestic market thus a better distribution of income, the improvement of income distribution can be seen already starting 2004 (it being an explicit target of the 2011 plan).

Thus, the country's path from 1980 to the middle of the first 2000 decade, looks very much like the one predicted of developing countries by Kuznets' hypothesis, setting during such a period China apart from the countries of the East Asian Miracle. Thereafter, a change took place, ever since growth going together with inequality reduction.

Since mid 2000s China seems to have moved onto a model more similar to Brazil's and, to some extent, to that of the East Asian Miracle countries. The switch takes place at a point that may erroneously look like the inversion point of a Kuznets curve. Instead , it seems to take place in correspondence of a value of the Gini measure of income distribution, instead than at a value of per capita GDP.

3.2 Brazil

Redistribution with growth is claimed to have been the strategy Brazil deliberately chose, at least from one point in time (after the liberal reforms of the 1990s) onwards, with the recent left wing governments (Bourguignon 2004; Rodrik 2005). This however seems to have completed a long process started already in the mid 1970s, and frozen for a time during the 1980, when growth in pc GDP went on without any further inequality improvement. Brazil returned to grow with redistribution since about year 2000.

In the meantime, the country has grown from being a low income to qualifying as a middle income country (in the middle of the 1980s), and recently further growing to an

upper end middle income country with a per capita GDP of a little over $ 8,500 USD (at PPP).

Brazil has in fact changed its development strategy implementing the liberal reforms associated to the so-called Washington Consensus in the 1990s by opening its economy, reducing the role of the state and applying restrictive macroeconomic policies. The abandonment of the exchange rate management mechanism in 1999 and the adoption of a policy framework combining inflation targeting and better fiscal management, favored a considerable improvement in macroeconomic fundamentals. This has permitted growth rates higher than in most other Latin American countries since the early 2000s, with a pattern on the whole less export oriented than China's. The two economies are bound together in many ways, and this adds to the interest in comparing them[10].

Ravallion (2009) shows that Brazil has complemented market-oriented reforms with progressive social policies aimed directly at poverty reduction. That is, Brazil after its market-oriented reforms of 1994 implemented active pro-poor distributional policies, notably, social assistance spending, that were critical to substantial reductions in poverty.

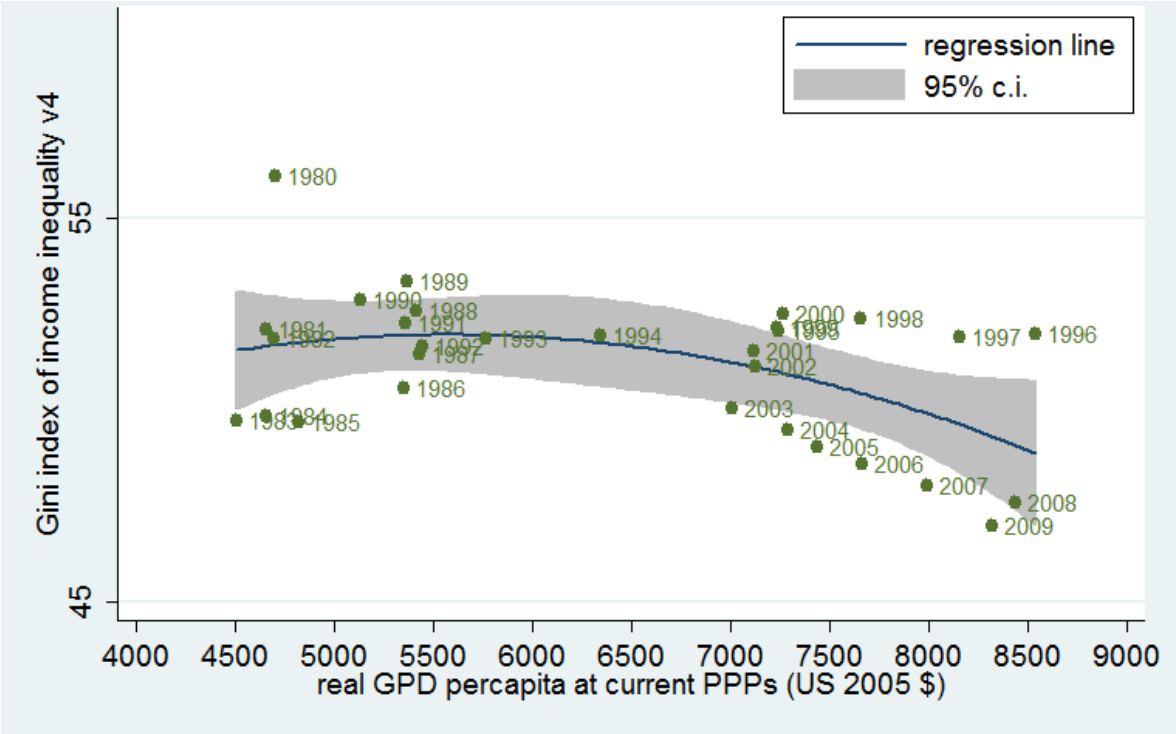
Thus, though in the last two decades the country has managed to grow at an average rate of 3.2% (but definitely less than China's), this has raised the question of as to why.

The economic policies implemented by the Brazilian Government since the 2000's had the target of promoting economic growth along with the expansion of the formal labor market, wages increase and redistributive public policies such as passive and active labor market policies, and massive cash transfers programs targeting poor households. We surmise the explanation may lie in this combination, that only since 2004 China has "discovered".

Figure 2 plots the two-variable time series for Brazil in the *Kuznets-plane*.

Figure 2. Gini index of income inequality *vs* per capita GDP. BRAZIL: 1980 – 2009.

[10]China's increased weight in world trade has considerably influenced this country: other than benefiting from the terms of trade since 2002, Brazil has maintained a comparative advantage in the production of commodities, increasingly satisfying China's hunger (Cardoso and Teles, 2009, Lattimore and Kowalski, 2008).



Source: own elaboration.

Figure 2 exhibits an almost flat central piece, whereby the income index seems is confined within a corridor with mid value around 50%, showing the growth without redistribution of the 1980, after a similar spell of growth in the mid seventies. Pc GDP continues to grow well into the years 2000s, since early, mid 1990s income concentration beginning to decrease, and sensibly so. Indeed, between 1993[11] and around 2008, the Gini index fell by 9%, the decline considerably accelerating after 2000.

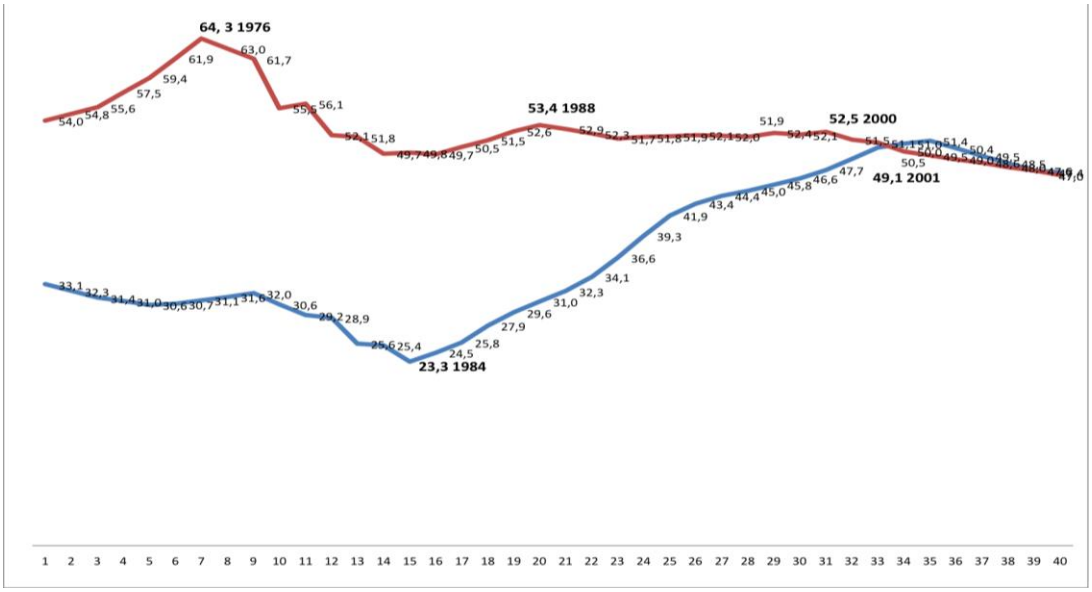
One can impute easily this to such programs as the family redistribution program called *Bolsa familia* and to the 25% rise in minimum wages, introduced by the recent left wing governments (though anticipated by other measures of previous governments, among them in particular Cardoso's).

3.3 Brazil and China: judgment and contrast

It may be useful a closer look at the comparative evolution of Gini indices in the two countries, see Figure 3.

[11]Thus, since already in the years of the implementation of the liberalization policies of the Washington Consensus. For an interpretation of the evolution of the Brazilian economy in terms of structural growth pattern, see Feijo, Lamonica, Punzo (2011).

Figure 3. Gini index of income inequality. –BRAZIL, –CHINA: 1970 – 2009.



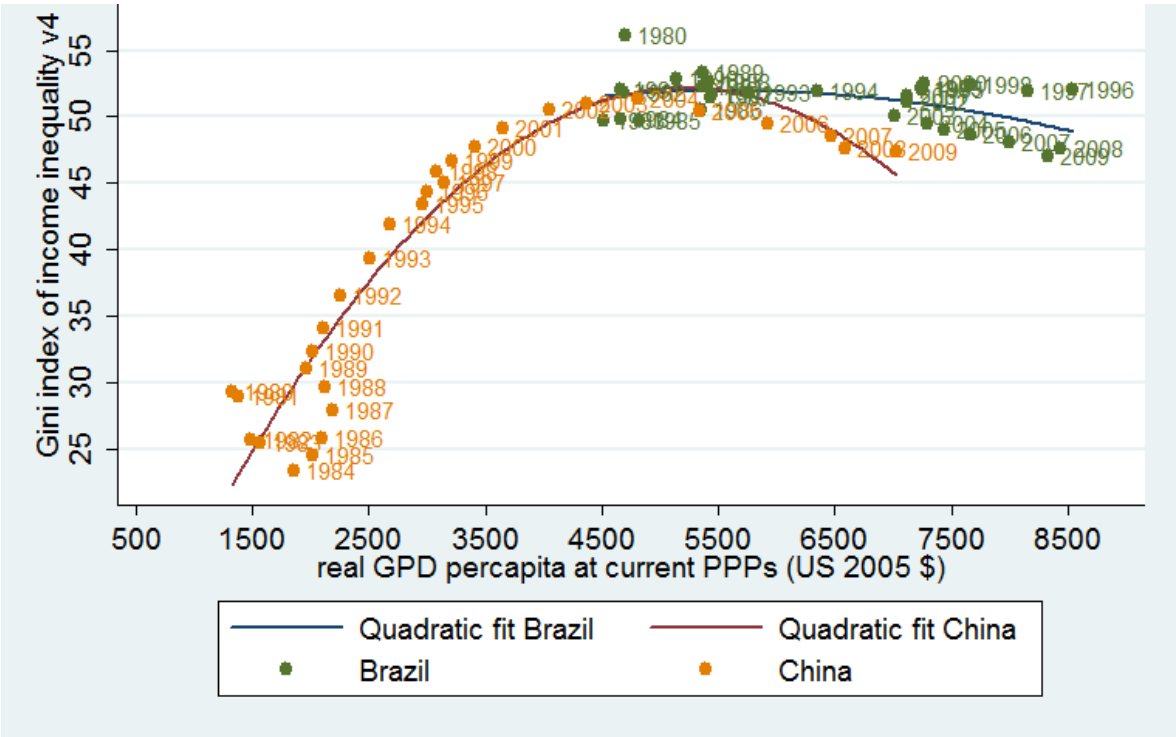
Source: own elaboration.

One sees a process (for China) of steady increase, starting at a minimal value in 1984, the immediate result of the 1980 reforms or the delayed result of the previous economic order, till a value round roughly 2001. On the other hand, after an all time high in 1976 (years of the Import Substitution Policies, ISI), and a second one in 1988 (years of the second miracle[12]), Brazil's index declines first softly (throughout the years of the liberal reforms) and then decidedly after 2000, the years across the Cardoso-Lula da Silva mandates. China's Gini overtakes Brazils' around 2001, and thereafter the two countries stay close, from a value slightly above 49% but decreasing.

This "convergence in income distribution" is the more interesting if we review the two graphs for China and Brazil together in the K-plane (Figure 4):

Figure 4. Gini index of income inequality *vs* per capita GDPP.

[12]See Castro and Pires de Souza (1985)



Source: Own elaboration.

The figure represents the time evolution by which two low-income countries graduated to the middle-income club. There are a few comments worth making about it. First ,we also see that "convergence in Gini" does not go together with the more conventional notion of convergence in pc GDP. On the other hand, the picture shows that, beyond *conventional* catching up in pc GDP, something important may be going on in the associated income distribution. It is here that one appreciates the difference between the experience of the two countries (also against other emerging economies). It is here that we see the sense and purpose of the exercise. In the *K-plane*, for example, there seems to be no evidence that in the 1980s Brazil was in a so-called middle-income trap, as often said, nor that China is on the verge of falling into it. A trap may *hide* a growth model switch.

We see China following an expansion path that, until around 2004, conjugates pc GDP growth with steadily increasing income concentration. Ever since (still now, it seems) that relation seems to have been reversed, income concentration being on the decrease, growth going on. But this is precisely the path that Brazil has been following (though with bumps and other irregularities) ever since the 1980s (and perhaps before). Such behavior has been variously interpreted[13], the prevailing interpretation being precisely that, together with other Latin American and South African countries, Brazil would

[13]See e.g. Palma (2011).

have been caught in a so called "middle income countries trap"[14], a fear for the near future of China. The explanation of the existence of the trap is connected with loss of competitiveness vis-a-vis lower income countries, and the incapacity of climbing up the technological ladder. Its implication is the slowing down in the long term growth. A time series, instead of a cross country, approach puts growth in perspective.

Our explanation is therefore different, being based upon the qualitatively properties of the relation between the two country's variables in the *K-plane*. China has thus been following a given *model of growth* since mid 1970s till a switch took place that may erroneously look like at the turning point of a Kuznets curve. The switch point is determined not so much by the level of per capita income (as it would be in the latter) as, rather, by the level of income concentration (or by the pair of coordinates, with income concentration as the trigger[15]).

It is interesting such switch value (a Gini indexat roughly 50%) also belongs to Brazil's path (and to Argentina's as well as probably to other countries), and that thereafter China and Brazil models (with different growth performances) have been somewhat similar. The figure suggests the existence of such a distinct model of growth, prevailing in Brazil ever since the beginning of the1990s, in fact beginning in the 1970s, where growth (though more moderate than in China) is conjugated with a steady path of reduction in income disparities. It is to this model to which China seems to have switched recently.

Summarizing, the above econometric exercises show that Brazil and China have two different "way" of interpreting economic growth, because during its growth process, Brazil tends to decrease inequality, while China increases it. Cointegration has been run over the period 1980-2009 for both countries, so our results are averages of this whole period. In China, however, during the last 5 years it seems (graphically) that the process has been reversed, because despite the economic growth, households' income inequality has decreased.

So, one can (tentatively) conclude that in China a *Kuznets-like* structural change mechanism has indeed been at work, a fact that seems to set the country apart from all other countries of the so called East Asian Miracle (EAM), as the story told by Stiglitz

[14]See Eichengreen *et als* (2012a), (2012b), (2013).

[15] Though in the specific case of these two countries the level too coincides. A look at Argentina shows the same switch though at much higher level of pc GDP.

depicts[16]. China's model would be one capital-accumulation driven, with a mix of public and private investment and major structural changes that altered the equilibrium between country and town, and agriculture and industry. This is a classical picture very much in the mind of Kuznets, whereby development goes along with increases in inequality, the historical experience of many a country (Stiglitz, (1996)).

On the contrary, the reverse *causal* relation found for Brazil appears more similar to the one operating in EAM countries, growth in per capita GDP feeding into the reduction of inequality, and the latter further feeding into growth. An explanation can be found in the redistributive policies implemented by the recent left wing party governments, but also by the liberalization policies of the end of the 80s.

If we like to put it in terms of a *Kuznets-like* curve (invoking the justification given by Palma, while we seem to have China on a classical one, we would have Brazil on a "U" or *anti-K* curve (*and* the same would be implied for the EAM countries before it, if Stiglitz is right). Our considerations, however, refer to the dynamic implications of the K and anti K relationship, in other words to the relationship between (differences in) pc GDP and (differences in) Gini indices. We will call the latter the *dynamic K* and (*dynamic)anti-K curves.* The ambiguity of the approach is in that, while stated in terms of point variables (levels of pc GDP and of Gini indices), the interpretation almost always refers to the rates of changes of the former.

Evidence for an U and an inverted U, on the other hand, can be used to support the thesis of the "end of the K curve", of its outright non existence, or finally to reject the thesis that "things have to get worse before getting better". Isn't this latter possibility that the EAM has shown to us?

4 Concluding remarks

We carried out an exercise in comparing two emerging countries against the backdrop of an extensive and *sort of* imposing literature discussing less developed (and emerging) countries against developed ones. Some such literature refers to the K curve and the

[16]This also seems to fit with other evidence, but it contradicts the classical (and also Kaldorian) theory according to which it is an income distribution eschewed in favor of the wealthy ones that generates growth through the latter higher propensity to save and invest.

related theory of development stages; some provide reformulations or give alternative explanations of the same curve. Most of the literature is however critical[17].

Recently, both Stiglitz and Palma came to conclude that the "K curve does not exist", or to put it in the latter's words: there is not necessity that "to get better it first has to get worse". Shin in a more conciliatory way has tried to make theoretical sense of Barro's (2000) findings that the relation (if it exists) applies differently to countries in different stages of development. This reminds us that the K theory is made up in fact of two parts, of which Shin (and partially Stiglitz) take up only the latter, a dynamic relationship (therefore, a prediction) between income concentration and the (rate of growth of) GDP (per capita), the former being a statistical evidence for an inverted U curve and Kutznets' structural change implications.

Other contributions have questioned the direction of "causality" (or the sign of the coefficient) without questioning the stability of the relation across countries (implicitly assumed to have a homogenous structures), finally some have questioned the foundations of a cross country regression over a pool of in principle heterogeneous structures[18].

Sharing the latter criticism and being a little careful about inference from cross countries econometrics; we have studied the (time) evolution[19] and the long run relationship between income inequality and per capita GDP over the period 1900-2009. In other words, we have looked at the Kutznets-like relation during the chosen time interval within each of the two countries, first separately and then comparatively.

Relations unveiled by our descriptive statistics, regressions and cointegration exercises on variables associated with Kuznets' theory are not in principle of the Kuznets type, first of all because, of course, while the brand name K-curve is derived from cross country analysis, our approach relies on time series. However, it is justified to refer to Kuznets's dynamic prediction. With this in mind, we have compared two countries that are classified as emerging economies as they have risen from the rank of low- to that of middle-income countries over the time period we study. The history of either of them could be expected to lie on an upward branch of a *K-like* curve. Contrary to such expectations, Brazil looks more like those countries of the East Asian Miracle (studied

[17]Palma (2011) rightly challenges the former use of the curve made recently, though it is suggested in Kuznets (1955).

[18]This latter is eventually the main point in Palma (2011). As for the different positions, they are usefully synthetized in Table 1 of Shin (2002).

[19]I.e. the realizations of the implied dynamical law.

by Stiglitz, 1996) where redistribution went along with growth and was fed with the resources the latter generated. At least until the recent policy reorientation, at the beginning of the second decade of the 2000, whose effect may still being working out fully, China did not belong to such club. It shifted to it after such a date.

If this is true, there might be two, not just a single version of a *Kuznets-like* curve: one looking like the conventional, and an upside down or *anti-Kutznets*, as seems to be implied by Stiglitz. Both may arise in less developed countries[20].

This finding is corroborated and strengthened by our co-integration exercise. As in one case we have structural change with massive capital accumulation-driven growth pattern (very much in the picture of a Kuznets's theory) and in the other a consumption-driven one (very much in an seemingly Keynesian demand-driven one) we feel justified to talk of two distinct models of growth at least till the mid 2000**,** withBrazil in a bunch with countries of the East Asian Miracle, China an Asian outlier.

According to the 2005 evidence produced by Palma (2011), a large number of countries, (accounting for almost 80% of total population) China among them, line up inside a cloud expanding horizontally in the K-plane within a Gini corridor with middle value around 40%. Associated values of the pc GDP may thus vary a lot, at the far right side the rich countries creating a vertical cloud along the Gini axis. Latin American countries (with Brazil) would be an outlier having a much higher Gini value.

i. If data does not lie, China has reached up to Brazil 's *distributive life of its own*, soon *after 2005*, and thereafter together they went down a downward sloping path in terms of income concentration. This suggests at least asking oneself: is a cross-country picture misleading?

ii. At hitting a Gini value similar to the one of Brazil, China seems to jump or switch onto an expansion pattern that in the K-plane looks pretty much like the latter's. This seems to suggest the existence of a switch value of the Gini at which *a model change takes place*. However, Brazil was on one such a pattern (unsteadily, though already since mid 1970s), so is the switch point country-specific, or "club of countries" specific.

Most of the past Chinese growth has gone along with huge deferred social and environmental costs. The bill has most likely come due now, at the time where income inequalities and in particular demand for higher wages are also on the surge, supported

[20]And not (as suggested by Barro and rationalized by Shin) at different stages of development.

by the new shortage of cheap labor. The 2011 reorientation of the economy towards a stronger domestic market, a lesser dependence of a weak international one, has to make do with such extra costs, hence the current slow down may not be a short term pause, it might reflect a serious re-orientation of the economic policy that tackles income disparities among other things.

Brazil's redistributive and integrative income policies of the years 2000, showing up in the decline in the concentration index, have financed a stronger consumption demand, with the birth and growth of a low middle and middle class, with higher services demands. To cater for such new demand, the Brazilian economy will have to grow and diversify, tilting the balance towards the production of services rather than the extraction of resources to export (the international slack will help in this direction). But, more importantly, most of the new demand reckoned in the statistics as households' consumption, is in fact households' investment for the future: education, health, more home computers, etc. Brazil has been statistically 'consuming", to be able to grow more in the future, it's traded the present for the future.

It's difficult to see it now, in the middle of the present turmoil, though.

References

Alesina, A., and D. Rodrik, (1994). "Distributive Politics and Economic Growth," *Quarterly Journal of Economics* 109(2), pp. 65-90.

Barro, R. (2000). "Inequality and Growth in a Panel of Countries",*Journal of Economic Growth* 5(1), pp. 5–32.

Banerjee, A.V.,E. Duflo (2003). "Inequality and Growth: What Can The Data Say", Journal *of Economic Growth*8(3), pp. 267–99.

Barros de Castro, A. and F. E. Pires de Souza (1985). *A Economia Brasileira em Marcha Forcada*. Paz e Terra, Rio de Janeiro:. (*perhaps, one could say á la Kuznets);*(*perhaps, one could say á la Kuznets);*

Berg, A., J. Ostry, and J. Zettelmeyer (2012). "What Makes Growth Sustained?" *Journal of Development Economics* 98(2), p. 149-166.

Bourguignon, F. (2004). "The Social Consequences of Economic Growth," in Aghion and Durlauf, (Eds), *The Handbook of Economic Growth*, Amsterdam: Elsevier.

Cardoso, E. and V. K. Teles (2009). "A brief history of Brazil's growth", Paper presented at the OECD Seminar on Growth Performance and Sustainability in the Enhanced Engagement Countries, Paris.

Chaudhuri, S., and M. Ravallion (2006). Partially Awakened Giants: Uneven Growth in China and India‖ in *Dancing with Giants: China, India and the Global Economy*, ed. by L. A. Winters and S. Yusuf (Washington: World Bank).

Choi, C.-Y., L.Hu, M.Ogaki, (2008)"Robust estimation for structural spurious regressions and a Hausman-type cointegration test", *Journal of Econometrics* 14, 327-351.

Deininger, K., and L. Squire (1998). "New Ways of Looking at Old Issues: Inequality and Growth," *Journal of Development Economics* 57(2), pp. 259–87.

Eichengreen, B., Donghyun Park and K. Shin (2012a), "When Fast Growing Economies Slow Down: International Evidence and Implications for China," *Asian Economic Papers* 11, pp.42-87.

Eichengreen, B., Dwight Perkins and K. Shin (2012b), *From Miracle to Maturity: The Growth of the Korean Economy*. Cambridge, Mass.: Harvard University Press for the Harvard Asia Center.

Eichengreen B., Park D., Shin K. (2013), "Growth slowdowns redox: new evidence on the middle-income trap", *NBER Working Paper 18673*, http://www.nber.org/papers/w18673.

Feenstra, R. C., R. Inklaar and M. P. Timmer (2013).“The Next Generation of the Penn World Table”, available for download at www.ggdc.net/pwt

Feijo, C., M. Tostes Lamonica, L. F. Punzo (2012), *“*Brazil’s economy- 1971 2008 growth patterns and structural change*”*, in Punzo, Feijo, Puchet (eds), *Beyond the Global Crisis: Structural Adjustments and Regional Integration in Europe and Latin America* (Routledge Studies in the Modern World Economy),

Ferreira, F., Phillippe G., and M. Ravallion, M. (2010). “Poverty reduction without economic growth?: Explaining Brazil's poverty dynamics, 1985-2004,” *Journal of Development Economics* 93(1), pp. 20-36.

Forbes, K. J. (2000). “A reassessment of the relationship between inequality and growth,” *American Economic Review* 90(4), pp. 869-887.

Gobbin N., G.Rayp (2008). “Different ways of looking at old issues: A time-series approach to inequality and growth”, *Applied Economics* 40(7), pp. 885-895.

Hansen B.E. (1992). “Tests for Parameters Instability in Regressions with I(1) Processes”, *Journal of Business and Economic Statistics* 10, pp. 321-335.

Hayakawa K. and E. Kurozumi (2008). “The role of “leads” in the dynamic OLS estimation of cointegrating regression models”, *Mathematics and Computers in Simulations* 10, pp. 555-560.

Herzer, D., S.Vollmer (2012). “Inequality and growth: evidence from panel cointegration”, *Journal of Economic Inequality* 10, pp. 489-503.

Johansen, S. (1995). *Likelihood-based inference in cointegrated vector autoregressive models*, Oxford University Press, Oxford.

Johansen, S. (1988). "Statistical Analysis of cointegration vectors", *Journal of Economic Dynamics and Control*, vol. 12, pp. 231-254.

Juselius, K., (2006). The Cointegrated VAR model: Methodology and Applications, Oxford University Press, Oxford.

Kuznets, S. (1955). "Economic Growth and Income Inequality", *American Economic Review* 45(1), pp. 1-28.

Lattimore, R. and P. Kowalski (2008). "Brazil: Selected Trade Issues", *OECD Trade Policy Working Paper* No.71, OECD, Paris.

MacKinnon, J., A. Haug, and L. Michelis (1999). "Numerical Distribution Functions of Likelihood Ratio Tests for Cointegration", *Journal of Applied Econometrics* 14(5), pp. 563-577.

McCallum, B. (1984), "On low-frequency estimates of long-run relationships in macroeconomics", *Journal of Monetary Economics* 14, pp. 3-14.

Montalvo, J.C. (1995). "Comparing Cointegrating Regression Estimators: Some Additional Monte Carlo Results", *Economic Letters* 48, pp. 229-234.

Newey, W.K. and K.D. West (1987), "A simple, positive semi-definite heteroscedasticity and autocorrelation consistent covariance matrix," *Econometrica* 55, 703-708.

Okun, A.M. (1960). "Equality and Efficiency: The Big Trade Off" (Washington, Brookings, 1975).

Palma , J. G. (2011) "Homogeneous middles vs. heterogeneous tails, and the end of the "Inverted-U": the share of the rich is what its all about", *CambridgeWorking Papers in Economics (CWPE)*.(Available at:http://www.econ.cam.ac.uk/dae/repec/cam/pdf/cwpe1111.pdf

Perotti R. (1994), "Income Distribution and Investment", *European Economic Review* 38, p.827-835.

Perotti R. (1996), "Growth, Income Distribution and Democracy: What the Data Say", *Journal of Economic Growth* 1(2), pp.149-187.

Persson T., G. Tabellini (1994), "Is Inequality Harmful for Growth", *American Economic Review*, 84 (3), pp.600-621.

Ravallion M., and Chen, (2007). "China's progress against Poverty", *Journal of Development Economic*s 82(1), pp. 163-184.

Ravallion, M. (2009), "A Comparative Perspective on Poverty Reduction in Brazil, China and India", *World Bank Policiy Research,* Working Paper No. 5080.

Risso, A., and E. Sanchez Carrera (2012). "Inequality and Economic Growth in China", *Journal of Chinese Economic and Foreign Trade Studies* 5(2), pp. 80-90.

Risso, A., L. F. Punzo, and E. Sanchez Carrera (2013). "Economic growth and income distribution in Mexico: A cointegration exercise", *Economic Modelling* 35, pp. 708-714.

Rodrik, D. (2005). "Growth Strategies," in: Philippe Aghion & Steven Durlauf (ed.), *Handbook of Economic Growth,* edition 1, volume 1, chapter 14, pages 967-1014.

Stiglitz, J. (1996). "Some lessons from the East Asian Miracle", *The World Bank Research Observer,* vol. 11, no. 2 (August 1996), pp. 151-77

Song, Z., K. Storesletten, and F. Zilibotti. (2011). "Growing Like China", *American Economic Review* 101(1), pp. 196-233.

Stock, J. H. and M. W. Watson (1993), "A Simple Estimator of Cointegrating Vectors in Higher Order Integrated Systems," *Econometrica*61(4), pp. 783-820.

Toda H. and P.C.B. Phillips (1993). “Vector autoregressions and causality”, *Econometrica* 61(6), pp. 1367- 1393.

Toda, H., and Yamamoto, T., (1995), “Statistical inference in vector autorregressions with possibly integrated processes”, *Journal of Econometrics* 66, pp. 225-250.