

# Inequality and Growth Re-Examined

Jacob Assa

New School for Social Research, New York, USA

Email: [assaj401@newschool.edu](mailto:assaj401@newschool.edu)

Received November 28, 2011; revised December 28, 2011; accepted January 5, 2012

## ABSTRACT

This paper examines the relationship between income inequality and subsequent economic growth. It builds on the model suggested by Alesina and Rodrik (1994) in which inequality works through greater demands for redistribution to slow down growth, and the idea by Ray (1998) that inequality negatively affects savings, work capacity, economic incentives, and access to and efficiency of credit and financial markets. Using an updated dataset and seven model variants, both OLS and 2SLS regressions find a strong negative effect of income inequality on future growth. The effect is considerably stronger for developing countries, but the existence or absence of democracy has no effect on either the relationship between inequality and growth or on the rate of growth itself. There is also no support for Barro's (2008) claim that inequality impacts growth positively in developed countries.

**Keywords:** Economic Development; Growth; Income Distribution; Inequality

## 1. Introduction

Inequality may be objectionable on intrinsic, moral grounds, as well as for functional reasons. The latter are based on the idea that inequality has an instrumental role vis-à-vis other economic processes, such as growth and development. While this is true for countries at any stage of development, Ray (1998) suggests that the consequences “are far more acute for developing countries than for their economically developed counterparts” [1]. Barro (2000) finds that inequality indeed has a negative impact on growth in poor countries, but a positive effect on growth in rich countries [2]. Furthermore, the causality between inequality and growth runs in both directions. For example, Kuznets's inverted-U hypothesis posits that inequality first rises and then drops as an economy grows. This paper will focus on impacts in the other direction—the effects of initial inequality on subsequent growth.

Recent research confirms the overall negative effects of inequality on growth. Fosu (2009) finds that initial inequality negatively affects the impact of GDP growth on poverty reduction for countries in sub-Saharan Africa [3]. Qin *et al.* (2009) shows the negative consequences of inequality in China on GDP and sectoral growth [4]. Castelló-Climent (2010) also finds a negative effect of inequality (both income and human capital) on economic growth but only for low and middle-income economies [5].

The theoretical motivation for this study follows the analysis in Alesina and Rodrik (1994, AR below). AR explains the effects of greater inequality (of income, education and land ownership) working through increased

demands for redistribution and higher taxes, resulting in lower growth rates. Other channels mentioned by Ray include the negative effects of inequality on savings, work capacity, economic incentives, and access to and efficiency of credit and financial markets [6]. Barro (2000) confirms the role of political economy, credit market imperfections and saving rates, and adds social unrest to this list [7]. In addition to these direct effects, De Gregorio and Lee (2004, quoted in Barro 2008) point out indirect effects of higher inequality: raising fertility, lowering secondary school enrolment and weakening the rule of law [7].

AR discusses heterogeneity in factor ownership (e.g. land ownership, or income and education as proxies) as the cause of differential individual preferences for redistributive policies. Such different preferences would result in a policy compromise (based on the median-voter theory), and the accompanying growth rate may not be the maximum growth rate. The authors clearly find that “the more unequal is the distribution of income and wealth, the lower is the rate of growth” [6]. This is because there would be more pressure for (distortionary) redistributive policies in more unequal societies, reducing the long-term growth rate. However, AR finds no effective difference in growth rates between democracies and non-democracies (since even dictatorships are subject to some pressure). This paper will attempt to study the overall relationship between inequality and growth, regardless of channel, using an updated dataset.

The next section presents the basic model used in this paper and several variants. Section 3 describes the data

set, which is then used to estimate the model in Section 4. Section 5 concludes.

## 2. The Model

Following AR, this paper will examine the impact of initial income inequality within different countries on their subsequent growth rates. The basic model is:

$$Y_i = \alpha_0 + X_i\beta + \varepsilon_i \quad (1)$$

where the dependent variable,  $Y_i$ , is the compound annual growth rate (CAGR). It is calculated for the period 1998-2008 for each country in the sample. The calculation is based on the geometric mean of per capita GDP (in constant 2005 PPP) for the first and last years:

$$CAGR = (Y_{2008}/Y_{1998})^{(1/10)} - 1$$

The independent variables matrix,  $X_i$ , includes GINI data around 1998 (see Section 3 below), per capita GDP in 1998 (in constant 2005 PPP) and the 1998/99 primary enrolment ratio.

Including a dummy variable for developing countries is useful in examining Ray's claim that inequality affects developing countries more intensely than developed ones:

$$Y_i = \alpha_0 + X_i\beta + Dev_i + \varepsilon_i \quad (2)$$

where  $Dev_i$  takes a value of 0 for developed countries (high-income economies in the World Bank classification, see Section 3 below), and 1 for developing countries (all other economies).

Furthermore, following Barro (2008), the model for the longer sample (using 2SLS) will include an interaction term between the log of per capita GDP in 1998 and the GINI coefficient, to examine Barro's finding that inequality has a negative effect for poor countries but a positive one for rich countries [7]. This will be further tested by running separate regressions for developed and developing countries.

An extended model includes a democracy dummy based on the EIU democracy index, in order to check whether the type of regime has an effect on the relationship between inequality and growth (posited by AR to work through pressure for redistribution):

$$Y_i = \alpha_0 + X_i\beta + Dem_i + \varepsilon_i \quad (3)$$

where  $Dem_i$  is the democracy dummy, taking a value of 1 for full or flawed democracies and 0 for non-democratic regimes (hybrid and authoritarian). In addition, the model will be estimated with both the development and democracy dummies.

## 3. The Data

Given the scarcity of data on land inequality, GINI coefficients for income have been used instead (data was

available from the World Bank for 141 countries around the year 1998). Following AR, and "to avoid reverse causation from growth to distribution" [6], the sample is first limited to countries with GINI data around the beginning of the period over which growth is measured. However, only 100 of the 141 countries in the full sample have GINI coefficients between 1992 and 1998, preceding the period of growth we seek to explain. For these 100 countries, OLS has been used. In order to include the other countries (with GINI data between 1999 and 2005), Two-Stage Least-Squares estimation is then used to account for the possible endogeneity from growth to inequality during the same period. Appendix I provides a list of all 141 countries in the larger sample and their corresponding dates for income GINI coefficients.

The dependent variable is the compound average growth rate of GDP per capita between 1998-2008 (data for 2009 has been excluded to avoid the effects of the financial crisis), and will be regressed on GINI around 1998, GDP per capita in 1998 and primary education enrolment in the school year 1998/99. As suggested in AR, including initial income per capita accounts for the possibility of convergence, while including initial primary enrollment measures human capital levels.

In addition, two dummy variables—for stage of development and type of regime—will be used. The World Bank income classification (as of January 2011) used in the analysis is as follows (based on annual per capita income):

- 1) Low-income economies (\$995 or less);
- 2) Lower-middle-income economies (\$996 to \$3,945);
- 3) Upper-middle-income economies (\$3,946 to \$12,195);
- 4) High-income economies (\$12,196 or more).

For the purpose of the dummy variable  $Dev_i$ , the first three groups above are considered developing countries ( $Dev_i = 1$ ), while the last group—high-income economies—is considered developed countries ( $Dev_i = 0$ ).

Data on democracy has been compiled by the Economist Intelligence Unit since 2006. The third edition of the EIU's Democracy Index reflects the situation as of November 2010. As described by the report, "the index provides a snapshot of the state of democracy worldwide for 165 independent states and two territories. [The index] is based on five categories: electoral process and pluralism; civil liberties; the functioning of government; political participation; and political culture. Countries are placed within one of four types of regimes: full democracies; flawed democracies; hybrid regimes; and authoritarian regimes" [8].

This paper uses EIU's democracy type and overall score:

- Full democracies—score of 8 to 10
- Flawed democracies—score of 6 to 7.99
- Hybrid regimes—score of 4 to 5.99
- Authoritarian regimes—score of 0 to 3.99

For the purpose of the dummy variable  $Dem_i$ , the first two groups are considered here to be democracies ( $Dem_i = 1$ ), while the last two groups are considered non-democracies ( $Dem_i = 0$ ).

#### 4. Estimation

The model and its different variants are estimated twice—once with OLS for countries where GINI data was available up to 1998, and once with 2SLS for the whole sample, including those countries with GINI coefficients after 1998. The use of an instrumental variable in the latter case is meant to deal with a potential endogeneity, since growth between 1998 and 2008 may have affected the GINI index measured within that period.

**Table 1** presents the results of the OLS regression for the 100 countries that have GINI coefficients for 1998 or slightly before (1992-1998). This restriction is applied to avoid reverse causation from economic growth to inequality. The results confirm AR’s finding that “income inequality is negatively correlated with subsequent growth” [6]. The coefficient for the GINI variable is negative and statistically significant at the 1% level in all 7 columns (the t-statistics are also quite high). On average, a one standard-deviation increase in the GINI index results in 6%-9% lower growth between 1998 and 2008. As more variables are added, the sample sizes decreases (only 72 countries have data on primary education or democracy).

The effect of initial per capita income in 1998 is small but negative and significant. The regressions including this variable also had higher adjusted  $R^2$  values, confirming AR’s point about using initial income per capita to control for convergence. As Barro puts it, “countries grow faster if they start poorer” [7]. Whether a country is developing or not has a large negative coefficient of -1.84 (significant at the 5% level), supporting Ray’s claim that the effect of inequality is much stronger in developing countries. The democracy dummy in Columns (5) and (6) is not statistically significant, implying that there is no difference in the rate of growth between democracies and dictatorships. The interactive democracy-GINI term in Column (7) is also statistically insignificant, supporting AR’s conclusion that there is no difference between democracies and non-democracies in terms of the relationship between inequality and growth.

In order to take advantage of the larger sample, the models were also estimated for all countries in the sample (including those with GINI coefficients up to 2005). To correct for a possible endogeneity bias (with growth affecting inequality), 2SLS regressions were used with primary school enrolment serving as the instrumental variable for GINI. This seemed a reasonable choice of instrument, since an unequal distribution of income is often correlated with unequal access to education, while the latter is not correlated with growth. Furthermore, as

**Table 1. Growth regressions for 1998-2008 using GINI coefficients up to 1998 OLS (heteroskedasticity-robust standard errors, variant HC1).**

Sample Size	N = 100	N = 72	N = 72	N = 72	N = 69	N = 69	N = 72
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<b>Constant</b>	7.07*** (7.59)	2.76** (2.25)	2.99** (2.33)	5.00*** (3.98)	3.45*** (2.81)	4.40*** (3.450)	4.27*** (3.25)
<b>GINI</b>	-0.09*** (-4.50)	-0.06*** (-3.10)	-0.09*** (-3.96)	-0.09*** (-3.65)	-0.09*** (-4.40)	-0.08*** (-3.02)	-0.07*** (-2.81)
<b>PRM98_99</b>		0.03*** (3.38)	0.06*** (4.47)	0.06*** 4.19	0.05*** (3.65)	0.06*** (3.79)	0.06*** (4.69)
<b>PCgdpPPP98</b>			-0.0001*** (-3.607)	-0.0002*** (-5.47)	-0.0002*** (-4.93)	-0.0002*** (-5.57)	-0.0002*** (-4.79)
<b>Developing</b>				-1.84** (-2.15)		-1.81* (-1.98)	-2.07** (-2.43)
<b>Democracy</b>					0.79 (1.40)	0.57 (0.97)	
<b>Democracy*GINI</b>							0.02 (1.652)
<b>Adj. R<sup>2</sup></b>	0.10	0.17	0.28	0.31	0.28	0.30	0.31

Sources: World Bank, *World Development Indicators* (accessed 24 April 2011); Economist Intelligence Unit, *Democracy index* 2010. The dependent variable is average per capita growth rate over 1998-2008. t-statistics are in parentheses. \*\*\*denotes significance at the 1% level; \*\*denotes significance at the 5% level; \*denotes significance at the 10% level.

Independent variables are defined as follows:

GINI: GINI coefficient data point around 1998 (1992-1998).

PRM98\_99: Primary school enrolment ratio in academic year 1998/1999.

PCgdpPPP98: Per capita GDP in 1998 (in constant 2005 PPP).

Developing: Developing country dummy (1 = developed, 0 = developed).

Democracy: Democracy dummy (1 = full or flawed democracy, 0 = hybrid or authoritarian regime).

**Table 2. Growth regressions for 1998-2008 using GINI coefficients between 1992 and 2005 2SLS (heteroskedasticity-robust standard errors, variant HC1).**

Sample Size	N = 99	N = 99	N = 99	N = 95	N = 95	N = 99	N = 99
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	10.27*** (3.65)	17.13*** (4.55)	18.51*** (4.71)	16.11*** (3.35)	18.03*** (3.57)	17.98*** (3.66)	23.07*** (5.31)
GINI <sub>IV</sub>	-0.18** (-2.62)	-0.33*** (-3.78)	-0.32*** (-3.66)	-0.31*** (-2.85)	-0.31*** (-2.85)	-0.31*** (-2.91)	-0.39*** (-4.22)
PCgdpPPP98		-0.0001*** (-3.44)	-0.0001*** (-2.98)	-0.0001*** (-3.66)	-0.0001*** (-2.96)	-0.0001*** (-2.96)	-0.0001** (-2.57)
Developing			-1.69** (-2.06)		-1.67** (-2.00)	-1.67** (-2.09)	-0.87 (-0.93)
Democracy				0.27 (0.42)	0.03 (0.04)		
Democracy* GINI <sub>IV</sub>						-0.001 (-0.07)	
logPCgdpPPP98* GINI <sub>IV</sub>							-0.008*** (-3.01)
Adj. R <sup>2</sup>	0.04	0.13	0.16	0.12	0.14	0.15	0.23

Sources: World Bank, *World Development Indicators* (accessed 24 April 2011); Economist Intelligence Unit, *Democracy index* 2010.

The dependent variable is average per capita growth rate over 1998-2008. t-statistics are in parentheses. \*\*\*denotes significance at the 1% level; \*\*denotes significance at the 5% level; \*denotes significance at the 10% level.

Independent variables are defined as follows:

GINI<sub>IV</sub>: GINI coefficient data point (between 1992 and 2005) instrumented by primary school enrolment ratio in 1998-1999 (PRM98\_99).

PCgdpPPP98: Per capita GDP in 1998 (in constant 2005 PPP).

Developing: Developing country dummy.

Democracy: Democracy dummy.

the primary education data was measured for the 1998/99 academic year in all countries for which it was available, it precedes the growth period studied here and hence cannot affect the dependent variable directly.

**Table 2** presents the results for the 2SLS regression, showing the instrumented GINI<sub>IV</sub> which was regressed on primary schooling in the first stage. The coefficients on the GINI<sub>IV</sub> variable are between 2 and 5 times higher than in the OLS regressions, likely the result of using a larger sample while controlling for endogeneity. They are all statistically significant at the 1% level, and imply an effect of up to 34% lower growth resulting from a one standard-deviation increase in the GINI index. The coefficient for initial per capita income is once again small but significant, allowing for convergence. The developing country dummy effect is a bit smaller (-1.69) than in the OLS results, but still negative and significant (at the 5% level). Once again, both the democracy dummy and the interactive democracy-GINI variable are not statistically significant, showing no difference—in terms of either the growth rate alone or the relationship of inequality of growth-between democracies and non-democracies.

Column (7) interacts the log of per capita GDP in 1998 with the GINI<sub>IV</sub> coefficient. Similar to Barro, the GINI<sub>IV</sub> itself is still strongly negative, but unlike Barro's results, the coefficient for the interaction term here is also negative and significant (at 1%). This contradicts Barro's conclusion that "the effect attenuates as per capita GDP

rises" [7].

To further test Barro's assertion that inequality affects growth negatively in poor countries but positively in rich ones, model (2) was estimated separately for developed countries ( $Dev_i = 0$ ) and developing ones ( $Dev_i = 1$ ). The result of the first regression ( $N = 31$ ) was indeed positive, 1.08, but not statistically significant (t-stat = 1.278), while the second regression ( $N = 68$ ) had a strongly negative coefficient -0.37, statistically significant at the 1% level (t-stat = -2.902). Thus there is no clear relationship between income inequality and subsequent growth in developed countries, while there is a negative and significant one in developing countries.

## 5. Concluding Remarks

The empirical results presented in Section 4 support the hypothesis that income inequality is negatively correlated with subsequent economic growth, at least in developing countries. Both the smaller sample with OLS and the larger sample with 2SLS showed a clear negative relationship. The effect was also stronger for developing countries in both cases. Democracy (or its absence) does not have a significant effect on either the relationship between inequality and growth or on the rate of growth itself, thus confirming that inequality creates pressures for redistribution in democracies and non-democracies alike. Furthermore, in contrast to Barro's 2008 findings, inequality in developed countries does not seem to have a

statistically significant positive affect on growth. The overall conclusion is that, beyond any moral objections to inequality, there are strong economic reasons to be concerned about it, as it retards growth under any political regime, at least in developing countries.

### REFERENCES

- [1] D. Ray, "Development Economics," Princeton University Press, Princeton, 1998.
- [2] R. J. Barro, "Inequality and Growth in a Panel of Countries," *Journal of Economic Growth*, Vol. 5, No. 1, 2000, pp. 5-32. [doi:10.1023/A:1009850119329](https://doi.org/10.1023/A:1009850119329)
- [3] A. K. Fosu, "Inequality and the Impact of Growth on Poverty: Comparative Evidence for Sub-Saharan Africa," *Journal of Development Studies*, Vol. 45, No. 5, 2009, pp. 726-745.
- [4] D. Qin, M. A. Cagas, G. Ducanes, X.-H. He, R. Liu and S.-G. Liu, "Effects of Income Inequality on China's Economic Growth," *Journal of Policy Modeling*, Vol. 31, No. 1, 2009, pp. 69-86. [doi:10.1016/j.jpolmod.2008.08.003](https://doi.org/10.1016/j.jpolmod.2008.08.003)
- [5] A. Castelló-Climent, "Inequality and Growth in Advanced Economies: An Empirical Investigation," *Journal of Economic Inequality*, Vol. 8, No. 3, pp. 293-321. [doi:10.1007/s10888-010-9133-4](https://doi.org/10.1007/s10888-010-9133-4)
- [6] A. Alesina and D. Rodrik, "Distributive Politics and Economic Growth," *The Quarterly Journal of Economics*, Vol. 109, No. 2, 1994, pp. 465-490. [doi:10.2307/2118470](https://doi.org/10.2307/2118470)
- [7] R. J. Barro, "Inequality and Growth Revisited," *ADB Working Paper Series on Regional Economic Integration*, No. 11, January 2008.
- [8] Economist Intelligence Unit, "Democracy Index 2010: Democracy in Retreat," London, 2010.

### Appendix 1. List of Countries and Years for GINI Coefficients for Income—Full Sample.

<u>Country</u>	<u>Year</u>	<u>Country</u>	<u>Year</u>	<u>Country</u>	<u>Year</u>
Albania	1997	Gambia, The	1998	New Zealand	1997
Algeria	1995	Georgia	1998	Nicaragua	1998
Angola	2000	Germany	2000	Niger	1994
Argentina	1998	Ghana	1998	Nigeria	1996
Armenia	1996	Greece	2000	Norway	2000
Australia	1994	Guatemala	1998	Pakistan	1997
Austria	2000	Guinea	1994	Panama	1997
Azerbaijan	1995	Guinea-Bissau	1993	Papua New Guinea	1996
Bangladesh	1996	Guyana	1998	Paraguay	1998
Belarus	1998	Haiti	2001	Peru	1996
Belgium	2000	Honduras	1997	Philippines	1997
Belize	1995	Hong Kong SAR, China	1996	Poland	1998
Benin	2003	Hungary	1998	Portugal	1997
Bhutan	2003	India	2005	Romania	1998
Bolivia	1997	Indonesia	2005	Russian Federation	1996
Bosnia and Herzegovina	2001	Iran, Islamic Rep.	1998	Rwanda	2000
Botswana	1994	Ireland	2000	Senegal	1995
Brazil	1998	Israel	2001	Sierra Leone	2003
Bulgaria	1997	Italy	2000	Singapore	1998
Burkina Faso	1998	Jamaica	1996	Slovak Republic	1996
Burundi	1998	Japan	1993	Slovenia	1998
Cambodia	1994	Jordan	1997	South Africa	1995
Cameroon	1996	Kazakhstan	1996	Spain	2000
Canada	2000	Kenya	1997	Sri Lanka	1996
Cape Verde	2001	Korea, Rep.	1998	St. Lucia	1995
Central African Republic	1993	Kyrgyz Republic	1998	Suriname	1999
Chad	2003	Lao PDR	1997	Swaziland	2001
Chile	1998	Latvia	1998	Sweden	2000
China	2005	Lesotho	1995	Switzerland	2000
Colombia	1998	Lithuania	1998	Syrian Arab Republic	2004
Comoros	2004	Luxembourg	2000	Tajikistan	1999
Congo, Rep.	2005	Macedonia, FYR	1998	Tanzania	2000
Costa Rica	1998	Madagascar	1997	Thailand	1998
Cote d'Ivoire	1998	Malawi	1998	Trinidad and Tobago	1992
Croatia	1998	Malaysia	1997	Tunisia	1995
Czech Republic	1996	Maldives	2004	Turkey	1994
Denmark	1997	Mali	1994	Turkmenistan	1998
Djibouti	1996	Mauritania	1996	Uganda	1996
Dominican Republic	1997	Mexico	1998	Ukraine	1996
Ecuador	1998	Micronesia, Fed. Sts.	2000	United Kingdom	1999
Egypt, Arab Rep.	1996	Moldova	1997	United States	2000
El Salvador	1998	Mongolia	1998	Uruguay	1998
Estonia	1998	Morocco	1999	Uzbekistan	1998
Ethiopia	1995	Mozambique	1997	Venezuela, RB	1998
Finland	2000	Namibia	1993	Vietnam	1998
France	1995	Nepal	2004	Yemen, Rep.	1998
Gabon	2005	Netherlands	1999	Zambia	1998