

EXPLAINING INTERNATIONAL AND INTERTEMPORAL VARIATIONS IN INCOME INEQUALITY*

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This paper explores the propositions that, income inequality is relatively stable within countries; and that it varies significantly among countries. A new and expanded data set provides broad support for both propositions. Drawing on a political economy and capital market imperfection arguments to explain the intertemporal and international variation in inequality, the empirical analysis shows that the predicted variables associated with the first argument (a measure of civil liberties and the initial level of secondary schooling) and the second argument (a measure of financial depth and the initial distribution of land) are indeed important determinants of inequality.

This paper explores two propositions regarding income inequality. They are: first, income inequality is relatively stable within countries; and second, it varies significantly across countries.¹ To illustrate, note that the Gini coefficient in India remained almost constant for forty years (1951–92) with mean 32.6 and standard deviation 2.0.² In contrast, the variation in Gini coefficients across countries is large: 61.9 in Honduras in 1968 compared with 17.8 in Bulgaria in 1976. If substantiated, these propositions have potentially significant implications for poverty. The significance of the first is obvious – barring any fundamental socio-political change, poverty reduction will depend crucially on the rate of economic growth. Given this, the significance of the second is that in inegalitarian economies the poor will enjoy a smaller share of any national increment in income than in more egalitarian ones.

Drawing on a new and expanded data set on inequality (Deininger and Squire, 1996a), the first of the paper's three sections conducts standard statistical tests of the two propositions. The sample comprises 573 observations on the most common measure of inequality – the Gini coefficient – for 49 developed and developing countries covering the period 1947–94. The results broadly confirm our two propositions. Specifically, analysis of variance (ANOVA) shows that about 90% of the total variance in the Gini coefficients

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¹ We also explore a weaker, combined version of these two propositions – namely, that intertemporal shifts in inequality are modest compared with international differences.

² The mean Gini coefficient for India reported in Table 2 is 39.15. This is after the data have been adjusted for difference in definitions. The mean for the unadjusted data is 32.55.

can be explained by variation across countries, while only a small percentage of the total variance is due to variation over time. Similarly, regression analysis reveals significant differences across countries, and fails to detect any significant time trend in 32 countries. Moreover, in 10 of the 17 cases where the data reveal a significant trend, it is quantitatively small – an annual change of less than 1.0% of the country's average Gini coefficient. To take a typical example, Jamaica shows a statistically significant and negative time trend but the change in its Gini coefficient from its 1980 value of 49.9 would be only 0.2 points a year. At this rate, it would take Jamaica 70 years to bring its Gini index in line with the average index for all countries in our sample – 36.2. In this sense, the observed intertemporal changes are small relative to the observed differences across countries. On the other hand, seven of the countries in the sample have annual changes in excess of 1.0% indicating that in certain circumstances inequality as measured by the Gini index can change more quickly – in China the index was increasing during our sample period at a rate of 3% a year, the largest rate of change that we observed. What actually happened in these seven countries is an interesting issue for future research.

In general, our results suggest that inequality is determined by factors which differ substantially across countries but tend to be relatively stable within countries. The second section of the paper explores some possible determinants of inequality. To do so, it draws on two ideas that have recently received attention in the literature on inequality and growth. The first posits a link from income or wealth inequality to policy via a political economy argument. In its simplest form, the rich are assumed to have the resources to lobby for policies which are beneficial to them but may be harmful to the rest of the economy and to growth (see Bertola, 1993). The second idea has to do with imperfections in the market for credit. By preventing the poor from making productive investments (such as education), credit constraints arising from asymmetric information perpetuate a low and inequitable growth process (see, for example, Banerjee and Newman, 1991). Taken together, the two ideas suggest that an initial state of inequality may be expected to continue because the rich have the capacity to protect their wealth while the poor are unable to augment theirs.

We find considerable support for both these ideas. In particular, the key variables associated with the political economy argument (a measure of political freedom and initial secondary schooling) and those associated with the capital market imperfection (the initial degree of inequality in the distribution of assets as measured by the distribution of land and a measure of financial market development) are all shown to be significant determinants of current inequality. This suggests that the rich are indeed able to exercise sufficient control over economic policy at least to maintain their wealth while the non-rich encounter capital market imperfections that limit their capacity to accumulate capital, again reinforcing the tendency for unequal distributions of income to remain so. To check the robustness of our main findings, we conduct sensitivity analysis by controlling for various other factors identified in both theoretical and empirical work on inequality and growth. The results

suggest that our findings are quite robust. Section 3 concludes by linking our results to previous work on the relationship between growth and inequality.

1. Testing the Two Propositions

This paper uses a new data set on Gini coefficients.³ Starting with a total of 2,480 observations on Gini coefficients covering 112 developed and developing countries for the years 1947–94, several criteria were used to ‘cleanse’ the data. First, all observations had to be from national household surveys for expenditure or income; second, the coverage had to be representative of the national population; and third, all sources of income and uses of expenditure had to be accounted for, including own-consumption. In addition, for the purpose of this paper, all observations had to be from countries with at least four observations covering a reasonable part of the 47 year period. These procedures resulted in a sample of 573 observations covering 49 countries. This is the data set used in this study. Before presenting the sample descriptive statistics, we note two points.

First, the definition of what is being measured by the Gini coefficient in our sample varies across countries. Inequality can be measured by gross income, net income, or expenditure and it can be per capita or per household. The distribution of our sample by definitional differences is shown in Table 1. Because variation in definition can undermine the international and intertemporal comparability of the data, we include controls for different definitions throughout Section 1. The results indicate that differences between coefficients defined on net and gross income and between household-based and individual-based coefficients are not significant. Differences between expenditure-based and income-based coefficients, however, are significant. In subsequent analysis, therefore, we have adjusted the data following the procedure recommended by Deininger and Squire (1996*a*). Specifically, we adjust for differences between income-based and expenditure-based coefficients by systematically increasing the latter by 6.6 points, this being the average difference observed by Deininger and Squire (1996*a*).

Table 1
Distribution of Gini Coefficients by Different Definitions

Unit of observation	Income			Total
	Gross	Net	Expenditure	
Household	240	73	19	332
Individual	102	78	61	241
Total	342	151	80	573

³ For further details see Deininger and Squire (1996*a*).

Second, the method used to calculate the Gini coefficients also varies across different sources. To minimise this problem we have recalculated the coefficients using a standard technique for as many observations as possible.⁴

With these points in mind, basic descriptive statistics for the adjusted data are reported in Table 2. Here we simply note that the overall sample mean is 36.2 and the standard deviation is 9.2. The number of observations per country is as follows: 28 countries have between 4 and 9 observations; 14 countries have between 10 and 19 observations; and 7 countries have 20 or more. In general, the developed countries have longer series and better coverage than the developing ones. As a preliminary test of our two propositions, note that the standard deviation of the means of the 49 countries (9.3) is substantially greater than any of the standard deviations of the within-country Gini coefficients for each country (see Table 2).

We begin with an analysis of the variance components of the Gini coefficients using the raw data. Table 3 reports the ANOVA results. Allowing for the fact that we have an unbalanced data set, we find that for the entire sample (Data set 1), 91.8% of the variance is cross-country variance, while only 0.85% is over-time variance. A total of 0.4% is due to the differences in definitions. Based on the F-values, only the country variation and variation due to income/expenditure definition are significant. After adjusting for the income/expenditure definition differences as described above (Data set 2), the ANOVA results show that the variance due to income/expenditure drops from 0.34% to 0.04% and is statistically no longer significant. This provides statistical evidence that the adjustment is necessary and useful.

Disaggregating the data (unadjusted) by income level according to the classification in the World Development Report, we obtain similar results. For high-income countries (Data set 3), the cross-country variance is 82.5% and the over time variance is only 1.9%. The corresponding figures for lower- and middle-income countries (Data set 4) are 93.1% and 1.4%. In this case, the variation due to income/expenditure definition is significant since most of the differences in income/expenditure occurs in this group. But, with the adjusted data, remaining variations due to definition are small and insignificant. We also repeated the ANOVA exercise for three subsamples in which we progressively increased the consistency of definitions: a subsample containing Gini coefficients based only on income (493 observations); a subsample containing only income-based and household-based Gini coefficients (313 observations); and a subsample containing coefficients defined on gross income per household (239 observations). In each case, the results (not reported) indicate that about 90% of the variation can be explained by country variation, while variation over time is small (1.1 to 1.7%).

We now turn to a least squares dummy variable regression which allows us to study individual country specific effects and perform explicit hypothesis testing

⁴ The computational tool (POVCAL) we used for recalculating the Gini coefficients is discussed in detail in Datt (1992).

Table 2
Summary Statistics of Gini Coefficients (Adjusted for differences in definitions)

Code	Nob	Mean	St. dev.	Max	Min	Max-min	Coverage
AUS	9	37.88	2.91	41.72	32.02	9.70	69 ~ 90
BEL	4	27.00	0.76	28.25	26.22	2.03	79 ~ 92
BGD	10	35.83	1.55	39.00	33.34	5.66	63 ~ 92
BGR	28	23.30	3.34	34.42	17.83	16.59	63 ~ 93
BHS	11	45.77	3.91	54.09	40.64	13.45	70 ~ 93
BRA	14	57.84	2.82	61.94	53.00	8.94	60 ~ 89
CAN	23	31.27	1.64	32.97	27.41	5.56	51 ~ 91
CHL	5	51.84	5.15	57.88	45.64	12.24	68 ~ 94
CHN	12	32.68	3.62	37.80	25.70	12.10	80 ~ 92
COL	7	51.51	2.48	54.50	46.00	8.50	70 ~ 91
CRI	9	46.00	2.80	50.00	42.00	8.00	61 ~ 89
CSK	12	22.25	2.29	27.19	19.37	7.82	58 ~ 92
DEU	7	31.22	1.58	33.57	28.13	5.44	63 ~ 84
DNK	4	32.08	1.09	33.20	30.99	2.21	76 ~ 92
DOM	4	46.94	2.90	50.46	43.29	7.17	76 ~ 92
ESP	8	32.85	1.73	37.11	31.02	6.09	65 ~ 89
FIN	12	29.93	2.08	32.04	26.11	5.93	66 ~ 91
FRA	7	43.11	5.62	49.00	34.85	14.15	56 ~ 84
GBR	31	25.98	2.56	32.40	22.90	9.50	61 ~ 91
HKG	7	41.58	2.60	45.18	37.30	7.88	71 ~ 91
HND	7	54.49	3.36	61.88	50.00	11.88	68 ~ 93
HUN	9	24.65	3.36	32.24	20.97	11.27	62 ~ 93
IDN	11	40.09	2.07	45.19	37.30	7.89	64 ~ 93
IND	31	39.15	2.03	43.65	35.77	7.88	51 ~ 92
IRN	5	49.83	1.26	52.05	48.48	3.57	69 ~ 84
ITA	15	34.93	2.52	41.00	32.02	8.98	74 ~ 91
JAM	9	48.77	2.84	54.31	44.52	9.79	58 ~ 93
JPN	23	34.82	1.32	37.60	32.50	5.10	62 ~ 90
KOR	14	34.19	2.54	39.10	29.82	9.28	53 ~ 88
LKA	9	42.45	4.52	47.80	35.30	12.50	53 ~ 90
MEX	9	54.59	2.76	57.90	50.00	7.90	50 ~ 92
MYS	6	50.36	1.79	53.00	48.00	5.00	70 ~ 89
NLD	12	28.59	0.91	29.68	26.66	3.02	75 ~ 91
NOR	9	34.21	2.73	37.52	30.57	6.95	62 ~ 91
NZL	12	34.36	2.78	40.21	30.04	10.17	73 ~ 90
PAK	9	38.10	0.81	39.04	36.51	2.53	69 ~ 91
PAN	4	52.42	4.34	57.00	47.47	9.53	70 ~ 89
PHL	7	47.62	2.27	51.32	45.00	6.32	57 ~ 91
POL	17	25.69	2.44	33.06	20.88	12.18	76 ~ 93
PRT	4	36.60	0.59	37.23	35.63	1.60	73 ~ 91
SGP	6	40.12	1.65	42.00	37.00	5.00	73 ~ 89
SWE	14	31.74	1.42	33.41	27.31	6.10	67 ~ 92
THA	8	45.48	3.54	51.50	41.28	10.22	62 ~ 92
TTO	4	46.21	3.28	51.00	41.72	9.28	58 ~ 81
TUN	5	49.11	1.26	50.60	46.84	3.76	65 ~ 90
TWN	26	29.62	1.50	33.60	27.70	5.90	64 ~ 93
USA	45	35.28	1.27	38.16	33.50	4.66	47 ~ 91
VEN	9	44.42	4.02	53.84	39.42	14.42	71 ~ 90
YUG	10	32.62	0.95	34.73	31.18	3.55	63 ~ 90
Overall	573	36.23	9.15	61.94	17.83	44.11	47 ~ 94

Note: Nob – Number of observations.

Table 3
Analysis of Variance of Gini Coefficients

Data set (Nob)	Source	DF	Sum of Squares	F-Value	Source	DF	Sum of Squares	F-Value	% of Total
1 (573)	Model	98	42,837.71	64.84	Country	48	42,262.78	130.61	91.81
	Error	474	3,195.24		Time	47	389.10	1.23	0.85
	Total	572	46,032.95		Income	1	157.00	23.29	0.34
					Hhld.	1	27.91	4.14	0.06
					Gross	1	0.93	0.14	0.00
2 (573)	Model	98	44,716.93	67.69	Country	48	44,280.97	136.85	92.42
	Error	474	3,195.24		Time	47	389.22	1.23	0.81
	Total	572	47,912.17		Income	1	17.90	2.66	0.04
					Hhld.	1	27.91	4.14	0.06
					Gross	1	0.93	0.14	0.00
3 (283)	Model	68	6,627.54	17.52	Country	19	6,449.03	61.00	82.49
	Error	214	1,190.81		Time	46	149.67	0.58	1.91
	Total	282	7,818.35		Income	1	19.98	3.59	0.26
					Hhld.	1	2.99	0.54	0.04
					Gross	1	5.88	1.06	0.08
4 (290)	Model	75	33,320.84	55.98	Country	28	32,618.22	146.80	93.14
	Error	214	1,698.23		Time	44	492.43	1.41	1.41
	Total	289	35,019.07		Income	1	164.73	20.76	0.47
					Hhld.	1	34.14	4.30	0.10
					Gross	1	11.32	1.43	0.03

Notes: 1: DF – Degrees of freedom

2: Descriptions for different data sets:

Data set 1: The whole sample, including all definitions.

Data set 2: The whole sample, adjusted for difference in income or expenditure definitions.

Data set 3: Subsample, high-income countries, including all definitions.

Data set 4: Subsample, low- and middle-income countries, including all definitions.

concerning the two propositions. Because we have seen that standard deviation of within-country Gini coefficients is small and because a plot of the Gini coefficients by country revealed trends for some countries, we consider a simple linear trend model:

$$g_{it} = \phi_i D_i + \theta_i t_i + \delta_1 d_1 + \delta_2 d_2 + \delta_3 d_3 + \omega_{it} \quad (1)$$

where g_{it} is the Gini coefficient, $i = 1, 2, \dots, N$ (number of countries), $D_i = 1$ for country i and 0 otherwise, $t_i = 1, 2, \dots, T_i$, and $\omega_{it} \sim \text{iid}(0, \sigma_\omega^2)$. The panel data are unbalanced since in general $T_i \neq T_j$ for $i \neq j$. In light of the ANOVA results, we use the adjusted data but include definitional dummies to test for any remaining effect. d_1 is the control dummy for income (= 1)/expenditure (= 0); d_2 is the control dummy for households (= 1)/individual (= 0); d_3 is the control dummy for gross income (= 1)/net income (= 0).

We would like to know whether, after controlling for the differences in definitions, the difference between the country specific effects ϕ_1, ϕ_2, \dots , and ϕ_N is statistically significant or not and we want to test for the existence of a

significant, within-country time trend, $\theta_1, \theta_2, \dots, \theta_N$. Accordingly, we test the following two hypotheses:

- (a) $H_0^a: \phi_1 = \phi_2 = \dots = \phi_N$,
 (b) $H_0^b: \theta_i = 0$, for $i = 1, 2, \dots, N$.

Based on the F-statistic in Table 4, hypothesis (a) is rejected at a 5% significance level. This confirms our first proposition – Gini coefficients differ significantly across countries. For individual time trends, we find statistical support for our second proposition in 32 of the 49 countries or 65% of the

Table 4
LSDV Estimation Results (Unrestricted Regression)

Dep var.: GINI

Control Dummy		Income		Households			Gross		
Estimate		4.00		-0.35			-0.80		
t-value		1.70		-0.61			-1.13		
Country Code	Country-specific	t-value	Trend Estimate	t-value	Country Code	Country-specific	t-value	Trend Estimate	t-value
AUS	34.18	13.90	0.35	3.04*	ITA	31.48	12.96	-0.37	-3.31*
BEL	23.62	8.03	-0.10	-0.44	JAM	49.77	59.58	-0.20	-2.77*
BGD	32.71	13.21	0.01	0.12	JPN	31.49	13.07	-0.02	-0.40
BGR	20.58	8.05	0.20	4.04*	KOR	31.89	12.89	0.10	1.68
BHS	43.47	17.77	-0.30	-3.65*	LKA	39.21	18.59	-0.09	-1.22
BRA	54.76	22.20	0.05	0.61	MEX	51.60	20.11	0.01	0.25
CAN	27.89	11.66	-0.06	-1.35	MYS	46.96	18.45	-0.17	-1.19
CHL	48.65	18.51	0.51	5.04*	NLD	24.20	9.74	0.11	0.83
CHN	24.72	8.70	0.80	4.54*	NOR	29.79	12.05	-0.22	-2.73*
COL	48.40	19.03	0.00	0.00	NZL	30.14	12.36	0.49	4.15*
CRI	42.71	17.01	-0.16	-1.74	PAK	38.10	52.02	0.06	0.71
CSK	18.65	7.12	-0.04	-0.60	PAN	49.48	18.25	-0.01	-0.08
DEU	28.34	11.23	0.13	1.10	PHL	43.83	17.24	-0.11	-1.66
DNK	27.85	10.44	0.21	1.13	POL	21.12	8.14	0.31	2.95*
DOM	42.31	14.51	0.34	1.88	PRT	34.96	18.67	-0.31	-1.62
ESP	33.26	40.47	-0.13	-1.24	SGP	36.89	14.61	0.01	0.09
FIN	25.98	10.54	-0.14	-1.35	SWE	27.71	11.34	0.01	0.13
FRA	34.22	12.97	-0.58	-6.40*	THA	42.16	17.09	0.31	4.10*
GBR	23.07	8.87	0.18	4.21*	TTO	41.76	14.90	-0.15	-1.15
HKG	38.44	15.47	0.21	1.71	TUN	49.57	43.57	-0.04	-0.37
HND	54.17	20.29	-0.37	-3.50*	TWN	25.97	9.99	-0.02	-0.43
HUN	21.04	8.02	0.14	1.92	USA	32.76	13.75	0.06	2.48*
IDN	40.69	45.87	-0.04	-0.50	VEN	41.16	16.23	0.27	2.26*
IND	38.41	50.02	-0.10	-3.29*	YUG	29.60	11.53	0.06	0.61
IRN	49.96	30.19	-0.03	-0.18					
NOB	573		R ²	0.95					
DF	472		F-Test	126.03					
Groups	49								

Notes: 1. Standard errors of individual country specific effects: 9.89.

2. For hypothesis (a), the F-statistic is 126.03. This leads to the rejection of hypothesis (a).

3. For hypothesis (b), 7 countries have significant negative trend, 10 countries have significant positive trend. (There is a total of 17 countries with significant trends (indicated by (*).)

4. The country-specific terms are equivalent to the 1980 predicted Gini coefficients.

sample.⁵ For 7 countries, however, we find significant negative trends, while 10 countries have significant positive trends when we apply the 5% t-test. But of the 17 countries with a significant trend, 10 of them have time trends that are quantitatively small – defined here as an annual change of less than 1.0% of the country's 1980 predicted Gini coefficient, the estimated country-specific term in the regression reported in Table 4. This is, of course, an arbitrary cut-off point. We note, however, that applying the mean absolute rate of change (0.6% a year) for these 10 countries to the average Gini coefficient (36.2) for our entire sample, it would take more than 20 years for the index to move 5 points. This compares with a difference between the maximum and minimum 1980 predicted values for each country of 36.1 points. Thus, whether or not one considers movements of 0.6% a year quantitatively large, it is clear that intertemporal changes are very modest compared with international differences.

For seven countries (Australia, Chile, China, France, Italy, New Zealand, and Poland), however, we observe a statistically large and quantitatively important time trend, thus establishing that countries can change the degree of inequality as measured by the Gini coefficient relatively quickly. For example, the results for New Zealand indicate an annual change of 1.6% implying that a change of 5 points in the Gini index could be achieved in only 10 years. The factors affecting changes of this magnitude in these 'non-conforming' countries present an interesting opportunity for future research. Here we simply note that four of the countries – Australia, France, Italy, and New Zealand – are OECD countries where the fiscal system in general and the welfare system in particular are well developed so that, given the political will, it should be feasible to influence inequality. And in the remaining countries, China and Poland have of course been experiencing major structural changes during the period covered by our sample.

Because we have less than 10 observations for 28 countries, the test for a significant trend may not be accurate. Reducing the sample to only those countries with 10 or more observations, however, yields broadly similar results. For the 21 countries with at least 10 observations, the time trend is insignificant for 12 countries, and in the 9 countries where the time trend is significant it is quantitatively important (an annual change of more than 1% of the mean) in only four countries – China, Italy, New Zealand, and Poland. For the group of 21 countries, the average absolute trend is 0.16, or an average absolute percentage change of 0.52% per year. For the 7 countries with at least 20 observations, the results are even stronger. Three countries have an insignificant time trend, and of the other 4 none have a quantitatively important trend.

⁵ Since most of the countries do not have enough observations to allow for suitable unit root tests, we have not pursued this approach. For the United States and United Kingdom, there are observable positive time trends since late 1970's and early 1980's. Since 1970, inequality in the United States has increased at a rate of 0.62% a year, while in the United Kingdom, the increase has been 1.37% a year. For the US data which have the longest time series, the simple Augmented Dickey-Fuller test suggests the presence of a unit root. However, in Raj and Slotje (1994), they found that the US Gini is stationary around a broken trend.

In fact, the average absolute trend for this group is only 0.1, while the average absolute percentage change is only 0.32% per year. Thus, for the countries where we have the most complete and reliable data, inequality appears to be quite stable over relatively long periods of time.

Recall that the results reported in Table 4 use the adjusted data for the Gini coefficient. With these data, we see that the definitional dummies are not significant. We also obtain broadly similar results for our two propositions (not reported) for the unadjusted data and in the subsample of observations with the same definition.

We have also estimated a random-effects model (with or without a time trend and using the adjusted data) to account for the loss of degrees of freedom in the LSDV regression. We assume that the country-specific effects are drawn from a random distribution, while at the same time controlling for the definition differences. The results are presented in Table 5. The only significant explanatory variable is the constant term with an estimated value of 37.7, close to the sample average. As a result of the large variation in Gini coefficients across countries, the constant has a standard error between 9.71 (without the time trend) and 9.82 (with the time trend) that is very close to the standard error of the country-specific effects (9.89) in the LSDV regression. Thus, the constant term in the random-effects model plays the same role as the country-specific terms in the LSDV regression, lending support to our assertion that the variations in inequality arise mainly from cross-country differences. Note also that the random-effects model provides no support for a general time trend: the mean value of the time trend is not significant with a 95% confidence interval of $(-0.015, 0.035)$.

Taken together, these results provide substantial support for our two propositions. Thus, Gini coefficients are clearly different across countries (propo-

Table 5
Random-effects Regression of Gini Coefficients

Dep var.: GINI

	Model I		Model II	
	Estimate	t-value	Estimate	t-value
Constant	37.67	17.31	37.74	17.23
Income	1.07	0.57	1.03	0.55
Households	-0.43	-0.84	-0.52	-1.00
Gross	0.77	1.20	0.78	1.21
Trend			0.01	0.80
Nob	573		573	
DF	569		568	
Groups	49		49	

Notes: Standard errors of error terms: Individual constant terms: 9.71 (Model I), 9.82 (Model II).

Standard errors of error terms: White noise error: 2.63 (Model I), 2.63 (Model II).