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Abstract

There has been a recent resurgence of interest in the relationship between income inequality and growth. We use the WIDER/UNDP World Income Inequality Database to investigate the effects of inequality and trade liberalisation on growth in a sample of exclusively developing countries. Cross-section (long-run) and panel (short run) techniques are used to test for the effect of inequality on growth controlling for other variables (initial GDP, endowments, investment, human capital and natural barriers to trade). We find consistent evidence for a negative effect of inequality on growth in the long run but no significant effect in the short run. Trade liberalisation appears to have a consistent and significant positive association with growth. These results are quite robust to the inclusion of alternative control variables, and we find no evidence of any interaction affect between inequality and trade liberalisation. We also find consistent evidence that countries relatively endowed with land (and thus dependent on primary commodity exports) and/or that face high natural barriers to trade experience lower growth rates. There is also evidence that, controlling for most other variables, sub-Saharan African countries experience below average growth performance; however, accounting for trade restrictions and natural barriers seems to eliminate this effect. The evidence suggests that inequality is an important factor in explaining low growth in developing countries over the long run.

Keywords: Inequality, cross-country growth, trade liberalisation

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1 Introduction

Research on the determinants of growth in developing countries has become concerned with possible linkages between policy reform, growth and inequality. Forbes (2000), in particular, has injected new life into analysis of the effect of inequality on growth. In principle, the relationship between inequality and growth may be in either direction – most analysis considers inequality as a determinant of growth, although growth may influence inequality. Empirically, there is no consistent evidence that growth (or the lack of it) affects within-country inequality on average (Ravallion, 2001). Milanovic (2002) shows that although global inequality rose between 1988 and 1993, this was due almost completely to an increase in inequality *between* countries, while within-country inequality was largely unaffected. If globalisation affects world inequality it is most likely to be because of differential growth rates between countries. We consider the extent to which initial inequality is a factor explaining growth differences.

Our aim is to explore the inequality-growth relationship for a sample of developing countries only. We use data that has recently been made available in the World Income Inequality Database (WIID, compiled by UNDP and WIDER) to construct a panel of 44 developing countries, including countries from sub-Saharan Africa (SSA). This sample benefits from being somewhat less heterogeneous than studies combining developed and developing countries, and we can be reasonably confident of the validity of pooling the countries in the cross-section regressions (and do test for outliers). However, we have the problem of including many poor performing economies whose growth is difficult to model, in particular SSA countries.

The conventional view is that income inequality tends to be associated with (or even a proxy for) inequalities in the distribution of power. High inequality will be associated with distortions in the economy, such as high levels of protection, and incentives for rent-seeking behaviour. These in turn tend to reduce growth. Thus, inequality and restrictive trade policies will tend to be correlated, at least in the long-run, and both associated with lower growth. Trade liberalisation is an indicator of economic policy reform in which distortions are reduced and market incentives increased. Whilst inequality may discourage liberalisation,

once trade liberalisation actually occurs it is expected to reduce the negative impact of inequality on growth.

Income inequality may have a direct effect in retarding growth. That is, an unequal distribution of income may mean that the majority of the population does not share in the benefits of growth, hence the incentives to them to contribute to growth are muted (e.g. weaker incentives to work harder or be entrepreneurial). This would be an 'anti trickle down' view of growth, but is consistent with some of the evidence for East Asia – that 'shared growth' encourages dynamism and effort (Morrissey and Nelson, 1998). Trade liberalisation should promote growth as it increases the efficiency of the economy, but the effect on inequality is ambiguous. Workers may shift from declining (import competing) to expanding (exporting) sectors, without any change in the overall level of income inequality. In this case there need not be a direct effect of trade liberalisation on the inequality-growth relationship.

An alternative view is that income inequality is representative of other distortions in the economy, and can be used as a proxy measure for these growth-retarding features of the economy. In an economy where power is concentrated, distortions are widespread and rent-seeking is prevalent, we may expect to observe relatively high levels of inequality (and relatively poor growth performance). In such a case, trade liberalisation is a signal of policy reform that reduces (some) distortions. Consequently, trade liberalisation in this view will alter the nature of the inequality-growth relationship. It need not affect the level of inequality, although one would expect inequality to fall as distortions are reduced and incentives increased.

This review addresses a number of questions. Are poorer countries more unequal and do more unequal countries grow more slowly, i.e. is inequality negatively related to growth? Is there a difference between the long and short run effects of income inequality on growth in developing countries? Cross-country regressions based on period overall growth and averages for explanatory variables can be interpreted as capturing the 'long-run' aggregate relationship. Panel-data techniques, using sub-period values for variables, can capture the 'short-run' nature of the inequality-growth relationship. This follows Forbes (2000) who, in a sample including industrialised countries but with few low-income countries, found that inequality was negatively associated with growth in the long-run, but the association was positive in the short-run. We consider whether this holds for developing countries.

Section 2 provides a brief overview of the theoretical and empirical literature on the impact of inequality on growth. Section 3 presents a brief discussion of the data and specifications used in the analysis. Section 4 presents the results for the cross-section, or long-run, relationship, and finds evidence that inequality does appear to reduce growth, controling for trade variables (openness, natural endowments and natural barriers). Section 5 extends this analysis with panel estimates to explore the short-run aspects of the relationships. Trade liberalisation is found to have a positive effect on growth, but this effect is dampened if natural barriers are high and/or if inequality is high. Section 6 concludes by relating our evidence to the theories outlined in the second section.

2 A Brief Overview the Literature

Most of the theoretical economics literature posits that inequality has a negative impact on growth. There are four general categories of model that explain how an unequal initial distribution of assets and income can affect growth. For convenience these can be termed political economy, social conflict, credit market and X-inefficiency models.

- The **political economy** argument is premised on the median voter model (Persson and Tabellini, 1994; Bertola 1993; Partridge, 1997; Alesina and Rodrik, 1994). The greater the inequality shown by the distance between the mean per capita national income and the median income of the eligible voters, the lower will be growth. The logic is that political decisions to redistribute income are more likely to be made when inequality is greater, and will result in economic policies that tax investment and growth-promoting activities. These models assume both implicit, if not actual, democracy and that redistribution is implemented in a way that reduces growth. This hardly seems an appropriate way to represent the majority of developing countries over the past three decades. The underlying mechanism is that in order to maintain support the political elite redistributes income and in doing so reduce the return on capital. There is little evidence for this in developing countries. The successful East Asian economies implemented redistribution via land reform, public spending or real wages, rather than by discouraging investment (Morrissey and Nelson, 1998). Few African or Latin American countries have redistributed income.

- The **social conflict** approach observes that an unequal distribution of resources is a source of political tension and social conflict. In such a socio-political environment, property rights are insecure and this discourages accumulation. The higher is the gap between the rich and the poor, the greater is the temptation to engage in rent seeking and this in turn reduces investment and constrains the ability of the government to respond to shocks (Benabou, 1996; Rodrik, 1998). Alesina and Perotti (1996) argue that greater inequality leads to less political stability and consequently sub-optimal investment levels.[2] Nafziger and Auvinen (2002) report that high inequality is a determinant of conflict and humanitarian emergencies.

- The **credit markets** channel (Tsiddon, 1992) is underpinned by the fact that investments are lumpy and access to credit depends on the existence of collateral. Consequently, there is a credit constraint stemming from unequal initial distribution of assets, and this hinders growth. In this context, inequality of land holdings represents a constraint on growth in the agriculture sector, typically the major productive sector in poor developing countries. A related argument is that greater income equality encourages human capital accumulation, as there are fewer liquidity constraints and investment in human capital is lumpy (Chiu, 1998).

- The fourth approach is based on the argument that high inequality reduces the **X-efficiency** of workers. X-efficiency refers to a measure of workers' productivity holding constant all other inputs into the production process including workers' skills (Leibenstein, 1966, cited in Birdsall *et al*, 1995). Workers' productivity is limited by a 'virtual' glass ceiling as they do not visualise themselves progressing beyond a certain point and this discourages effort and perpetuates a vicious cycle of low incomes and therefore high inequality. Thus, inequality has a disincentive effect that retards growth.

In all of these theories inequality has a disincentive effect that retards growth. The first three approaches are accumulation-based and long run in nature; they relate inequality to growth in an indirect way, via investment. This fourth theory relates to incentives and labour

[2] A number of recent studies provide evidence that political instability reduces growth in SSA (Gyimah-Brempong and Traynor, 1999; Guillaumont *et al*, 1999).

productivity, rather than investment and accumulation. As such, this can be viewed as a direct effect of inequality on growth that should be apparent even over the relatively short run.

Empirical Evidence on Inequality and Growth

The 1990s has seen a growing interest in research on whether inequality retards growth. Most empirical work has relied on the Gini coefficient or income shares as measures of inequality. Mbabazi *et al* (2001) summarise a range of studies, and the principal findings are:

- There is general evidence for a negative effect of inequality on economic growth, although this result is not robust in all specifications (Birdsall *et al*, 1995). Benabou (1996: Table 2) summarises a range of studies and shows that the balance of evidence is for a negative and significant relationship.
- Land inequality tends to have a more robust (negative) influence on growth than income inequality (Alesina and Rodrik, 1994; Birdsall and Londono, 1997; Deininger and Squire, 1998).
- There is evidence, at least for developed countries, for a positive, significant and robust relationship between inequality and growth in the medium and short run, that is, higher inequality is associated with higher growth (Forbes, 2000). This is in contrast to the evidence for a negative relationship in the long run.

The differences in the results from studies of the inequality-growth relationship can be largely attributed to four factors – differences in sample coverage, time period, data quality and estimation methods. Forbes (2000) sample includes no sub-Saharan African country and half of the sample comprises OECD countries. About half of the countries in the samples used by Deininger and Squire (1998), Barro (1999), Banerjee and Duflo (2001) are developing. The evidence suggests that the relationship is different for OECD as compared with developing countries. For this reason we use a sample of developing countries only.

Almost all studies before 1996 are based on long period averages for a cross-section of countries, and thus capture any ‘long-run’ relationship. Later studies use the Deininger and Squire (1996) data that includes many developing countries and permits the construction of panels to address short-run issues. Forbes (2000) is the innovative study that uses sub-period panels to examine the ‘short-run’ relationship. We extend this analysis to a sample of developing countries.

Data quality is always a problem for econometric analysis of developing countries, and is especially acute regarding inequality. The Deininger and Squire (1996) database is widely accepted as one of the most reliable sources of data on inequality (and is included in the WIID data source we draw on). Knowles (2001) provides a critical discussion of this data, demonstrating that the use of income as against expenditure based measures biases the results. Nevertheless, as being the most widely comparable data available, we use the WIID data.

Another reason for differences in results could be the estimation methods. Cross-section estimation methods have many weaknesses, documented by, among others, Levine and Renelt (1992). The use of panel estimation methods to control for country and time specific effects has been precluded by the paucity of good quality data. Forbes (2000) stands out in this regard. Banarjee and Duflo (2000) present a sophisticated econometric analysis of the relationship between inequality and growth, allowing for a non-linear relationship and accounting for country-specific differences. They find no evidence of a consistent relationship between the level of inequality and growth; much depends on the data and sample used, and the other control variables included. However, their principal results are that *changes* in inequality, in any direction, tend to have a negative effect on growth and that inequality changes are less in those countries with higher initial levels of inequality. They find that lagged inequality has a negative impact on growth in those countries where inequality is relatively low (perhaps because it is more likely to change in such cases).

What emerges from the foregoing discussion is that there is likely to be a negative relationship between inequality and growth in the long run, although this may not be the case in the short-run. Research on the inequality-growth relationship has tended not to include SSA countries in the sample, nor has the potential role of trade and trade policy been explored. As trade liberalisation is an indicator of economic policy shifting to a market-oriented regime with greater incentives, it should have a positive impact on growth. There may be interactions between inequality and trade policy that should be taken into account. On the one hand, the beneficial effects of trade liberalisation may be less in countries with high inequality (as the incentive effects are not transmitted widely). On the other hand, whilst inequality changes slowly, trade liberalisation policies can be implemented relatively quickly

and may provide an impetus for reduced inequality. Thus, we expect to observe effects of inequality and trade liberalisation on growth, and of some interaction between the two.

3 Data and Empirical Specification

The analysis is based on data for 44 developing countries over the period 1970-95 (details on data and sources are provided in the Appendix). Our dependent variable is growth in per capita GDP (*GROWTH*). The growth literature points to the importance of initial values in explaining subsequent growth, and these are captured by the initial value of real GDP (*GDP0*). The additional variables are measures of the increases in the stock variables. The increase in the capital stock is captured by the average rate of investment (*INV*). Secondary school enrolment (*SEC*, the average over the whole period) is the proxy for investment in human capital.

As our concern is specifically with inequality, the basic specification estimated, similar to that used in most empirical work in this area (Perotti, 1996, Forbes, 2000), is:

$$GROWTH = \beta_0 + \beta_1 GINI + \beta_2 GDP0 + \beta_3 SEC + \beta_4 INV + \mu \qquad (1)$$

If initial income (*GDP0*) captures convergence the expected sign is negative. However, in a cross-country regression it may capture country-specific initial conditions, and the sign could be positive. The coefficient on *GINI* is expected to be negative. The coefficients on *SEC* and *INV* are expected to have positive signs. Note that this measure of human capital is aggregate, and not broken down by gender, nor do we include the purchasing power parity of the investment deflator relative to that in the United States as a proxy for market distortion (but we do use an measure of trade policy distortion). The variables included above are widely accepted as core explanatory variables.

To this basic specification we then add other variables believed to be important in the inequality-growth relation. Obviously, the potential list is large, but we limit the number included for reasons similar to those advanced by Forbes (2000) and Perroti (1996), namely; the need to maximise degrees of freedom given the limited availability of inequality data and to facilitate comparability between studies. We include a dummy variable for SSA to test if

there is an 'Africa effect' in our sample. We then include a measure of natural resource endowment (*NRE*) to capture important structural features of the economy. The underlying hypothesis is that countries with relatively low endowments of natural resources, thus relatively high labour endowments, will need to industrialise to promote export growth and avail of their comparative advantage (Mayer and Wood, 2001). However, countries endowed with natural resources will tend to have export dependence on primary commodities. This can retard growth both because extractive industries have weak linkages with the rest of the economy (or agricultural exports are largely unprocessed) and because primary commodities tend to face deteriorating terms of trade. This may help, in particular, to explain Africa's poor growth performance (Wood and Mayer, 2001). Countries with higher *NRE* values are predicted to exhibit slower growth.

Then we include two trade variables. There is a large literature on the relationship between trade policy and growth, and the difficulties of measuring trade stance are well known (see Edwards, 1993, 1998; Greenaway *et al*, 1998; Milner and Morrissey, 1999; Rodrik, 1992, 1998, 1999). Given the problems of measuring openness we use one of the more widely accepted measures, the proportion of years between 1965 and 1990 that an economy could be considered open (*OPEN*), from Sachs and Warner (1997). This measure has demonstrated robustness in empirical studies (Harrison, 1996; Edwards, 1998). We also include by the ratio of cif unit import prices to fob prices as a measure of natural barriers to trade (*NBT*). There is recent evidence that high transactions costs to trade can be a constraint on growth, and in particular can limit the beneficial effects of trade liberalisation (Milner *et al*, 2000).

It is likely that some of these variables will be correlated and, indeed, that there may be important interaction effects between some of them. One might expect a high correlation between initial GDP and inequality as it has often been argued that the more unequal countries are also the poorer countries. The data does not provide sufficient evidence for this proposition in our sample - the correlation coefficient is very low at –0.067. However, there is a relatively high correlation (above 0.5) between *SEC* and both *GDP0* and *INV*. As the correlation between *GDP0* and *INV* is relatively low (0.15), it is likely that the coefficient on *SEC* will not be significant. Similarly, there is a relatively high correlation between *NRE* and *NTB* (0.38), both of which tend to have growth-reducing effects. This suggests a 'double whammy' in that countries with the highest transport costs also tend to export primary

commodities (for which transport costs are likely to be a higher share of value). We note that *NRE* has much higher variance.

4 Cross-section (long-run) Results

Table 1 presents the results from estimating the basic specification of equation (1). Investment is the principal 'driver' of growth, although our human capital variable is not significant. While growth may itself be a determinant of investment, implying potential endogeneity, our use of the average investment/GDP ratio implies that this should not be a serious problem for overall period growth rates. The coefficient on *GINI* is found to be negative, i.e. higher inequality results in lower growth. This result is quite robust in the three specifications reported. We also find that the dummy for SSA countries (*SSA*) has a negative highly significant coefficient that is independent of inequality. The coefficient on initial GDP is weakly significant only when *SSA* is included and *SEC* excluded, suggesting collinearity between these three variables. As *SEC* is not significant, this is the variable we choose to drop (regression 1.3), in line with other studies, such as Clarke (1995) and Deininger and Squire (1996). This implies that the coefficient on *GINI* includes any indirect effect of income inequality on growth through its effect on education (Knowles, 2001).

Table 1: Cross-section Regressions for Growth: Base Specification

	(1.1)	(1.2)	(1.3)
GINI	-0.050**	-0.040*	-0.039*
	(-2.41)	(-2.00)	(-1.91)
GDP0	-0.0005	-0.0004	-0.0004*
	(-1.56)	(-1.28)	(-1.70)
SEC	0.021	0.006	
	(0.98)	(0.26)	
INV	0.272***	0.262***	0.270***
	(6.53)	(6.44)	(7.02)
SSA		-1.298**	-1.387***
		(-2.53)	(-3.05)
R^2 (adj)	0.572	0.602	0.612
N	42	42	42

Notes: Figures in parentheses are t-ratios: *** denotes significant at 1 percent level, ** significant at 5 percent and * significant at 10 percent. The F-test supports the hypothesis that all coefficients are jointly significant (i.e. rejects the null that all are zero). *SEC* is not significant even if initial GDP omitted. Diagnostic tests (the Breusch Pagan (BP) heterosecdasticity test, Durbin Watson (DW) correlation test and Jarque-Bera (JB) test on residuals for normality) reveal no evidence of serial correlation or heteroscedasticity. The normality assumption of the error term is not violated and tests support the functional form used. The inclusion of $GINI^2$ does not provide evidence for a non-linear relationship.

Table 2:Cross-section Regressions with Openness

	(2.1)	(2.2)	(2.3)	(2.4)
GINI	-0.025*	-0.045**	-0.027**	-0.048***
	(-2.01)	(-2.59)	(-2.16)	(-2.95)
GDP0	-0.0004*	-0.0004	-0.0005**	-0.0005**
	(-1.91)	(-1.50)	(-2.66)	(-2.19)
SEC	0.014	0.010	0.017	0.014
	(0.79)	(0.41)	(1.22)	(0.77)
INV	0.247***	0.236***	0.187***	0.160***
	(7.31)	(5.59)	(4.40)	(3.17)
SSA	-1.158**	-1.085**	-0.883**	-0.707
	(-2.70)	(-2.11)	(-2.48)	(-1.54)
NRE	-0.039***		-0.039***	
	(-5.00)		(-8.65)	
NBT		-8.485**		-11.149***
		(-2.57)		(-3.48)
OPEN			2.026***	2.292***
			(4.08)	(3.48)
R^2 (adj)	0.722	0.621	0.793	0.709
N	42	42	42	42

Notes: As for Table 1. Further details available on request.

We then introduce the 'resource' variables (*NRE* and *NBT)*, and the results are in Table 2 (regressions 2.1 and 2.2). The coefficient on each is negative and significant when included separately. If both are included together only *NRE* is significant; the most plausible explanation for this is that the correlation coefficient between them is reasonably high (0.38) and the *NRE* variable has a greater magnitude and much higher variance. We experimented with interaction terms but these were not significant. The coefficient on *GINI* and the SSA dummy remain negative and significant. The magnitude of the coefficient on *GINI* is lower when *NRE* is included rather than *NBT*. It appears that *NRE* captures some of the negative effects associated with inequality. This is consistent with the argument that inequality of

ownership of resources, such as land, is greater than income inequality, and will tend to have a greater (negative) effect on growth when *NRE* is high.[3]

The final two columns of Table 2 include a variable for the orientation of the trade regime. The results in regressions (2.3) and (2.4) show that the coefficient on *OPEN* is positive and significant. Thus, openness is conducive to growth. The inclusion of *OPEN* adds to the explanatory power of the regression and does not affect the coefficients on other variables, except that the coefficients on *INV* and *SSA* are smaller. These results suggest that part of the positive effect of *INV* is due to openness, while part of the 'negative SSA effect' is due to those countries being closed. Note that the SSA dummy remains negative and significant except in regression (2.4), in which the coefficient on *NBT* is large and highly significant. The SSA countries will all have low values of *OPEN*, although accounting for this alone does not eliminate the 'SSA effect'. Similarly, most SSA countries will tend to have high natural barriers, but this alone does not explain the negative effect. The two combined, however, appear to eliminate the significance of the SSA dummy. A possible interpretation is that openness provides less benefit to SSA countries because they face high natural barriers.

This section used cross-section estimation methods, acknowledging the shortcomings highlighted by Levine and Renelt (1992), to explore the effect of inequality on growth in developing countries. The results should not be considered in terms of the magnitude of the inequality effect on growth, rather they should be considered as an indication of the direction of the aggregate long-run effect. While there may be an omitted variable bias, we note that the coefficient estimates and significance levels appear quite robust. Furthermore, a number of control variables are used. Endogeneity of inequality is not a problem as we are using the initial value of the Gini but period growth. Similarly, as the dependent variable is long-term growth it is unlikely that endogeneity of other explanatory variables is a problem.

5 Panel Data (short-run) Estimates

[3] For a smaller sample, we ran the regression using a measure of inequality of land ownership; the results were broadly similar, although there is evidence that land inequality has a greater negative association with growth than income inequality.

We now turn to panel estimation methods to investigate the short run effects of inequality on growth, and the relationship of this to trade liberalisation. A panel is constructed of five 5-year time periods running from 1970-74 to 1990-1994. A sub-set of the countries in the cross-section analysis is used (determined by data availability). Investment is Gross Domestic Investment as a percentage of GDP averaged over the five year period (*GDIP*). The *GINI* is income inequality at the start of the five-year period, or as near to then as available (from WIID). A period dummy (*PDum*) is used for 1980-94, during which most of the sample was engaged in structural adjustment (including, for many, trade liberalisation). Starting income is measured as the log of initial GDP (*GDP0*) in each period. Initial period *NRE* and *NBT* values were also calculated. These variables constitute the base specification for the panel.

We are particularly concerned about the effect of trade liberalisation, and include this having controlled for the other variables in the base specification. The indicator of the timing of trade liberalisation used is the Sachs and Warner (1997) index, a dummy variable taking a value of 1 for each year beginning from the year when liberalisation is said to have occurred and 0 before this.[4] We augment the Sachs-Warner index (*SWaug*) to add another five countries using our judgement of when they liberalised (see Appendix).[5] A criticism of dating liberalisation at a particular year is that it will take time for effects to occur, but note that we are concerned only with the *period* of liberalisation.

[4] We also tried the World Bank and Dean indicators used in Greenaway, Morgan and Wright (1998), but the coefficients were insignificant in almost all specifications. We are grateful to Peter Wright for providing the data.

[5] Only results using *SWaug* are reported as this gives the largest sample. The smaller panel using *SW* was estimated and results were very similar.

Table 3: Panel Regressions with Trade Liberalisation

	(3.1)	(3.2)	(3.3)
GINI	0.0006	0.0007*	0.0006
	(1.361)	(1.658)	(1.412)
GDP0	-0.0211**	-0.0223***	-0.0230***
	(-2.369)	(-2.630)	(-2.711)
GDIP	0.0020***	0.0024***	0.0023***
	(3.501)	(4.379)	(4.413)
SWaug		0.0199***	0.0219***
		(3.416)	(3.644)
NRE			0.0015
			(1.282)
NBT	-0.0885	-0.0907	-0.1289
	(-0.918)	(-0.989)	(-1.341)
PDum	-0.0083*	-0.1581***	-0.0129**
	(-1.791)	(-3.215)	(-2.379)
R^2 (adj)	0.401	0.459	0.463
N	145	145	145
Estimator	FEM	FEM	FEM

Notes: As for Table 1. A Lagrange Multiplier test rejected the null hypothesis that the classical regression model is appropriate against an alternative of fixed or random effects. The Hausman test was used to choose between Random Effects (REM) and Fixed Effects (FEM) models. Variants of were tested with *NRE* (always insignificant) in place of *NBT* but other coefficients were largely unaffected.

Results are reported in Table 3. The coefficient on *GINI* is positive although only (weakly) significant in one case (3.2). We find only weak evidence in support of Forbes (2000), that inequality appears to be conducive to growth in the short-run. As previously, investment is a major determinant of growth, and there is evidence for convergence within the sample. The coefficients on *NBT* and *NRE* are insignificant. We find robust evidence that trade liberalisation, as measured by the *SWaug* index, is associated with increased growth. Note that the period dummy (*PDum*) has a negative coefficient, implying that liberalisation offsets some other negative effect on growth. This suggests that there is an unobserved effect that

tended to reduce growth in the 1980s (failure to account for this may be a reason why other studies do not find a positive effect of liberalisation). The insignificance of *NRE* in the panel may be because it is largely time-invariant and other variables pick up any related country-specific effects. Similarly, *NBT* does not vary much over time.

The regressions in Table 3 may be mis-specified as *GDIP* is likely to be endogenous, i.e. growth is a determinant of average investment rates during each period. To address this we replace *GDIP* with *SECR* (vale at start of period to proxy for the productivity of investment), as enrolment will not be as responsive to growth as investment within a period. Endogeneity of inequality does not appear to be a problem – growth does not appear to be a determinant of changes in inequality (results available on request) and the coefficient on inequality is mostly insignificant in Table 3. To explore the possibility that the growth-retarding effect of inequality may be conditional on liberalisation we construct an interactive term (*PR*), where *P* is the *SWaug* index and *R* = (100-*GINI*)/100. Thus, *PR* is zero if a country has not liberalised and, once the country does liberalise, approaches one as inequality decreases. The hypothesis is that liberalisation dampens any adverse effects of inequality by removing distortions in resource allocation. To address possible interaction between trade liberalisation and natural barriers we constructed an interactive term *PT*, where *P* is *SWaug* and *T* is the reciprocal of *NBT*. Thus, *PT* is zero if countries have not liberalised and, once countries do liberalise, approaches unity as natural barriers fall. The results are in Table 4.

Table 4: Panel Regressions with Interactive Terms

	(4.1)	(4.2)	(4.3)
GINI	0.00004	-0.0001	-0.0001
	(0.145)	(-0.400)	(0.395)
SECR	0.0053***	0.0004**	0.0004**
	(2.962)	(2.574)	(2.609)
GDP0	-0.0077**	-0.0077**	-0.0077**
	(-2.086)	(-2.500)	(-2.490)
SWaug		0.1781***	0.0181***
		(3.479)	(3.539)
NBT	-0.1407**	-0.1134**	-0.1127**
	(-2.217)	(-2.010)	(-1.996)
PR		0.0025	
		(0.855)	
PT			0.0010
			(0.654)
PDum	-0.0239***	-0.0294***	-0.0294***
	(-4.952)	(-5.861)	(-5.858)
R^2 (adj)	0.206	0.244	0.243
N	140	140	140
Estimator	REM	POLS	POLS

Notes: As for Table 3. Lagrange Multiplier and Hausman tests were used to choose between pooled OLS specification (POLS), FEM and REM. Further results available on request.

There is robust evidence of convergence, and that countries with higher levels of human capital tend to exhibit higher rates of growth (picking up the investment effect). There is also robust evidence that growth performance was generally poor in the 1980-94 period, due to factors not specified in our model (the coefficient on *PDum* is consistently negative and significant). The evidence that trade liberalisation is associated with higher growth appears robust: the coefficient on *SWaug* is positive and significant. The evidence on the effect of *NBT* is also robust: natural barriers have a negative and significant association with growth.

The coefficient on *GINI* is consistently negative but insignificant in all regressions. Neither interactive term is significant, i.e. neither *PR* nor *PT* add to the explanatory power of *SWaug*. There is no evidence of any interaction between liberalisation and inequality.

6 Conclusions

This paper uses cross-section and panel econometric techniques to investigate the links between growth, inequality and trade liberalisation for a sample of developing countries. There are three broad conclusions. First, within the sample, there is no evidence that those countries that are initially poorer are also more unequal. Second, inequality appears to have a negative effect on growth in the long run, although we find no evidence for a short run effect. This negative effect persists when we control for factors that promote growth (investment, education and openness), factors that retard growth (natural resource endowments and barriers to trade), and initial GDP (for which there is evidence of convergence). Third, Africa does appear to be different – even allowing for the other explanatory variables, SSA countries have a below average growth performance.

Although some results are sensitive to specification, the pattern of results for panel estimates is similar to that for the cross section. Investment is the 'driver' of growth, and there is evidence of convergence in the sample. Trade liberalisation tends to have a positive association with growth. High natural barriers to trade tend to be associated with lower growth, but there is no evidence that the benefits of liberalisation are less when barriers are high. However, we only find evidence for a significant effect of inequality on growth in the long-run; the coefficient on *GINI* is insignificant in most panel regressions.

The four theories proposed to explain the relationship between inequality and growth in Section 2 can now be evaluated against the evidence in this paper.

- The **political economy** models are all premised on some version of an argument that inequality encourages redistribution policies that then reduce growth. An implication is that inequality that leads to redistribution reduces growth but should also reduce future inequality. There is no convincing evidence for this. Banerjee and Duflo (2001) find that inequality tends to change least in countries with high inequality, i.e. these countries do

not redistribute income to a significant degree. Redistribution is most prevalent in richer economies, for which Forbes (2000) finds that higher inequality is associated with higher growth in the short run (which is not support for these models). There are no consistent changes in inequality in our sample, suggesting no consistent pattern of redistribution. Our evidence is that inequality has a consistent long-run negative effect on growth in developing countries.

- **Social conflict** models can be considered as alternative 'socio-political economy' models, in which inequality increases tension and conflict (perhaps because it does not lead to redistribution). Conflict and social tension discourage accumulation and therefore growth. If this type of model can be interpreted as representing elite rent-seeking and corruption as social conflict measured by inequality, then this is supported by the evidence for developing countries. Higher inequality results in lower growth, and the elites behind this effect withstand pressures for redistribution.

- **Credit market** models are based on the observation that the poor are constrained in their ability to access credit, therefore invest less and growth is lower. Our results do not test such hypotheses, even indirectly, although we do find that investment is a driver of growth. Future research could explore whether inequality does indeed constrain the level and/or productivity of investment.

- The **X- efficiency** models are appropriate to catch the direct effect of inequality in reducing incentives for effort, hence slowing dynamism and growth. Such effects should be observable in the short-run, but we find no evidence for a negative short-run relationship between inequality and growth in developing countries.

Our results for developing countries suggest that inequality does tend to retard growth, whereas trade liberalisation tends to be associated with increased growth. This supports an interpretation of the 'socio-political economy' models whereby inequality captures rent-seeking behaviour and associated distortions that constrain growth. We cannot infer, from the analysis here, that redistribution (reducing inequality) actually increases growth. We find no evidence of short-run (panel) effects of inequality on growth, perhaps because on average inequality does not change much. The results are consistent with the argument that it is not

inequality *per se* that retards growth but rather that inequality may encourage, or be a proxy for, the types of distortions that reduce economic performance. Trade liberalisation represents the removal of some such distortions (but not all), and has the hypothesised positive association with growth. This is not to claim that trade liberalisation ensures growth. Indeed, our results show that high transport costs (necessary for trade) constrain growth, as do unfavourable resource endowments. However, reducing trade distortions, *ceteris paribus*, is conducive to growth. Similarly, reducing the distortions associated with inequality would be conducive to growth.

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Appendix: List of Variables and Data Sources

GDP0 = GDP per capita in 1970

GROWTH = average real per capita growth rate over 1970-1995 period

INV = average investment to GDP ratio over 1970 – 1995 period, or for sub-periods in panel estimates

SEC = secondary school enrolment rate in 1970. We also tried using percentage of primary school complete in total population (LPC) and percentage in primary school complete in population greater than 15 years (LPC15).

SECR = secondary school enrolment rate at the start of each period in the panel.

GINI = Gini coefficient of income inequality

LandGini = Gini Land concentration Index

NRE = Total Land per worker

NBT = CIF/FOB factor

OPEN = Proportion of the years between 1965 and 1990 that the economy is considered to be open by the criteria set by Sachs and Warner (1997).

SSA = dummy variable with the value of unity for countries in Sub-Saharan Africa and zero for all others.

SW = Sachs and Warner index of trade liberalisation.

SWaug = Augmented SW index (see Table A1).

Sources are *World Development Indicators 1997 and 2000* (CD-ROM), Barro–Lee data set, World Income Inequality Database (WIID), Sachs and Warner (1997), IFAD (2001) for LandGini, *International Financial Statistics Yearbook 1995* (CIF/FOB factor)

Table A1: Additional countries for Augmented Sachs-Warner Index

	1970-74	1975-79	1980-84	1985-89	1990-94
Egypt	0	0	0	0	1
Nepal	0	0	0	0	1
Madagascar	0	0	0	1	1
Nigeria	0	0	0	1	0
Turkey	0	0	0	1	1