Did Partial Globalization Increase Inequality? The Case of the Latin American Periphery, 1950-2000

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Abstract

Inequality is an important threat to the globalization of the world economy that we experience today. This contribution uses the coefficient of height variation as a measure of inequality. This indicator covers not only wage recipients, but also the self-employed, the unemployed, housewives, children, and other groups who may not participate in a market economy, for the period 1950-79, for which income inequality data is mostly unavailable or inconsistent. It turns out that within-country inequality is higher in time periods of greater openness. This result is confirmed for the time period 1950-2000, and a much broader model.

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Did Partial Globalization Increase Inequality? The case of the Latin American Periphery, 1950-2000

I. Introduction

To understand the relationship between globalization and inequality is one of today's major economic agendas. Is it possible that the current globalization will fail, just as the previous tendency toward globalization in the period 1850-1914 did, because inequality stimulates anti-integration forces? Timmer and Williamson (1998) found that during the 19th century, inequality in New World countries such as the USA, Brazil, Argentina, Canada and Australia provoked anti-immigration policies that led to the disintegration of Atlantic labor markets. Rising inequality could as well decrease the legitimation of international integration, so that those groups which normally benefit from it (for example, the well-educated in medium and rich countries, and the world inhabitants on average) might not defend it with enough vigor, after having seen television reports about children in Pakistan sewing soccer balls late in the night.

There are other reasons why the study of inequality determinants is important. Firstly, inequality is now often considered as a component of the standard of living (Frank, 2000; Deaton, 2001): Being at the bottom of the income distribution is much harder to bear if the distance to the wealthier part of the economy is large.

In addition, inequality research is important because many growth studies in the 1990s found a strong negative impact of inequality on growth (Galor and Zeira, 1993; Alesina and Perotti, 1994; Alesina and Rodrik, 1994; Persson and Tabellini, 1994; Birdsall et al., 1995; Clarke, 1995; Benabou, 1996; Deininger and Squire, 1998). Recently, two studies have questioned the generality of this finding. Barro (2000) argued that inequality is preventing growth only in very poor countries, while medium income countries actually grew faster with more inequality according to his regression analysis. Forbes (2000) found that most of the inequality retardation effect is picked up by time invariant fixed effects, and in the short run inequality is correlated positively with growth. Hence, we have an on-going debate that is certainly indicating the importance of inequality studies by economists.

The central question of this paper is whether openness impacts on inequality in developing countries. Our expectation is that openness in fact decreases inequality in countries with abundant unskilled labor. But inequality is a complex event. Kuznetsian labor market disequilibria during rapid technological change could lead to higher incomes of some social groups with better skills or more direct access to profitable information (for example, the inhabitants of the capital could be better informed). We will therefore put the hypothesis to the empirical test, controlling for as much other potential determinants as possible.

Why should openness matter for inequality? Most research in this field has been on OECD countries, arguing that imports of goods that are mainly produced with unskilled labor could decrease the demand for unskilled labor within the rich OECD countries, depressing unskilled wages and increasing inequality. However, factor endowments and relative scarcities in developing countries (LDCs) fundamentally differ. Wood (1994, 1997, 1998) and some others have studied the impact of openness on inequality in less developed countries. Robinson (2001) argues that globalization is mostly innocent of driving inequality in Latin America. Instead, he puts most of the blame on hostile elites (but his income inequality data does in general not start before 1970).[1]

In the absence of unusual complementarities between factor inputs and other counter-acting forces, poor countries will increase their exports of unskilled-labor intensive products in globalization periods, because their abundant factor and their comparative advantage are likely to be in this segment. Increasing production with unskilled labor should increase

[1] For the countries considered here, there is one number on income inequality dated before 1970 in the Deininger and Squire data set (see Appendix B). There is more information on income inequality in the richer Latin American countries (Mexiko, Chile, Argentina), and on land inequality.

unskilled labor demand and wages. Therefore, the expectation is that inequality would be falling in LDC's upon engaging in international trade.

Alas, the empirics do not confirm this theoretical expectation for Latin America. After opening up their countries to imports in the 1980s and early 1990s, wage gaps increased rather than decreased as expected (Ahsan 2002, Bulmer-Thomas 1996). In contrast, three East Asian Tigers in the 1960s and early 1970s did conform better to economic theory: Their wage gaps did decline. Wood hypothesized that the reason for this might be because at the time the Asian Tigers entered the international market they had only modest competition in the market for goods with a high content of unskilled labor. However, in the 1980s the Chinese giant did integrate into the world market, and many others followed. The Latin American unskilled workers were unlucky, because by continental Asian standards, their wage was already impressively high. This story is plausible, but has to be confirmed by supplementary evidence. After all, Wood and others did not consider comprehensive inequality data for Latin America before the 1980s. In East Asia, too, wage gaps are insufficient evidence, because large parts of the economy did not earn wages. We will augment the existing literature on this important line of research with new data as follows.

Studies on the influence of globalization and deglobalization on within-country inequality have been performed on the long-run trends worldwide. Lindert and Williamson (2001) considered the data of Bourguignon and Morrison (2000) who found a strong decline of within-country inequality during the de-globalization phase of 1914-45, whereas within-country inequality rises during globalization phases. They explain in detail that the theoretical expectation of land-rich New World countries does fit this observation (because immigration was much lower in the closed world economy of the war and inter-war period, and trade and capital flow restrictions might have benefited the New World poor on the expense of labor abundant Old World countries' workers). However, inequality declined in the European industrial core as well, a fact that cannot be explained with simple Stolper-Samuelson trade theory. Inflation, policy (socialism, and the welfare state), increasing taxation of the rich and more education for the poor, increasing limitations for entrepreneurial people and more protection for workers, employees and less entrepreneurial people – all these factors are potential candidates to explain this surprising result. We will not finally explain this in our study, but this result might follow the same mechanism as our results for Latin America here.

II. Measuring inequality for LDCs without income distribution data

There are numerous ways to measure and conceptualize inequality. Firstly, due to the traditional structure of economic data that tends to be mainly aggregated by national entities, we have to distinguish between-country and within-country inequality. In this study, we will consider only the inequality within countries. Lindert and Williamson (2001) have convincingly argued that between-country inequality is not increased by globalization, if only the participants of globalization are considered. In addition, Boltho and Toniolo (1999) and Schultz (1998) found that between-country inequality did not increase at all in the post-war period, it actually declined in the 1980s and 1990s (this might be sensitive to different weighting procedures, as converging China and India have large weights). Wade (2002) recently summarized the contrary view. In contrast, household income inequality within 20 of 21 OECD countries was rising (Lindert and Williamson, 2001; Burniaux et al., 1998; Atkinson, 2000). The development of inequality within Less Developed Countries (LDCs) is, however, still unclear because available data are problematic.

How can we measure inequality in LDCs? Those studies that go back in time with consistent data have concentrated on wage inequality between industries, or they used indicators such as real wage divided by real GDP/c that do not include whole distributions of income, but just two means. Wage inequality is clearly problematic, as so many inhabitants of LDCs do not receive wages: There are many self-employed people - for example, the numerous peasants of Latin America. In addition, many people receive their income in the shadow economy, and many potential wage recipients are unemployed (or both). The amount of transfer between the wage recipient and the rest of his or her household is also far from constant. In addition, using wage data we often have to limit our analysis to the large cities, whereas regional inequality is one of the major contributors to overall inequality. All these reasons, but especially the measurement problem of unemployment and self-employment with traditional wage inequality measures, suggest that the inequality of heights is a good complement to conventional indicators, and perhaps even better in some ways.[2]

In addition, Deaton (2001) and Pradhan, Sahn and Younger (2001) argued convincingly that measures of health inequality are important by themselves, not only in relation to income. There is a comprehensive anthropometric theory documented in the literature, therefore we can remain brief on this point (Komlos, 1985; Steckel, 1995; Baten, 2000b, and on height inequality especially Baten, 2000a).

While the stature variable has its specific problems[3], heights do measure important biological aspects of the standard of living.[4] Using this indicator, we are able to include the unemployed, the self-employed, the participants of hidden economies, housewives, children, and of course wage recipients, too. In this study, however, our sample is restricted to mothers. We will consider below how this restriction might influence our analysis. We do not claim that height inequality should be the only measure. We would rather argue that in order to answer important questions we have to resort to a multitude of different measures and see the extent to which they correlate with one another.

In addition, this variable has the advantage to be an outcome indicator, whereas real income is an input to human utility. Public goods in the health and educational sphere, for

[2] Komlos (1985) was arguing on very similar grounds for the usefulness of stature as an indicator of the standard of living.
[3] For example, heights are especially sensitive to milk consumption. And while this might translate into a higher probability of living a long and healthy life, there are also counter-examples.
[4] For collections of recent examples, see Komlos and Baten (1998), Steckel and Floud (1997), and Komlos and Cuff (1998). On height inequality research, see Soltow (1992) and Quiroga and Coll (2002).

example, with their strong egalitarian impact, are not measured by income inequality, but they are reflected in the inequality of heights.[5]

One additional advantage of height inequality as an indicator is its availability. In a database designed to consider the health of children and demographic characteristics of the whole population from the late 1980s to early 2000s, the firm Macro International has collected an enormous amount of information on education, anthropometrics, and demography of women born between 1950 and 1979.[6] The data continues until about 1985, but women younger than 20 are no longer included, as the probability of selectivity bias decreases with age in this group. We also exclude extreme heights (below 125 cm or above 180 cm). Extreme heights account for 0.21 percent of the original sample of 71163 women, so we are not losing many observations here.

Height inequality could be measured in principle by standard deviations, coefficients of variation, or centimeter distances between main occupational and income groups. The latter measure has already often been used by economic historians, but we use the coefficient of height variation – the advantage is that one does not have to rely on (always somewhat arbitrary) social classifications. A more detailed study analyzed the different measures of equality for early 19th century Bavaria, as the ideal data set was available for this region and time period (Baten, 1999, 2000a): nearly the whole male population was measured at a homogeneous age and the economic status of all parents was recorded. This allowed for a comparison of the different measures that turned out to be highly correlated. The standard deviation was not a good measure, as anthropologists argued that it increases with average height. The coefficient of variation (CV), in contrast, is a robust estimator of inequality, if certain conditions of homogeneity are fulfilled (especially: no mixture of still growing and adult individuals). Nevertheless, the very high correlation between CV and the standard

[5] We thank Hans-Werner Sinn for this hint.

[6] The Demographic and Health Survery project (DHS) is funded by the U.S. Agency for International Development. The data set can be accessed under: http://www.measuredhs.com after applying for permission.

deviation (if average height is not too unsimilar) makes a comparison with the more intuitive standard deviation possible. Recently, World Bank and development economists have suggested the Theil entropy measure of height as an inequality indicator (Pradhan, Sahn and Younger, 2001). If the CV of height (as suggested by Baten, 1999, 2000a) is calculated for their data, both measures are highly correlated (a regression R-square of 0.99), so the CV can easily be converted into the Theil measure.[7]

Next we need to address the potential problem of measurement error that should be closely scrutinized, especially for data from developing countries. Measurement error leaves mean height estimates unbiased, while it increases standard errors, because errors high and low cancel each other out. Unfortunately, the same is not the case with coefficients of variation, because measurement errors get added into the sum of squares and look to the analyst just like greater inequality. Therefore, variation in CV could be due to variation in measurement error theoretically.

Where would we expect measurement error in our sample? Almost all of the women in a specific country were measured in the same year (some repeated surveys were taken only a few years apart), by similarly educated personnel, so that the sources of measurement error are limited. Age misreporting (such as rounding to numbers ending with 0 or 5) cannot be a major problem, because we aggregate all measurements into five year birth cohorts. One could perhaps imagine that this measurement error increases over time, because some of the older women start to shrink earlier than others. In that case, a time trend should catch the systematic error component. If CVs were regressed on a simple time trend, and on a time trend for the first four observations only (1950-54 to 1965-69), we obtain the result that in

[7] Using their data in table 2 and 3, the regression of CV of height on the Theil entropy measure and their square yields:
CV = 4.096 + 1.652 * Theil – 0.110 * Theil-squared. All significant at 1-percent-level of significance. Adjusted R-square is 0.999. N=55. The authors argue that heights of children under age 5 are better suited than adult heights, but do not really prove this hypothesis in our view. Their main argument is that some anthropometric studies have found height distributions of young children to be homogenous between genetic groups. We do not yet have studies that found the opposite for adults, if all environmental factors are controlled for. Clearly, for the time period under study by Pradhan et al. (2001) only heights of children below age 5 are available.

both cases time was not significant at any reasonable level of significance (p-values: 0.58 and 0.54 respectively). We also tested whether observations which depended on less than 300 cases had higher standard deviations, because a lower number of cases might make an individual measurement error more influential. But again, there is no significant influence when CVs are regressed on a dummy variable for those cases with 300 or less observations (p-value: 0.36). To sum up, while measurement errors should always be seriously scrutinized when using coefficients of height variation, in this case we can reject a potential bias arising from this factor.

III. Data

III.1 Potential selectivity and geographical coverage

The company Macro International Inc. performs surveys of child health and health-related behaviour in order to create a solid and representative database for improving child health (among other aims). They recorded heights of several 100,000s of women (mothers) in many developing countries that were mostly born between 1950 and 1979. As the height of adults is mostly determined in the three years after birth, the height of the mother can shed light on the development of nutritional status in this period. One potential lacuna in our data is the environmental influence on growth at later ages, especially during the adolescent growth spurt. However, Baten (2000b) finds that this effect is negligible compared to the impact of the first three years, as long as individuals have reached their final height.

Does this data set of mothers tell us something about all women and about the population in general? Moradi (2002) has explored the potential difference between mothers and non-mothers. He finds a very moderate selectivity among young mothers: Mothers at age 20-25 were slightly less educated than the reference population. By employing usual height elasticities for education levels, Moradi estimates about one millimeter shorter height of mothers, compared with the reference population of all women aged 20-25. Among older women, there was no significant selectivity. This result suggests that selectivity might not be a great problem, but further studies that investigate this potential bias for other countries would be welcome. However, data sets are scarce and if they are available, women are often recorded in hospitals (with typically stronger selection bias than in our DHS case). Our consideration of height inequality is probably unaffected by this very small height level selectivity of one millimeter, because we are considering coefficients of variation that do not correlate with height levels.

While there might be no selectivity among average heights, what about the variability of heights? A comparison with those pieces of income inequality information that are available for our countries in the 1970s suggests that our measure of height inequality is very consistent with income inequality (see appendix A).

The geographical coverage of the Latin American periphery is comprehensive. Macro International provides sufficient data on heights on seven countries that are indicated by darker shading in figure 1. "Periphery" means low income and insufficient access to best-practice technology of the economic core. The countries Brazil, Peru, Colombia, Bolivia, Dominican Republic, Nicaragua and Guatemala represent a high share of this periphery, whereas temperate zone and higher-income countries such as Argentina, Chile, Uruguay, Venezuela and Paraguay are not in the Macro International sample.

Figure 1: Countries of our study (dark/blue: included)

Source: see table 1.

The number of cases per country is not correlated with size. Peru is particularly well-documented, allowing a more detailed analysis below, whereas we have fewer measurements on Brazil, a very large country (Table 1).

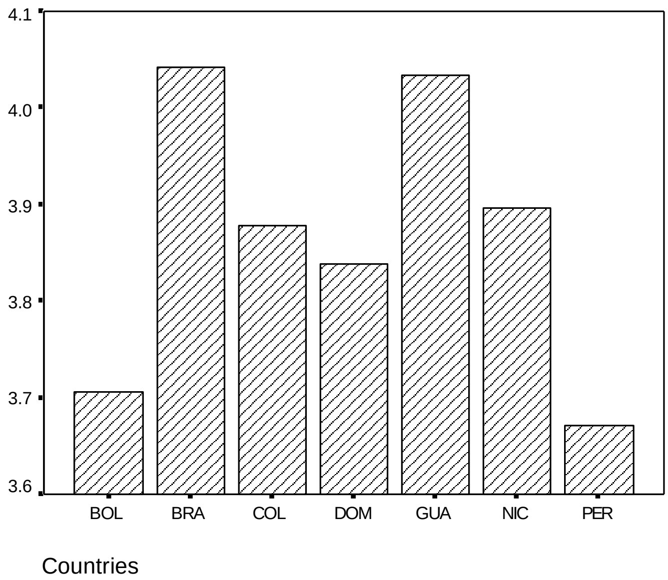
Table 1: Underlying number of cases

Years	BOL	BRA	COL	DOM	GUA	NIC	PER
1950-54	428	145	271	313	638	144	861
1955-59	1181	432	678	778	1562	399	2211
1960-64	1919	787	1412	1522	2399	760	3978
1965-69	2539	1261	2296	2456	3081	1182	5434
1970-74	2531	1314	2594	1832	3785	1410	6250
1975-79	1040	420	1424	478	1530	1113	4222

Source: Calculated from the Demographic and Health Surveys performed by Macro International Inc.

What country differences of height inequality do we observe? The CVs of Brazil and Guatemala are relatively high, whereas the average inequality in Peru and Bolivia was relatively low (Figure 2). In the Brazilian case, regional inequality could play a certain role, which we will control below with cross-sectional (country) fixed-effects regression models.

Figure 2: Height inequality 1950-79 (pooled)



Source: see table 1.

III.2 Do the height differences plausibly reflect the biological standard of living?

Komlos (1989, p. 183) was the first to forge the term "biological standard of living" in his study on Habsburg heights. In Baten and Wagner (2002), biological standard of living is defined by its components life expectancy, morbidity and quality of nutrition. One possibility to counter-check the validity of our Latin American height data set is to compare it with life expectancy, although one should keep in mind that each component has its idiosyncratic part. If different components of living standard are correlated, the probability of mismeasurement is lower.

How can we assess the correlation between different components of the standard of living? In the following, we compare female height levels with life expectancy of both sexes to find out whether female height is a good predictor for the biological standard of living of both males and females in Latin America (Table 2).[8]

[8] Haines (1998) compared the development of height and life expectancy in the 19th century U.S., for example. Murray (1997) is a very important methodological contribution in this field, and Fogel (1994) and Steckel (1995) summarize.

Table 2: Regressions of life expectancy on height in Latin America 1950-54, 1975-79

	Latin America 1950-54	Latin America 1975-79	"OECD" sample 1950
Constant (life expectancy with 'high' stature)	71.6 (0.00)	77.7 (0.00)	73.3 (0.00)
Height deviation from 'high' value*	-1.1 (0.05)	-1.0 (0.09)	-1.2 (0.00)
Adj. R-square**	0.47	0.36	0.83
N	7	7	17

* The "high" value is the Dutch value of the 1990s (rounded to 180 cm for males, 170 cm for females, see Drukker and Tassenaar 1997). The idea behind this is that Dutch heights are the tallest in the world, suggesting that their net nutritional status is also the best. We have female heights for Latin America and compare it with male heights for the "OECD" sample. The latter sample consists of Spain, Italy, Austria, Bavaria, Württemberg, Netherlands, Belgium, Germany [total], France, England, Switzerland, Denmark, Sweden, Norway, Schleswig, United States, Australia), Source: see table 1, World Bank (1999) and Baten and Komlos (1998, p. 868-69), p-values in parentheses.
** For the "OECD"-sample, we had to use a non-adjusted R-square, because we took it from Baten and Komlos (1998).

We calculate the explanatory variable as the height deviation from a "high" value, so that the impact of each centimeter deviation from this value on the number of expected life years can be estimated. This specification suugested by Baten and Komlos (1998) follows the spirit of the Human Development Index upper bounds. Its main advantage is to allow a direct interpretation of the constant. The constant explains how long people would have lived at this level of height, given medical technology, public health and all the other determinants of life expectancy.[9] We define the constant in the regression of life expectancy on female height (column 1 and 2) as the approximate height of young Dutch females during the 1990s that is close to 170 cm (for males 180 cm). At this "high" level of height, Latin Americans would have lived 71.6 years in the early 1950s, and 77.7 years in the late 1970s (Table 2, column 1 and 2). Interestingly, this constant is not too far from a constant that can be estimated using a sample of OECD countries and regions (column 3). It is remarkable how similar the estimate of the constant for the 1950s is in both the Latin American and the OECD sample.[10]

[9] In the Baten and Komlos 1998 study on "OECD" countries and regions, the constant rose from 63 years around 1860 to 67.9 years in 1900 to 73.3 years in 1950.
[10] We follow the slightly complicated procedure of Baten and Komlos (compared with using height directly as explanatory variable), because this has three advantages: (1) direct comparability with their results, (2) the nice

These regressions of Latin American life expectancies suffer from severe "micronumerosity" (that is, small number of cases) as there are only seven countries in our two cross-sections. However, in spite of the small number of cases, all coefficients are significant at least at the 10 percent level, and R-squares suggest that all countries are close to their regression line (Table 2). In addition, the results are plausible: In the early 1950s, a centimeter of height deviation from the female high value of 170 cm meant 1.1 year less life expectancy, in the late 1970s it diminished modestly to 1.0 years less. The coefficient of the OECD estimate is very similar with a 1.2 years loss for each centimeter below 170 cm.[11]

Summing up, a comparison of two components of the biological standard of living suggests that they are closely related. This indicates a generally high validity of the data used in this study. Moreover, the results are consistent with other studies on this relationship for OECD countries. And there is an additional interesting aspect of our results: The correlation between height and life expectation suggests that centimeter differences between income groups also proxy life expectancy differences. For example, if groups of higher status are 1.5 cm taller, this proxies suggests that they lived 1.5-1.7 years longer.

Note however, that we can perform this data quality evaluation exercise only with average heights and life expectancies, not with the inequalities of both. We report in appendix A a comparison of height inequality and income inequality that provides further support for the use of height CVs in the cases studied here. Moradi and Baten (2003, reported in more detail below) do the same with 29 African countries and confirm the validity of height CVs from the same source.

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interpretation of the constant ('how long do people live if they had the high Dutch height level?') and (3) the estimation of the vertical intercept is less problematic, because the observations are clustered not too far from the vertical intercept. The distance is small relative to the variation in independent and dependent variables.

[11] It is possible that the similarity between Latin American and OECD countries in the height–life expectancy relationship (albeit there is no similarity of height and mortality levels, of course) should not be generalized to other developing regions of the world. Latin America has a idiosyncratic demography. For example, Klasen (1994) found that in Latin America mortality-determining discrimination against women is relatively modest by LDC standards, whereas Asia for example has much stronger excess female mortality.

IV. Explanatory variables: Openness and other potential determinants of inequality

IV.1 Openness

How can we measure "openness"? Given the importance of this variable, much work has been done in this field. Most economists agree that simple trade shares of GDP are insufficient by themselves to capture the degree of openness of an economy. If two neighbouring free-trade countries have exactly the same factor endowment, it is possible that their trade is relatively low in spite of their openness, simply because production is so similar. On the other hand, two highly protected countries can experience high trade shares, if their endowments are sufficiently different. Many alternative measures for "openness" have been proposed. We will consider two of them (and a third one in section V.2) that are somewhat extreme cases among the many different measures, and see if both have the same effect on our inequality variable whose variation we want to explain.

World Bank economists, under the lead of Greenaway, have created a four category system of "strongly" or "moderately outward oriented countries", and "moderately" or "strongly inward oriented countries", and they applied this to 41 developing countries. The criteria to classify countries into these groups are the following: direct trade controls (quota, import licences), effective rates of protection, export incentives, and exchange rate overvaluation (World Bank, 1987). The idea behind the latter variable was that inward orientation often led to an overvaluation of the exchange rate. Among our seven Latin American countries, none reached the highest level of outward orientation (of the 41 LDCs, only Hong Kong, South Korea and Singapore reached this category). We coded our countries in the remaining three groups with an integer index of 1 to 3.

Another, more recent attempt was the openness index of Sachs and Warner (1995) for 79 countries. These authors also consider high tariffs, important tariff barriers, plus state monopolies of major commodity exports, a high black market premium for national currencies, and a socialist economic system. This variable is coded as a binary variable.

Rodriguez and Rodrik (1999) critized that especially the state monopoly and currency black market premium might measure other economic characteristics than just lacking openness. The currency value distortion also indicates other macroeconomic problems. However, if there is no perfect measure of openness it is a promising strategy to use both and see if the results are consistent. For the Latin American case both indices are not significantly correlated, because some countries' openness is jugded in a different way (Table 3): There is some disagreement between World Bank and Sachs/Warner about Brazil: The World Bank regards this country as moderately outward oriented, S&W as closed (until 1991). There is broad consensus about the Dominican Republic, Nicaragua and Peru, WB is more optimistic about Colombia's and Guatemala's 1960s. S&W are more optimistic about Bolivia in the 1960s.

In spite of our conceptual skepticism against the trade share of GDP as a measure of "openness", we will also test this variable below, and we find that it confirms the other two measurement concepts.[12] Finally, we also recalculated the Sachs-Warner-Index in a way that takes into account the criticism by Rodriguez and Rodrik (1999): We removed the black market, state monopoly and socialism component, so that "SW tariff/non-tariff barriers" will denote the remaining two components that are generally accepted indicators of the export incentive structure (a tariff rate of more than 40 percent and non-tariff barriers that affect more than 40 percent of imports).[13]

Table 3: Opening and Closing according to Sachs/Warner and World Bank

Country	Opening	Closing
Bolivia	SW1956 SW1986	SW1979 WB1973ff
Brazil	SW1991	
Colombia	SW1986	WB1973ff
Dominican Republic	SWNever	
Guatemala	SW1989	SW1962

[12] We thank Robert Hunter Wade, Thorvaldur Gylfason, and Stephan Klasen for their comments on this point.
[13] We thank Stephan Klasen for his important hint (on another paper) in this respect.

		WB1973ff
Nicaragua		SW1961
Peru	SW1992	SW1968

WB: No changes 1963-85: Nicaragua remains moderately inward oriented, Brazil remains moderately outward oriented, Dominican Republic remains strongly inward oriented. Sources: Sachs and Warner (1995), World Bank (1987).

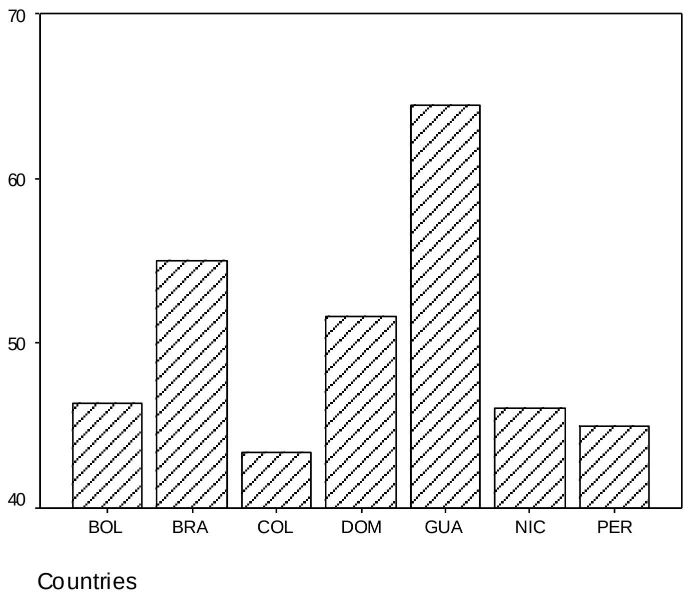
IV.2 Other explanatory variables

Inequality of education

Human capital endowment is a very likely candidate that could influence inequality. Moreover, it might be a proxy for endowment inequalities that we are not able to measure (such as wealth inequality or inequality of entrepreneurial ability), but this assumption has to await further, more detailed research.

We measure educational inequality with the coefficient of variation of the highest year of schooling that the women in our sample received (Figure 3). In order to minimize measurement error with regard to timing, we lagged this variable so that we consider educational inequality for the period when women likely received most of their schooling (on average 3.5 years) between age 6 and 10. Some women might have gone to school later, but most of schooling was probably received at this age. Variation of the lag specification did not change the results.

Figure 3: Educational inequality by country



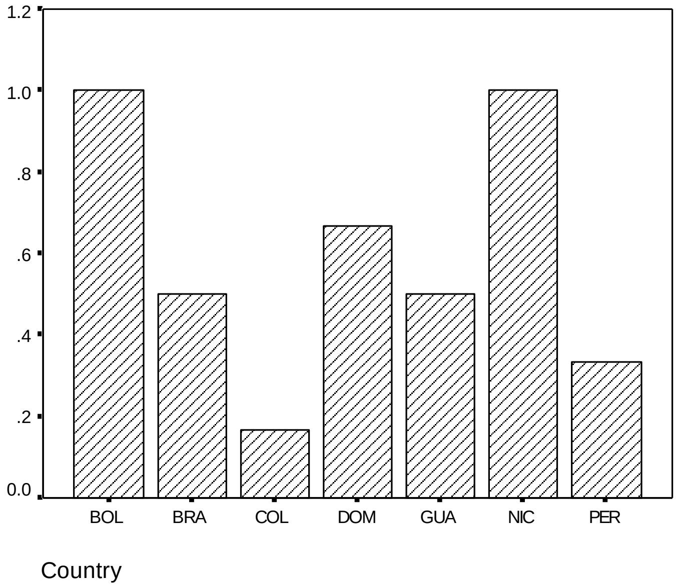
Source: see table 1.

Dictatorship

Li, Squire and Zou (1998) also emphasize the importance of political freedom for income equality: If dictatorship provides privileges to certain groups in society, this might lead to higher inequality. On the contrary, democracy could result in a more equal distribution of incomes. The reseach project “POLITY IV”, at the University of Maryland, has created comprehensive surveys on the democratic or autocratic behaviour of governments in recent history. We measure dictatorship by using the democracy score that ranges from 0 (=autocratic) to 10 (=very democratic). We coded the values 0 to 4 with a "dictatorship" dummy to denote particularly undemocratic regimes. One could imagine that dictatorship might increase inequality, as most Latin American dictators were right-wing, who might have taken political steps to redistribute income in favor of the rich. They also typically suppressed unions who strove for flatter pay schemes. However, there were exceptions, such as the Peruvian dictators after 1965. But the results do not change if we differentiate between different political orientations of dictatorship.[14] Empirically, Colombian government did get the best grades during this period, while Nicaragua and Bolivia were particularly non-democratic (Figure 4).

[14] See: http://www.uni-tuebingen.de/uni/wwl/regr_lag.pdf, regression 3 and 4.

Figure 4: Dictatorship

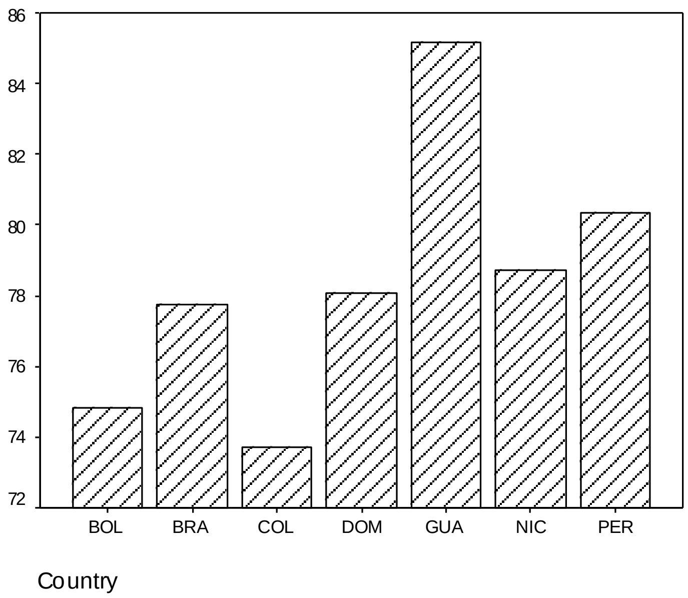


Source: Polity IV project, Univ. Maryland.

Gender inequality: female excess mortality

Our data set relates to women, and although we found a relatively close relationship with life expectancy of both sexes above, a control variable for gender discrimination might strengthen the validity of our regressions. We constructed a rough indicator of excess female mortality by dividing female mortality by male mortality (multiplied by 100, see Figure 5). As there is a biological survival advantage for women, a value close to 100 would suggest that less nutritional and medical resources were provided to females. Better measures that take into account changing age structures could improve the results here.

Figure 5: A Proxy for Female Excess Mortality: relative mortality by country



Source: World Bank (1999).

V. Did Openness correlate with higher inequality?

V.1 A simple model

In four regressions of inequality, we employed the two different concepts of openness plus differing sets of other factors as explanatory variables (Table 4). The first two regression columns employ the World Bank concept of openness, and the two regressions on the right use the Sachs/Warner concept. Regressions 1 and 3 are least square dummy variable models that account for country fixed effects. The advantage of this method is that a certain control for unobservable, country specific factors is given that varies little over time.

Table 4: Determinants of inequality in the Latin American periphery, 1950-79
Dependent variable: height inequality (coefficient of variation of height)

Which concept of openness?	World Bank	World Bank	Sachs/ Warner	Sachs/ Warner
Openness	0.22 (0.04)	0.14 (0.00)	0.29 (0.01)	-0.04 (0.65)
Ineq education * 100	-0.12 (0.88)	0.77 (0.00)	-1.36 (0.16)	1.13 (0.04)
Dictator * 100	3.79 (0.64)		3.72 (0.63)	3.49 (0.60)
Fem./male mortality * 100	0.80 (0.45)		0.68 (0.51)	0.14 (0.88)
Trend		0.00 (0.52)		
Constant	2.81 (0.00)	-1.07 (0.87)	3.57 (0.00)	3.19 (0.00)
Country fixed effects included?	YES	NO	YES	NO
Adj. R-sq.	0.32	0.36	0.38	0.10
N	42	42	42	42

N=42; Constant refers to omitted country in fixed effects models; p-values in parentheses. Tests for heteroskedasticity, autocorrelation, and RESET tests indicated no estimation problems. Sources: See table 1 and text.

We find a relatively consistent positive influence of openness on inequality (Table 4).[15] Only in specification 4, is there no influence of openness. This is caused by the fact that Sachs and Warner classified Brazil as an always "closed" economy (and it had a high CV of heights). However, if country fixed effects are controlled for (col. 3), the openness variable regains significance even with the Sachs/Warner classification. The coefficients of openness are very robust.[16] Are these coefficients large or small? A representative "high inequality observation" has a CV of 4.10, a "low inequality observation" has 3.66.[17] Therefore, the difference between open and closed economies (0.29) in the SW specification accounts for more than two-thirds of the difference between high and low (0.44). Therefore: this influence is large and economically meaningful.

[15] Moreover, in dozens of other regression specifications this variable turned out to be very robust.
[16] Even if we take into account that the World Bank concept is coded as integers between 1 and 3, whereas the SW concept is coded as a dummy variable, after adjustment the coefficients are still in the same magnitude.

Our result that higher openness is associated with greater inequality was not visible in Frank's (2001) study on one Brazilian frontier province (Mato Grosso) during the 1900s to 1920s. Frank calculated pay ratios of the state treasurer of Mato Grosso (proxying 'high' income group) relative to teachers and receptionists (porteiros) and found that those pay ratios did not decline in the decade after the Brazilian export boom ended (during WWI). In a similar vein, wealth inequality - on which Frank has more comprehensive data - did not increase during the export boom. Some other indicators provided mixed results. The difference of Frank's evidence and ours is that (1) the time period is different: the 1900s to 1920s had quite a different institutional background in many respects (2) wealth inequality is well-known for varying quite little and changing slowly (especially when landed wealth is dominant) and (3) the sample coverage is quite different (one province vs. seven major countries). Thus, while we have to admit that our results might not hold for the pre- and interwar years, we do not feel that Frank's study casts serious doubts on our main findings.

In the regressions reported in Table 4, educational inequality can explain some of the height inequality measure, if we assume that there are no unobservable country-specific variables that we cannot measure (col. 2 and 4). However, if we include country fixed effects, this variable becomes insignificant. There might be an influence, but we cannot be sure.

The other variables have no statistically significant coefficients. The signs of the coefficients are as expected (higher inequality under dictatorship and female excess mortality regimes) and relatively robust, but the lack of significance indicates that there is at least a large amount of variation around these observations. This can be caused by measurement problems, but more likely the influence is unsystematic. The trend tested in regression 2 is insignificant.

The country fixed effects (not shown in detail) resemble the averages in figure 2. Especially Brazil and Guatemala had a much higher height inequality than Peru or Bolivia.

[17] "Representative" high and low: Those are one standard deviation above and one standard deviation below the

Brazil is so much larger than all the other countries under concern here, therefore the influence of inter-regional inequality could be quite large. Note that the gini coefficient of income inequality in Brazil is also exceptionally large after the 1970s, not only our height CV measure. How to explain the high inequality in Guatemala? The long civil war could not be the reason, because Guatemala had already high inequality before it started. Could inequality be caused by a very high share of American Indian origin of the population? This seems unlikely, because Peru has also a high share. In addition, under favourable conditions Guatemalans of Indian origin rapidly converged in height to US standards, as Bogin (1991) demonstrated.

The explanatory power of these models is relatively large, even without country dummies almost 40 percent of inequality variation can be explained. The Sachs and Warner concept of openness leads with controls for fixed effects to higher explanatory power. To sum up this section, we find a consistent positive influence of openness on inequality. We cannot be certain whether educational inequality had an increasing effect, because significance vanishes in the fixed effects model. Our control for female discrimination did not have an observable influence.

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mean. Note that we are dealing here with standard deviations of coefficients of variation of height.

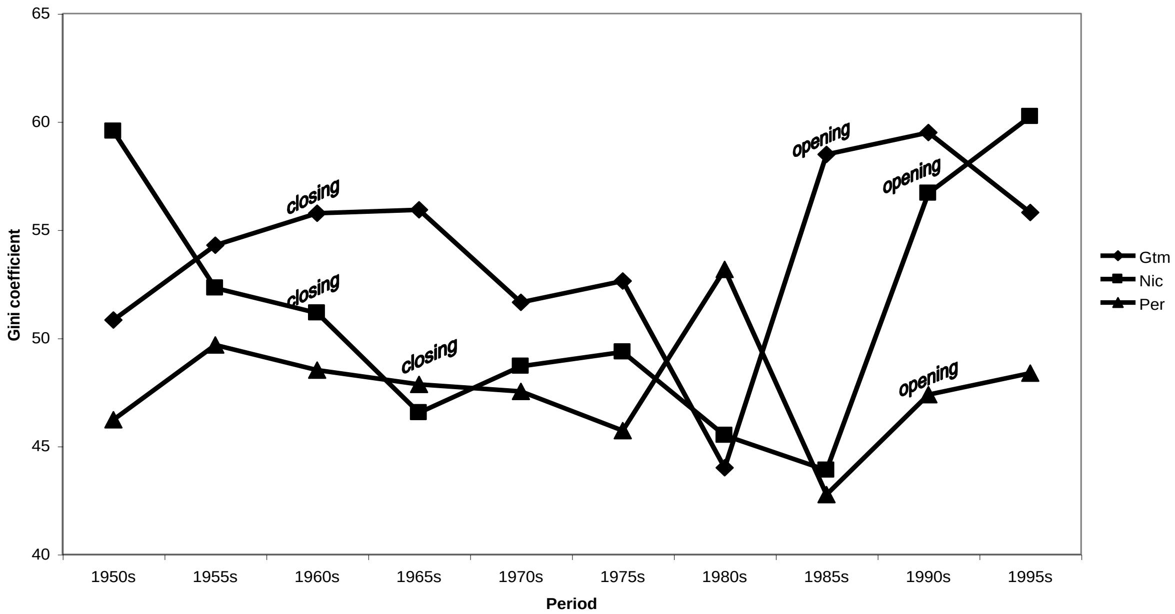
V.2 Extending the basic model: Adding 1980-1999 and other explanatory variables

Inequality is a complex phenomenon, not to be explained with one or very few determinants. We will consider additional influences by including as many additional variables with potential explanatory power as possible (in addition to openness, education, and dictatorship that we considered above). However, these tests with additional variables would not be possible if we could only use the 42 observations of the period 1950-79 examined in section V.1. Especially for the 1950s, many of the additional explanatory variables are not available, leaving us with an insufficient number of cases. We therefore decided to increase the data set with gini coefficients of income inequality from the Deininger-Squire data set for the 1980s and 1990s (see Appendix B for the definition of variables). The overlapping period of the 1970s indicated a high cross-sectional correlation between height CVs and income gini coefficients (see appendix A). It is therefore possible to estimate gini coefficients of income on the basis of height CVs.

Although these two inequality indicators do not measure exactly the same, the causal relationship between purchasing power and consumption of food and other health resources appears sufficiently strong for this time period and region to yield such a close correlation. Moreover, this estimation of income inequalities on the basis of CVs of height is confirmed by a recent study on 29 African countries (Moradi and Baten, 2003). The authors find in a panel study (N=84, with country fixed effects) that one additional per cent height CV means between 13.4 and 16.8 points of the gini coefficient of income scale. That is very close to our estimate of 15.5 (appendix table A1). Moradi and Baten (2003) find also a very close correlation between those two measures over time for individual countries.

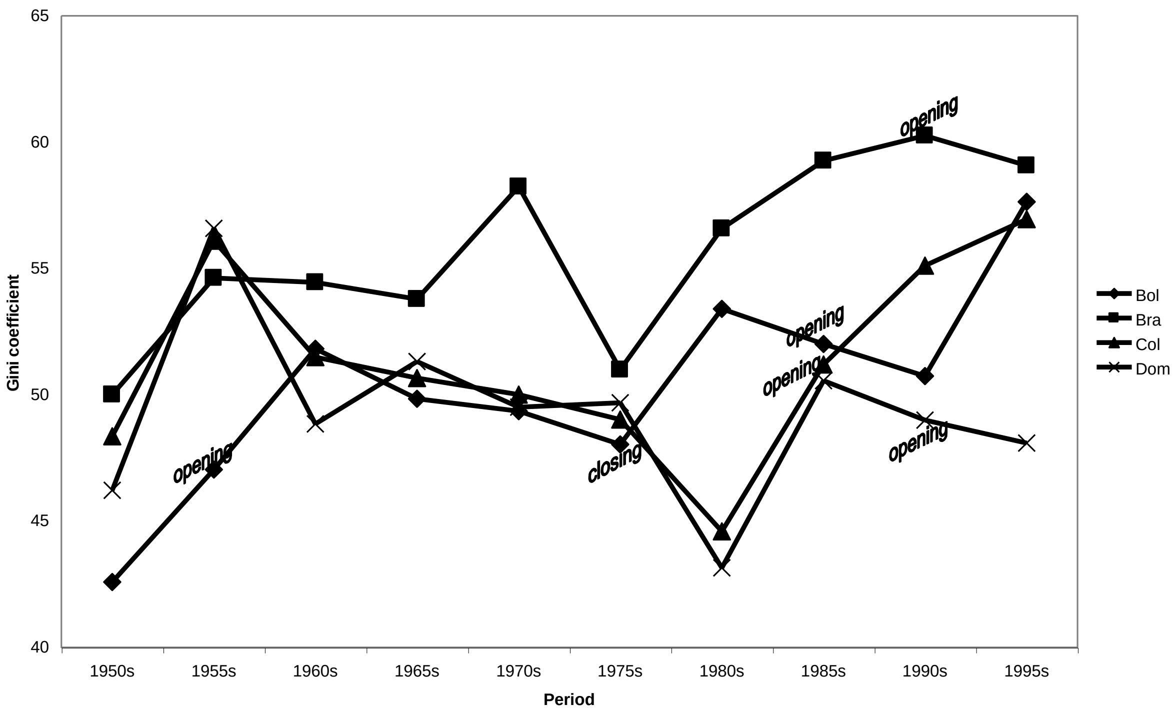
The results of our estimations are given in Figure 6a and 6b. The development of the 1950s and 1960s, and most of the 1970s is based on height CVs, whereas the 1980s and 1990s are directly taken from the Deininger and Squire data set. As expected, the volatility of income inequality increased substantially during the 1980s and 1990s, when globalization and other developments led to considerable shifts in some countries. The figures also reveal that the opening of an economy is typically followed by higher or increasing inequality value and vice versa.

Figure 6a: Inequality trends and opening/closing of initially open countries



Source: see table 1 and Sachs and Warner (1995). Gini coefficients of minor quality are Gtm 1980s, 1990s, 1995s, Nic 1980s, 1985s, and Per 1985s.

Figure 6b: Inequality trends and opening/closing of initially closed countries



Source: see table 1 and Sachs and Warner (1995). Gini coefficients of minor quality are Bol 1980s, and 1985s.

However, since there are some datapoints of minor quality, we control for this by adding dummy variables. Our principal measure of openness, the index created by Sachs and Warner is only available until 1992. We update this measure on the basis of the sub-indices of the "economic freedom index" as far as it fits the definitions of Sachs and Warner ("Trade", "Government Intervention" and "Black Market").

We include several additional explanatory variables: Kuznets curve effects, demography, speed of structural change from agriculture to industry, and financial depth.

Kuznets curves: Tocqueville wrote already in the early 19th century:

"If one looks closely at what has happened to the world since the beginning of society, it is easy to see that equality is prevalent only at the historical poles of civilization. Savages are equal because they are equally weak and ignorant. Very civilized men can also become equal because they all have at their disposal similar means of attaining comfort and happiness. Between these two extremes is found inequality of condition, wealth, knowledge - the power of the few, the poverty, ignorance, and weakness of all the rest." (Tocqueville, 1997 [1835], pp.42-43).

Kuznets (1955) found that inequality first rises and then declines with economic development. He explained his inverted-U curve by labor-market disequilibria: Since technological progress favors initially the rewards to some specialized skills, unskilled labor is less demanded and its wage falls. Therefore, inequality rises initially. Later-on, the diffusion of skills and economic policies serve as egalitarian forces which reduce inequality. We therefore add Kuznets variables by adding real GDP per Worker in linear and quadratic form and expect a positive coefficient of the former and a negative effect for the latter.

Demographic effects: Did competition of baby-boomers reduce their wages? Demographic effects could have an influence on inequality, too: According to the normal life-cycle effect of income, people in their 40s and 50s have the highest income. Teenagers and young adults between age 15 and 40 earn less on average, and beyond age 60 income starts to decline again. If "fat" cohorts (for example, the "baby boom" generation of the 1960s) enter the labor market, we would expect a rise in inequality, because the supply of "young" labor is very large, whereas the share of the richer "mature" age group is relatively smaller.

Higgins and Williamson (1999) found a robust influence of both cohort size of the mature age groups and the Kuznets curve on inequality in an unbalanced panel of 111 developed and developing countries (LDCs: mainly 1980s and 1990s). In contrast, openness was seldomly significant in their regression models. We include cohort size effects by taking the share of the mature population (aged 40-59), relative to the total population in the age groups 15-69 (working age), using the same specification as Higgins and Williamson (1999) do. We had to interpolate some of the values (as for the following variables, too), but the results below were robust even if all interpolations were excluded.

Speed of structural change: How much did agricultural productivity lag behind? Agricultural productivity, and therefore agricultural incomes might lag behind industry and services, and this could lead to rising inequality. Bourguignon and Morisson (1998) suggested that relative labor productivity in agriculture (per non-agricultural productivity) might lead to higher gini coefficients. It turned out significant in their regressions.

A "curse of land"? In the spirit of Sachs' "curse of natural resources", Bourguignon and Morisson (1998) and Higgins and Williamson (1999) also included arable land per capita in their regressions to measure the influence of land endowment on inequality.

Financial Depth: Some inequality theories suggest that a non-developed financial system offers insufficient credit possibilities especially for the poor (who have no securities), so that they cannot make profitable investments. This might also lead to higher inequality. Li, Squire and Zou (1998) focus on financial depth, and they measure this concept with the indicator M3 per GDP.

Table 5: Determinants of income inequality in the Latin American Periphery, 1950-1999

Model No.	(1)	(2)	(3)	(4)	(5)	(6)
Openness Concept:	S/W	S/W	S/W	S/W	adj. (M+X)/Y	S/W tar./non t.
Constant	46.08 (0.00)	38.21 (0.02)	18.57 (0.42)	58.00 (0.07)	22.84 (0.36)	20.44 (0.48)
Openness	3.58 (0.00)	3.43 (0.01)	2.23 (0.02)	6.63 (0.01)	0.15 (0.10)	3.30 (0.06)
Cohort Size 40-59 ("mature")		0.29 (0.66)	1.21 (0.30)	0.47 (0.70)	0.75 (0.54)	0.89 (0.55)
Arable Land per capita		3.67 (0.66)	8.67 (0.47)	-22.96 (0.34)	21.54 (0.11)	18.15 (0.18)
RGDP/worker			-0.00 (0.65)	-0.01 (0.16)	-0.00 (0.70)	0.00 (0.94)
RGDP/worker squared			0.00 (0.59)	0.00 (0.22)	0.00 (0.70)	-0.00 (0.94)
Dictatorship			-1.90 (0.13)	-1.91 (0.30)		
Productivity ratio Ind/Agr				1.36 (0.34)		
M3/GDP				-0.01 (0.34)		
Country fixed effects included?	YES	YES	YES	YES	YES	YES
Adj. R-sq	0.34	0.32	0.35	0.60	0.27	0.30
N	70	70	63	36	63	62

Constant refers to omitted country in fixed effects model; p-Value in parentheses; Gini coefficients of minor quality have been controlled for with dummy variables. Tests for heteroskedasticity, autocorrelation, and RESET tests indicated no estimation problems. Sources: see Appendix B. S/W: Index by Sachs and Warner, augmented with data on the 1990s. S/W tar./non t.: Sachs-Warner-Index, but reduced to tariff component and non-tariff-component only (that is, socialism, black market premium and state monopoly of major exports are removed from the index.) Zeroes with a minus sign indicate numbers that are too small to appear non-zero when rounded to two digits.

What are the results if we include those additional variable? While there remains a significant influence of openness throughout all specifications, most variables of the extended model remain insignificant (Table 5). We conclude that even in our extended model that includes 20 additional years and a comprehensive set of additional variables, openness does not lose its influence on Latin American inequality.

In additional sensitivity analyses (not shown here), we found that the results were not sensitive to slight changes in the lag structure. When we lagged the openness variable by five years in order to allow trade and trade incentive shocks to work their way through the economy, the results were basically the same.

We also tested the influence of the trade share of GDP, adjusted with the Gylfason method (that is, adjusting the share with the population as one would expect a lower trade share in larger countries, see Gylfason 1999). The coefficient is significant at the 10 percent level, but its significance is not very robust. Adding the dictatorship dummy, for example, increases the p-value of significance from 0.10 to 0.13. Given the conceptual problems that this variable has, we would not expect a very high measurement quality. But it is reassuring that also with this measurement concept of openness, the coefficient is significant in most specifications.

Finally, we also recalculated the Sachs-Warner-Index in a way that takes into account the criticism by Rodriguez and Rodrik (1999): We removed the black market, state monopoly and socialism component, so that the remaining components – a tariff rate of more than 40 percent and non-tariff barriers that affect more than 40 percent of imports – are undisputed. Here again, openness had a significant impact on inequality, and this coefficient remained significant through various specifications. In sum, we find that all four openness measures have a similar impact on inequality in the Latin American Periphery.

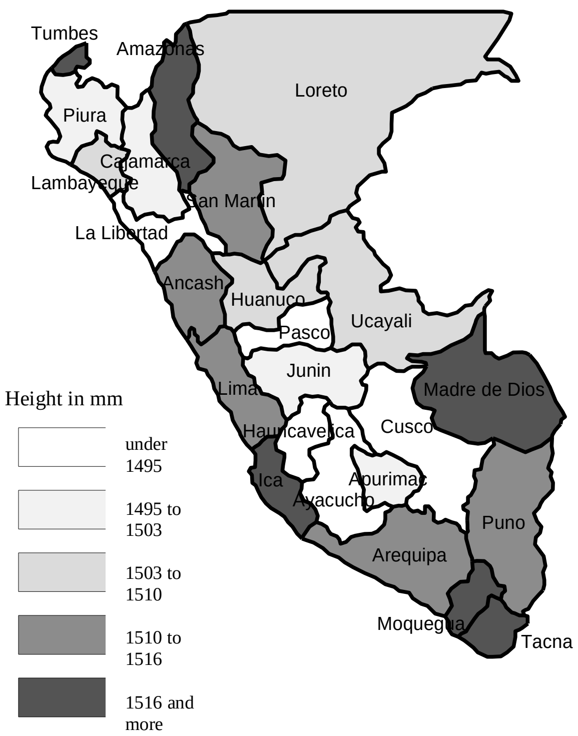
VI. Did openness increase regional inequality or occupational inequality?

VI.1 Regional inequality: the well-documented case of Peru

In today's China, and to a lesser extent in other countries such as Russia, regional inequality is one driving force of widening income gaps: The communist Chinese government did open up special economic areas along the coast. This partial globalization leads to strong inequality, but not because in these zones wage gaps are widening. The reason is that the non-participating regions in the interior do not participate in this type of globalization, caused by the political decision of the government. One could imagine that the decline of inequality in our closed Latin American economies might be caused by declining regional inequality.

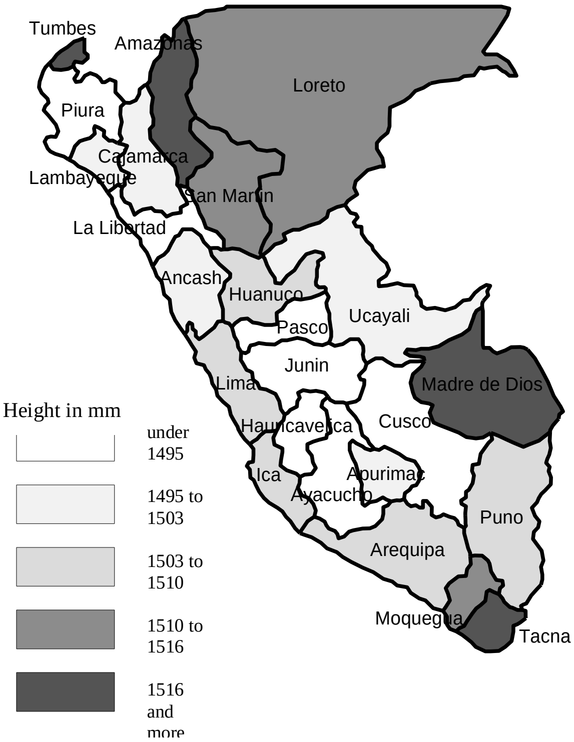
This was not the case, at least not in Peru, our best-documented case. In Peru before 1968, the poorest regions were the central highlands, whereas the frontier Amazonas region and the coastal zones had better nutritional status (Figure 7). After the closing of the economy in 1968, the heights of the central highlands did not converge to those of the coastal zones and the Amazonas region (Figure 8 and 9). Just the opposite: The coastal zones compared favourable with the poor regions. Their biological standard of living was rising, whereas it remained on a low level for example in Ayacucho, Hauncavelica and Apurimac.

Figure 7: Average heights in Peruvian regions, "closed period" 1968-79



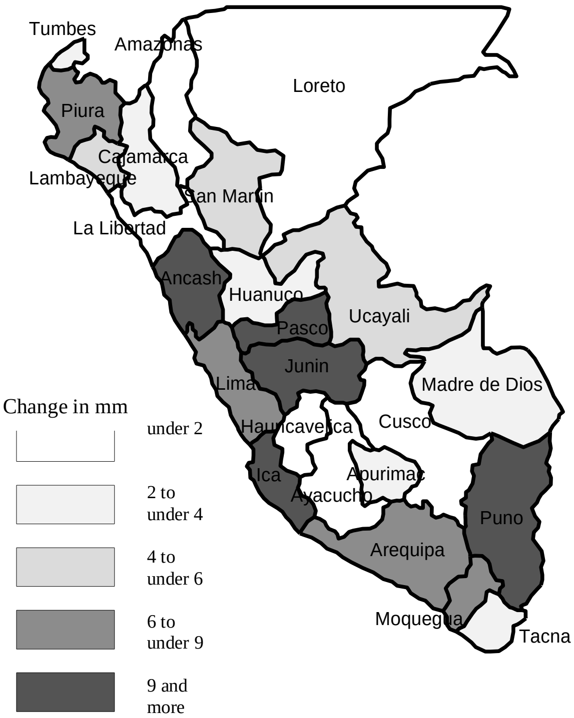
Source: see table 1.

Figure 8: Average heights in Peruvian regions, "open" period 1950-67



Source: see table 1.

Figure 9: Change in Peruvian heights, 1950-67 to 1968-79



Source: see table 1.

The inhabitants of these central mountaineous regions must have been very disappointed: A left wing dictator promised that the standard of living should dramatically rise for everybody after the “foreign exploiters” were chased out of the country. But what did happen? Regional inequality widened (although we cannot be sure whether a part of the development might be caused by selective migration, but this seems unlikely).

During the late 1970s of the dictatorship period, Abimael Guzmán, a charismatic professor at the Universidad Nacional de San Cristóbal de Huamanga, who was nicknamed “Shampoo” for his ability to convince his students of almost anything, appeared in these most depressed regions and found enthusiastic support among the disappointed peasants. He created the maoistic Sendero Luminoso movement. The main recruitment area was exactly in these regions that were situated at the bottom of the Peruvian economy, and fell even further in the relative income position.

VI.2 Regional and occupational inequality: the other cases

For three other cases, apart from Peru, we have more information on regional (and educational) inequality in “open” and “closed” periods of their 1950-79 economic history. We will compare two types of regional inequality (overall and capital-versus-other regions) with social inequality.

Does greater openness increase inequality mainly across regions, or across socio-economic classes? In order to test the first hypothesis, we calculate the coefficient of variation of average heights for all available regional classifications separately by more “open” and “closed” periods (according to Sachs and Warner). This method has the important drawback that migration cannot be controlled. Although the DHS data set mentions some information on migration behaviour, the variable "birth region" cannot be reconstructed. Therefore, the results of this investigation and the following one on capital versus rest differentials are only a first approximation to the question whether regional inequality might play a large role.

We find that regional inequality among all regions is not higher in "open" periods (Table 6). The coefficient of variation is only slightly higher in Guatemala, Nicaragua and Peru, but it is much lower in Bolivia. Brasilia, Colombia and Dominican Republic were not open in the period 1950-79 according to the Sachs and Warner index.

Table 6: Coefficient of height variation between regions in "open" and "closed" periods, 1950-1979

Country	Closed	Open
Bolivia	1.92	1.07
Guatemal	1.10	1.15
Nicaragua	0.66	0.67
Peru	0.74	0.79

Source: see table 1.

We also calculated the height differential between the capital region and the rest of the country in phases of globalization and deglobalization (Table 7). The idea behind this is that - following standard trade theory - open periods may bear special opportunities for profitable investments. The inhabitants of the capital could benefit in particular from open periods by having the possibility to react faster than peasants due to information advantages. Urban communication networks, spatial proximity to government, national press and other media stand in contrast to underdeveloped communication structures in rural regions. In this reading, information advantages of inhabitants of the capital in "open" periods contribute to the higher inequality in two countries: The height differential is considerably higher in Bolivia and Guatemala, but note that it is almost constant in Peru and even lower in Nicaragua. For these two latter countries, the capital-compared-with-the-rest hypothesis cannot explain the phenomenon, but for Bolivia and Guatemala it can.

Table 7: Average heights in the capital and the rest of the country, 1950-1979

Country	Closed			Open		
	Capital	Other	Difference	Capital	Other	Difference
Bolivia	150.42	150.08	0.35	151.66	150.97	0.68
Guatemala	150.62	147.04	3.58	151.43	146.13	5.30
Nicaragua	154.50	153.61	0.89	152.32	152.82	-0.50
Peru	151.49	150.00	1.49	151.07	149.52	1.56

Place of residence assumed to be same as the place of birth, Source: see table 1.

Finally, we contrast these findings with the height differential of two socio-economic groups (Table 8). As we lack information about the parents of our individuals, we use the years of schooling as a proxy for social status. The difference (in cm) between those that received the best schooling (5-10 years) and the less educated (0-4 years of schooling) is given in table 8, again by open and closed periods. In contrast to the regressions in table 4, here we have the interaction between openness and educational inequality.

Table 8: Mean height by openness and educational strata, 1950-1979

Country	Closed			Open		
	High Educ.	Low Educ.	Difference	High Educ.	Low Educ.	Difference
Bolivia	151.66	150.14	1.52	152.15	151.19	0.96
Guatemala	150.30	147.69	2.61	147.36	150.76	-3.4
Nicaragua	154.42	153.83	0.59	154.82	153.48	1.34
Peru	150.86	150.44	0.42	150.82	149.94	0.88

"High Educ.": mean height of persons 5-10 years in school, "Low Educ.": mean height of persons 0-4 years in school. Source: see table 1.

In the cases of Nicaragua and Peru, this height differential might in fact explain a considerable part of the openness-inequality relationship, whereas in Bolivia and Guatemala it does not. The height differential between the socio-economic groups is lower in Bolivia in times of openness. Moreover, its sign even becomes negative in Guatemala. In contrast, we find a larger height differential in "opened" Nicaragua and Peru.

To sum up, we can reject general regional inequality as an explanatory variable for the phenomenon (assuming no omitted variables, measurement error etc.) Inequality between the capital and the rest of the country has explanatory power in the case of Bolivia and

Guatemala, whereas socio-economic inequality could be a driving force in the case of Nicaragua and Peru. The former might be caused by information asymmetries between the capital and other regions. The latter may reflect the better position of well-educated individuals in open economies.

VII. Conclusion

We considered inequality to be an important threat to the globalization of the world economy that we experience today and wanted to know whether openness itself, or partial globalization forces, increase inequality. In a second step, we discussed the potential influence of inequality on anti-globalization forces.

In order to answer these questions, we used a yet unusual measure of inequality: the coefficient of height variation. This measure covers not only wage recipients (as some other inequality indices do), but also the self-employed, the unemployed, housewives, children, and other groups who may not be participating in a market economy. In addition, this variable has the advantage to be an outcome indicator, whereas real income is an input to human utility. Public goods in the health and educational sphere, for example, with their strong egalitarian impact, are not measured by income inequality, but they are reflected in the inequality of heights.

It turned out that within-country inequality was higher in time periods of greater openness, whereas closed economies had lower inequality. This result was robust under four different definitions of "openness". Other potential determinants, such as demographic variables, Kuznets effects, structural change, conflict, dictatorship, and female discrimination had none or limited influence on height inequality. This remained also true if gini coefficients of income for 1980-99 were included in the regressions.

However, it is partial openness that we considered here. Under full economic integration, inequality will fall again. It is perfectly possible that inequality follows a modified

Kuznets' inverse U-curve, in which the "explanatory" variable is not income (as in Kuznets' curve), but openness: Only very open economies on the right segment of this curve might have decreasing inequality. Perhaps the Atlantic economy from 1870 until 1913 was open to this degree, as O'Rourke and Williamson (1999) find overall decreasing inequality driven by globalization, in Europe and countries of former European settlement. But most of the openness we observed in world economic history during the last centuries was probably "partial" openness, i.e. on the left of the modified Kuznets curve.

The egalitarian tendency of inward-looking development did not result in less overall regional inequality, however. The central highlands of Peru, for example, remained depressed within a closed economy, while the coastal regions developed better. These depressed regions became the recruitment base of one of the most violent terrorist movement, the maoistic Sendero Luminoso. However, the increasing differential between the capital and the rest of the country might have contributed to higher inequality in "open" periods in some countries, as higher educational inequality did in other countries.

What is the policy implication of this paper? We would not argue that inward-looking development should be promoted. Taylor (1998) and many others have convincingly demonstrated the detrimental effect of inward-looking policies on average income growth. The benefits of globalization on between-country convergence (of participants) and the average long-run increase in world living standards are larger than the costs discussed in this study. Rather, this contribution wants to measure the risks of partial globalization, arising if the government does not provide enough tax-financed schooling to the poorer segments of the economy. We would suggest that inequality effects have to be counter-balanced by creating public goods for education and health, so that we will be able to enjoy an integrated and richer world economy in the 21st century. In order to monitor the effectiveness of those economic policies, even unsual measurement strategies have to be adopted to solve the problem of lacking data, as we demonstrated in this study.

Appendix A: Is height inequality correlated with income inequality data?

If there is a potential measurement error, it is a very important task to compare different indicators for the economic variable that we are interested in. The natural comparison for height inequality is income inequality. However, the number of cases for comparison is very limited. Robinson (2001) reports all available data points of high measurement quality in the Deininger and Squire data set for the countries here under study, mostly from the 1970s. We can reconstruct 8 data points (including data on 1980/81 for Brazil and Peru). These few points are in fact highly correlated with height inequality (Table A1). Each unit of the CV means 16 points of the Gini coefficient. The distance of 0.44 between low and high height inequality (=two standard deviations) accounts for 7 points on the Gini scale. Looking at the variation of Latin American Gini coefficients, this seems realistic. This close correlation even allows an estimation of income inequality for the 1950s to 1970s as we discussed in the text.

Table A1: Regressions of income inequality on height inequality

Height inequality (CV)	15.51 (0.05)
Constant	-8.61 (0.70)
R-sq	0.49
N	8

P-values in parentheses. Source: see table 1, Robinson (2001)

Table A2: Estimated Gini coefficients of income inequality (based on height CVs)

	1950-54	1955-59	1960-64	1965-69	1970-74	1975-79
Bol	42.6	47.0	51.8	49.8	49.4	48.0
Bra	50.0	54.6	54.5	53.8	58.2	51.0
Col	48.4	56.1	51.5	50.7	50.0	49.0
Dom	46.2	56.6	48.9	51.3	49.5	49.7
Gua	50.8	54.3	55.8	55.9	51.7	52.6
Nic	59.6	52.3	51.2	46.6	48.7	49.4
Per	46.2	49.7	48.5	47.9	47.5	45.7

Source and methods: see table 1 and text

Appendix B: Definitions and Sources of variables

ginikorr: Gini Coefficient of inequality in income of households or persons;
Sources **1980-2000:**
- Deininger and Squire data set (1996)
http://www.worldbank.org/growth/dddeisqu.htm
- UNDP, World Income Inequality Database (WIID):
http://www.undp.org/poverty/initiatives/wider/wiid.htm
- World Development Indicators, 2001: http://www.worldbank.org/data/
- Miquel Székely: The 1990s in Latin America: Another Decade of Persistent Inequality, but with Somewhat Lower Poverty, Working Paper Inter-American Development Bank, June 2001.

Procedure of data selection: If possible, high quality data with national coverage concerning income were taken from the Deininger-Squire "high quality" data set, Szekely and WIID. Some Gaps (BOL85, GTM80/90/95, Per85) were filled by adding data of lower quality (concerning expenditure, urban focus …) from Deininger-Squire, WIID and WDI 2001. We control for this by adding a dummy variable.
1950-79: Gini coefficient constructed on basis of the regressions of income inequality (gini) on height inequality (cvht), 8 datapoints included. Formula:
newgini = -8.61+cvht x 15.51.
Source for cvht (height differential of birth cohorts of mothers, used as a measure for inequality): Macro International DHS surveys.
Gini coefficients for Nicaragua in the 1980s were estimated on the basis of a regression of gini coefficients of income on the gini coefficients of education for Guatemala and Nicaragua 1960-1980 (R-square=0.77, gini[inc] = - 0.0046 + gini[educ.] * 0.729), and then calculated based on gini coefficients of education for Nicaragua in the 1980s.

opensw (Sachs/Warner): openness-dummy by Sachs and Warner (1995), 0=closed; 1=open; The SW openness indicator is a zero-one dummy which takes the value 0 if the economy is closed according to one of the following criteria:

1. average tariff rates = higher than 40%
2. nontariff barriers cover on average more than 40% of imports
3. socialist economic system
4. state monopoly of major exports
5. black market premium higher than 20% during the 1970s or 1980s

Source: http://www.nuff.ox.ac.uk/Economics/Growth/datasets/sachs/sachs.htm

openness (Sachs/Warner): measure of openness; 1950-1992 = opensw; 1994-2000: calculated on the basis of the sub-indices of the economic freedom index of the Heritage Foundation that fit the definitions of Sachs and Warner ("Trade", "Government Intervention" and "Black Market"); coded accordingly to the definitions of the economic freedom index: 0-2,95 = 1 = open; 2,96-5 = 0 = closed; Sources:
http://www.heritage.org/research/features/index/;
http://www.nuff.ox.ac.uk/Economics/Growth/datasets/sachs/sachs.htm

openness (M+X/Y, adjusted with Gylfason 1999 method): The trade share of GDP, adjusted for population size, with the regression given in Gylfason 1999.

productivity ratio: productivity ratio of industry and services to agriculture = Real GDP per worker in industry and services / Real GDP per worker in agriculture; calculated on basis of "Agriculture value added per Worker, constant 1995 USD" (Source: 1999 World Development Indicators CD-ROM), "Labor Force in agriculture, % of total" (Source: 1999 World Development Indicators CD-ROM), "Real GDP per Worker, 1985 international prices" (Source: Heston and Summers: Penn World Tables 5.6, http://datacentre2.chass.utoronto.ca/pwt/)

m3gdp: "Liquid liabilities as % of GDP" ("broad money"), or M3/GDP: the sum of currency and deposits in the central bank (M0), plus transferable deposits and electronic currency (M1), plus time and savings deposits, foreign currency transferable deposits, certificates of deposit, and securities repurchase agreements (M2), plus travelers checks, foreign currency time deposits, commercial paper, and shares of mutual funds or market funds held by residents. Source: 1999 World Development Indicators CD-ROM

dictatorship: democracy score, scored from 0 (=autocratic) to 10 (=very democratic); we coded the values 0 to 4 as a "dictatorship" dummy to denote particularly undemocratic regimes. Source: Marshall and Jaggers: Polity IV-data set; http://www.bsos.umd.edu/cidcm/inscr/polity

rgdpw: Real GDP per Worker, 1985 international prices, Source: Alan Heston and Robert Summers: Penn World Tables 5.6, http://datacentre2.chass.utoronto.ca/pwt/), augmented by Maddison (2001).

rgdpsq: Real GDP per Worker, squared; Source: see above

araland: Land use, arable land (hectares per person) Arable land (hectares per person) includes land defined by the FAO as land under temporary crops (double-cropped areas are counted once), temporary meadows for mowing or for pasture, land under market or kitchen gardens, and land temporarily fallow. Land abandoned as a result of shifting cultivation is not included. Missing cases are interpolated by linear regressions or averages of neighboring observations. Source: 1999 World Development Indicators CD-ROM

mature: proportion of the adult population 15-69 who are 40-59 old, a measure of cohort size effects. Since there are some gaps in the data proportion of the total midyear population (for early years enumerated census population) who are ages 40-59 was calculated and interpolated. Proportion of the adult population (15-69) was calculated on basis of regressions; Formula: mature = 13.981+proportion of total poulation 40-59 x 0.73
Source: US Census Bureau: International Data Base (IDB); http://www.census.gov/ipc/www/idbnew.html

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