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Height, Trade, and Inequality in the Latin American Periphery, 1950-2000

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Abstract

Which variables determine whether a country chooses an open or protected market? It has been argued that economic downturn leads to a higher propensity for protectionism. We find for seven Latin American countries in the second half of the 20th century that declining GDP motivated the opening wave, especially during the 1980s.

Moreover, inequality could play a role, either in favor of "opening", as Stolper-Samuelson models would predict, or in favor of closing, as recent empirical studies found that open periods were associated with higher inequality. Using anthropometric indicators, we find that inequality in general tended to motivate "closing", whereas inequality did not stimulate opening.

JEL Classification: F02, F43, O54, N76

Keywords: Economic opening / closing, inequality, Latin America, anthropometric measurements, height, international trade

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Introduction

The question whether a country chooses free trade or protectionism – and why – is one of the crucial issues in a globalizing world. Wallerstein (1987) argued that higher union-induced unemployment leads to a higher propensity to protectionism. In other words, workers perceive the world market as a possible culprit for the threat of unemployment, and hence promote closing of their economy, especially in rich countries. For Less Developed Countries (LDCs), inequality could be a motivation for opening their economies, as unskilled workers' wage might rise with new export possibilities of their products, if workers had enough influence on economic policy (see Milner and Kubota 2005 for a sceptic view of this influence). In contrast, recent research found that "closed" periods were associated with less inequality, and vice versa, even after controlling for a large number of other potential influences (Baten and Fraunholz 2004). This would suggest that inequality experiences could increase the propensity for protectionism.

Apart from purchasing power based measures (such as the Gini coefficient of income inequality), we use anthropometric techniques to measure inequality. This study is the first which assesses the relationship between inequality, opening and closing using a long-run perspective, given its newly constructed data set on inequality for the 1950-80 period based on anthropometric indicators.

Motivated by the political economy impact of height we also consider height as a proxy variable for the standard of living. Beside education and medical supply we find that high-quality protein consumption was an important determinant of average height in Latin America in the second half of the 20th century.

Theories and hypotheses

Both economists and political scientists have put forward a number of theories about the phenomenon of protectionism and liberal trade policies. While economists assumed a free trade policy as "natural", because it allows Smithian growth, political scientists assumed protectionism as the usual behaviour because of the infant-industry argument of Friedrich List, and they tried to explain the puzzle that some countries were opening their markets (Milner 1999). For example, the opening wave during the 1860s, 1950s, or 1980s would have been expected by economists, whereas political scientists find it puzzling that a number of countries opened up to international trade during this period (Haggard and Webb 1994, Milner 1999).

Which opening and closing behaviour would be expected from standard trade models? Those focus on the question how the incomes of production factors and industries changed by opening or closing of economies. In the simplest two-factor, two-good general equilibrium Stolper-Samuelson model, 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 the demand for unskilled labor and their wages should rise. Therefore, a decline of inequality could be expected in LDC's upon expanding international trade. If there would only be two factors playing a role, Latin American unskilled laborers should favor free-trade policies, whereas capital-owners should object to it. However, it is obviously an important question whether workers (or a populist government striving for legitimization) can perceive their interest and are powerful enough to transform their de factor interests into economic policy (Milner and Kubota 2005). Moreover, clearly ideology or nationalism could also stimulate policies without economic background.

Similar arguments hold for mobility of factors of production. For the reverse movement on the international labor market during the late 19th and early 20th century, O'Rourke and Williamson (1999) reported that the closing of the Argentine, U.S. and other New World economies against immigration was caused by increasing inequality, whereas the continued openness of the Brazilian economy can be explained by modest inequality and relatively high wages during the coffee boom. In the latter country, relatively low inequality kept the country open for migrants, whereas in the former three countries high inequality led to closing, what we would expect from the model described above.

In other words, during this period, Stolper-Samuelson forces worked for the countries under study. We will assess three hypotheses for Latin American product markets 1950-2000:

Hypothesis (1) High inequality led to an opening of Latin American countries.[1]

However, the empirics for the 1980s and 1990s do not confirm the effects expected from the two-country, two-factor, two-good Stolper-Samuelson model for Latin America. After opening up most of Latin American countries to imports in the 1980s and early 1990s, wage gaps between skilled and unskilled workers increased rather than decreased as expected (Ahsan 2002, Bulmer-Thomas 1996). In contrast, three East Asian Tigers in the 1960s and early 1970s had declining wage gaps after opening their economies to foreign competition. Wood (1994, 1997, 1998) 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, by the 1980s the Chinese giant entered 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. In other words, the Stolper-Samuelson world did not apply to the Latin American situation. This suggestion is plausible, but should be confirmed by supplementary evidence, before we reject hypothesis (1). After all, Wood and others did not consider comprehensive inequality data for Latin America before the 1980s.

Recently new data on inequality during the 1950-1999 period has been generated (Baten and Fraunholz 2004), which is used here for the first time to explain opening and closing of markets to international trade. It has been argued that foreign investments appear to have had a strong bias in favor of the more accessible regions around the capital, which were often better protected against property right violations, say, by local criminals (Baten and Fraunholz 2004). Remote regions might have obtained less investment, give those capital market contraints. This might have driven regional

[1] A competing model was based on the Ricardo-Viner-model (or specific factor model). The basic idea here is that import-competing industries will be in favour of protectionism, whereas export-oriented industries might benefit from free trade and hence advocate those policies. However, this view cannot be put to test with our data.

inequality during the more “open” periods. Based on this historical experience, Latin American societies might have chosen protectionism after experiencing inequality, and vice versa.[2]

Hypothesis (2) High inequality led to a closing of Latin American countries, and prevented them from opening.

Apart from inequality, the average living standard and perception of job security could play a role as well. The newspapers today are full of the perceived threat of world market integration on potential unemployment in the developed world. Even in Less Developed Countries, this threat could stimulate protectionist tendencies, given the high volatility of world market demand. For example, Wallerstein (1987) argued that unemployment led to increasing propensity to protectionism whereas Magee and Young (1986) mentioned more generally an economic downturn as determinant of closing which leads to our third hypothesis:

Hypothesis (3) Economic downturn increased the propensity for protectionism.

Blattman, Clemens, and Williamson (2003) published an important study on the determinants of proctectionism during the 1870-1938 period. They supported the O’Rourke and Williamson (1999) view that Stolper-Samuelson forces were at work, whereas the relevance of colonialism appeared limited. Moreover, they assessed additional factors such as export booms and protectionism of trading partners.[3] They showed in ten regressions that some of those factors mattered, but that the statistical significance was highly dependent on specification and not very robust.[4]

Data and measurement concepts

[2] One possibility to reconcile the Stolper-Samuelson predictions with the evidence would perhaps be to extend the two-factor model above to a four-factor one, including also skilled labourers who were in short supply, and land owners, who owned a factor input that was relatively abundant in Latin America. The usual Stolper-Samuelson model would suggest that capital-owners and skilled workers were more in favour of closing the country (and not competing with U.S. imports, for example), and capital-owners were certainly a powerful group. Land-owners were another powerful group that should have been in favour of free trade, as were the less powerful unskilled workers. The latter two groups could have formed alliances. However, as we are lacking data, we cannot yet test this theory.

[3] They also studied factors that were very typical for this period, for example, the dramatic decline of transport costs after the introduction of steam ships and a denser railroad network.

[4] In their Table 4, on the right side of the table, only 8 of the many t-values were larger than 2, whereas many more were significant on the left side of the table. And some of the former, such as schooling, had an unexpected sign.

In the last two decades, a new and comprehensive source of anthropometric data has become available for developing countries: the Demographic and Health Surveys (DHS). Funded by the U.S. Agency for International Development and conducted by Macro International Inc. in association with local statistical offices, the DHS program collects data on population, nutrition and the health of women and children in developing countries. The DHS-surveys are based on comprehensive and representative samples of households and are repeated approximately every five years to allow for comparisons over time (Macro Int, 2004). In all surveys standardized household and women's questionnaires were used. The latter covered topics such as women's social background, fertility, contraception, access to medical care, nutrition and health of children, AIDS, etc. For determining nutritional status, anthropometric data were collected. In the first phase (DHS-I: from 1984), only the height of children aged 1-3 and 5 years was measured. During the second phase (DHS-II: from 1988), DHS started to measure the height and weight of mothers as well, which became the standard for surveys of the third phase (DHS-III: from 1992). In the current phase (from 2000), the anthropometric part of the surveys includes all women between 15 and 49 years of age. Consequently, the DHS-surveys offer an excellent anthropometric database, reporting the heights of more than 71,000 women in 7 Latin American countries.[5] Training and equipment for height measurements followed WHO guidelines (Loaiza, 1997). Conducted by DHS personnel or local experts, training included classroom instructions as well as field practice. A quality-control test was administered thereafter for ensuring proficiency and compliance with international standards.[6] Using measuring boards with a headpiece, heights were recorded to the nearest millimeter. We excluded women below 20 years of age from our analysis because many of them had not yet reached their final height at the time of the survey.

Macro International provides sufficient data on heights on seven countries located in the Latin American periphery. "Periphery" means low income and insufficient access to best-practice

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[5] The database covers other continents as well, such as Africa and Asia, see Moradi/Baten (2005).

[6] In some countries, a second quality-control test was conducted halfway through the survey.

technology of the economic core. The countries Brazil (BRA), Peru (PER), Colombia (COL), Bolivia (BOL), Dominican Republic (DOM), Nicaragua (NIC) and Guatemala (GUA) represent a high share of this periphery, having GDP in 1965 of 1259- 3532 ($ of 1990), whereas temperate zone and higher-income countries such as Argentina, Chile, Uruguay and Venezuela, range from 4631 to 9841 ($ of 1990, Maddison, 2001), are not in the Macro International sample. The number of cases per country is not correlated with size. Peru is particularly well-documented, whereas we have fewer measurements on Brazil, a very large country with a population of 180 million (Table 1). We organize all height values by birth cohorts. In order to avoid short-term random distortions and problems of age-heaping, we aggregate by five-year-cohorts, and arrange all the other variables accordingly.

Height inequality

Given that income inequality estimates are not available in standardized form before the 1970s and 1980s we use an anthropometric measure: the coefficient of height variation (CV). CV offers a good complement to conventional inequality indicators (Moradi and Baten 2005, Komlos 2007). In general, we would expect a certain level of income which enables people to buy food and medical resources to lead to a corresponding height level. Should the distribution of these inputs become more unequal, heights would also be expected to become more unequal. Yet, while a correlation with income does exist, this correlation is only partial. Some important inputs are not traded on markets but are provided as public goods, such as public health measures or food supplements for school children. Public goods lead to deviations between purchasing power-based and height-based inequality measures. Moreover, income measures neglect the distribution of resources within households. This is a major argument in favor of height-based measures: heights are an outcome indicator, whereas real income represents an input into human welfare. Deaton (2001) and Pradhan et al. (2003) have argued convincingly that measures of health inequality are important in their own right, not only in relation to income. Heights do capture important biological aspects of the standard of living (Komlos 1985; Steckel 1995). Height inequality pertains to not only wage recipients, but also the self-employed, the unemployed, housewives, children, and other groups who may not be participating in a market economy. Moreover they can be constructed for seven countries of Latin America for the 1950-80 period. Income inequality data is mostly unavailable or inconsistent for this period and continent.

Which anthropometric measures have been used to measure inequality in nutritional status? Comparisons have frequently been made between the mean statures of different occupational or income groups (Soltow 1992; Steckel 1995; Quiroga and Coll 2000). The extent to which the mean height of certain groups differ from each other indicates the degree of inequality in nutritional status and health. However, for applying this method, it is crucial to choose comparable classification of social or occupational status, which is often not feasible for LDCs. The height CV, in contrast, describes inequality without requiring occupational classification (introduced by Baten 1999; 2000; Moradi and Baten 2005; see also Pradhan et al. 2003 on a similar approach). While the height distribution of a given population can be used as a measure of its average nutritional status, it can likewise serve for measuring nutritional inequality within the population.[7] The effects of inequality on heights are best understood by comparing the likely outcomes of a hypothetical experiment, in which a homogenous population is exposed to two alternative allocations of resources A and B after birth: (A) All individuals receive the same quantity and quality of resources N_A (nutritional and health inputs). (Perfect equality). (B) Available resources are allocated unequally and independently of the genetic height potential of the individuals. In the case of (A), the height distribution should only reflect genetic factors with N_A leading to a corresponding average height. The unequal allocation of nutritional and medical resources in scenario (B) allows some individuals to gain and become taller, while others experience decreasing nutritional status, and both tails of the distribution shift outward. Consequently, the standard deviation of the height distribution in case (B) is greater.

[7] The following discussion is based on Moradi and Baten 2005.

However, the standard deviation is not a satisfactory measure of inequality, because variance increases with average height (Schmitt and Harrison, 1988). The coefficient of variation (CV) takes this effect into account. For a country i and a quinquennium t, the CV in percentage points is defined as:

$CV_{it} = \frac{\sigma_{it}}{\mu_{it}} \cdot 100$. Thus, the standard deviation σ is expressed as a percentage of the mean μ. Baten (1999; 2000) compared height differences between social groups using the CV for early 19th century Bavaria.[8] The CV of height turned out to be highly correlated with occupational status differences. Therefore, high CVs reflect social and occupational differences without relying on a classification system. For decomposing world health inequality, Pradhan et al. (2003) proposed to standardize height inequality by assuming that the height distributions in OECD countries reflect only the genetic growth potential of individuals. However, this would mean that no nutritional and health inequality exist in these countries, which is obviously not quite true. In Germany during the 1990s, for example, height differences between social groups were as large as two centimeters (Baten and Boehm, 2006; Komlos and Kriwy, 2003). Even in egalitarian Scandinavia, some height inequality remains between regions (Sunder 2003).

Following Baten and Fraunholz (2004), we use the Gini coefficients of income inequality from the Deininger-Squire data set for the 1970s to 1990s. Baten and Fraunholz (2004) used the period overlapping with the DHS surveys of the 1970s to estimate the relationship between the Gini coefficient and height CV (Baten and Fraunholz, 2004, Appendix A. They used a panel based on the countries Brazil, Colombia, Dominican Republic, Guatemala, and Peru). The estimated relationship between Gini coefficients of income and height CVs was:

Gini coefficient = -8.61 + 15.51 * CV of height inequality

This is quite helpful for the following analysis, as we can transform the height CVs for 1950s to 1970s into a common metric with the Gini coefficients available for the 1970s to 1990s, using the

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[8] Compare Komlos (2007) and Bassino (2006), which also use CV at a regional level.

"predicted"[9] values from a regression of Gini coefficients on height CVs (the predicted values are scaled as Gini coefficients). Why is this possible? Although these two inequality indicators do not measure exactly the same effects, the causal relationship between purchasing power and consumption of food and other health resources appears sufficiently strong for Latin America in the second half of the 20th century to yield such a significant correlation. Moreover, this estimation of income inequalities on the basis of CVs of height is confirmed by a recent study on 28 African countries (Moradi and Baten 2005). The authors find in a panel study (N = 78, with country fixed effects) that one additional percentage point of height CV means 13.18 points of the Gini coefficient of income inequality (Table 2). This is very close to the Baten and Fraunholz estimate of 15.51 points. The results of these inequality estimates are given in Figures 1 and 2. The development of the 1950s and 1960s, and most of the 1970s is based on height CVs, whereas the 1980s and 1990s are 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 income shifts in some countries. Overall, there was no clear trend of CVs over the whole period. Rather, inequality in the initially open countries is somewhat decreasing until 1975-79 in Figure 1 and then increasing. The initially closed countries (Figure 2) show a mixed pattern with a tendency to increase towards the end of the period. Taking one example, Colombia had a downward trend in inequality until the 1980s (based on both height and income inequality data) that was also found by Meisel and Vega (2007). Afterwards, Colombian inequality increased again.

Which factors determine our explanatory variable "height"?

Insofar as height, which is included in our inequality indicators, is still a relatively new welfare measure, we include a small digression and explore with which welfare components height is most

[9] Please note that the "prediction" ("predicted" or "fitted" value is simply a statistical term) is for the period of the 1950s to 1970s, based on the recent evidence for the 1970s to 1990s.

strongly correlated. We consider purchasing power approximated by GDP, education (proxy: school years), health investments that we measure with hospital beds, and the consumption of high-quality nutrients (especially milk).

First we consider some descriptives of height levels and changes in the seven Latin American countries (Figures 3 and 4). Information on height of females is available for the birth cohorts 1950-54 to 1975-79, so height changes are limited to 5 quinquennia (Figure 3). Height changes were mixed in the 1950s. Five countries had modest increases, but Brazil and the Dominican Republic had a slight decrease. Between the late 1950s and the early 1960s, however, Latin America experienced a strong upward movement of heights, especially in Colombia and Brazil. The following quinquennium was mixed again, and from the late 1960s to the 1970-74 oil crisis period there was a substantial decline in many countries, with the winners of the early 1960s plus the Dominican Republic being affected the most. Guatemala – hard hit by civil war (cf. Table 3) – remained least affected. Finally, the late 1970s were a growth phase in most countries again. The cumulative increase during these two decades ranges from 0.8 cm in the Dominican Republic to 1.7 cm in Colombia.

Which variables might influence height strongly, and what do these variables measure in detail? While education, GDP, and health investments are frequently associated with height and health outcome, the “milk” variable should be explained in a greater detail. Earlier research found that proximity to milk production often led to taller heights and better health, especially for many historical populations. Milk appears to have been a bottleneck of health and longevity, given that it is rich in high-value protein, calcium and vitamins. In the absence of good transport systems with refrigeration high local supply of milk typically implied a substantial consumption, because milk could not be transported unspoiled over more than five or ten kilometers. It produced favourable health outcomes even in regions where purchasing power was not necessarily high: The shadow price of milk was low, because it could not be shipped, but was used for subsistence (and the butter was sold) (on the milk effect see Baten 1996; market integration in general: Komlos 1987, 1989). In addition, there was an indirect advantage via equality: the transport problem led to a low shadow price of milk in remote milk producing areas. This induced a relatively egalitarian distribution of high-value proteins. Thus, even low income groups could consume a healthy diet. In contrast, in large cities, only high-income groups could afford a protein-rich diet which was based on meat there (especially pork). As nutritional inequality tends to reduce average height because of declining marginal effects of food on height, this second effect reinforced the proximity-to-nutrients effect on average height (Steckel 1995, Boix and Rosenbluth 2007). As explanatory variables with an emphasis on individual supply and health we include in our regression milk consumption (kg per year and person), education (in average years of schooling) and medical supply (hospital beds per 1000 inhabitants, Table 4). We expect a positive influence by these variables on height. Furthermore we include real GDP per capita as an explanatory variable, which should also have a positive influence on height, and openness, which might proxy the positive or detrimental effect of market integration. The most widely used index of openness was constructed by Sachs and Warner (1995) for 79 countries. The authors considered 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. They coded their openness variable as a binary variable. We also control for the occurrence of civil wars, by using a dummy variable.[10] Finally, we want to test if height inequality had an impact on average height (Steckel and Floud 1997; Komlos 1996). We would expect a negative sign, implying that inequality reduces average height, because of the declining marginal product of food and health resources on height. As a caveat, we need to mention that height measures the effect of two decades of inputs whereas the other variables are for 1 time period. However, Baten (2000), following Tanner (1990), found econometrically that the strongest influence on final adult height is exerted during the first three years of life, whereas other influences are not as important.

[10] Source: Correlates of War-project of the University of Michigan, version 3, cf. Sarkees (2000), cf. Table 3.

In model (1) (Table 4) we obtain significantly positive coefficients for education, health investment (proxy hospital beds), and milk consumption (GDP is negatively significant, which we discuss below). The health investment and milk consumption variables remain significant in other model specifications, whereas the influence of education is not as robust once inequality is controlled for. A joint F-Test suggests that education and inequality are jointly significant. This is not astonishing, as it has been argued that more primary schooling is a device against height inequality, and probably also income inequality (Moradi and Baten 2005).

The impact of those variables is not only statistically, but also economically significant. One additional standard deviation of milk consumption is 22.32, and multiplied with the coefficient of 0.78 this leads to an increase of height of 17.4 mm (model 1), a remarkable amount.[11] This seems large, but milk consumption varied between 10.9 kilogram per head and year in Bolivia 1960-64 to 82.4 in Nicaragua 1965-69. One standard deviation of additional hospital beds corresponds to an average increase of 14.1 mm (model 1, $\sigma = 0.71$), and one standard deviation of education equals 8.1 mm additional height ($\sigma = 0.41$). The explanatory power of the regression is very high, with R-Squares of 0.81 and 0.82.

In contrast, openness and inequality were not significant in any of the models we estimated. Many scholars have argued that openness also has a positive influence on welfare (World Bank 1987), but in this case we do not find a direct influence on height. In a similar vein, the civil war variable has the expected negative sign and is statistically significant in model 2 and 3.

In sum, we find that height is closely correlated with health investment and high-quality proteins, and to a lesser extent with education. The relationship with GDP is positive (model (4)), but not very robust. Once health investment, education and protein consumption is controlled for, the residual influence of GDP per capita is even negative (models (1)-(3)). The reason might be that GDP per capita is not a precise measure of welfare. Apart from rising welfare, other factors also increase

[11] Calculated for those observations for which height data is available.

GDP: for example, if a larger fraction of the population does not consume meals that are cooked at home, but use prepared meals, GDP is rising (as it does not count value-added created within households). Moreover, ecological damages and their removal increase GDP. Finally, GDP is particularly sensitive to incomes of the richer strata of society and of capital owners. After holding the welfare components of GDP constant in multiple regressions such as the one above, the other components of GDP are influencing the sign of its coefficients. In other word, GDP is here a measure for reduced household and subsistence production, environmental pollution, and extra income for the richest parts of the society, after its usually dominant welfare components have been captured by the other variables of health and protein consumption.

This digression on one of our main explanatory variables, which underlies the inequality estimates for the pre-1980 period made clear that height proxies a number of basic needs that can lead to satisfaction: nutrition, health, and education. Moreover, openness did not influence height, which is important for the following analysis.

How to explain opening and closing of an economy

We use the index of openness by Sachs and Warner (1995) for our dataset. In the following, we consider the change between a value of 1 and a value of 0 as closing, and the change between a value of 0 and a value of 1 as opening. In order to expand our period till 2000 we add to the openness-data by Sachs/Warner (that ends in 1992) using some re-calculation of the sub-indices of the economic freedom index of the Heritage Foundation.[12] By merging these two variables, we obtain our dependent variable for the multinomial regression below.

Again, we control for the occurrence of civil wars by using a dummy variable. In a war-stricken country, political decisions about opening or closing are distorted and might not follow the patterns that

[12] We use those 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; source: http://www.heritage.org/research/features/index.

we would expect theoretically (Table 3). A possibility to distinguish econometrically between opening and closing events is the multinomial logit model. This technique explains the choice between three (or more) alternatives, in our case: opening, closing, and "no change" (which is the reference category, for comparison). We are encouraged to use this model after conducting several tests whether the assumptions underlying this specification are appropriate. The Hausman specification of the maintained assumption of Independence of Irrelevant Alternatives was conducted. Here we have the basic idea to test the reverse implication of independence from irrelevant alternatives property. We compared multinomial results with those from the simple logit model (two categories combined to one). For both types of equations we could clearly not reject the null hypothesis that the multinomial logit model is appropriate for the data.

In the standard logit model, we would have a set of covariates that predicts *ln(p/1-p)*, where *p* is the proportion with the given outcome. In contrast, in our multinomial logit model we have the same set of covariates that predicts $ln(p_0/p_1)$ and $ln(p_2/p_1)$.That implies that the results for both equations in the multinomial logit model refer to the reference category (*p1*) which is *no change*. Written in a way of log odds we obtain the following equations for the rate-specification:

First equation:

$$\ln(p_0 / p_1) = \alpha_{i0} + \beta_{10} \log GDP_{it} + \beta_{20} \log GDP_{it-1} + \beta_{30} Inequality_{it} + \beta_{40} Inequality_{it-1} + \beta_{50} Interaction(\log GDP * Inequality)_{it} + \beta_{60} War_{it} \quad (3)$$

Second equation:

$$\ln(p_2 / p_1) = \alpha_{i2} + \beta_{12} \log GDP_{it} + \beta_{22} \log GDP_{it-1} + \beta_{32} Inequality_{it} + \beta_{42} Inequality_{it-1} + \beta_{50} Interaction(\log GDP * Inequality)_{it} + \beta_{62} War_{it}$$

For the interpretation of this model (3) it is important to know that e.g. β_{10} refers to the change in the log odds of outcome p_0 (closing) relative to outcome p_1 (no change) associated with a unit change in $\log GDP_{it}$.[13]

[13] In the same way β_{12} refers to the change in the log odds of outcome p_2 (opening) relative to outcome p_1 (no change) with a unit change in $\log GDP_{it}$.

Our sample for 1950-99 contains 70 observations of either opening, closing, or no change in openness status, and 63 observations after including lagged explanatory variables. We find that inequality was actually a major determinant of closing (upper panel of Table 5). The coefficient of inequality for the probability of opening implies that an increase of our inequality measure by 1 unit increases the probability to lead to a protectionist policy by more than the factor 4 (odds ratios: exp(6.03)=416). Thus, this result clearly shows support for hypothesis (2) and tends to reject hypothesis (1).

We also used interaction terms to find out whether GDP interacted with inequality to stimulate opening or closing. If GDP and inequality both increased, the higher Gini coefficient did not lead to a protectionist policy. Quite the opposite, the coefficient of the interaction term was negative (upper panel of Table 5). It seems as if the higher income might have compensated in those situations for the dissatisfaction arising from increasing inequality.

In contrast, opening was more likely during economic downturns # (see bottom panel of Table 5). Hence we rejected hypothesis (3) that opening was less likely during downturns. This is more in line with Rodrik's (1992) argument that economic downturn can cause both, opening and closing, as the driving element is rather dissatisfaction with previous policy.

Conclusion

We focused on the question whether a country chooses free trade or protectionism, which is certainly one of the crucial issues in a globalizing world. We started with a number of theories that had been posed both by political scientists and economists. Most economic theories about this decision process depart from the Stolper-Samuelson view that the abundant factor benefits most from opening, which is unskilled labor in Less Developed Countries (LDCs). Hence one might expect that workers and populist governments might be in favour of opening the economy. However, we did not find this pattern: just the opposite, we found a stronger influence of inequality on protectionism. Dissatisfaction with inequality could have led to changes in favour of closing the economy.

Another strain of political theory focuses on declines of average living standards. Magee and Young (1986), for example, argued that economic downturns lead to a higher propensity to protectionism. Hence, the average standard of living of the people, as far it translates into satisfaction or dissatisfaction, might influence the decision to open or close markets for goods. We find for seven Latin American countries that a GDP decline motivated the opening wave, especially during the 1980s.

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Table 1. Number of cases in the DHS Survey, Adult females

Years of birth	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
Total	9638	4359	8675	7379	12995	5008	22956

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

Table 2. Regressions of Gini coefficients of income equality on the CV of height inequality in Africa and Latin America

Which region?	Coeff. Africa	t-Stat Africa	Coeff. Latin America	p-val. Latin America
Constant	-23.43	(-0.80)	-8.61	(0.70)
CV	13.18	(1.72)	15.51	(0.05)
R-sq. adj.	0.81		0.49	
N	78		8	

Note: The regression in the first column also includes the three variables "Coverage females population in %", "Age group 20-24 (1=yes)", "Age group 45-49 (1=yes)", which are all insignificant. Moreover, country fixed effects, and fixed effects for population coverage and income definition, and for primary source are included. Those are all jointly significant. The degrees of freedom in column, given all those dummies, is 42. Source for Africa see Moradi and Baten, 2005.

Table 3. Civil wars in the Latin American periphery between 1950 and 2000

Country	Years of participation
Bolivia	1952
Brazil	
Colombia	1950 – 1962
	1984 – 2000
Dominican Republic	1965
Guatemala	1954
	1966 – 1972
	1978 – 1984
Nicaragua	1978 – 1979
	1982 – 1990
Peru	1982 – 1995

Source: Correlates of War-project of the University of Michigan, version 3, cf. Sarkees (2000).

Table 4. Panel-regression: Height, 1950–1979

	Model (1)	Model (2)	Model (3)	Model (4)
Milk cons.	**0.78**	**0.78**	**0.85**	
	(0.00)	(0.00)	(0.01)	
Civil war	-29.52	**-29.69**	**-54.44**	-3.70
	(0.11)	(0.09)	(0.02)	(0.12)
Log GDP	**-33.04**	**-42.72**	-31.63	**14.07**
	(0.07)	(0.03)	(0.11)	(0.00)
Hosp.beds/1000 inh.	**18.92**	**21.22**		
	(0.00)	(0.00)		
Education	**27.06**	20.27	17.00	
	(0.10)	(0.20)	(0.30)	
Openness	1.34	-3.22	-9.13	-2.83
	(0.95)	(0.85)	(0.56)	(0.33)
Gini-Coeff.		-1.82	0.65	0.10
		(0.53)	(0.75)	(0.68)
Constant	**1,651.57**	**1,852.89**	**1,691.88**	**1,392.45**
	(0.00)	(0.00)	(0.00)	(0.00)
Observations	20	20	28	42
Number of countries	7	7	7	7
R-squared (overall)	0.80	0.82	0.74	0.01

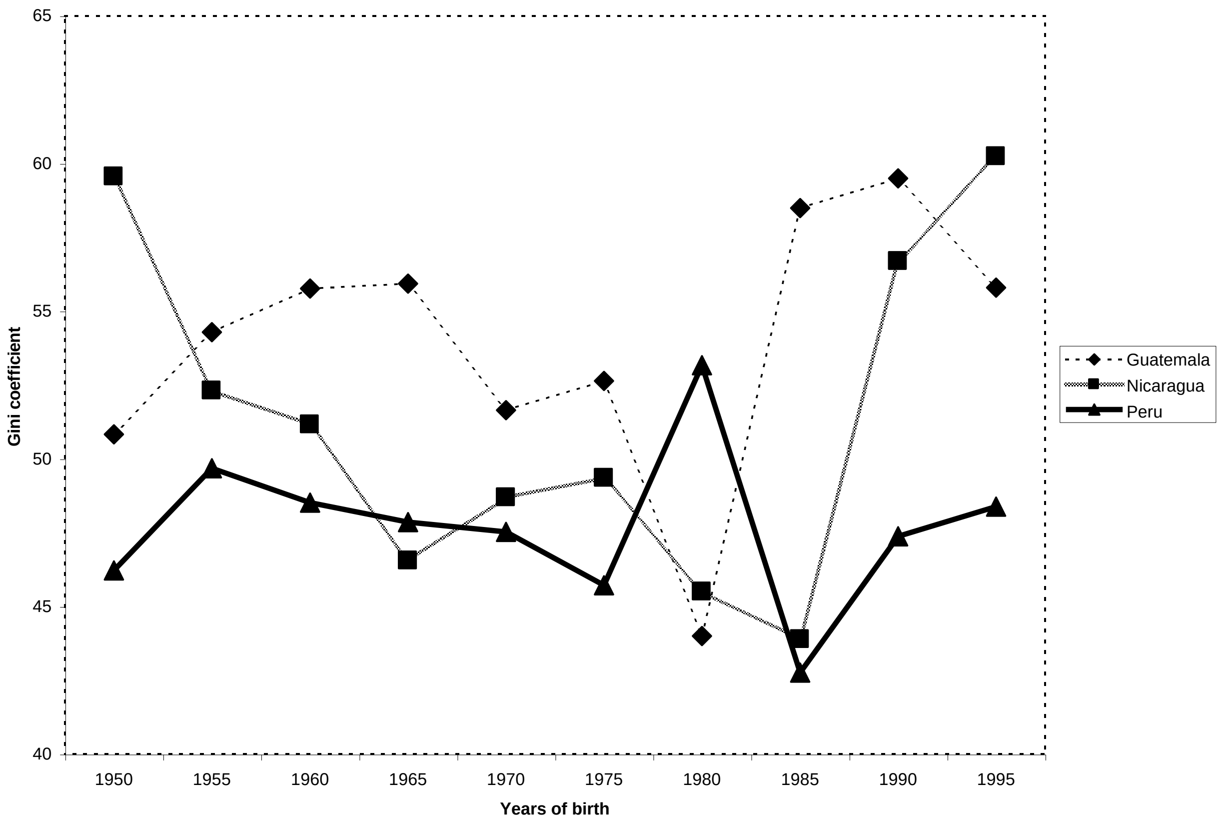
p-values of robust standard errors in parentheses. Adjusted standard errors were calculated, given that clustering of countries is a possibility. Hausman test prefers in most specifications random effects model. Coefficients that are significant on the 10% level are given in bold.

Table 5. Multinomial-logit-regression: "Opening" and "closing", 1950-1999

Opening / Closing	Model 1	Model 2
Eq. 1 (**Closing** vs. no change)		
Log GDP	37.70	**30.05**
	(0.106)	(0.000)
Log GDP (Lag 1)	- 3.10	
	(0.540)	
Inequality	**6.03**	**5.15**
	(0.073)	(0.000)
Inequality (Lag 1)	0.03	
	(0.733)	
Interaction-term	**- 0.64**	**- 0.55**
Log GDP * Inequality	(0.072)	(0.000)
Civil war	- 1.32	- 1.58
	(0.326)	(0.341)
Constant	**- 327.86**	**- 282.74**
	(0.076)	(0.000)
Eq. 2 (**Opening** vs. no change)		
Log GDP	**- 30.03**	- 10.63
	(0.078)	(0.200)
Log GDP (Lag 1)	**8.12**	
	(0.000)	
Inequality	- 3.80	- 1.87
	(0.127)	(0.154)
Inequality (Lag 1)	- 0.11	
	(0.304)	
Interaction-term	0.42	0.21
Log GDP * Inequality	(0.121)	(0.136)
Civil war	- 0.97	0.33
	(0.375)	(0.655)
Constant	201.18	92.06
	(0.169)	(0.227)
Log pseudo-likelihood	- 43.83	- 54.54
Pseudo R2	0.241	0.104
Observations	63	70

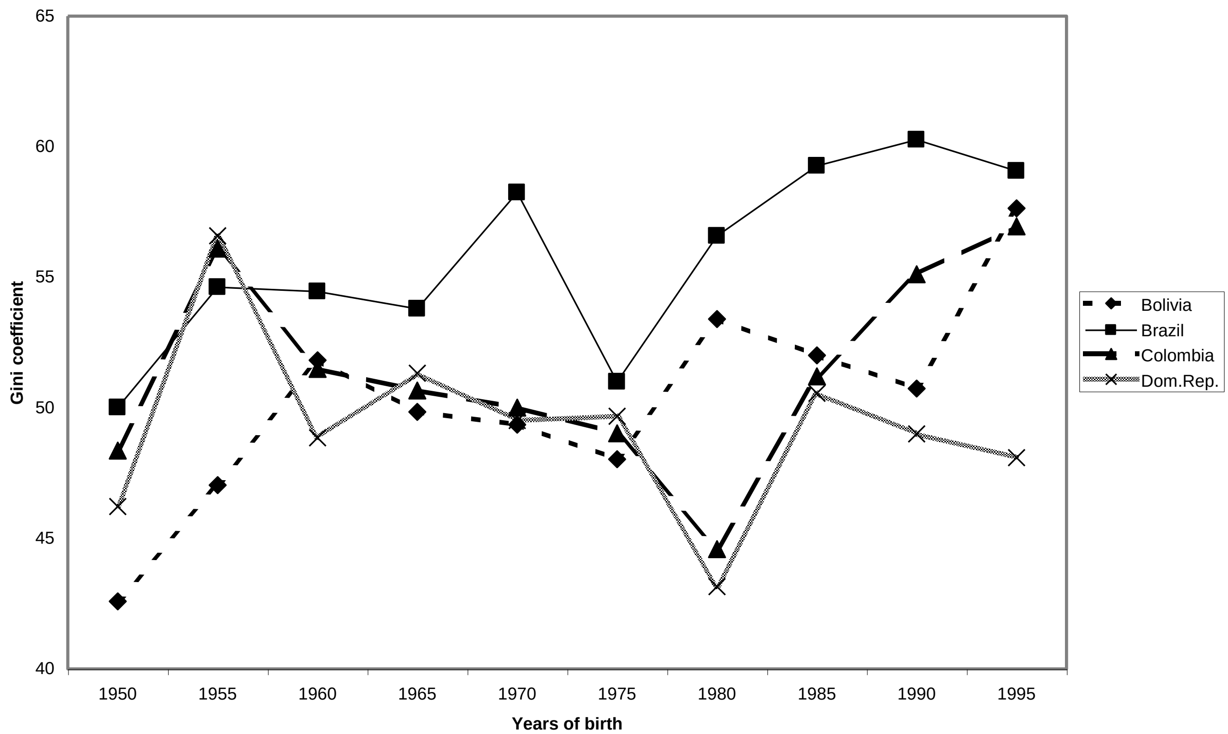
P-values are set in parentheses. Coefficients that are significant on the 10% level are given in bold. To include a valid panel structure in our model we use panel-adjusted standard errors (Huber/White/sandwich estimator of variance) with clustering on countries. On the measurement of inequality, see text)

Figure 1. Estimated inequality trends of the initially open countries (in the metric of Gini coefficients between 0 and 100)



Source: See Table 1 and Sachs/Warner (1995).

Figure 2. Estimated inequality trends of the initially closed countries (in the metric of Gini coefficients between 0 and 100)



Source: see table 1 and Sachs/Warner (1995).

Figure 3. Changes of height (adult females in 7 Latin American countries)

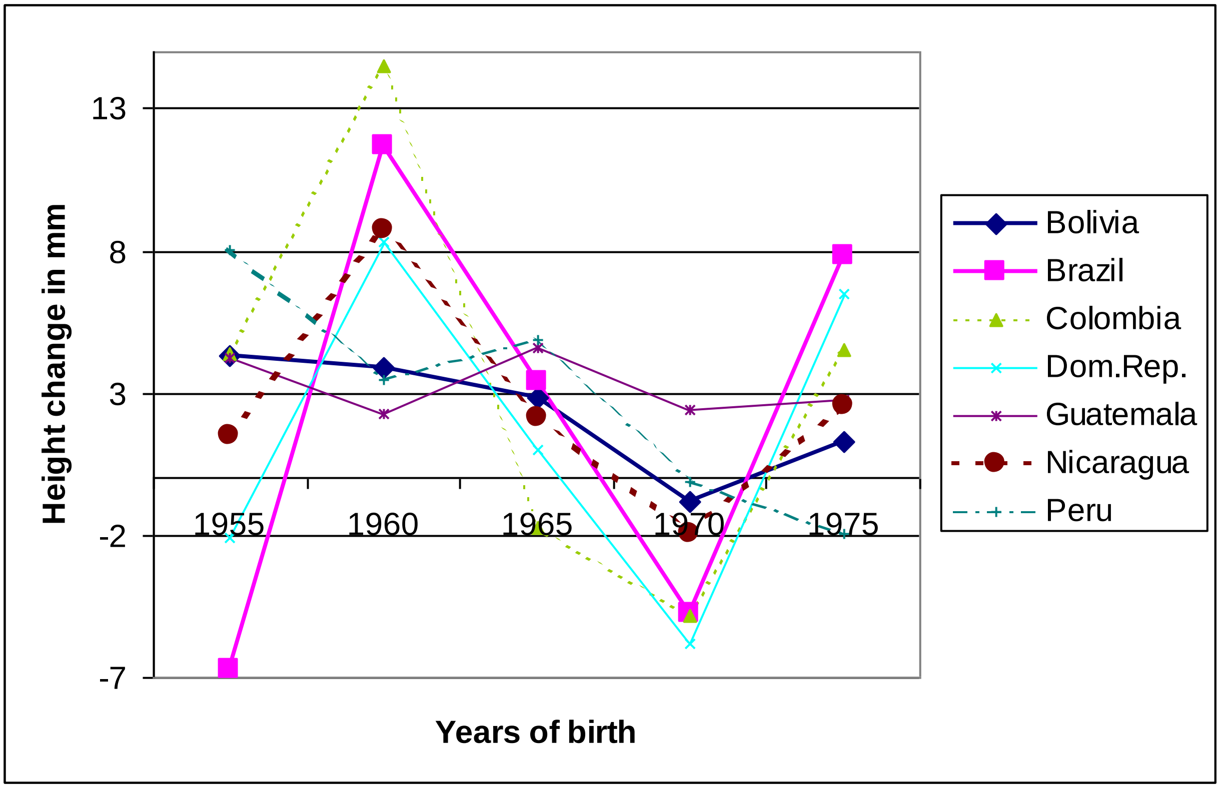


Figure 4. Levels of height (adult females in 7 Latin American countries)