POLICY RESEARCH WORKING PAPER 2375

Asset Distribution, Inequality, and Growth

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Policymakers addressing the impact of inequality on growth should be more concerned about households' access to assets — and to the opportunities associated with them — than about the distribution of income. Asset inequality — but not income inequality — has a relatively great negative impact on growth and also reduces the effectiveness of educational interventions.

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Summary findings

With the recent resurgence of interest in equity, inequality, and growth, the possibility of a negative relationship between inequality and economic growth has received renewed interest in the literature. Faced with the prospect that high levels of inequality may persist and give rise to poverty traps, policymakers are paying more attention to the distributional implications of macroeconomic policies. Because high levels of inequality may hurt overall growth, policymakers are exploring measures to promote growth and equity at the same time.

How the consequences of inequality are analyzed, along with the possible cures, depends partly on how inequality is measured.

Deininger and Olinto use assets (land) rather than income — and a GMM estimator — to examine the robustness of the relationship between inequality and growth that has been observed in the cross-sectional literature but has been drawn into question by recent studies using panel techniques.

They find evidence that asset inequality — but not income inequality — has a relatively large negative impact on growth.

They also find that a highly unequal distribution of assets reduces the effectiveness of educational interventions.

This means that policymakers should be more concerned about households' access to assets, and to the opportunities associated with them, than about the distribution of income.

Long-term growth might be improved by measures to prevent large jumps in asset inequality — possibly irreversible asset loss because of exogenous shocks — and by policies to facilitate asset accumulation by the poor.

This paper — a product of Rural Development, Development Research Group — is part of a larger effort in the group to examine the determinants and impact of inequality. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Maria Fernandez, room MC3-508, telephone 202-473-3766, fax 202-522-1151, email address mfernandez2@worldbank.org. Policy Research Working Papers are also posted on the Web at www.worldbank.org/research/workingpapers. The authors may be contacted at kdeininger@worldbank.org or polinto@worldbank.org. June 2000. (28 pages)

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Introduction

There has recently been a resurgence of interest in issues relating to equity, inequality, and growth in the development literature. Inequality is "back on the agenda" (Kanbur and Lustig 1999) both in the theoretical debate and in discussions by policy-makers. A significant and growing theoretical literature points towards the possibility of a negative relationship between inequality and economic growth (Piketty 1999), as well as the scope for persistence of high levels of inequality and poverty traps. Policy makers and international institutions aim to "face up to inequality" (Interamerican Development Bank, 1998), to pay greater attention to the distributional implications of traditional macro-economic policy advice, to identify situations where high levels of inequality may hurt overall growth, and to explore measures that would promote growth and equity at the same time (Tanzi and Chu 1998; Solimano, Aninat, and Birdsall 1999, Lundberg and Squire, 1999). Indeed, inequality has begun to enter the popular discussion and even unconventional proposals such as a universal cash grant equal to the value of a college education to all Americans, to be financed through a wealth-tax, receive serious discussion (Ackerman and Alstott, 1999).

Compared to the widespread concern, both at the theoretical and the policy level, about the possible deleterious consequences of inequality, the empirical evidence advanced in favor or disfavor of such a link is thin, especially in two respects. First, even though most of the theoretical models for a link between distributional issues and economic growth are based on households' access to *assets*, the majority of the empirical "tests" of such a link relies on data concerning the distribution of (after tax) *income*. Given that there are large differences even between different definitions of income inequality, this may be inappropriate. More importantly, even if one finds a negative relationship between inequality and subsequent growth, the resulting policy recommendations will differ depending on whether inequality of income or inequality of assets is the underlying factor. In the latter case, policies to enhance growth

should emphasize *ex ante* equality of opportunity. The range of options includes policies that increase opportunities and incentives for creation of new physical and human capital assets, better definition, enforcement, and protection of property rights to assets held by the poor, and possibly one-time measures of redistribution. If, by contrast, income inequality causes low growth, more direct redistribution of current income or consumption might be called for.

Second, the large majority of empirical analyses of inequality rely on cross-country, cross-sectional evidence rather than analysis of panel data. Although the level of evidence to be obtained from cross-country regressions will always be limited, many growth regressions reported in the literature are sensitive to inclusion of region-specific dummies, pointing towards omitted variable bias. Even if the results are robust, they can hardly be treated as structural estimates and may proxy, for example, for country specific attributes such as history, factor endowments, and cultural factors. Indeed, use of better data with repeat observations for any given country and application of panel data econometric methods has, in some recent studies, led to the disappearance of the traditional negative relationship between income inequality and economic growth. If true, this would imply that the whole gamut of policy-recommendations derived from the negative inequality-growth relationship could be spurious, that –at least insofar as economic growth is concerned– there is no reason for policy-makers to worry, and that attention should shift to promoting growth rather than worrying about distributional issues.

In this paper, we aim to address both of these problems. To be able to distinguish between asset and income inequality, we use measures for both in our regressions, although the main emphasis is (in line with theoretical discussions) on asset inequality. To address methodological concerns, we use panel data econometric methods, applying the GMM estimator by Arrellano and Bover (1995).

There are two main results. Using a sample of 5-year averages for 60 countries (with a total of 300 observations), much larger than the standard in the inequality-growth literature, we find that initial*asset* inequality, as measured by the land distribution, has a significant growth-reducing impact. In contrast to much of the inequality-growth literature –which found a disturbing negative impact of education on subsequent growth– use of a measure of the economy's human capital stock reveals that higher levels of human capital contribute positively to a country's growth. In addition, the interaction between asset inequality and a country's human capital stock is negative and significantly different from zero, suggesting that policies to expand education will have less of an impact in countries where assets (and with them access to entrepreneurial opportunities) are distributed in a highly unequal fashion.

To determine whether this result comes about only as a consequence of the correlation between asset and income inequality and to ensure comparability with the literature on income inequality, we include the distribution of both income and assets. While the coefficient on land inequality remains significant and

negative, income inequality has a positive sign, comparable to the findings by other studies. Other coefficients, in particular the negative sign of the interaction between asset inequality and education, do not change substantively. This suggests not only that our results are robust across different samples but also that inequality in the distribution of assets and income affect growth through different channels.

The evidence in support of a growth-reducing impact of asset inequality is of policy relevance in a number of aspects. First, measures of deregulation and privatization of state assets can, if not implemented carefully and accompanied by an appropriate regulatory framework, lead to large increases in the inequality of asset distribution. For example, fire-sales of assets without an adequate regulatory framework can, as in a number of Eastern European countries, lead to huge jumps in inequality in a relatively short period of time. Experience suggests that high levels of inequality are very difficult and costly to reverse. Special care to prevent that implementation of privatization policies will lead to possibly permanent shifts in the distribution of assets may therefore be warranted.

Second, with imperfect information and incomplete markets for risk and insurance, the danger for irreversible asset-loss in response to temporary shocks is particularly acute for the poor in remote rural areas. To the degree that they are unable to subsequently recoup such losses, the result of unexpected disaster may be a permanent and irreversible shifts in the asset distribution. Policies to improve the functioning of financial markets and to establish safety nets during times of crises have the potential of preventing a one-off shock from being translated into permanent increases in inequality and asset-loss by vulnerable groups in the population. Our results suggest that such policy measures to reduce existing capital market imperfections could be justified not only in terms of equity but also as a means to ensure individuals' access to economic opportunities and thereby sustain an economy's potential for longer-term growth.

Third, our results suggest that, especially in countries characterized by high levels of asset inequality, redistribution of assets may be a policy option to be seriously considered. However, a long history of failed attempts at expropriative redistribution of land all over the world illustrates that such a policy may be very costly and, unless it aims at a comprehensive increase in the asset base of the poor, not sustainable. The costs included, in addition to administrative expenses, the attenuation of property rights, the difficulties to the functioning of regular markets, a reduction of incentives for investment and asset accumulation, and often also an increase in social tension and political polarization.[1] Thus, although our results provide support to asset redistribution as a means to enhance growth, emphasis needs to be on building up the asset endowments (of both physical and human capital) of the poor and on instruments,

[1] While hard evidence is hard to come by, in many cases these costs appear to have more than outweighed the benefits from redistributive measures – and in some cases (e.g. in Chile) even led to their complete reversal.

such as a land tax, that are in line with efforts to improve economic efficiency. Research on the costs and benefits of specific redistributive measures would be very desirable but, in order to yield meaningful results, will have to be conducted at the micro level rather than in a cross-country perspective.

The paper is organized as follows. Section two provides the conceptual background by reviewing the basis for a link between inequality and growth, the empirically testable hypotheses that emerge, and the empirical evidence regarding these hypotheses. Section three discusses the empirical approach, the econometric methodology and estimation strategy, the choice of variables and data, and key results obtained. Section four concludes by highlighting areas for further research concerning measures of asset inequality and the channels through which the effect may be transmitted, and possible policy implications.

2. Inequality and growth: Theoretical basis and empirical evidence

We motivate the paper by providing a brief overview of the theoretical and empirical literature that has investigated links between income or asset inequality and growth. This illustrates that, in addition to being subject to problems of possible endogeneity, the emphasis on *income* distribution in the empirical literature may not be in line with theoretical models that are framed almost exclusively in terms of the distribution of assets. We then review the empirical evidence for a inequality-growth link, focusing in particular on the differences between cross sectional and panel data approaches.

2.1 Theoretical links

Depending on the main mechanism at work, one can distinguish three classes of inequality-growth models. In *redistributive political economy* models, the only way in which distribution could affect growth is through determining the pivotal "median voter" and the critical link is through the impact of such politically motivated redistribution on investment and the evolution of the economy's capital stock. In models with *capital market imperfections*, credit constraints will prevent the poor from undertaking profitable indivisible investments, implying that a more egalitarian initial*asset* distribution will result in higher aggregate investment and formation of physical or human capital. If combined with intergenerational mobility (or the lack thereof) or the possibility for voluntary public good provision at the local level, this can lead to poverty traps and permanent social stratification. Finally, the distribution of assets can, through its impact on *economic efficiency* or *social stability*, affect the cost of market exchange, incentives to invest, societies' ability to respond to exogenous shocks in a coordinated and effective way, and levels of violence.

2.1.1 Political economy models

Much of the early literature on inequality and growth relied on political decision-making mechanism of majority voting as the main process to generate a systematic link between inequality and growth (Persson and Tabellini, 1994, Alesina and Rodrik 1994). The underlying idea is that if, under an unequal distribution of income or wealth, the (myopic) median voter will derive short term gains from a redistribution from capital towards labor, she will approve such a measure, even though this will result in lower long term growth. In societies where resources are distributed in a more egalitarian fashion, such incentives for redistribution will not arise (the median voter would hurt herself) and therefore capital accumulation and growth will be higher.

There may, however, be two problems with this argument. First, the empirical conclusion can easily be reversed if, rather than being spent on consumption, tax revenue is used to invest in productive pursuits or public goods (infrastructure, law and order, secure property rights, education, etc.) that would not have been financed otherwise. If this is the case, the impact of inequality on individuals' voting behavior and the net effect of taxation will be more difficult to predict (e.g., Bertola, 1993, Cooper 1998, and Saint Paul and Verdier 1994). The nature and use of taxation will, in addition to the distribution of assets and political power in society, depend on the nature of the externality. This generates the scope for multiple equilibria (Bourguignon and Verdier 1998) and discontinuities whereby and abrupt changes in inequality occur as a strategic move by the elite to avoid a revolution or costly political unrest (Acemoglu and Robinson 1998). Among others, it would imply that the seemingly simple relationship between inequality and growth through this channel no longer holds.

Two more practical problems affect the assumptions made in this class of models. On the one hand, individuals appear to be less myopic than implicitly assumed –even the prospect of upward mobility in the income distribution can be shown to be a potent force that limits economic agents' desire to vote for redistributive schemes (Benabou and Ok 1998). On the other hand, if there is indeed a lot of politically motivated redistribution of resources within the economy, the data used in many empirical studies of this issue – which are generally based on consumption rather than before tax income – will be endogenous. To the degree that income inequality reflects the outcome of an economic process that includes income redistribution through taxes and public goods, it is not clear why a relationship should exist.

2.1.2 Credit market imperfections and indivisible investments

A second class of models establishing a systematic link between the distribution of *wealth* and subsequent growth based on credit market imperfections. The concept underlying this reasoning is straightforward: Individuals are assumed to be able to engage in specific productive projects, the success probability of which is private information. To ensure an adequate incentive structure on the part of borrowers, lenders will demand collateral, leading to the emergence of equilibrium credit rationing. As a consequence, only

entrepreneurs with sufficiently high levels of personal wealth will be able to finance their "project". With a simple indivisibility, e.g. a fixed setup cost per project, the initial wealth distribution will determine how many individuals will be able to undertake such projects as well as the equilibrium interest and wage rate (Aghion and Bolton 1997).

One example for such an indivisible investment is human capital. If education has to be financed by accessing capital markets, it can be shown that even among individuals with equal ability, those with higher wealth may be able to become educated while the poor ones will not. In the presence of financial market imperfections, countries with different distribution of wealth (and initial wealth level) will follow different growth paths and may converge to different steady states (Galor and Zeira 1993). Depending on the parameters of the model, the initial distribution of wealth can affect not only aggregate rates of growth but also lead intergenerational persistence of poverty and the emergence of "poverty traps". Thus, redistribution of wealth by the government could improve productive efficiency, enhance aggregate growth, and, if there are multiple equilibria, affect the economy's growth trajectory.

These models have a clear and testable empirical implication: If there is indeed a link between inequality and investment through capital market imperfections, one would expect a negative relationship between growth and the distribution of assets, but not necessarily the distribution of *income*. Instead, one should. Furthermore, as the extent of credit rationing will depend on per capita income, this relationship should become weaker as the economy grows richer.

2.1.2 Social stability, stratification, and violence

If accumulation of capital occurs at the local level (i.e. through local financing of public goods and "neighborhood effects"), inequality can, through endogenous stratification of communities and the ensuing differences in the level of public good provision, affect growth even if there are no credit market imperfections. To generate such an effect, it is sufficient to have an externality from locally produced public goods (Benabou 1994, Durlauf 1993). If, for example, quality of the educational system is a local public good (and complementary to parents' own level of human capital), one will observe agents to sort into communities that are differentiated by their wealth (or human capital) level. Such segregation which, in addition, can be reinforced by traditional political mechanisms (e.g. voluntary contribution to school financing, zoning restrictions, etc.), can lead to permanent divergence in wealth levels and some communities being caught in poverty traps (Fernandez and Rogerson, 1993; Durlauf 1994).

Inequality may affect growth not only because it reduces investment in local public goods or by capital-constrained individuals. One example is the incentive-effects associated with ownership of factors of production, as most famously discussed in the literature on sharecropping. A second element is that

inequality can create barriers that affect the cost of social interaction and economic exchange, e.g. through ethnic homogeneity and social capital (Knaack and Keefer 1995; Temple 1998; Collier 1998). Finally, inequality can be directly associated with the production of public "bads" such as violence and crime which will affect economic growth through the direct damage created, the need to spend resources on preventive activities, and the impact of the induced insecurity of property rights on investment incentives. While crime and violence is a multi-faceted phenomenon, an increasing conceptual and empirical literature links violence and inequality. A simple model of crime in this sense yields the intuitive prediction that, for given social factors, only the poorest members of society will engage in criminal activity and that even temporary increases in inequality may be associated with increased levels of crime (Bourguignon 1999).

2.2 Empirical evidence

2.2.1 Income inequality

Summaries of the empirical literature that tests relationships between income inequality and growth in a cross section of countries are provided by Benabou (1996) and Perotti (1996). The majority of this literature finds a negative impact of inequality on growth whereby a one standard deviation decrease in inequality increases the annual growth rate of per capita GDP by between 0.5 to 0.8 points. This is too little to account for the outstanding performance of East Asian economies, but it is clearly of relevance and could lead to significant differences in longer-term performance across economies. Use of better data that allow incorporation of panel aspects (using 5- or 10-year averages) suggests, however, that the empirical relationship weakens considerably (and may actually be reversed). This led to fear that the "empirical regularity" of a negative inequality-growth relationship may be similar to the famous Kuznets curve - very robust in a cross section but disappearing once country level fixed effects were introduced (Fields and Jakubson 1994; Fishlow, 1995, Deininger and Squire 1998).

Forbes (1998) uses fixed effects, random effects, and the Arrellano-Bond estimator with 5-year periods for 35 countries, generally obtaining a positive and significant relationship between income inequality and growth. This relationship is robust to variations in samples, inclusion of different variables or different measures of inequality, and divisions of the sample by region, initial income, and other specification tests. Similarly, Zou and Li (1998) find that the negative relationship between inequality and growth disappears in a panel context, for a sample of 35 countries with 5-year averages. Barro (1999) based on a panel estimator using an expanded sample[2] with ten-year averages, suggests that the negative impact of

[2] He expands the data set by adding more obsevations getting 84 countries (or 146 observations) with at least one observation for the Gini coefficient.

inequality on growth may depend on a country's wealth level, although even then the overall effects are weak and the relationship lacks robustness.

However, other studies suggest that income inequality may have an impact on growth. Even though they do not consider growth directly, Flug et al. 1998 use panel data to show that income inequality, lack of financial markets, and to some degree income volatility all have a negative impact on investment in human capital, measured by secondary enrollment. Rodrik (1998) finds that both inequality and low institutional quality reduce societies' ability to effectively respond to exogenous shocks. Fajinzilber, Lederman, and Loyaza (1998), using panel data techniques, find a significant impact of inequality on crime, in addition to evidence for significant hysteresis and susceptibility to temporal shocks. This can be linked to economic losses by noting that crime in Latin American countries leads to losses averaging about 7.5% of GDP (Bourguignon 1998).

2.2.2 Asset inequality

There is some micro level evidence that the distribution of assets may matter more than the distribution of income (which may, in addition, suffer from problems of endogeneity). Even in industrialized countries where credit market constraints should be less severe, initial distribution of assets (as measured by inherited wealth) may be a key variable for individuals' ability to start up enterprises and climb up the income distribution (Blanchflower and Oswald 1997; Bardhan et al. 1999). In China, Ravallion (1998) finds a significant and negative effect of local asset distribution on individuals' consumption growth.

At the country level, a number of recent contributions examine the possibility that, in line with the theoretical models discussed above, it is less inequality of income but mal-distribution of assets that causes reductions in countries' growth rates (e.g. Birdsall and Londono 1998, Deininger and Squire 1998, Persson and Tabellini 1994). While they find support in favor of an impact of the asset distribution, the evidence is largely based on cross-scctional rather than panel data evidence. Thus, due to differences in data (income vs. asset distribution) and methods (cross-sectional versus panel), the empirical literature has yielded ambiguous predictions regarding the presence, let alone the magnitude, of a possible impact of inequality on growth. Below, we will investigate this issue using panel data techniques.

3. Data and econometric estimates

3.1 Estimation strategy

In the empirical analysis of the determinants of growth the following equation is conventionally specified:

$$(y_{it} - y_{it-1}) = \delta y_{it-1} + \beta' X_{it-1} + \gamma' Z_i + \varepsilon_{it} \quad (1)$$

where y_{it} denotes the logarithm of per-capita GDP of country i observed in period t, X_{it-1} is a vector of country-specific time-varying variables affecting growth, and Z_i is a vector of country-specific time-invariant variables that also affect GDP growth, and ε_{it} is an error term that captures the effects of time-invariant and time-varying unobserved country characteristics. While δ is a scalar parameter, β and γ are parameter vectors which are conformable with X_{it-1} and Z_i, respectively.

As discussed above, the disturbance term ε_{it} captures the effect of unobserved time-varying and time-invariant country characteristics. Therefore, we specify the one-way error component model such that $\varepsilon_{it} = u_i + e_{it}$, where u_i is a country specific time-invariant effect and e_{it} is time-variant disturbance. We assume that $cov(e_{it},u_i)=0$ and $cov(e_{it},e_{is})=0$, for any $t \neq s$. Thus, (1) becomes:

$$(2) \qquad (y_{it} - y_{it-1}) = \delta y_{it-1} + \beta' X_{it-1} + \gamma' Z_i + u_i + e_{it}.$$

The OLS estimator of the parameters in (2) is likely to be biased and inconsistent for two reasons: First, by construction, y_{it-1} is correlated with u_i since:

$$(3) \qquad (y_{it-1} - y_{it-2}) = \delta y_{it-2} + \beta' X_{it-2} + \gamma' Z_i + u_i + e_{it-1},$$

and, after adding y_{it-2} to both sides of (3), we have:

$$(4) \qquad y_{it-1} = (\delta+1) y_{it-2} + \beta' X_{it-2} + \gamma' Z_i + u_i + e_{it-1},$$

which implies that y_{it-1} is indeed correlated to the disturbance of (2) because of is correlation to the error component u_i (even though e_{it} is white-noise).

Second, it is likely that some of the variables in vectors X_{it-1}, and Z_i are correlated with the error component u_i. For instance, as explained by Leamer et al. (1999), income and/or asset inequality is correlated to factor endowments, and conditioned by the country-specific history all of which are unobservable characteristics measured by u_i.

With panel data, the usual solution to the lack of orthogonality between explanatory variables and the error component u_i is to estimate the specified parameters by applying OLS to the "within groups" transformation, or "first differencing", of both left- and right-hand-side variables in (2). In our case, however, estimation of equation (2) via "fixed-effects" methods would create a number of new problems. First, the first difference of y_{it-1}--which we define as $\Delta y_{it-1} \equiv y_{it-1} - y_{it-2}$ is, by construction, correlated to the first difference of e_{it}, given by $\Delta e_{it} \equiv e_{it} - e_{it-1}$. Second, even though X_{it-1} is uncorrelated, by assumption, to the error component e_{it}, X_{it} is likely to be contemporaneously correlated to e_{it}, which implies that ΔX_{it-1} will be correlated to Δe_{it}. Therefore, the OLS estimator of δ and β obtained by regressing Δy_{it} on Δy_{it-1} and

ΔX_{it-1} will be biased and inconsistent. Finally, since the first difference of Z_i is zero, we would not be able to identify the γ's through fixed-effect estimation methods.

The last issue –i.e., the lack of identification of γ when the within transformation is adopted– can be solved by employing the IV estimators proposed by Hausman and Taylor (1981) and Amemiya and MaCurdy (1986), which were later generalized by Breusch, Mizon and Schmidt (1989). For the other problems, i.e., the lack of orthogonality between Δy_{it-1}, ΔX_{it-1}, and the first differenced disturbance Δe_{it-1}, which are inherent to dynamic panel data, Arellano and Bond (1991) formulate a consistent and unbiased GMM estimator which uses twice lagged y_{it} and X_{it} as instruments. Building on this, Arellano and Bover (1995) provide a unifying GMM framework that can be generalized for the estimation of Hausman and Taylor-type models, as well as dynamic panel data models. Here we adopt Arellano and Bover's framework to compute a GMM estimator of δ, β and γ. This GMM estimator is based on two sets of orthogonality conditions The first set relies on the orthogonality between Δe_{it}, and the predetermined variables $y_{it-2}, y_{it-3}, \ldots, y_{i1}$, and $X_{it-2}, X_{it-3}, \ldots, X_{i1}$. The second set relies on the orthogonality between $(u_i + e_{it})$ and the first difference of the predetermined variables given by Δy_{it-1}, $\Delta y_{it-2}, \Delta y_{it-3}, \ldots, \Delta y_{i2}$, and ΔX_{it-1}, ΔX_{it-2}, $\Delta X_{it-3}, \ldots, \Delta X_{i2}$, in addition to orthogonality between $(u_i + e_{it})$ and the strictly exogenous components of Z_i, here denoted by Z_{1i}. Note that for this GMM estimator to be feasible, $T \geq 3$ must hold, and hence, while y_{i1}, y_{i2}, X_{i1}, and X_{i2} are used as instruments, we cannot explore the orthogonality conditions for $t=1$ and 2. For more details on how to compute this type of GMM estimator, see Arellano and Bover (1995).

3.2 *Data issues*

Despite the large amount of interest in inequality issues, empirical analysis of the topic in a developing country context has, for all but a handful of countries (e.g. India, Taiwan, and Korea), been limited due to the absence of appropriate data. A number of compilations (with Jain 1975 being the most widely used) provide a poor basis for making inferences on changes in inequality over time. To provide a valid basis for inferences on issues of changes in inequality over time as well as cross-country comparisons of inequality that involve developing countries, data on income inequality should satisfy three basic criteria (Deininger and Squire 1996).

First, they should be based on *household surveys*, rather than estimates drawn from national accounts statistics or administrative records. While administrative sources may be acceptable in the case of developed countries, both their quality and their coverage varies widely in developing countries and in the same country over time. Use of such data can therefore create the illusion of changes in inequality that are due only to the

fact that administrative coverage, the quality of reporting, or the method of imputing certain variables in national accounts changed.[3]

Second, measures of inequality should be based on *comprehensive coverage* of all sources of income or uses of expenditure, rather than covering, say, wages only. It is well known that income in kind (e.g. from home production) is of particular importance in developing countries. In African countries, for example, surveys indicate that between 30-40% of income are from sources in kind rather than cash. To the degree that the poor rely disproportionately on income in kind, its neglect would lead to significantly overstate inequality, especially in African countries. Also omission of non-cash sources of income can generate the appearance of a spurious decrease in inequality as, in the process of development, more and more households participate in the formal economy.[4] Again, only use of a comprehensive measure of income or expenditures allows to overcome this constraint.

Finally, inequality measures should be *representative* of the population at the national level, rather than dealing with only the rural or urban population, or with workers or taxpayers.[5] Restricting attention to wages may be acceptable in developed economies where wage earners comprise the lion's share of the economically active population. Even then, inferences on changes in inequality over time may be biased if there are large shifts in the composition of income (e.g. increases in the importance of non-earned income) that can not be easily corrected for. Things are more difficult in developing countries where a significant share of the population is self employed in agriculture or in the informal sector. Policies of macro-economic liberalization, removal of anti-export bias, and public sector retrenchment that have been undertaken in many developing countries generally have benefited the self-employed and the rural sector, while hurting urban bureaucrats and wage earners. Assessing the impact of such policies merely on the basis of wage earnings may give rise to erroneous conclusions.

The resulting data set contains at least one observation on the Gini index for 108 countries and information on shares received by different quintiles in the population for 103 countries (Deininger and Squire, 1996). There are 54 countries with four or more observations and 32 countries with eight or more observations.[6] This allows to go beyond comparison of "growth spells" as in Fields and Jakubson (1995) and Ravallion (1995) as well as the data used in the initial literature on income inequality (Persson and Tabellini 1994; Alesina and Rodrik 1994).

[3] This leads to the exclusion of data such as Adelman and Morris (1973), Ginneken and Park (1984), and Altimir (1986).
[4] This could be part of the reason for the disappearance of the Kuznets curve once better quality data are used (see Deininger and Squire 1998).
[5] A more detailed justification of these points, together with some examples, is provided in Deininger and Squire (1996).
[6] Rapid evolution in the number of household surveys available for developing countries since the data was established implies that both the coverage and the quality of the data can be significantly expanded. As discussed below, an update is currently under preparation.

Although this signifies a considerable improvement, there are two main shortcomings. First, comparability of inequality indicators across countries (and in some cases even within the same country) is limited by the fact that, in cases where unit record data were not available (or survey coverage was limited), the data base contains differences in definition regarding three issues, namely whether (i) income or expenditure are used to measure inequality; (ii) if income is used, whether it is measured gross or net of taxes; and (iii) whether the household or the individual is the unit of observation. As more and more unit record data become available, this will cease to be a serious problem and we refer to the description of the original data-base for a more thorough discussion of these issues.

A second, and possibly more substantive, issue is that redistributing income is only one -and most likely a relatively inefficient- way for governments to reduce undesirably high levels of inequality. In view of the disincentive effects and problems of adverse selection that are associated with *ex post* redistribution of income, it has been argued that it may be more desirable for governments to be concerned about *ex ante* equality of opportunity rather than ex post equalization of economic outcomes.[7] Indeed, the literature has long recognized that it may be the distribution of assets, rather than income, that underlies a systematic effect of inequality on growth, for example by restricting access to credit markets and thus the ability to finance productive but indivisible investments. Nevertheless, data on the distribution of assets have rarely been used in empirical analysis. To partially remedy this shortcoming, we have assembled data on the initial distribution of operational holdings of agricultural land from the decennial FAO World Census of Agriculture[8] and other sources for 261 observations from 103 countries. The data suggest that—as is the case with other assets—the distribution of land is more concentrated and characterized by greater cross-country variation than that of income (with mean Gini coefficients of 63 and 37, and standard deviations of 19 and 9, respectively).

Data on land holdings are attractive for a number of reasons. First, possession of land could be a major determinant of individuals' productive capacity and their ability to invest, especially in agrarian economies where land is a major asset. Second, in contrast to income, the measurement of which is often associated with large errors, the distribution of land is relatively easily ascertained[9] and does not require assumptions regarding the mapping from income flows into stocks of assets. The available data, however, refer to the operational rather than the ownership distribution of land. Nevertheless, we note that these

[7] While a wide array of policies for (possibly targeted) provision of public goods is available to deal with such problems of structural inequality of opportunity, very little work has thus far been done to provide more systematic evidence across countries. The planned extension of the data base will address this issue, thus contributing to what appears to be an interesting area for future investigation.

[8] The data are from FAO which compiles summaries of official "Agricultural Censuses", conducted at the beginning of each decade. We therefore do not have to deal with data problems of the kind encountered for income distribution data.

[9] Problems may arise from the fact that aggregate measures of land distribution do not adjust for soil quality or land improvements (e.g. irrigation), rarely account accurately for land held under communal tenure arrangements, and that -especially in regions such as Sub-Saharan Africa where population density is still relatively low- land may not have scarcity value.

data constitute a lower bound for the latter in that the rental market generally seems to contribute to a more equal distribution of land holdings. Using these data we find that, indeed, the assumption of a one-to one mapping from the distribution of income to the distribution of assets that has been used in much of the literature receives little empirical support—the correlation between the Gini coefficients for initial distribution of land and income is relatively low (0.39). Finally, coverage is more equal both geographically and over time than for data on income distribution. In most cases observations on land distribution are available for earlier dates than estimates on income distribution and for countries in which no nationally representative data on income inequality are available.

To estimate the parameters of the growth equation (1) and the investment equation (2), we complement the distributional data described above with measures of real GDP per capita (chain index) and the share of investment in GDP are from the Summers-Heston (1995) data set as well as data on the per capita human capital stock are taken from Nehru, Swanson, and Dubey (1995) who utilize the perpetual inventory method to overcome some of the shortcomings associated with the use of enrollment figures as a proxy for educational attainment.

Time-varying variables used in the regressions are per capita GDP, the income Gini coefficients and the measure of country and year specific educational stock. Time-invariant variables included are initial Gini coefficients for the initial (1960-1970) land ownership distribution. Land ownership Gini coefficients are assumed to be endogenous and therefore are not in the set Z_{1i} which thus contains only a vector of ones. To attenuate the effect of missing data, the time-varying variables included in the growth equations are measured in 5-year averages for the periods 1960-65, 1965-70, 1970-75, 1975-80, 1980-85 and 1985-90.

Table 1 shows descriptive statistics by region and income category, following the World Bank's classification. Values in the "initial" columns are for 1970-75, the first 5-year period for which an equation is specified, as values for 1960-65 and 1965-70 are used only as instruments. Table 2 presents actual initial and latest data for each country included in the regressions.

Based on the conceptual discussion above, we are interested in three main issues, namely

(i) Whether inequality affects growth in a reduced form specification with education and land inequality (plus interactions between education and lagged GDP as well as land inequality) as right hand side variables. Results are in tables 3 (for the "full" set) and 4 (with income inequality), respectively.

(ii) To what degree a possible growth reducing impact of inequality comes through investment, i.e. whether inclusion of investment in the above equations leads to the disappearance of the negative

sign on asset (or income) inequality. The relevant regressions include, in addition to the variables used earlier, investment and interaction on the right hand side. Results are presented in table 5.

(iii) Whether, apart from the impact of inequality on growth, one can discern an impact of inequality on investment –which could be interpreted as corresponding to the credit market channel discussed earlier. Preliminary results for the applicable regressions are presented in table 6.

For each regression, we present results for three models: Model I refers to the GMM estimates in which X_{it} is assumed to be contemporaneously correlated to the time-varying disturbance term e_{it}, and therefore, only twice lagged observations of X_{it} are included in the instrument set. Model II refers to the GMM estimates in which X_{it} is assumed to be uncorrelated to the time-varying disturbance e_{it}, and therefore, both lagged and future values of X_{it} are included in the instrument set, as in Amemiya and MaCurdy (1986) and Breusch, Mizon and Schmidt (1989). Model III refers to the *within* or *fixed effects* estimator.

While model I only requires the assumption of no serial correlation of the e_{it} for consistency, model II requires in addition lack of contemporaneous correlation between X_{it} and e_{it}. Model III is inconsistent by construction and presented only for sake of comparison. For each set of regressions, we compute Hausman test statistics to test the specifications of models II and III against the specification of model I. Test statistics are given in the tables. In all of the cases, model II and III are rejected in favor of model I, not surprisingly as model III is inconsistent by construction and the assumption of X_{it} being uncorrelated to e_{it} appears to be very strong. Discussion of the results will therefore generally focus on the parameter estimates from model I.

3.3 *Results and Discussion*

Reduced form growth equation: In the reduced form (table 3, equation 1), we find evidence for conditional convergence, a negative impact of land inequality, and a positive and significant coefficient for education. The positive coefficient on education is in contrast to many empirical studies, but in line with results where a more adequate measure of the human capital stock is used (Freeman and Lindauer, 1999). The coefficient on the land Gini is not only highly significant but also comparatively large. To illustrate its magnitudes, note that a reduction of about 10 percentage points in the land Gini of Brazil would be equivalent to an increase of this country's human capital stock of 1.44 years (from 4.3 to about 5.7 years). Such a shift would leave Brazil still at 0.74 –with a distribution of land that is more unequal than in Mexico (0.61) and in East Asian countries such as Korea (0.34).

While equation 1 suggests the presence of weak convergence across countries, allowing for the fact that the impact of education varies across income levels (by including an interaction term with the level of

income) leads to a number of additional points of interest. First, it suggests that there is actually divergence for all countries below a minimum level of human capital stock (with a point estimate of about 6 years). Also, the negative sign of the coefficient on the interaction between education and income points towards greater effectiveness of additional investment in education in poor countries. Land inequality remains negative and significantly different from zero.

Adding an interaction between education and asset inequality (table 3, equation 3) suggests that high inequality of asset ownership reduces the effectiveness of policies that aim to increase aggregate growth through investment in education. At the same time, the coefficient on the land Gini becomes positive, though insignificant. Evaluating the derivative of growth with respect to education suggests that greater inequality in the asset distribution will reduce growth for all countries with a human capital stock above 1.53 (which is virtually everybody).

One question of relevance for the policy discussion is whether and to what degree the results obtained thus far just reflect the high correlation between land and income inequality, or whether these two variables have indeed a differential impact on growth. Given the limited availability of high quality data on income distribution, inclusion of the income Gini (table 4) into the reduced form equation reduces the sample to 31 (dropping in particular almost all the African countries) with an average of 3.5 observations per country. While magnitudes of coefficients change, land inequality remains significant. Indeed, signs and significance of all the coefficients discussed earlier remain as discussed above (including a positive effect of education, a negative impact of the interaction between education and income, and a significant growth-reducing impact of asset inequality). In line with what has been found by other contributions to the literature, the coefficient on income inequality is positive and significant in two of the three equations. Exploring the channels through which income and asset inequality could differentially affect growth might be a promising area of study for further research.

Growth equation with investment: While, according to the theories discussed earlier, investment is likely to be affected by inequality, it is of interest to examine to what degree inequality has an independent effect, after levels of investment in physical capital are controlled for. Results reported in table 5 suggest that inequality affects growth not only through investment but appears to have an independent impact on efficiency of resource use. In all specifications except equation 2, lagged investment and the economy's human capital stock appear as highly significant determinants of growth. The interaction between education and income indicates divergence of growth rates for countries with a human capital stock below 3.5 years and convergence thereafter. Furthermore, we find that the land Gini is significant and negative if included on its own (equation 1) or in interaction with human capital (equations 2 and 3).

Further information would be needed to decide what is at the root of this phenomenon. One could think of either an "incentive effect" as discussed in the sharecropping literature or a "social capital effect" whereby inequality would increase the cost of social and economic interaction, including the ability to maintain rule of the law in an unbiased way. The issue, as well as the link between inequality and investment, deserves further study.

4. Conclusion and areas for further research

While the link between *income* inequality and lower subsequent growth may indeed be tenuous (or even opposite of what has been traditionally assumed), *asset* inequality appears to remain as a major causal determinant of countries' growth performance even if panel data techniques are used. In addition to a direct growth-reducing effect, high land ownership inequality also poses a limit to the effectiveness of educational policies in contributing to aggregate growth, as indicated in our regressions by the negative and significant interaction between inequality and the stock of human capital. Furthermore, asset inequality appears to have a negative "incentive effect" that goes beyond the traditional channel of credit market imperfections and reduced investment. In this section we briefly highlight a number of possible implications for research and policy.

It would be desirable to obtain a more comprehensive measure of asset ownership in the economy to explore the robustness of the results, identify potential channels for the effect of inequality on growth, and identify causal implications of changes in the distribution of wealth. Although inequality of assets is likely to be more stable intertemporally than the distribution of income, the assumption of it being unchanged over a long time period may not correspond to reality. Following the lead of a number of recent papers investigating changes in the asset distribution and their determinants, it would be useful to proceed to a more complete empirical characterization of mobility in the income as well as the asset distribution. By using micro-level data, this would allow to go beyond land and education to include a broader array of key assets available and public services useful to poor households. This would facilitate a better assessment of public policies aiming at increasing equality of opportunity, a better measure of changes in household welfare, and a and but also provide a better measure of household welfare that includes other types of Comparing the impact of asset ownership on the well-being of the poor (and of different strata within society) with the effect of increased access to public goods could, by exploring interactions between the two, lead to important policy conclusions.

If, as suggested by the above results, asset ownership is an important determinant of growth that can only be imperfectly be substituted for by public investments, well-designed measures to redistribute assets

should, at least in theory, allow countries to increase equity and efficiency at the same time. However, historically, attempts at asset redistribution have rarely been an unqualified success. Indeed, in many countries the side-effects of redistributive policies have, by undermining the functioning of markets, reducing incentives for investment, and increasing social tension and polarization, probably done more harm than good – especially since many of them did not strive to reduce the extent of market imperfections and facilitate sustainable asset accumulation by the poor. Research into mechanisms that offer potential to increase the asset endowment of the poor, possibly starting with past and current attempts at land reform, may have a high payoff not only to design interventions but, more importantly, to gain a better understanding of the mechanisms and forces at work.

Even though more research is needed to elaborate on the impact of asset ownership on growth and the channels through which such an impact comes about, our results point towards a number of direct policy implications.

First, as a consequence of macro-economic liberalization and the need to constrain and focus the role of the state in the economy on a number of well-defined areas, many developing country economies are currently undergoing major structural transformations that have the potential of profoundly and permanently altering the distribution of assets. The presence of a link between asset distribution and growth would suggest that special attention be warranted to prevent such policies (e.g. privatization) from leading to a major worsening of inequality of asset ownership.[10] In addition to ensuring continuing and possibly better targeted government provision of key public goods, emphasis on the regulatory framework, transparent processes of divestiture of state assets, and high levels of accountability, would receive increased justification to prevent emergence of wealth concentration that might be difficult to reverse thereafter.

Second, well-known imperfections in insurance markets normally expose poor people in developing countries to high levels of risk and volatility. Safety net policies to prevent potentially irreversible loss of assets in case of macro-economic or localized crises may have an important role as a complement to more informal mechanisms of insurance. This is especially in view of the fact that a minimum level of asset ownership can provide the scope for considerable self-insurance against idiosyncratic risk and nutritional crises.

Finally, our results highlight the importance of human capital as a growth-enhancing asset, supporting policy-makers' emphasis on education as one instrument to overcome inequality. However, the negative interaction between education and asset ownership also suggests that educational expansion alone may

not be sufficient to achieve the social transformation needed as a basis for sustainable development. Innovative programs to foster the acquisition of productive assets could be of great importance, especially if they increase investment incentives and help the poor utilize their labor in a more productive way (Putterman, Roemer, and Silvestre 1998). More research in the design as well as the economic returns and political feasibility of such programs, and in particular their scope to replace recurrent transfers, would be desirable.

[10] Data on indicating a significant worsening of *income* inequality (by more than 20 points in Russia and Ukraine, for example) in a large number of transition economies (Milanovic1998; Kanbur and Lustig 1999) suggest that, even if there is no one-to one correspondence between income and asset distribution, such concerns may not be unfounded.

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Table 1: Descriptive statistics by major regions

		5-year Periods				
		1966-70	1971-75	1976-80	1981-85	1986-90
East Asia & Pacific	Observations	9	9	9	9	9
	Gdp / capita	3554.07	4308.22	4816.67	5460.29	6230.52
	Investment rate	18.68	21.18	22.79	23.65	23.90
	Human capital / cap.	4.88	5.33	5.86	6.42	6.81
	Land Gini	0.56	0.56	0.56	0.56	0.56
	Income Gini	37.26	38.89	38.53	38.60	40.04
Latin America	Observations	17	17	17	17	17
	Gdp / capita	2799.40	3213.91	3587.54	3505.84	3520.17
	Investment rate	16.79	18.70	19.44	15.39	14.20
	Human capital / cap.	4.23	4.66	5.16	5.75	6.17
	Land Gini	0.81	0.81	0.81	0.81	0.81
	Income Gini	57.24	50.93	49.77	49.06	50.16
Mid-East & N. Africa	Observations	6	6	6	6	6
	Gdp / capita	2932.57	3755.43	4391.93	4150.70	3980.92
	Investment rate	13.48	15.38	17.49	17.80	14.36
	Human capital / cap.	2.31	2.98	3.74	4.42	4.89
	Land Gini	0.67	0.67	0.67	0.67	0.67
	Income Gini	43.67	41.65	41.90	42.95	38.17
North America	Observations	2	2	2	2	2
	Gdp / capita	11114.80	12720.90	14346.60	15145.70	17247.90
	Investment rate	22.57	22.88	23.74	23.14	25.12
	Human capital / cap.	9.64	9.75	10.03	10.41	10.76
	Land Gini	0.64	0.64	0.64	0.64	0.64
	Income Gini	35.61	35.28	35.91	35.12	36.54
South Asia	Observations	4	4	4	4	4
	Gdp / capita	1014.45	972.65	1094.55	1287.20	1474.65
	Investment rate	8.60	8.19	9.82	10.18	10.06
	Human capital / cap.	2.53	2.85	3.15	3.48	3.72
	Land Gini	0.56	0.56	0.56	0.56	0.56
	Income Gini	33.30	33.32	35.37	36.68	33.57
Sub-Sah. Africa	Observations	7	7	7	7	7
	Gdp / capita	838.20	894.31	947.91	889.80	822.48
	Investment rate	7.36	7.83	8.03	6.50	6.27
	Human capital / cap.	1.11	1.40	1.74	2.14	2.50
	Land Gini	0.61	0.61	0.61	0.61	0.61
	Income Gini	39.00		44.00	41.21	35.75
Western Europe	Observations	15	15	15	15	15
	Gdp / capita	7135.32	8525.07	9449.48	10130.35	11483.41
	Investment rate	26.35	27.77	26.05	23.17	24.34
	Human capital / cap.	7.20	7.40	7.62	7.92	8.19
	Land Gini	0.57	0.57	0.57	0.57	0.57
	Income Gini	37.09	34.88	30.82	29.74	30.83
Total	Observations	60	60	60	60	60
	Gdp / capita	3939.27	4656.86	5202.31	5454.50	5970.10
	Investment rate	17.68	19.18	19.57	17.69	17.37
	Human capital / cap.	4.58	4.95	5.37	5.84	6.20
	Land Gini	0.65	0.65	0.65	0.65	0.65
	Income Gini	40.63	39.32	38.51	36.91	38.58

Table 2: Descriptive statistics by country

Country	GDP per capita		Human capital		Investment		Income Gini		Land Gini
	Initial	Final	Initial	Final	Initial	Final	Initial	Final	
ARG	5256	5261	5.94	7.53	15.66	13.80	.	.	85.62
AUS	9951	14343	6.07	7.55	29.16	26.50	32.02	38.67	85.31
AUT	6910	11929	8.78	8.71	24.86	25.30	.	23.05	68.81
BGD	1162	1315	2.36	3.11	5.90	2.82	34.2	32.93	41.87
BOL	1517	1667	3.37	6.24	20.24	5.06	.	42.04	76.77
BRA	2139	4226	2.66	4.36	18.20	16.76	57.61	56.77	84.10
CAN	9601	16917	8.59	9.95	22.60	27.12	31.855	30.33	55.15
CHE	11972	15883	6.46	6.91	28.28	32.84	.	.	50.01
CIV	1487	1409	0.43	2.05	9.48	5.68	.	38.51	42.29
COL	1987	3206	2.99	4.97	15.42	14.38	52.02	51.20	82.93
CRI	2692	3381	5.44	7.81	13.12	19.06	.	44.04	80.63
CYP	3396	7409	6.58	7.65	28.80	24.04	.	.	62.00
DEU	8541	13498	8.51	8.43	28.70	23.80	33.57	28.10	55.39
DNK	9127	13613	8.06	9.10	26.74	22.68	.	33.15	43.02
ECU	1818	2805	3.61	5.66	20.14	18.22	.	.	83.99
EGY	1075	1906	3.08	4.74	2.88	5.06	.	.	54.90
ESP	5357	8738	5.61	7.09	26.36	26.04	.	26.92	84.46
FIN	7103	13331	7.48	9.74	34.72	31.88	31.8	23.59	49.42
FRA	8357	13211	7.80	8.45	27.52	26.14	44	30.90	54.40
GBR	8173	12687	9.42	10.16	18.84	19.14	24.78	31.24	67.73
GRC	3639	6498	7.33	8.70	26.00	18.04	.	35.19	45.43
GTM	1903	2106	2.39	3.49	8.28	7.58	.	58.66	85.34
HND	1190	1401	2.70	4.41	14.76	12.28	61.88	54.31	76.50
IDN	654	1784	2.33	4.35	8.66	27.54	31.7	32.55	55.47
IND	727	1184	1.86	3.50	13.00	14.74	31.064	31.07	61.42
IRN	4075	3370	1.30	3.74	17.50	19.78	43.665	.	62.30
IRQ	4352	3496	1.56	4.08	6.20	19.85	.	.	72.61
ISR	5170	8985	3.57	7.11	25.60	18.86	.	.	80.05
ITA	6789	11845	6.63	7.83	28.48	24.24	.	33.97	74.30
JAM	2432	2409	6.48	7.99	28.92	15.30	.	42.83	80.29
JOR	1624	3372	2.21	4.88	9.80	12.36	.	36.10	67.65
JPN	6079	13124	10.46	10.98	32.66	35.22	35.3	36.30	43.20
KEN	667	893	1.87	4.07	16.38	11.54	.	.	74.95
KOR	1370	5615	4.14	7.61	19.48	32.12	31.9325	33.64	33.85
LKA	1216	2050	4.67	6.21	6.08	12.74	37.71	38.40	65.73
MDG	1121	696	1.98	3.44	1.32	1.82	.	.	80.40
MEX	3730	5457	3.77	5.85	15.88	14.50	57.7	54.98	60.66
MLI	417	537	0.20	1.10	6.16	7.14	.	.	47.76
MMR	400	547	1.32	2.55	7.76	7.20	.	.	44.03
MYS	1845	4365	3.55	6.13	17.42	27.24	50	48.35	64.01
NLD	8326	12272	8.04	8.39	27.66	22.42	.	29.42	50.46
NOR	7687	14740	8.61	9.45	31.48	29.78	36.04	23.40	39.14
NZL	8993	11634	6.36	8.76	22.74	24.14	.	37.19	76.41
PAK	952	1350	1.25	2.08	9.42	9.94	30.235	31.90	55.59
PAN	2336	3111	5.00	7.40	21.32	12.34	57	56.47	80.40
PER	2644	2606	4.08	6.49	15.56	17.30	.	42.76	92.30
PHL	1345	1662	5.53	7.67	12.88	14.82	.	45.73	56.00
PRT	2870	6203	4.06	5.65	22.52	17.98	.	36.76	71.81
PRY	1344	2041	5.38	5.79	8.64	18.02	.	.	85.69
SEN	1126	1156	0.53	1.97	4.84	4.06	.	.	49.27
SLV	1832	1825	2.96	4.92	6.94	7.68	.	.	82.11
SWE	10082	14341	8.79	9.81	24.48	22.98	33.4097	31.89	45.64
THA	1349	3002	4.18	5.68	17.40	20.30	42.63	47.87	42.55
TUN	1299	2756	2.12	4.76	18.92	10.22	.	40.24	64.56
TUR	2096	3462	2.48	4.44	18.58	21.80	56	44.09	59.45
TZA	409	537	0.81	2.40	9.92	11.80	39	.	78.99
UGA	641	529	1.92	2.49	3.42	1.82	.	33.00	54.88
URY	3855	4610	5.23	7.83	8.70	10.62	.	.	81.30
USA	12629	17579	10.69	11.57	22.54	23.12	39.36	42.74	73.10
VEN	7520	6321	3.32	6.51	24.88	14.54	.	47.70	91.70

Table 3: Results of growth equation estimation, large sample

	Equation 1			Equation 2			Equation 3		
Lagged GDP (log)	**-0.1118**	0.0141	-0.4821	**0.2885**	0.1543	-0.5504	**0.2165**	0.0803	-0.5611
	0.0406	0.0345	0.0454	0.0496	0.0230	0.0814	0.0423	0.0223	0.0828
Human capital (log)	**0.1039**	-0.0088	0.1072	**1.1511**	0.6628	-0.1724	**0.9203**	0.3036	-0.1017
	0.0400	0.0380	0.0474	0.2197	0.0836	0.2802	0.1713	0.0663	0.2972
Human cap. GDP				**-0.1607**	-0.0889	0.0399	**-0.0971**	-0.0472	0.0476
				0.0290	0.0115	0.0395	0.0223	0.0112	0.0409
Human cap. Land Gini							**-0.0047**	0.0009	-0.0021
							0.0014	0.0008	0.0029
Land Gini	**-0.0111**	-0.0032		**-0.0065**	-0.0060		0.0020	-0.0036	
	0.0029	0.0014		0.0018	0.0006		0.0020	0.0014	
Intercept	**1.5568**	0.2142		**-1.5000**	-0.6221		**-1.4661**	-0.2653	
	0.3884	0.2951		0.3824	0.1440		0.2966	0.1176	
Hausman test		109.70	934.83		17.50	199.17		29.78	185.08
No of countries	60	60	60	60	60	60	60	60	60

Note: Bold coefficients are significant at 5% level

Figures below the coefficient estimates are standard errors

Table 4: Results of growth equation estimation, small sample

	Equation 1			Equation 2			Equation 3		
Lagged GDP (log)	**-0.1887**	-0.0573	-0.4170	-0.0529	0.2841	-0.3381	**-0.1100**	-0.1730	-0.6392
	0.0341	0.0171	0.0647	0.0465	0.0351	0.1614	0.0524	0.0170	0.1714
Human capital (log)	**0.2738**	-0.0471	0.2246	**0.5571**	1.2223	0.5131	**0.4187**	0.3589	1.2213
	0.0514	0.0256	0.1155	0.2257	0.1631	0.5524	0.1793	0.0829	0.5527
Human cap. GDP				-0.0454	-0.1650	-0.0398	-0.0116	0.0163	0.0659
				0.0270	0.0201	0.0745	0.0251	0.0103	0.0755
Human cap. Land Gini							-0.0021	-0.0050	-0.0222
							0.0019	0.0007	0.0059
Income Gini	0.0017	-0.0035	0.0033	**0.0041**	-0.0057	0.0033	**0.0046**	0.0009	0.0032
	0.0021	0.0010	0.0023	0.0016	0.0009	0.0023	0.0010	0.0006	0.0022
Land Gini	**-0.0049**	-0.0040		**-0.0041**	-0.0053		-0.0001	0.0095	
	0.0010	0.0004		0.0007	0.0003		0.0035	0.0014	
Intercept	**1.4750**	1.0801		0.3879	-1.3790		0.5634	0.6595	
	0.2694	0.1397		0.3373	0.2572		0.3089	0.1266	
Hausman test		36.49	28.63		820.80	31.10		60.84	49.47
No of countries	31	31	31	31	31	31	31	31	31

Note: Bold coefficients are significant at 5% level

Figures below the coefficient estimates are standard errors

Table 5: Results of growth equation estimation with investment, large sample

	Equation 1			Equation 2			Equation 3		
Lagged GDP (log)	**0.1128**	0.0971	-0.5386	**0.1750**	0.0157	-0.5491	**0.1371**	0.0028	-0.5503
	0.0510	0.0214	0.0856	0.0552	0.0193	0.0868	0.0466	0.0156	0.0870
Lagged Investment (log)	**0.0892**	0.0859	-0.0161	0.0216	0.0993	-0.0167	**0.1608**	0.0548	0.0113
	0.0215	0.0104	0.0358	0.0264	0.0087	0.0359	0.0454	0.0154	0.0643
Human capital (log)	**0.6053**	0.5774	-0.1548	**0.9292**	0.2611	-0.0824	**0.7953**	0.2680	-0.0941
	0.2047	0.0745	0.2833	0.2368	0.0626	0.3005	0.1956	0.0583	0.3016
Human cap. GDP	**-0.0859**	-0.0772	0.0374	**-0.0878**	-0.0400	0.0450	**-0.0498**	-0.0475	0.0514
	0.0271	0.0102	0.0399	0.0268	0.0093	0.0413	0.0235	0.0088	0.0431
Human cap. Investment							**-0.1038**	0.0449	-0.0232
							0.0351	0.0156	0.0441
Human cap. Land Gini				**-0.0059**	0.0010	-0.0021	**-0.0043**	0.0004	-0.0019
				0.0018	0.0006	0.0029	0.0014	0.0005	0.0030
Land Gini	**-0.0030**	-0.0039		0.0026	-0.0031		0.0003	-0.0017	
	0.0015	0.0005		0.0022	0.0011		0.0017	0.0010	
Intercept	-0.6753	-0.5564		**-1.2519**	-0.0811		**-1.1567**	-0.0004	
	0.2998	0.1261		0.3801	0.1181		0.3259	0.1030	
Hausman test		71.34	160.28		195.61	202.27		97.12	174.48
No of countries	60	60	60	60	60	60	60	60	60

Note: Bold coefficients are significant at 5% level

Figures below the coefficient estimates are standard errors

Table 6: Results of investment equation estimation

	Equation 1			Equation 2			Equation 3			Equation 4		
Lagged investment	**0.6985**	0.9376	0.0380	**1.1980**	1.1565	0.1130	**0.2074**	0.8467	-0.0725	0.1010	0.9863	-0.2030
	0.1091	0.0464	0.0589	0.0869	0.0409	0.1074	0.0751	0.0411	0.0920	0.0803	0.0314	0.0957
Human capital (log)	0.0371	0.0128	0.0557	**0.9065**	0.4410	0.1177	**0.2235**	0.0463	0.3178	**0.6871**	-0.2999	2.2070
	0.0570	0.0324	0.0768	0.3034	0.0825	0.3182	0.0442	0.0189	0.1464	0.3183	0.0806	0.5714
Human cap. Investment				**-0.2271**	-0.1886	-0.0585						
				0.0883	0.0311	0.0700						
Human cap. Land Gini				**-0.0058**	0.0016	0.0010				-0.0066	0.0048	-0.0298
				0.0028	0.0011	0.0051				0.0048	0.0013	0.0087
Income Gini							-0.0060	0.0063		-0.0027	0.0055	0.0067
							0.0034	0.0010		0.0037	0.0009	0.0034
Land Gini	0.0282	-0.0022		0.0032	-0.0049		**-0.0038**	-0.0039		0.0100	-0.0121	
	0.0165	0.0023		0.0036	0.0019		0.0018	0.0007		0.0080	0.0025	
Intercept	-1.0570	0.3123		**-0.5216**	-0.0682		**2.4954**	0.4116		**1.7484**	0.6300	
	0.9281	0.2055		0.2319	0.1044		0.2829	0.1151		0.5251	0.1514	
Hausman test	0.00	6.34	40.43	0.00	24.65	272.64	0.00	129.93	26.51	0.00	198.87	-15.77
No of countries	60	60	60	60	60	60	31	31	31	31	31	31

Note: Bold coefficients are significant at 5% level

Figures below the coefficient estimates are standard errors

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