External Debt and Pro-Poor Growth

by Rolf Maier (olbes@gmx.de)

Abstract

To reveal effects and consequences of high indebtedness on income poverty, this paper explores empirically a linear and non-linear impact of external debt on pro-poor growth in developing and transitional countries. To examine this hypothesis, we test the distribution effect of external debt to GDP, external debt to exports, and debt services to exports on the poorest 20 and 20 to 40 percent in a cross-country approach. In addition, we estimate the total effect, i.e. the distribution and growth effect, to analyse potential trade-offs between the impact of unsustainable external debt levels on poverty through overall economic growth and via distribution. To test the poverty effects, we collect an irregular and unbalanced panel of time-series cross-country data on the first and second quintile of 58 developing and transitional countries for the period 1970 – 1999. We apply two econometric specifications, a growth equation and a system GMM estimation, to cover econometric issues, cross-country variation and dynamic aspects of within-country changes of the income of the poor.

Empirical findings of the impact of the debt indicators on pro-poor growth have to be interpreted carefully due to inconsistent results of the sensitivity analyses. Thus results do not indicate an optimal external debt level with respect to pro–poor growth. On the contrary, higher external debt levels are associated with negative effects on the level of the income of the poorest 40 percent without exhibiting any significant effects on the growth rates. Thus concise policy recommendations with respect to debt sustainability levels and debt relief are difficult. A cautious conclusion would be that debt relief may affect the poor positively, but seems not to be a sufficient policy instrument for improved growth rates of the income of the poorest 40 percent. This policy proposal would be in line with calls for more poverty-targeted capital inflows, as even total debt relief would release only insufficient resources for poverty reducing activities. With this interpretation, however, we abstract from political economy and bad governance issues which may prevent poverty reducing debt relief initiatives.

1. Introduction

Two of the major problems the world faces at the moment are poverty and heavily indebted countries. Forced by popular pressure from the NGO community and the anti-globalization movement, IMF and Word Bank have implemented the HIPC Initiative to link debt relief with poverty reduction programs. From an economic point of view, however, the relation between external debt and poverty reduction seems not to be well analyzed. Rarely do theoretical models explain transmission mechanisms between external debt and income poverty. Effects may be implicitely present in models linking external debt to economic growth, but causalities still remain elusive.

To uncover effects and consequences of indebtedness on income poverty, we explore empirically the impact of external debt on pro-poor growth in developing and transitional countries. The underlying hypothesis is that the poor may be especially vulnerable to unsustainable external debt levels. To confirm this hypothesis we estimate both the distribution and total effect, i.e. the distribution and growth effect, of external debt to GDP, external debt to exports, and debt services to exports on the poorest 20 and 20 to 40 percent. If high external debt leads to significant 'anti-poor' growth, a major impact of debt relief on pro-poor growth may be concluded and sustainable debt levels proposed.

To reveal possible effects of external debt on pro-poor growth we first review in section 2 the literature on the external debt to growth link and debt sustainability definitions. Even if theoretical concepts are only indirectly related to pro – poor growth, we propose four possible effects of high external debt on poverty. Section 3 gives detailed description of data coverage, data sources and descriptive statistics. While we discuss our concept of pro-poor growth in section 4, we explain econometric specifications, econometric issues and estimation results in section 5. We conclude in section 6 with the major findings of our research.

2. External debt and pro-poor growth

2.1 Literature review

There are few models, in which the impact of external debt on poverty is explicitly analyzed (Schinke 1994, Loko/Mlachila/Nallari/Kalonji 2003, Agénor/Fofack/Izquierdo 2003). Nevertheless, the linkage is implicitly present in the theoretical literature on external debt and foreign capital (Eaton 1989, Hjertholm 2000, Pattillo/Poirson/Ricci 2002). Thus we first discuss major insights from these models on pro-poor growth and debt sustainability. Subsequently, we present approaches which directly analyze the impact of external debt on poverty.

Based on a Harrod-Domar growth model, the two gap model focuses on two binding gaps for economic growth, the internal gap between investment and saving and the external gap

between imports and exports (Chenery/Strout 1966). The internal gap describes the need for additional resources in developing countries to accumulate capital. The external gap assumes import commodities to be essential for the production of investment goods. Thus economic growth is constrained by the inflow of foreign capital to fill the larger gap. Subsequently, growth-cum-debt models predict stages of indebtedness in the growth process of developing countries. But debt sustainability only holds, if the growth rate of output is equal to or exceeds the rate of interest (Czerkawski 1991, Nikbakht 1984). Due to its limitation on the internal gap, however, growth-cum-debt models exclude the problem of converting the savings surplus into foreign exchange and the external orientation of the country. Thus the 'debt dynamics' approach requires the growth rate of exports to be equal or exceed the interest rate of the debt.[1] To summarize these models describe the necessity and positive effect of external debt on the development process. Debt sustainability conditions, however, require a sufficient growth of internal and external sectors to service the interest payments and accumulated debt.[2]

Foreign capital can also be seen as growth enhancing in neoclassical growth models, as the marginal product of capital is assumed to be above the world interest rate in low capital countries. Frameworks with intertemporal optimization respond to the sustainable debt issue consequently in the neoclassical tradition. The optimal level of debt will be reached if the marginal benefit equals the marginal cost of the external capital (Hjertholm 2000, Eaton 1989). But the assumption of perfect capital mobility in these models seems at least to be arguable for developing countries. The risk of debt repudiation and moral hazard may hinder the countries' possibility to borrow capital on international capital markets without constraints. Thus loss of access to world financial markets may result in reduced investment and economic growth (Borensztein 1990, Cohen 1993).[3]

Another part of the literature analyses the negative economic consequences of high external indebtedness. Debt overhang models are motivated by the problem of the creditors needing to be their loans repaid from defaulting and insolvent debt countries.[4] A debt overhang situation occurs when the expected present value of potential future resource transfers is less than its debt, i.e. debt overhang is the part of debt without expected future repayment (Krugman 1988).[5]

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[1] For literature and conceptual shortcomings of the debt dynamics approach, see Hjertholm (2000).
[2] For a related discussion of sustainability of private sector foreign indebtedness, see Pitchford (1995).
[3] In addition, literature on sovereign debt is only concerned with the debt repayment and rescheduling issue of lenders facing a repudiation risk, but does not cover human development or poverty considerations. For models of debt repudiation, see Cohen 1998; for the problem of sovereign debt restructuring, see Krueger (2002), for the political economy of debt crisis in a historical perspective, see Aggarwal (1996).
[4] The point of departure of debt overhang theories is an assumed analogy of national insolvency to private bankruptcy. Bankruptcy laws are justified by the costs to postponing the inevitable: a 'grab race' between creditors, loans withheld from the country, and choice of risky investments by the debtor. As these inefficiencies are assumed to be relieved by partial debt forgiveness, both, creditors and debtors, benefit. On critique to the assumed analogy, see Meier (1989).
[5] However, if the perspective is broadened from the sole repayment possibility to the problem of development costs of debt repayment, a debt overhang problem exists if a country has exceeded its capacity to repay its debt without a net development cost. Despite operational pitfalls, i.e. that one has to deal with the governance issue and the problem of measuring development costs of debt repayment, the second definition would bring more into focus the human development and pro-poor growth problem. Two minimum levels of debt relief might be derived from debt overhang concepts: the level of repayment sustained under the debt overhang and the discount rate on private debt. The underlying assumption would be that the discount on the secondary market indicates the proportion of the debt the

The basic argument of the effects of debt overhang on growth is usually demonstrated in a two-period model. If debt exceeds the repayment level of the debtor, it leads to a distortionary tax. Any increase in output is taxed at a marginal tax rate to repay the debt. Future domestic and foreign investment is discouraged as the returns from investing are diminished by the marginal tax. On the other hand, if partial debt is relieved, the debt becomes a lump-sum burden and investment is encouraged (Sachs 1989, Krugman 1988, Basu 1997). One disincentive effect of debt overhang on growth is thus explained by reduced investment due to a lower after-tax return.[6] Empirical evidence of this effect, however, remains uncertain (Morriset 1990, Desphande 1997, Cohen 1993).[7] In addition, as the tax base in low income countries is rather narrow, investors might be more concerned about uncertainties created by pressure on the external account (Serieux 2001a).

Disincentive effects of the debt overhang on growth have also been discussed in a broader perspective. Any productive activity might be discouraged as the gains will be taxed away in the future to balance the financing gap. Thus the politicians may have lower incentives to undertake difficult structural reforms. In this way, debt overhang impacts on economic growth through macroeconomic policy, affecting the level and efficiency of investment (Pattillo/Poison/Ricci 2002). Furthermore, the disincentive effect of debt overhang on investment cannot only be explained by taxation, but by general macroeconomic instability. A large public debt might negatively influence key indicators of macroeconomic stability (fiscal deficit, exchange rate, inflation rate) increasing their fluctuation and thus the uncertainty of future investments (Dornbusch 1989). Empirical evidence supports this hypothesis (Hjertholm 2000). Macroeconomic uncertainty, however, will lower the level and efficiency of investment as the investor's behavior is assumed to be risk-adverse, leading to a lower economic growth. Thus debt relief may promote growth with price stability (Armendáriz de Aghion/ Armendáriz de Hinestrosa 1995). In addition, the psychological burden of debt overhang on inventiveness and optimism has been emphasized by Dent/Peters (1998).

Related to the negative effects of debt overhang on economic growth is the capital flight issue. Capital flight may increase the need for external debt as the money is lost for domestic investment. In addition, high external debt and debt service obligations may lead to economic uncertainty (expectation of exchange rate devaluation, fiscal crisis, expropriation risk), resulting

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market treats as debt overhang. However, both propositions do not take into account additional development costs of the debt overhang (Serieux 2001a).

[6] For a discussion of this effect in different economic circumstances (degree of capital mobility, uncertainty, change of real interest rate, capital flight), see Corden (1989), Helpman (1989). However, in a simulation, the effect of credit rationing on investment due to foreign debt was found to be more important (Borensztein 1990)

[7] This disincentive effect would be a strong argument for debt relief to restore growth by increased investment. Morisset (1990) found a weak direct effect of debt relief on private investment, but a strong indirect effect through a decline of domestic interest rate and an increase in domestic credit for Argentina. Deshpande (1997) found a negative relationship between debt stock and domestic investment for 13 severely indebted countries during 1971 – 1991. Cohen (1993), however, could only show a negative relationship between actual debt-service and investment, but no negative impact of accumulated large debt on investment in a sample of 81 developing countries.

in flight of private capital (debt-driven capital flight).[8] Negative consequences may be reduced economic growth by lost resources, reduced government revenue by erosion of tax base and regressive income redistribution due to austerity measures and shifted tax burden. However, in regressing different capital flight measures on real growth of GNP and additional variables for Kenya in the period 1981 – 91, the coefficients on capital flight have not found to be statistically significant (Ajayi 1996).

Recent empirical research has focused on a nonlinear impact of external debt on growth. Using a sample of 99 developing countries, Elbadawi/Ndulu/Ndung'u (1997) proposed three channels of indebtedness on growth: the indirect effects on public sector expenditures and deficits, liquidity constraints related to debt servicing and the debt overhang effect on investment. The authors extended a debt Laffer curve approach to indicate the relationship between external debt and growth.[9] At low levels debt stimulates growth, but beyond a certain threshold, accumulated debt impacts negatively on growth.[10] The three channels of transmission are shown to be empirically evident. Cohen (1997) found that the risk of debt crisis significantly lowered growth in Latin American countries.[11] The likelihood of debt crisis has the largest negative effect on growth beyond a certain threshold (e.g. debt to exports of 200 percent, debt to GDP of 50). In addition, Cohen (1998) has explored the effect of debt crisis of the 1980s on the economic growth in African countries in the 1990s. Half of the growth slow-down can be explained by the debt crisis while a sustainable debt to exports ratio is suggested to be between 200 to 250 percent.[12] Pattillo/Poirson/Ricci (2002) analyzed the impact of external debt (measured by debt to exports, debt to GDP, net present values of debt to exports, net present values of debt to GDP) and debt reduction on growth in an augmented growth model (Mankiw/Romer/Weil 1992) using a sample of 93 developing countries over the period of 1969 - 1998. Empirical results support the debt Laffer curve hypothesis. A negative growth effect is proposed at debt levels above 160 – 170 percent of exports and 35 – 40 percent of GDP. Thererfore per capita growth slows between half to a full percentage point, if debt is doubled, as the differential in per capita growth seems to be in excess of 2 percent for countries with external indebtedness below 100 and above 300 percent of exports.

The theoretical and empirical literature covers the external debt problem mainly with respect to economic growth. The link to poverty and human development is implicitly present in the assumption that overall growth leads to poverty reduction. The direct impact of external debt on poverty, however, is only rarely explicitly modelled and tested. Schinke (1994) analyzes the consequences of indebtedness on poverty through the change of relative prices of traded to

[8] However, the causality between external debt and capital flight can run in both directions. For a distinction in debt-driven capital flight, debt-fueled capital flight, flight-driven external borrowing and flight-fueled external borrowing, see Ajayi (1996).
[9] The usual debt Laffer curve indicates the relationship between the amount of debt repayment and the outstanding debt for a given level of liquidity (Claessens, Diwan 1989)
[10] The growth maximizing debt to GDP ratio is calculated at 97 percent (Elbadawi, Ndulu, Ndung'u 1997)
[11] The probability of rescheduling depending positively on the debt-to-GDP ratio is used as a proxy for the risk of debt crisis.
[12] Debt crisis is instrumented as debt/GDP ratio and a dummy which counts the number of reschedulings.

non-traded goods in a factor endowment framework. The basic concept is that foreign capital inflows (external debt) lead to an increase of the relative price of non-traded to traded goods.[13] The relative price change may result in different effects on poverty depending on wage rigidities in the labour markets of the trade and non – trade sector. Agénor/ Fofack/ Izquierdo (2003) analyze the effect of alternative expenditure allocations caused by debt relief (lump-sum transfers to households, investment in infrastructure, education or health) on income distribution and poverty in a dynamic general equilibrium model. The underlying assumption is a sustainable debt situation before debt relief is granted. A comparison of the alternative strategies with respect to poverty reduction simulations suggest the superiority of investment in infrastructure. Finally, Loko/Mlachila/Nallari/Kalonji (2003) estimate empirically the impact of external debt on three human development indicators (life expectancy, infant mortality, and gross primary enrollment rates) for 67 low income countries (of which 41 are HIPCs) for the period 1985 to 1999. Once the effect of income is controlled for, the debt indicators are found to have limited but not negligible effect on the non-income poverty indicators.[14]

The debt - poverty issue is closely related to the sustainability problem of external debts. In general, debt sustainability conditions state a situation in which the country will have the capacity to serve its debt obligations. In the creditors' view, debt sustainability is fulfilled when the country meets its debt-service obligations after imposition of different debt rescheduling measures. The NGOs' community definition of debt sustainability, however, is more concerned with the human development needs in general, requiring improved integration of the poverty issue in the enhanced HIPC initiative (Befekadu 2001). In a case study for Ethiopia, Befekadu (2001) analyzed the burden of debt, in the context of the international development target to halve the poverty rate by 2015. Based on a Harrod-Domar model, he estimated the needed annual growth and investment rate of GDP as 8.5 % and 44.2 %, respectively. Even total debt relief would release resources from servicing the debt to only approximately 2 % of GDP, so additional capital inflows are assumed to be essential. Serieux (2001b) critically assessed the enhanced HIPC initiative with reference to poverty reduction and sustainable debt. Based on data for 22 eligible countries, the analysis states that the budgetary savings of debt relief only are small relative to aid flows. In addition, debt relief levels are not derived from country specific needs to alleviate poverty, but result from fixed debt indicator ratios. Maintaining sustainable debt levels would also require unrealistic economic growth. To achieve the envisaged poverty reduction, long-term lending linked to countries' debt capacity and provision of additional poverty-reduction funding is proposed. Critique of the enhanced HIPC initiative is also prominent from the NGO community (EURODAD, 2001, 2002) which stresses the inappropriateness of the debt sustainability condition to reduce poverty by half until 2015. A poverty-focused debt sustainability criterion is promoted, assessing the resources necessary to

[13] The reason for this is that the amount of traded goods relative to non-traded goods is increased, as external debt is assumed to be identical with net imports of goods and non factor services. As non – traded goods are diminished relative to traded goods, the relative price of non – traded goods increases (Schinke 1994).

[14] For example a 20 percent increase in the debt-service ratio would lead to a 1 percent decline in life expectancy at birth (Loko/Mlachila/Nallari/Kalonji 2003).

foster pro-poor growth and human development. In this 'bottom-up' approach the resources for essential human needs are subtracted from the overall resources available to the government's budget. One-third of the remaining resources should be used to service foreign debt.

2.2 Effects of external debt on pro-poor growth

Based on the discussion in the theoretical and empirical literature we propose four major effects of high external debt on pro-poor growth and poverty. While the first two effects are more related to the size of debt-service obligations, the third and fourth effects are more dependent on the amount of the accumulated external debt stock.

Budgetary process' effects (internal transfer problem)

A large stock of debt may impact on pro-poor growth through the budgetary process. Higher debt service obligations affect government expenditures with possible negative effects on the income of the poor.[15] If further revenue is needed to service the interest payment and principal repayment, the government has several possibilities to fill the financing gap resulting from its budget constraints.

First, the government may increase revenues. Taking into account the narrow tax base, indirect (trade) taxes, and limited institutional infrastructure of developing countries, increased tax revenues are both economically and politically unlikely. Second, the government increases the budget deficit. Accumulating further domestic or external debt, however, only postpones and likely worsens the effects.[16] In addition, inflationary finance by seignorage may discourage economic growth by the disruptive effect of high inflation rates (Temple 1999, Montiel 2003, Epaulard 2003). Furthermore, the poor may be hit disproportionately by the negative effects of high inflation rates on their income due to its denomination in nominal terms without access to indexation, a decline in real wages due to rigidity of nominal wages, the impossibility of hedging inflation with other assets, and the 'inflation tax' with effects similar to a regressive tax.[17] Empirical evidence on the negative distribution effect of inflation, however, is mixed. One reason may be that economy-wide inflation rates do not correctly reflect the effects of price changes relevant for the poor (Romer/Romer 1998, Easterly/Fisher 2001, Dollar/Kraay 2001, Anderson/White 2001, Ghura/Leite/Tsangarides 2002, Agénor 2002, Ames/Brown /Devarajan/Izquierdo 2002, Epaulard 2003).

[15] The need to mobilize additional domestic resources due to higher debt service payments is also called the internal transfer problem (Meier 1995).
[16] In addition, access to international credit markets may be impossible, if high external debt is perceived as an insolvency problem by creditors.
[17] In addition, a change in distribution of income and wealth may be explained by high and variable inflation, if the middle-class, as holders of nominal liabilites, benefits from its loss of value and the poor holds only nominal assets (Agénor 2002).

Third, the government may reduce its expenditures concerning social spending (health, education, social security etc.) and public investment.[18] Lower investment in education leads to lower human capital and lower economic growth (Mankiw/Romer/Weil 1992). In addition, social spending may be closely related to poverty reduction programs and non-income poverty reducing public activities. Whether pro-poor growth is negatively influenced by contraction in social expenditures, however, depends also on the previous structure of the social spending programs, as social expenditures often disproportionately benerfit upper-income households in developing countries (Dollar/Kraay 2001, Baldacci/de Mello/Inchauste 2002, Agénor 2002, Davoodi/Tiongson/Asawanuchit 2003).[19]

The crowding-out hypothesis states that higher current debt service obligations could crowd-out current public investment in productive activities due to reduced resources (Cohen 1993, Claessens/Detragiache/ Kanbur/Wickham 1996). As public investment is a significant proportion of total domestic investment in most developing countries, lower public investment reduces long-term growth through macroeconomic multiplier effects (Dornbusch 1989). In addition, poverty is increased by reduced investment in infrastructure (Agénor/Fofack/Izquierdo 2003).[20] Furthermore, public and private investment may be complementary and public expenditures may crowd-in private investment, resulting in positive externalities, thus fiscal distress hits the economic growth even harder (Agénor 2002). Finally, reduced public expenditures may also affect investment and growth negatively by import compression, if the economy's ability to substitute between imported and domestic capital goods is limited and government expenditures are an important part of imported capital goods (Hjertholm 2000).

External account effects (external transfer problem)

External debt-service obligations have to be repaid usually in foreign currency. Countries with limited reserves (most developing countries) may receive the required foreign currency from foreign direct investment, private debt flows, nonconditional official development assistance, or earnings from exports. At least in severely indebted developing countries, however, the first three possibilities are less significant, in part because of their limited access to international financial markets, thus debt-service obligations must mainly come from export earnings.[21] One problem in increasing exports, however, is the fact that the growth rate of exports depends on factors (e.g. type of exports, market shares, competitiveness, access to developed countries' markets) not always in control of developing countries. In addition, if all developing countries

[18] Curtailing government expenditures may also lead to increased poverty via cuts in real wages and layoffs of employees in the public sector (Agénor 2002).
[19] So cuts in social spending may nevertheless lead to reduced poverty, if social expenditures are better targeted to the poor (Agénor 2002).
[20] Supply side effects of increased infrastructure encompass higher productivity and reduced risk of confiscation, which lead to reduced poverty in the rural nontrade sector. For a deeper discussion of the channels proposed in this rather comprehensive model, see Agénor/Fofack/Izquierdo (2003).
[21] Mobilizing additional net exports of goods and services to meet the needed foreign currency due to higher debt service payments is also called the external transfer problem (Meier 1995).

increase exports at the same time, they have to compete with each other and might lose possibilities of saving foreign-exchange (Abbott 1993).

The foreign exchange demand imposed by the debt-service obligations may be passed on through exchange rate depreciation or import restrictions.[22] On the demand side, a depreciation of the real exchange rate would benefit consumers of nontradables, while it would harm consumers of imported goods. The depreciation could increase domestic food prices due to higher prices of imported food. This could lead to negative effects for the poor, if they are net consumers of food (Baldacci/de Mello/Inchauste 2002). On the supply-side, improved agricultural exports may increase the income of the rural poor, while diminished demand for labor in the nontraded sector may decrease the income of the urban poor, i.e. earnings fall for those employed in the non-trade sector with respect to the trade sector.[23] Thus real exchange rate depreciation could positively affect the poor, if they work mainly in the tradable sector, but consume nontradables (Ames/Brown/Devarajan/Izquierdo 2002, Agénor 2002). Furthermore, if a gain in competitiveness is achieved by a real depreciation, short term unemployment is likely, due to decreased spendable income of workers. In addition, a country will gain much less foreign currency revenue, when all developing countries are forced to depreciate (Dornbusch 1989).

Currency depreciation increases the domestic costs of debt-service obligations. The net result may be an increase in the price of imported intermediate inputs and capital goods without improved capacity to import (import compression) resulting in a contraction in aggregate supply and investment (Serieux 2001a). However, increased prices for imported intermediate input and capital goods may result in more demand for unskilled workers, if skilled and unskilled labour are net substitutes. On the other hand, negative supply shocks are also possible, if the economy is a net importer of intermediate inputs (Agénor 2002). If countries defend a fixed exchange rate, the increased demand for foreign exchange must be achieved by restrictions on imports. It is probable that aggregate supply and investment is decreased by reduced supply of imported intermediate inputs and capital goods (import compression). Futhermore, non-price restrictions may lead to rent-seeking incentives with negative effects on output and investment (Serieux 2001a).

Finally, the budget and external account effects are not independent. A currency depreciation results in an increased value of debt service in domestic currency. Inflationary financing may be caused by the additional budget deficit with disturbing effects on the income of the poor (Dornbusch 1989, Meier 1995).

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[22] Effects of nominal devaluations on the income of the poor are ambiguous, depending also on their effect on the real exchange rate (Edwards 1989, Ghei/Hinkle 1999). The effects of devaluation on real output and economic growth in developing countries are controversially discussed. A devaluation might lead to contraction caused by its effect on both aggregate demand and supply (Krugman/Taylor 1978). Empirical evidence appears to confirm the contractionary devaluation hypothesis at least in the short run, even if the applied methodology may be criticized (Edwards 1989, Agénor 1991, Agénor/Montiel 1996/1999, Kamin/Klau 1998, Rogers/Kamin 2000).

Disincentive effects

The debt overhang approach states the disincentive effects of external debt on investment. First, debt overhang affects economic growth negatively by a reduced investment due to a lower after-tax return. Second, any productive activity might be discouraged, as the gains will be taxed away in the future to balance the financing gap. Thus the politicians may have lower incentives to undertake difficult structural reforms affecting the level and efficiency of investment. Finally, a large public debt may negatively influence key indicators of macroeconomic stability (fiscal deficit, exchange rate, inflation rate) increasing the uncertainty of future investments. Increased uncertainty may also result from ongoing rescheduling negotiations which are dependent on a complex political process (Claessens/Detragiache/Kanbur/Wickham 1996). Macroeconomic uncertainty, however, will lower the level and efficiency of investment. While debt overhang works mainly through economic growth, the income of the poor may be additionally influenced by these disincentive effects.

Macroeconomic uncertainty

The poor may also be affected negatively by increased macroeconomic uncertainty and volatility due to high indebtedness (Breen/Garcia-Peñalosa 1999). Increased precautionary savings caused by higher uncertainty about future income may increase poverty due to reduced growth. In addition, credit market effects, i.e. higher incidence of credit rationing or increased risk premium and borrowing rates for private firms may affect negatively the poor via fallen labour demand (Agénor 2002).

Higher levels of external debt may also increase the propensitiy of debt crisis (Cohen 1997, 1998).[24] While a financial crisis in itself may impact negatively on the poor (Baldacci/de Mello /Inchauste 2002), debt crisis may additionally affect the income of the poor in the longer-run via asymmetric effects, i.e. poverty is less reduced in subsequent expansions than increased during contractions. First, parents' decision to take children out of school to work during recessions may not be reversed in expansions diminishing the human capital of the poor. Second, expectations may be more pessimistic during phases of crisis than optimistic in booming times. Third, credits may be rationed to firms due to a higher perceived risk of default in recessions. This effect may not completely offset during expansions.[25] Fourth, inadequate insurance and credit mechanisms for poorer households may prevent the ability to smooth consumption with possible negative effects. Finally, unskilled workers may lose their jobs first in recessions if firms "hoard" their skilled labor force due to higher turnover costs. During expansions companies may

[23] In addition, a higher cost-of-living index in the urban areas may offset the positive supply effect on small farmers in the tradable sector (Agénor 2002).
[24] The probability of rescheduling depending positively on the debt-to-GDP ratio is used as a proxy for the risk of debt crisis.
[25] A related reason would be a net worth effect, i.e. that a burst of asset price bubbles during crisis would lead to a downturn in the value of collaterals leading to a credit crunch. Asset prices, however, may not reach former price levels in a subsequent expansion period (Agénor 2002).

increase fixed investment if complementarity between skilled labour and physical capital is high, leading to persistent unskilled unemployment (Agénor 2002).

To summarize our discussion on poverty effects of external debt, we propose the hypothesis that high external debt should impact negatively on the income of the poorest 40 percent in developing and transitional countries. Since low levels of external debt may also be growth-enhancing, we additionally test a debt Laffer curve effect, i.e. external debt promotes the income of the poor at low levels and diminishes the income of the poor at high debt levels. We expect these hypotheses to be relevant for the distribution effect and the total effect, i.e. for both the distribution and the (distribution-neutral) growth effect.

3. Data sources and descriptive statistics

3.1 Data on income inequality measures

Empirical tests on the impact of external debt on pro-poor growth are limited by data availability. In addition, incomparability of inequality data can cause severe problems in cross-section analysis (Atkinson/Brandolini 2001). Due to different concepts used in income distribution surveys across time and space cross-section analysis of pro-poor growth using first and second quintile share of income has to be applied with caution. Data on income inequality may vary in various aspects, e.g. in income concept (income, expenditure), tax treatment, reference unit (household/family/household equivalent/person) or coverage (age/area/population). Concerning the income definition, expenditure should be preferred to income for developing countries based on practical measurement reasons especially for rural (poor) households (Atkinson 1993, Deaton 1997). In addition, data on income distribution can be based on different sources (national household surveys, income tax records, social security/labor market agency records).[26] Thus comparability of data on first and second quintile share of income has to be handled with care. While data on quintile shares of income can not be restricted to completely comparable samples due to limited data availability, only samples should be used with observations as fully consistent as possible (Atkinson/Brandolini 2001).

Our data on the first and second quintile share of income (and the Gini coefficient) are based on three sources: the UNU/WIDER-UNDP World Income Inequality Database, Version 1.0, 12 September 2000, the Global Poverty Monitoring described in Chen and Ravallion (1997, 2000)[27] and the World Development Indicators 2002 Table 2.8 (see table 1). The observations are chosen by a successive selection procedure with restriction criteria motivated by the problems outlined above. For the UNU/WIDER database (2000), we first restrict the sample to data based

[26] see for further details UNU/WIDER–UNDP World Income Inequality Database, Version 1.0, 12 September 2000, User guide; Atkinson/Brandolini (2001).
[27] The Global Poverty Monitoring is available under www.worldbank.org/research/povmon/index.htm and continually updated.

on surveys covering all area, all population, all age and fulfilling the 1 OKIN quality rating.[28] Second, as we are interested in pro-poor growth, only countries with at least two spaced observations are selected. To cover medium-to-long run growth and measurement errors due to fluctuations we draw the first available observation and every following with at least three years distance to the preceding. Only in four cases have we allowed for a two year distance within a spell for pragmatic reasons.[29] In addition, the income concept and income recipients (reference unit) have to be identical for each spell.[30]

The Global Poverty Monitoring data set is based on nationally representative surveys. All measures of household living standards are normalized by household size. The distribution and empirical Lorenz curves are household-size weighted. The income shares are estimated from primary data sources using parameterized Lorenz curves with flexible functional forms (Chen/Ravallion 1997). We have selected the sample on data of first and second quintile share of income due to the restriction criteria outlined above.[31] In addition, actual data are drawn from the World Development Indicators 2002 Table 2.8 using the same methodology for low- and middle-income countries as used by the Global Poverty Monitoring data set.[32] This selection procedure has resulted in 371 observations in total, 231 for developing, 27 for transitional and 113 for industrial countries in the period 1950 - 1999. Finally, data on our three debt indicators, i.e. the ratio of total external debt to GDP, ratio of total external debt to exports, and ratio of total debt services to exports, have to be available, reducing the total sample further to 209 observations for 58 countries (186 observations for developing countries and 23 observations for transitional countries) in the period 1970 to 1999 (table 1).

In our regressions we use, first, the same income concept and reference unit for each spell, i.e. we do not construct all possible spells between the observations in each country.[33] In addition, we select in some cases two observations per country per year, exchanging the observations between the spells (table 1). Second, in adjusting the income inequality measures to form all possible spells in each country we regress the first/second quintile share and Gini coefficient on dummy variables for different income definitions and regional dummies.[34] The adjusted

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[28] *Reliable income or expenditure data referring to the entire (national) population, not affected by apparent inconsistencies* (UNU/WIDER – UNDP World income inequality database, Version 1.0, 12 September 2000, Users guide).

[29] Bulgaria 1991 – 93, Gabon 1975 – 77, Guatemala 1987 – 89, Kenya 1992 – 94.

[30] One can further strengthen the selection criteria by also requiring the same type of survey for each spell to control for differences in survey design not captured by the same income definition and reference unit. Due to data availability, however, we omitted this idea.

[31] In one case we allowed for a two years distance within a spell for pragmatic reasons (Belarus 1993 – 95).

[32] For description of estimation method see World Development Indicators 2002 Table 2.8 (About the data).
As noted in the description of the data set used by Dollar/Kraay (2001), several 'high-quality' data from the Deininger and Squire (1996, 1998a) database are not incorporated in the UNU/WIDER database (2000). We checked the Deininger and Squire (1996, 1998a) database, but no additional observations could be gained due to our restriction criteria.

[33] The length of time between two observations with the same income concept within a country ranges from 2 to 14 years with a median of 4 years in our sample.

[34] We prefer to use regional dummy variables in the adjustment regressions, since we have only 371 observations and eight different income definitions in our sample, which are not equally distributed among regions (e.g. income (unknown tax treatment) and net income are only present in three out of five regions in developing countries). If we omit regional dummy variables, the coefficients of these income definitions may falsely capture also regional differences in inequality. Since we only subtract the estimated coefficients of the income definitions from the unadjusted income inequality measures, regional differences in inequality are not consumed away by this adjustment procedure. To check this issue

first/second quintile share and Gini coeffcient are then calculated by subtracting the estimated coefficients of the alternative income dummies from the unadjusted measures to form a sample of inequality measures corresponding to the distribution of household expenditure (table 2).[35] In general, the number of observations per country varies significantly from 2 (almost all Sub-Saharan Africa and Eastern Europe countries) to 8 (Indonesia, India).

Mean income of the poorest is measured as the share of income earned by the poorest first and second quintile times mean income, divided by 0.2. Data on mean income are based on the PPP-adjusted real income per capita (constant 1996 US dollars using the chain index) reported in the Penn World Tables Version 6.1 (Heston/Summers/Aten 2002, Heston/Summers 1991). Though the mean income from national accounts may differ from mean level of household income (expenditure) due to measurement errors, income definition, or underestimation of income (consumption) in developing countries caused by nonparticipating rich, we use per capita GDP.[36]

Looking at summary statistics, (adjusted) first/second quintile, (adjusted) mean income of the first/second quintile, growth rates of the first/second quintile, and growth rates of the mean income of the first/second quintile vary considerably in the different regions (table 5). For example, Eastern Europe has on average a highly negative growth rate of the first quintile (-4.70 percent), while in South Asia the growth rate of the first quintile share is on average only weakly negative (-0.62 percent).[37]

3.2 Debt indicators and additional macroeconomic variables

Total external debt to GDP ratio (EDT/GDP) and, alternatively, total external debt to export ratio (EDT/XGS) are used as debt indicators, because they are prominent indicators in the debt sustainability discussion and the HIPC debt relief initiative.[38] Total external debt comprises long-term debt (public/ publicly guaranteed, private nonguaranteed), IMF credit and short-term debt as defined in the Global development finance 2000 (table 3). One possible expectation would be a nonlinear impact of EDT/GDP and EDT/XGS, i.e. for low values of the two debt indicators

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further, we also run adjustment regressions without regional dummy variables. If we compare correlations of the two adjusted first/second quintile shares and Gini coefficients with its unadjusted version, the correlation coefficients for the adjustment process with regional dummy variables are always closer to one, confirming our approach.

[35] Subtracting the estimated coefficients of the alternative income dummies from the unadjusted measures means that we calculate the adjusted measures by subtracting the alternative income dummies multiplied by its coefficient from the unadjusted first and second quintile share. On critic of this adjustment procedure, see Atkinson/Brandolini (1999).

[36] One pragmatic reason is that the UNU/WIDER-UNDP Database does not indicate the mean level of household income for each household survey. For a discussion of applying this procedure in pro-poor growth regressions, see Eastwood/Lipton (2001), Dollar/Kraay (2001). For a further discussion of discrepancies between national accounts and household survey measures of living standards, see Ravallion (2001a).

[37] The high average annual growth rate for the mean (income) of the first quintile in Sub-Saharan Africa stem from three spells (Guinea 1991 – 94, Kenya 1992 – 94, Senegal 1991 – 95) with values over 18 percent. If we omit these observations in regressions without outliers, the mean of the growth of the first quintile (growth Q20) is 0.59 and the mean of the growth of the mean income (growth mean Q20) 1.05. In addition, the mean of the growth of the second quintile (growth Q40) is 0.44 and the mean of the growth of the mean income (growth mean Q40) is 1.05 without the spell for Kenya 1992 – 94.

[38] Of course, it would be more useful to use data on the net present value of external debt. The reason for this is that debt stock indicators based on the net present value are better suited for comparing streams of future debt repayments. Information on net present value of external debt, however, is not available.

pro-poor growth should be stimulated, while for high values the accumulated debt impacts negatively on the 20 percent and 20 to 40 percent poorest. This assumption would be an adaptation of a debt Laffer curve effect on the pro-poor growth issue. Higher total debt service to exports (TDS/XGS) indicates a liquidity constraint causing external account effects and less resources for productive activities. Thus the coefficient of TDS/XGS is expected to be negative, caused by budgetary process' and external accounts effects.[39] As this variable measures only the scheduled payments, and data for actual payments are not available, empirical results do not necessarily reflect the real situation (Patillo/Poirson/Ricci 2002).

The variables overall budget surplus to GDP and government consumption to GDP are controlled for.[40] Their use is motivated by the impact of indebtedness on the poor via public sector financing as explained in the section on budgetary process' effects. Budget deficit is expected at least not to have negative coefficients as better public finances should not decrease pro-poor growth. The impact of government consumption, however, is ambiguous as benefits of public sector do not necessarily support the poorest part of an economy more than other income groups.[41] In addition, government size can also negatively impact on the income of the poor due to distortions of private decisions and its proxy for bad governance (Barro/Sala-i-Martin 1995). Unfortunately, we could not test the impact of health and education expenditures to GDP on pro-poor growth due to lacking data availability for our sample.[42] Human capital may play a crucial role for the income of the poor, thus we use the average years of secondary schooling in the total population aged 25 and over as proxy for investment in education with expected positive coefficients.[43] We also include life expectancy as a proxy for investment in health with expected positive effect.

The rate of inflation is used to cover macroeconomic uncertainty effects and to control for inflationary financial effects on pro-poor growth. Low levels of inflation are expected to stimulate or at least not hinder pro-poor growth, while high or crisis levels of inflation should impact negatively on pro-poor growth.[44] Furthermore, we use terms-of-trade to capture external environment effects with expected positive impact (Barro/Salah-i-Martin 1995,

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[39] TDS/XGS is also included in regressions controlling for EDT/GDP of EDT/XGS to separate debt overhang effects from crowding-out effects (Claessens/Detragiache/Wickham/Kanbur 1996, Patillo/Poirson/Ricci 2002).

[40] We have also controlled for public investment in our regressions. Results, however, are almost always insignificant, so we omitted public investment from our approach. This result is in line with similar findings in the literature (Ghura/Leite/Tsangarides 2002).

[41]. In developing countries social expenditures often benefit more the middle class and the rich (Dollar, Kraay 2001, Davoodi, Tiongson, Asawanuchit 2003).

[42] Davoodi/Tiongson/Asawanuchit (2003) collected data on education and health expenditures for 81 countries for the period 1960 to 2000. Even if the dataset was accessible (which is not the case), it would be inconvenient for our purposes as only less than half of the countries are present in our sample.

[43] We also experimented with three other education indicators (average years of schooling in total population aged 25 and over, average years of primary schooling in total population aged 25 and over, and percentage of "secondary school attained" in total population aged 25 and over). While results remained similar, secondary education turned out to be the most relevant indicator.

[44] Because overall inflation may not necessarily reflect the price index of the poor, we also used inflation in food prices as price index. The assumption would be that inflation in food prices may hurt especially the poor, as a considerable amount of their consumption is paid on food. As data on food inflation are more restricted than data on overall inflation, and the correlation between both inflation indicators is rather high (0.99) in our sample, we use only overall inflation to cover price changes in goods other than food.

Ghura/Leite/Tsangarides 2002).[45] We also controll for financial development measured by M2 to GDP ratio with expected positive coefficient. A positive impact of financial sector development on the poor may be reasoned by better access to credit and improved risk sharing (Ghura/Leite/Tsangarides 2002). Furthermore, the initial value of the adjusted Gini coefficient is added to cover the impact of initial inequality on the growth of the mean income of the poor with expected positive coefficient. Adding the initial inequality in the growth equation can be justified by testing the hypothesis of inequality convergence. A positive coefficient for the initial Gini coefficient would confirm the convergence of inequality (Ravallion 2000). Finally, civil liberties are used to test institutional effects on the poor. The index is measured on a scale from one to seven with one indicating the most liberal state. Thus the coefficient should be negative, if less civil liberties result in anti - poor growth and policies.[46] Data sources and definitions of additional macroeconomic variables are presented in table 3. As we confront missing values and outliers the number of observations vary for each variable and restrict the size of the sample due to the econometric specification (table 4). In addition, not all additional macroeconomic variables are used in all specifications, due to insignificant coefficients.

Finally, we take a short look at descriptive statistics for debt indicators and additional macroeconomic variables. First, high average values of the different debt indicators are not necessarily in the same regions. So we observe high values of the external debt to GDP ratio in Middle East and North Africa and Sub – Saharan Africa. On the other side, while EDT/XGS is over the average in South Asia and Sub – Saharan Africa, the difference in TDS/XGS between the regions is less pronounced (table 4 and 5). Correlation coefficients between the debt indicators, however, indicate relative high positive correlation between EDT/GDP and EDT/XGS, EDT/XGS and TDS/XGS, but low positive correlation between EDT/GDP and TDS/XGS (table 6). Correlation coefficients between the debt indicators and additional determinants of pro-poor growth, however, are not necessarily consistent. While EDT/XGS is, as expected negatively correlated to a one percent significance level with budget surplus, secondary education and life expectancy, the correlation between TDS/XGS and the three variables is weakly negative and insignificant. Thus correlation coefficients for TDS/XGS do only weakly support the budgetary process' effects. On the other hand, EDT/GDP is positively correlated with government consumption and secondary education (table 6). Finally, inflation is on the average high in Central Europe (+191 percent) and in Latin America (+67 percent, table 5), but amazingly not at all correlated with the debt indicators (table 6).

[45] Terms-of-trade growth reflects external shocks from world market orientation. The sign of the coefficient, however, may be indifferent as a positive terms-of-trade growth can improve the income of the poor representing for example an increase in the relative price of agricultural commodities (benefiting the rural poor) or a fall in the price for imported consumption goods (benefiting the urban poor). Otherwise, positive terms-of-trade growth can also decrease the income of the poor by adverse supply-side effects due to the shift in relative prices.

[46] To cover the omitted variable issue we also controlled for other additional macroeconomic variables, i.e. we used the economy's dependency on international markets proxied by trade openness (exports plus imports divided by GDP), impact of institutions measured by political rights, and macroeconomic uncertainty captured by output volatility. Test statistics, however, indicate no significant impact of these covariates in our regressions.

4. Pro-poor growth

Analytically, the impact of external debt on the income of the poor can be distinguished in the growth and the distribution effect [47]:

$$\partial Y^{p20/40}_{it} / \partial D_{jit} = \partial \ln(Y_{it})/\partial D_{jit} + [\partial Y^{q20/40}_{it}/\partial \ln(Y_{it}) * \partial \ln(Y_{it})/\partial D_{jit} + \partial Y^{q20/40}_{it} / \partial D_{jit}]$$

$$= \rho_j + [(\alpha_1 - 1) * \rho_j + \gamma_j] \quad (1)$$

with

$Y^{p20/40}_{it}$: mean income of the 20 percent/20 to 40 percent poorest defined as $\ln(Q^{20/40}_{it} * Y_{it}/0.2)$

$Y^{q20/40}_{it}$: $Y^{p20/40}_{it} - \ln(Y_{it}) = \ln(Q^{20/40}_{it} * Y_{it}/0.2) - \ln(Y_{it}) = \ln(Q^{20/40}_{it}) + \ln(Y_{it}) - \ln 0.2 - \ln(Y_{it})$ $= \ln(Q^{20/40}_{it}/0.2)$

$Q^{20/40}_{it}$: first/second quintile share of income

Y_{it}: real per capita income

D_{jit}: debt indicator with j = 1, ... , 3

ρ_j: (equiproportionate) growth effect of debt indicator on mean income ($\partial \ln(Y_{it})/\partial D_{jit}$)

$(\alpha_1 - 1)$: distribution effect of mean income ($\partial Y^{q20/40}_{it}/\partial \ln(Y_{it})$)

γ_j: distribution effect of debt indicator ($\partial Y^{q20/40}_{it} / \partial D_{jit}$)

The (equiproportionate) growth effect (first term on the right hand side of the equation) measures the effect of the debt indicator on mean income (ρ_j). The distribution effect (second term in brackets) measures the impact of the debt indicator on the first/second quintile share in two parts, the difference between α_1 and one times the growth effect and the direct effect γ_j of the debt indicator D_{jit} on the first and second quintile share. Thus the income of the poor could be affected directly and indirectly through growth by external debt, and trade-offs of the debt indicator affecting economic growth and the first/second quintile share in opposite directions could be analyzed.[48]

A natural benchmark for pro-poor growth would be equipropotionate growth with $\alpha_1 = 1$ and $\gamma_j = 0$, i.e. no distribution effects (equation (1): $\partial Y^{p20/40}_{it} / \partial D_{jit} = \rho_j$). Thus pro-poor growth could be defined by a distribution effect:

$$\rho_j + [(\alpha_1 - 1) * \rho_j + \gamma_j] > \rho_j \quad \text{i.e.} \quad \gamma_j > 0 \quad \text{for } \alpha_1 = 1 \quad (2)$$

[47] There is considerable ongoing discussion on the appropriate definition and measurement of pro-poor growth. While none of the measures proposed has so far set an international accepted standard, both the growth effect and the distribution effect have been identified as most critical for reduction in absolute poverty (Kakwani/Pernia 2000, Anderson/White 2001, Bourguignon 2001, Eastwood/Lipton 2001, Chen/Ravallion 2001, Kakwani/Son/Khandker 2003, Klasen 2003, Ravallion 2003).

[48] In the discussion of our concept of pro-poor growth we abstract from nonlinear effects to simplify the analysis. Interpretation of nonlinear effects of external debt on the income of the poor is straightforward.

One drawback of defining pro-poor growth only by equation (2) is the fact, that a situation with a negative growth effect ($\rho_j < 0$) would also be labelled as pro-poor if $\gamma_j > 0$. In this case the debt indicator would affect the growth rate negatively ($\rho_j < 0$), but this effect would be diminished by a positive effect on the first/second quintile share, if $\gamma_j > -(\alpha_1 - 1) * \rho_j$ (as ρ_j is assumed to be negative, the direct distribution effect of the debt indicator γ_j must be greater than the distribution effect via growth if $\alpha_1 > 1$). To cover this issue, pro-poor growth could be defined by a total effect assuming $\partial Y^{p20/40}_{it} / \partial D_{jit} > 0$:

$$\rho_j + [(\alpha_1 - 1) * \rho_j + \gamma_j] > 0 \quad \text{i.e.} \quad \gamma_j > -\rho_j \quad \text{for } \alpha_1 = 1 \qquad (3)$$

This condition would require a positive impact of a total effect, adding the growth and distribution effect. A positive impact of the debt indicator on first/second quintile share has to more than offset the negative effect of the debt indicator through growth. On the other hand, a growth situation would be also labelled pro-poor, if the positive growth effect of a debt indicator exceeds its negative distribution effect.

In our approach we choose equation (2) and equation (3) as our pro-poor growth conditions, to cover both the distribution effect and the total effect of debt indicators on the lowest 20 and 20 to 40. We also profit from the fact that the coefficient α_1-1, while often different from zero, is almost always insignificant in our regressions. Thus, assuming no indirect distribution effect via the mean income ($\alpha_1 = 1$), pro-poor growth is defined in equation (2) by a positive distribution effect ($\gamma_j > 0$). In equation (3) pro-poor growth is achieved if the total effect of the distribution effect and growth effect is positive ($\gamma_j + \rho_j > 0$). By estimating both equations, trade-offs between the distribution effect and growth effect can be analyzed. If estimations for the distribution effect are positive ($\gamma_j > 0$), but the coefficients for the total effect are zero ($\gamma_j + \rho_j = 0$), we can conclude that the growth effect of the debt indicator on the income of the poor has to be negative ($\rho_j < 0$). If estimations for the distribution effect are negative ($\gamma_j < 0$) and the total effect is zero ($\gamma_j + \rho_j = 0$), the growth effect of the debt indicator on the income of the poor has to be positive ($\rho_j > 0$).

5. Econometric Specifications and Estimation

5.1 Econometric specifications

To measure the impact of debt indicators on pro-poor growth we choose two different econometric methodologies, a system generalized method of moments estimation for a level and first-differenced equation and a growth equation using pooled OLS, random or fixed effects estimation.[49]

[49] In the discussion on econometric specification we abstract from nonlinear effects to simplify the analysis. Interpretation of nonlinear effects of external debt on the income of the poor is straightforward.

5.1.1 System GMM Estimation: level and first differenced equation

To estimate the distribution effect we formulate the following ad hoc equation in levels, i.e. we regress the mean income of the 20/20 to 40 per cent poorest on the mean income, debt indicators, and variants of additional variables.

$$Y^{p20/40}_{it} = \alpha_0 + \alpha_1 \ln(Y_{it}) + \beta_k X_{kit} + \gamma_j D_{jit} + \mu_i + \varepsilon_{it} \quad (4)$$

with

$Y^{p20/40}_{it}$:	mean income of the 20 percent/20 to 40 percent poorest defined as $\ln(Q^{20/40}_{it} * Y_{it}/0.2)$
$Q^{20/40}_{it}$:	first/second quintile share of income
Y_{it}:	real per capita income
i:	cross-section units (split or not split countries)
t:	year of observation
$\mu_i + \varepsilon_{it}$:	composite error term including unobserved country effects
X_{kit}:	additional variables with k = 1, ... ,n
$D_{1,2,3it}$:	total external debt to GDP (EDT), total external debt to exports (EDT/XGS), total debt services to exports (TDS/XGS)

To present more clearly the distribution effect we subtract Y_{it} from both sides [50]:

$$Y^{q20/40}_{it} = \alpha_0 + (\alpha_1 - 1)\ln(Y_{it}) + \beta_k X_{kit} + \gamma_j D_{jit} + \mu_i + \varepsilon_{it} \quad (5)$$

with

$Y^{q20/40}_{it}$:	logarithm of first/second quintile share divided by 0.2

However, to include information on within-country variation and to cover econometric issues discussed in the next section we apply a system GMM estimator, i.e. we estimate the level equation (5) and its first difference (6) as a system with the restriction of having the same coefficients α_1-1, β_k and γ_j

$$Y^{q20/40}_{i,t+z} - Y^{q20/40}_{it} = (\alpha_1 - 1)[\ln(Y_{i,t+z}) - \ln(Y_{it})] + \beta_k[X_{ki,t+z} - X_{kit}] + \gamma_j[D_{ji,t+z} - D_{jit}] + [\varepsilon_{it+z} - \varepsilon_{it}] \quad (6)$$

[50] $Y^{q20/40}_{it} = Y^{p20/40}_{it} - \ln(Y_{it}) = \ln(Q^{20/40}_{it} * Y_{it}/0.2) - \ln(Y_{it}) = \ln(Q^{20/40}_{it}) + \ln(Y_{it}) - \ln 0.2 - \ln(Y_{kt}) = \ln(Q^{20/40}_{it}/0.2)$

with

z: distance of years between two observations of a spell with identical income definition or distance of years between observations within a country

To handle the incomparability problem of inequality data, we choose two different routes. First, we split the countries requiring the same income definition within each subgroup (e.g. Côte d'Ivoire 1: 1985/88, Côte d'Ivoire 2: 1988/95, see table 1) and using only the unadjusted income definition. While the number of cross-section units is now increased, the number of observations for the level equation is decreased as the first observation per cross-section unit is omitted due to the first-differenced procedure. The advantage of this procedure is that the first-differenced equations are now formed only by observations with the same income definition per country. On the other hand the first/second quintile shares in the level equations are not directly comparable. Therefore, secondly, we do not split the countries and form first-differenced equations for all observations per country using the adjusted first/second quintile share of income. In this case we omit one of the two observations for the same year in one country (e.g. Côte d'Ivoire 1988/1, see table 1).[51] While in this case income definitions in the first-differenced and level equation are comparable, the adjustment procedure may influence the estimated coefficients (Atkinson, Brandolini 2001). One general drawback of the system GMM estimation in our context, however, is the fact that we are confronted with irregular panel data, i.e. z ranges from 2 to 14 in both approaches. In the system GMM estimation, however, z is assumed to be identical in the first-differenced equation.

The results of the system GMM estimation can be interpreted as a mixture of the level and first-differenced equation, i.e. pooled cross-section regression of the impact of the debt indicators on the level of first/second quintile at certain country-year observations (5) and the impact of the change of the debt indicators on the change of the first/second quintile share (6) between the observations within a country. Combining (5) and (6) in the system GMM estimation the coefficients of the debt indicators (γ_j) and the additional regressors (β_k) capture the distribution effect. Thus relying on (2) a significant γ_j, $\beta_k > 0$ indicate pro-poor growth (positive distribution effect), while γ_j, $\beta_k < 0$ could be labelled as anti-poor growth on the average.[52] Interpreting the system GMM approach as a level equation, a one percentage point increase in the debt indicators would change the first/second quintile share by $\gamma_j * 100$ percent.

[51] We compare the values of the adjusted first and second quintile of both per country-year observations (e.g. Venezuela 1987/1, 1987/2) with the values before (e.g. Venezuela 1981) and after (e.g. Venezuela 1993) the country-year observations to decide whether we omit the first or second observation as ordered in table 1. If one of the adjusted observation varies considerably with respect to the other observations, we omit this observation.

[52] This interpretation would apply equivalently to $\alpha_1 - 1$. As $\alpha_1 - 1$, however, is almost ever insignificant, we present only results for the system GMM estimation of equations (5) and (6) omitting $\ln(Y_{it})$.

Finally, to estimate the total effect we regress the mean income of the poorest 20 and 20 to 40 percent on debt indicators and variants of additional regressors, taking as level equation in the system GMM methodology variants of the following equation: [53]

$$Y^{p20/40}_{it} = \alpha_0 + (\beta_k+\rho_k)X_{kit} + (\gamma_j+ \rho_j)D_{jit} + \mu_i + \varepsilon_{it} \quad (7)$$

Taking into account (3) a significant $(\beta_k+\rho_k) > 0$, $(\gamma_j+ \rho_j) > 0$ indicates pro-poor growth (positive total effect), while $(\beta_k+\rho_k) < 0$, $(\gamma_j+ \rho_j) < 0$ would indicate anti-poor growth on the average. Trade-offs between the distribution effect and growth effect are present, if estimations for the distribution effect (γ_j) and the total effect ($\gamma_j + \rho_j$) differ in sign.

5.1.2 Growth equation: pooled OLS, fixed effects or random effects estimation

To measure also within country-variation, to cover the problem of an irregular panel in the first-differenced equation and the incomparability issue of income inequality measures, we also use a growth equation forming the dependent variable exclusively from spells with identical definitions of inequality income measures and divide the growth rates of each spell by the distance of years to calculate (regular) annual averages. Thus we regress the annual average growth rate of the mean income of the 20/20 to 40 per cent poorest on the annual average growth rate of mean income and initial values for the debt indicators and additional macroeconomic variables.

$$y^{p20,\,40}_{it} = \alpha_0 + \alpha_1 y_{it} + \beta_k X_{kit} + \gamma_j D_{jit} + u_{it} \quad (8)$$

with

$y^{p20/40}_{it}$: average annual rate of growth of the mean income of the 20/20 to 40 per cent poorest defined as $100/z*[\ln(Q^{20/40}_{i,t+z}*Y_{i,t+z}/0.2) - \ln(Q^{20/40}_{it}*Y_{it}/0.2)]$

z: distance of years between two observations of a spell with identical income definition

y_{it}: average annual rate of growth of the mean income defined as $100/z*[\ln(Y_{i,t+z}) - \ln(Y_{it})]$

X_{kit}: additional variables with k = 1, ... ,n; only initial values (at beginning of spell)

D_{jit}: debt indicator with j = 1, ..., 3; only initial values (at beginning of spell)

u_{it} error term of unknown form

We subtract y_{it} from both sides in (8) to derive more clearly the distribution effect:

$$y^{q20/40}_{it} = \alpha_0 + (\alpha_1-1)y_{it} + \beta_k X_{kit} + \gamma_j D_{jit} + \varepsilon_{it} \quad (9)$$

[53] In this approach we assume that α_1-1 equals zero.

with

$y^{q20/40}{}_{it}$: average annual rate of growth of the first and second quintile share defined as $100/z^* \ [\ln(Q^{20/40}{}_{i,t+z}) - \ln(Q^{20/40}{}_{it})]$ [54]

Again $\gamma_j > 0$ or $\beta_k > 0$ indicate pro-poor growth (positive distribution effect) with respect to (2), i.e. a one percentage point increase of the debt indicator or the additional variables would increase the average annual growth rate of the first/second quintile share by γ_j and β_k percentage points, respectively.[55]

Finally, we estimate also the total effect in using variants of the following equation[56]:

$$y^{p20,\,40}{}_{it} = \alpha_0 + (\beta_k+\rho_k)X_{kit} + (\gamma_j+\rho_j)D_{jit} + u_{it} \qquad (10)$$

With respect to (3) a significant $(\beta_k+\rho_k) > 0$, $(\gamma_j+\rho_j) > 0$ indicate pro-poor growth (positive total effect), while $(\beta_k+\rho_k) < 0$, $(\gamma_j+\rho_j) < 0$ would indicate anti-poor growth on the average. Again, trade-offs between the distribution effect and growth effect are indicated, if estimations for the distribution effect (γ_j) and the total effect ($\gamma_j + \rho_j$) differ significantly in the sign of the coefficients.

5.2 Econometric issues

In estimating variants of equations (5), (6), and (9) several econometric issues have to be mentioned.[57] First, if we estimate the level equation (5) alone by pooled OLS, coefficients would be biased and inconsistent due to unobserved heterogeneity correlated with regressors (Dollar/Kraay 2001, Eastwood/Lipton 2001, Chen/Ravallion 1997). Fixed-effect or first-difference estimation in a panel data framework would be standard remedies to the unobserved heterogeneity issue. However, within-country variation of income distribution may be too limited compared to the greater variability of first and second quintile shares across countries (Dollar/Kraay 2001). Thus we apply a system GMM estimator using both information on the levels (cross country variation) and first-difference (within country variation) of income distribution data (Arellano/Bover 1995, Blundell/Bond 1998). Estimating the growth equation (9) by pooled OLS, the estimated coefficients may also be biased and inconsistent due to unobserved country-specific effects in ε_{it}. We use both a Hausmann test for fixed and random effects and a Breusch Pagan Langrange multiplier test for random effects to cover this issue. If

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[54] $y^{q20/40}{}_{it} = y^{p/20/40}{}_{it} - y_{it}$ = $100/z^*$ $([\ln(Q^{20/40}{}_{i,t+z}*Y_{i,t+z}/0.2) - \ln(Q^{20/40}{}_{it}*Y_{it}/0.2)] - [\ln(Y_{i,t+z}) - \ln(Y_{it})])$
= $100/z^*$ $([\ln(Q^{20/40}{}_{i,t+z}) + \ln(Y_{i,t+z}) - \ln 0.2 - \ln(Q^{20/40}{}_{it}) - \ln(Y_{it}) + \ln(0.2) - \ln(Y_{i,t+z}) + \ln(Y_{it})])$
= $100/z^*$ $[\ln(Q^{20/40}{}_{i,t+z}) - \ln(Q^{20/40}{}_{i\,t})]$

[55] This interpretation would apply equivalently to $\alpha_1 - 1$. As $\alpha_1 - 1$, however, is almost ever insignificant, we present only results for the growth equation (9) omitting y_{it}.

[56] In this approach we assume that α_1 equals one.

[57] The discussion in this section is also relevant for regressions on the total effect (equations 7 and 10).

we can not reject the null hypothesis in both tests, pooled OLS is the appropriate method. Otherwise, we present results for the random effects (the Breusch Pagan test is rejected, but not the Hausmann test) or fixed effects model (the Hausmann test is rejected).

Second, even if time-invariant country-specific effects can probably be dismissed, omitted variable bias might be an issue due to variables whose values change over time. In addition, as the econometric specification is not based on a comprehensive theoretical framework, but more found in ad hoc considerations and plausible reasoning, model uncertainty problems might arise (Ghura/Leite/Tsangarides 2002).[58] Thus excluded variables might be correlated with the regressors leading to biased estimates.

Third, measurement error in dependent and independent variables could generate biases in the estimated coefficients. While measurement error in the data on first/second quintile might be more severe due to flawed inequality data, measurement error in the dependent variable only causes biases in case of systematic correlation with regressors (Wooldridge 2000).[59] Measurement error in explanatory variables, however, might lead to inconsistent estimates. Varying definitions and accuracy in data collection, for example, cause measurement errors especially present in data on developing countries.[60]

Fourth, in estimating level and first difference equations (5), (6) or the growth equation (9) simultaneity might be an issue.[61] In case of reverse causation, estimations would be biased and inconsistent. The impact of the (growth rate of) first/second quintile income on explanatory variables (X, D), however, is controversially discussed. While, on the one hand, endogeneity is denied due to pragmatic reasons (Dollar/Kraay 2001), reverse causation may be argued for because of major policy and institutional changes in developing countries and political economy reasons (Lundberg/Squire 2001). We do not instrument for X and D in the system GMM estimations due to limited data availability and plausibility.[62] Finally, only initial values for each spell are used for the regressors X and D to avoid endogeneity due to explanatory variables in the growth equation.[63]

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[58] The problems of omitted variables and model uncertainty are connected by the exclusion of significant explaining regressors which might be correlated with the selected regressors. But while the omitted variable issue points to the inconsistent estimation of the selected parameters, the problem of model uncertainty focuses on the misspecification of the general model and the problem in explaining pro-poor growth by a single ad hoc model. On the problem of model uncertainty in cross-country growth regressions, see Temple (1999). On the issue of model uncertainty in pro-poor growth regressions with macroeconomic policy variables, see Ghura/ Leite/ Tsangarides (2002).

[59] As $y^{p20/40}$ is formed by y, i.e. the dependent variable would be systematically related to an explanatory variable in regressions with y, a biased coefficient of y might be expected. However, remembering $y^{q20/40}$ in equation (5), this is equal to stating that the growth rate of the first/second quintile must be correlated with the growth rate of mean income. As the data on first/second quintile and mean income stem from different sources, this can not be assumed in advance (Dollar/Kraay 2001). On the issue of biased estimates in case of identical data sources, see Chen/Ravallion (1997).

[60] On the measurement error problem in cross-section growth regressions and on the flawed data in the Penn World Table, see Temple (1999).

[61] On the problem of simultaneous examination of inequality and growth and their joint determinants, see Lundberg/Squire (2001).

[62] One could use lagged values of X and D as instruments. However, as our sample is often restricted to only two observations per country, we would have to drop all these countries from the regression.

[63] On this solution, see Lundberg/Squire (2001). On the empirical application of this method to deal with the endogeneity issue in cross-section growth regressions, see Barro/Sala-i-Martin (1995). But even in this solution endogeneity might remain a problem, see Temple (1999).

A significant impact of the (growth rate of the) mean income of the poor on the (growth rate of the) mean income might be possible.[64] Considering equations (5), (6), and (9) reverse causation thus would mean impact of the (growth rate of) first/second quintile share on the (growth rate of the) mean income.[65] Using only a level equation (5), contemporaneous reverse causation would cause inconsistent OLS estimation, while lagged reverse causation would justify OLS estimation, assuming serial independence. Thus, considering the growth equation (9), pooled OLS estimation is unbiased and consistent if lagged reversed causation can be assumed with serial independence (Eastwood/Lipton 2001). Concerning the system GMM estimation, reverse causation was covered in using instruments for mean income. In the level equation (5), we instrument for mean income using accumulated growth in mean income over three years prior to time t (e.g. Brazil 1967 to 1970 for 1970). In the first difference equation (6), we instrument for growth in mean income using the level of mean income at the beginning of the period, and accumulated growth in the three years prior to time t (Dollar/Kraay 2001, Ghura/Leite/Tsangarides).[66] A Sargan test on overidentifying restrictions was used to test for validity of extra instruments (Arrelano/Bond 1991, Bond/Blundell 1998). As the coefficient for (the growth rate of the) mean income is one in most of the cases, however, we present only results omitting (the growth rate of the) mean income.

Assuming lagged reverse causation of $y^{q20/40}$ on y in the growth equation (9), serial correlation in the error term within countries and over time remains to be discussed. In static models, autocorrelation in the error term leads to incorrect standard errors, but not to inconsistent estimates in OLS estimation. Serial correlation in models with lagged endogenous variables, however, would result in inconsistent estimates. Given a serially correlated error term the structure of the variance-covariance matrix for equation (9) would be block diagonal with a separate block for each country. Thus off-diagonal elements would only be non-zero within these blocks (Chen/Ravallion 1997). As different surveys are used within almost each block, the error term is assumed to be serially independent. Considering the system GMM estimator, the assumption of no serial correlation of the error term ε_{it} in the level equation (5) is essential for consistency (Bond/Blundell 1998). Thus tests for first-order and second-order serial correlation of the first-differenced residuals $\varepsilon_{it+z} - \varepsilon_{it}$ of equation (6) are reported. If disturbances ε_{it} are not serially correlated, first order serial correlation in first differenced residuals $\varepsilon_{it+z} - \varepsilon_{it}$ have to be significant negative (m1) and second order serial correlation in the first differenced residuals insignificant (m2) (Arrelano/Bond 1991, Bond/Blundell 1998).

[64] Biased estimates might also be possible due to joint causation (Timmer 1997, Eastwood/Lipton 2001).
[65] The effect of initial income inequality on subsequent growth has been often empirically examined. The evidence, however, is mixed with negative (Perotti 1996, Alesina/Rodrik 1994), positive (Forbes 2000, Li/Zou 1998) and indifferent effect of initial income inequality on future growth (Deininger/Squire 1998b). In addition, a negative effect only for countries with mean income below $ 2000 (in constant 1985 purchasing power) was found (Barro 2000).
[66] Example: given the first difference equation Brazil 1960 – 1970 we use mean income of 1960 and the accumulated growth of mean income between 1957 and 1960 as instruments for the first difference of mean income 1960 - 1970.

5.3 Estimation strategy and results

To measure the effect of external debt on pro-poor growth, we apply the following estimation strategy. First, we estimate separately the linear and nonlinear effect of EDT/GDP and EDT/XGS. In addition, equations for linear and nonlinear effects of EDT/GDP and EDT/XGS are extended by TDS/XGS as an additional regressor to distinguish budgetary process' (crowding-out hypothesis) and external account effects from the effects of the accumulated debt stock (Claessens/Detragiache/Kanbur/Wickham 1996, Patillo/Poirson/Ricci 2002, Loko/Mlachila/ Nallari/Kalonji 2003). We test these eight equations for the first and second quintile in the growth equation and the system GMM estimation (table 13 to 15).[67]

Second, we test this set of equations in specifications with regional dummy variables and with additional macroeconomic variables. To analyze potential trade-offs between this distribution effect and the growth effect we additionally test the total effect of the debt indicators on the mean income of the 20 and 20 to 40 percent poorest adding macroeconomic variables. Due to our fundamentally empirical approach, we finally apply different robustness checks to confirm the results, i.e. we test results without outliers, with mean income, and with both adjusted and not adjusted inequality income measures in the system GMM estimations.[68]

To present a general overview of our results we indicate in table 13 to 15 a matrix of significant findings for the debt indicators. In the rows we indicate the different specifications applied. The eight columns denote the eight combinations of debt indicators we test in each specification. Finally, only significant results for debt indicators are presented in the matrix. In table 13 we present results for the distribution and total effect of debt indicators on the growth rate of the first quintile share. If we look in the row 4, we see the findings regressing the growth rate of the first quintile share on regional dummy variables, macroeconomic variables (secondary education, budget deficit, inflation, M2/GDP, and Gini coefficient) and the eight different combinations of the debt indicators without outliers. Only the nonlinear effect of EDT/GDP, i.e. EDT/GDP and EDT/GDP^2, seems to be relevant in combinations with and without TDS/XGS.

5.3.1 Debt indicators and pro-poor growth: distribution effect

Relying on this overview we first emphasize general findings for the distribution effect. In the growth equation debt indicators have no distribution effect on the growth rate of the poorest 20

[67] To fix the eight equations more clearly we regress the growth rate of the first quintile separately on EDT/GDP, EDT/GDP and EDT/GDP^2, EDT/XGS, EDT/XGS and EDT/XGS^2, EDT/GDP and TDS/XGS, EDT/GDP and EDT/GDP^2 and TDS/XGS, EDT/XGS and TDS/XGS, and, finally, on EDT/XGS and EDT/XGS^2 and TDS/XGS (see table 13 to 15).
We also test all specifications only with TDS/XGS as debt indicator. In the growth equation, TDS/XGS is weakly positive (+0.06) at a 10 percent significance level only for the growth rate of the first quintile in regressions without outliers and with regional dummy variables. In the system GMM estimation, TDS/XGS is only significantly positive (+0.004) for the first quintile in the unadjusted approach. Finally, TDS/XGS is significantly positive for the mean of the first quintile (+0.006) and the mean of the second quintile (+0.004) in the adjusted and unadjusted approach, if we test the total effect. Thus the positive results do not differ much from the coefficients estimated for TDS/XGS in other specifications. In addition, distribution effects of TDS/XGS are not very robust. Therefore we do not present findings for TDS/XGS separately.

to 40 percent.[69] The only effect we find for the growth rate of the first quintile is a nonlinear effect of EDT/GDP, if we omit outliers (table 14). In the system GMM estimations nonlinear effects of EDT/GDP seem to be relevant for the first quintile and, more weakly, the second quintile share. While TDS/XGS is relevant only for the first quintile, the few significant findings for EDT/XGS indicate no clear relationship (table 14 and 15).

First, we regress the growth rate of the first quintile on eight combinations of debt indicators and regional dummy variables to control for cultural, historical and economical differences of income inequality in the six regions (Cornia 2002). The Eastern Europe and Central Asia dummy is omitted, reflecting the different economies of countries with former planning systems with respect to other developing countries.[70] In addition, the comparability of data to the other regions is problematic due to major structural transformations of these economies and sampling biases in surveys (Chen/Ravallion 1997).[71]

Concerning the growth equation, findings confirm the hypothesis of important difference in the growth rates of the first quintile, as coefficients for all five regions differ positively in a highly significant way from Eastern Europe and Central Asia (table 7).[72] Thus within-country inequality has been worsening considerably in transitional countries during the ninties with respect to other regions of middle and low–income countries.[73] Furthermore, our estimations show that external debt to GDP is significant only in the nonlinear specification without outliers (table 7 equations 4 and 8). Our findings, however, indicate a reverse Laffer curve effect between EDT/GDP and the average annual growth rate of the first quintile share. Thus an increase in the external debt to GDP ratio would first diminish the growth rate until a threshold around 70 percent for EDT/GDP, and then increase the growth rate of the first quintile share after this turning point.[74] Around three quarters of the observations for EDT/GDP are under 70 percent in our sample without outliers indicating a prevalent negative impact of EDT/GDP on the growth rate of the first quintile share. The slope of the nonlinear effect, however, is not very steep, e.g. a one percentage point change of EDT/GDP at a level of 40 percent for EDT/GDP would decrease the growth rate of the first quintile share by only 0.03 percentage points.[75] Adding TDS/XGS, the threshold would increase to around 79 percent for EDT/GDP (table 7 equation 8).[76] Thus the effect of EDT/GDP

[68] We indentify outliers from graphical analysis and descriptive statistics without a strict rule (table 4).
[69] Therefore we present only results for the first quintile share in table 13.
[70] In our sample, however, only countries of Eastern Europe are part of the ECA dummy variable (table 1).
[71] As only 13 out of 127 spells are based on data from Eastern Europe and Central Asian countries, we use these data for pragmatic reasons.
[72] While this result is also confirmed for regressions for the second quintile, we do not present findings due to insignificant debt indicators.
[73] As for the reasons for widening inequality in transitional countries, see Grün/Klasen (2001).
[74] The turning point is calculated by dividing the coefficient of EDT/GDP through twice the coefficient of EDT/GDP^2 taking absolute values of the coefficients: 0.07/2 * 0.0005 = 70 (Wooldridge 2000).
[75] The effect of EDT/GDP on the growth rate of the first quintile share is approximately the coefficient of EDT/GDP plus twice the coefficient of EDT/GDP^2 multiplied with the chosen value of EDT/GDP: -0.07 + 2 * 0.0005 * 40 = -0.03 (Wooldridge 2000).
[76] We identified one outlier for TDS/XGS (Algeria 1988: TDS/XGS 76.6)

is negative in most of the cases and would only at very high levels impact positively on the growth rate of the first quintile share.[77]

Economically, a reverse Laffer curve effect of EDT/GDP on the growth rate of the first quintile share is hard to interpret. One could criticize the robustness of results not taking into account outliers. But even the three most extreme values of EDT/GDP, which are omitted as outliers, are associated with a positive growth rate of the first quintile (Jordan 1991: EDT/GDP 249.3, y^{q20} 4.22; Mauretania 1988: EDT/GDP 205.1, y^{q20} 7.77; Zambia 1993: EDT/GPD 214.8 y^{q20} 2.47).[78] So crisis levels of initial debt stock seem not to negatively affect subsequent growth rates of the first quintile. However, as the curvature of the nonlinear effect on the growth rate of the first quintile share is only small, the difference of the economic impact of a one percentage point rise of EDT/GDP at the turning point (70 percent of EDT/GDP) and the highest level of EDT/GDP (153.4 percent) would only be around 0.08 percentage points.[79] In addition, the explanatory power of the regressions is not very high as shown in a low R-squared values (between 0.10 and 0.23).

Finally, total debt service to exports ratio has a significantly positive effect on the growth rate of the first quintile share in regressions without outliers adding EDT/GDP (table 7 equations 6 and 8). A ten percentage points increase in the initial total service to GDP ratio would increase the average annual growth rate of the first quintile share by 0.8 percentage points (table 7 equation 8). The amazingly positive impact is also present in regressions replacing EDT/GDP by EDT/XGS, even if estimated coefficients for TDS/XGS are never significant (table 7 equations 9 to 16).[80] Thus the expected negative effect of TDS/XGS due to budgetary process' and external account effects could not be confirmed with respect to the poorest 20 percent.[81]

The system GMM estimations confirm the hypothesis of important inequality difference between regions, as coefficients for four regional dummy variables differ from Eastern Europe to a one or five percent significance level negatively (table 8). The legacy of the communist system is a more equal income distribution which is in strong contrast to the unequal income distributions in developing countries. While we measure in the growth equation the change in inequality with a dramatic increase in the Eastern Europe region, we look here on the differences in the levels of the first and second quintile share. And, despite the dramatic fall, the levels in the first and

[77] In our sample without outliers, less than 25 percent of the observations for EDT/GDP have a value higher than 79 percent. EDT/GDP varies between 1.4 and 153.4 percent with a mean of 55.6 percent and a standard deviation of 36.52.

[78] One could additionally conjecture that results are biased due to the problematic high growth rates in SSA (table 5). In regressions without outliers, however, we omit the observations with incredible high growth rates in SSA (growth Q20: Guinea 1991 – 94 (+25.26), Kenya 1992 – 94 (+19.28), Senegal 1991 – 95 (+18.12); growth Q40: Kenya 1992 – 94 (+18.50)) resulting in low growth rates for SSA (growth Q20: 0.59, growth Q40: 0.44). In addition, the insignificant results for the nonlinear effect of EDT/GDP with outliers on the growth rate of the first quintile are mainly due to the three outliers in the dependent variable.

[79] At the turning point we have no impact at all. So the difference is the value at the highest observation for EDT/GDP in the sample. As we use the results from regressions without outliers and TDS/XGS (table 7 equation 4), we calculate: -0.07 + 2*0.005*153.4 = 0.083.

[80] We identified four outliers for EDT/XGS (Ethopia 1995: 1276, Madagascar 1993: 709, Uganda 1989: 716, Uganda 1992: 1474).

second quintile shares are still high in the Eastern Europe region compared to developing countries. The mean of the (adjusted) first quintile for Latin America is e.g. 0.037 (0.038) compared to 0.091 (0.085) in Eastern Europe in our sample, while the average annual growth rate of the first quintile is –0.07 in Latin America compared to –4.70 in Eastern Europe (table 5).

Controlling for regional effects, we find evidence to a high significance level for the Laffer curve effect in the first and second quintile share (table 8 equations 1 to 3). Thus an increase of the external debt to GDP ratio at low levels would increase the first and second quintile share until a threshold is reached, and then worsen the distribution situation of the poorest 20 and 20 to 40 percent. The turning points are at 129 and 125 percent of external debt to GDP, respectively, for the first and second quintile share. As only ten percent of the observations in the sample tested are over 125 percent for EDT/GDP, the findings indicate mainly a positive impact of EDT/GDP on the first and second quintile share. Again, the curvature of the nonlinear effect is small. Interpreting the system GMM approach as a level equation, a one percentage point increase in EDT/GDP at a level of 40 percent for EDT/GDP would increase the first quintile share by only 0.2 percent. One drawback of our results is the fact that, first, the Laffer curve effect is only present in estimations using the unadjusted approach, while coefficients are insignificant in regressions with adjusted income inequality (table 8 equations 2 and 4). And, second, the Laffer curve effect is present but not significant, if we add TDS/XGS (table 8 equations 5 to 8). The different nonlinear effects in the growth equation and the system GMM estimation can be mainly explained by the fact that we measure two different things in both approaches. In the growth equation we test the impact of the debt indicators on the average annual growth rate of the first or second quintile share. In the system GMM approach, however, we estimate the effect of the level (and first-difference) of debt indicators on the level (and first–difference) of the first or second quintile share.[82]

Similar to the growth equation we find a small positive impact of TDS/XGS on the first quintile (table 8 equations 9 to 14), i.e. a one percent increase in total debt service to exports ratio would be amazingly associated with a 0.4 percent rise of the first quintile share. Thus again the expected negative effect of TDS/XGS due to budgetary process' effects and external account effects could not be confirmed with respect to the poorest 20 percent. Finally, we also present significant results for the nonlinear effect of EDT/XGS on the second quintile share, controlling additionally for TDS/XGS (table 8 equations 16). This result, however, should not be overinterpreted as it can not be confirmed in the unadjusted approach, the first quintile share, in

[81] Since we omit observations with incredible high growth rate for SSA in regressions without outliers, the results are not biased due to the problematic high growth rate in SSA (table 5).

[82] To reveal the systematic differences of the estimation methodologies, we, first, estimate a sample used in the growth equation in a system GMM approach. As we need two observations with growth rates per country (three observations for the first and second quintile share) to apply the system GMM estimator, we omitted all countries with only two observations. Estimated results for the system GMM estimations are a mixture of the growth equation and the first difference of the growth equation. Second, we also tested effects of the level and first differenced equations of a system GMM estimation separately in OLS. Estimated coefficients for system GMM estimation are here a mixture of a level equation and the first difference of the level equation. Thus the difference between the system GMM estimations and the growth estimations stems apparently from the fact that we regress the level of the first/second quintile on the level of debt indicators, while in the growth equation we regress the growth rate on the level of the debt indicators.

other specifications and test on first order correlation is failed (table 8 equations 13 to 15 and table 14, 15).

Finally, we control for additional macroeconomic variables which are suggested in the empirical literature with respect to inequality and pro – poor growth (Timmer 1997, Gallup/Radelet/ Warner 1998, Gugerty/Timmer 1999, Romer/Romer 1998, Easterly/Fisher 2001, Eastwood/Lipton 2001, Ghura/Leite/Tsangarides 2002).[83] In the growth equation we control for budget deficit to GDP, financial development (money and quasi money to GDP), secondary education (average years of secondary schooling in total population aged 25 and over), inflation and initial Gini coefficient. In the system GMM estimation, we substitute budget deficit by government consumption due to its proven relevance in this estimation methodology (Ghura/Leite/Tsangarides 2002).[84] While the Gini coefficient was found to be highly significant in a similar approach (Ghura/Leite/Tsangarides 2002), regressing the first quintile share on the Gini coefficient in a level/first-difference equation seems tautological, as a change in inequality in the first and second quintile share is only explained by change in overall inequality, i.e. no new information on the determinants of inequality are added in this specification. Thus we omit the Gini coefficient in the system GMM estimations.[85]

In the growth equation all specifications for the debt indicators are irrelevant with respect to the second quintile share. In addition, linear and nonlinear effects for EDT/XGS (and extended by TDS/XGS) and linear effects for EDT/GDP (and extended by TDS/XGS) are insignificant in regressions with and without outliers (table 13). On the other side, the nonlinear effect of EDT/GDP on the first quintile can again be confirmed, if we omit outliers (compare table 9 equations 2 and 4 with table 7 equations 4 and 8).[86] Our estimation results indicate again a reverse Laffer curve effect between EDT/GDP and the growth rate of the first quintile share with a turning point around 63 (table 7 equation 4). Around 70 percent of the observations for EDT/GDP are under 63 percent in our sample without outliers, indicating a prevalent negative impact on the growth rate of the first quintile share in most cases. The slope of the nonlinear effect, however, is not very steep, e.g. a one percentage point change of EDT/GDP at a EDT/GDP level of 40 percent would decrease the growth rate of the quintile share by only 0.036 percentage points. In addition, the nonlinear effect is only weakly significant to a ten percent level. Adding TDS/XGS the turning point would slightly increase to 65 percent for EDT/GDP (table 9 equation 4).[87]

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[83] To identify additional key determinants we executed batteries of regressions in both the growth equation and system GMM estimation. We used public investment, food inflation, output volatility, terms of trade, trade openness, life expectancy, government consumption and indicators for civil liberties and political rights as additional regressors.

[84] We identify one outlier for financial development (Jordan 1991: 132 %), three for inflation (Brazil 1988: 651 %, Brazil 1993: 1997%, Poland 1990 555 %) and incredible high rates of government consumption for all observations of Jordan and Lesotho (above 47 %).

[85] We also omit M2 to GDP ratio due to insignficant results.

[86] Since we omit observations with incredible high growth rate for SSA in regressions without outliers, the results are not biased due to the problematic high growth rates in SSA (table 5).

[87] One problem with this result is the fact that the Hausmann test indicates a fixed effects estimation to a significance level under 1 percent (table 9 equation 4). Concerning the result of the fixed effects estimation, the coefficients would change considerably (e.g. a constant of -56.50). Explanations of these effects may be based on the sole focus on

Concerning the additional explanatory variables, budget deficit, intial inequality, and inflation impact significantly positive on the growth rate of the first quintile share (table 9 equations 1 and 3). So the budgetary process' effects would be supported, if we assume that higher external debt results in increased budget deficit by raised debt service payments. Concerning results from the correlation matrix, however, only EDT/XGS is significantly negative correlated with budget surplus (table 6). As the budget deficit is negatively defined, a one percentage point decrease in the budget surplus to GDP ratio diminishes the growth rate of the first quintile share between 0.26 and 0.43 percentage points. In addition, a one percent rise of inflation would counterintuitively increase the growth rate of the first quintile share between 1.02 and 1.47 percentage points. However, the positive impact of inflation becomes insignificant if we drop outliers (table 9 equations 2 and 4). Finally, the Gini coefficient is significantly positive indicating a positive impact of higher initial inequality on the average annual rate of growth of the first quintile. Thus the hypothesis of inequality convergence is confirmed by this result. One drawback of our findings is the fact that R-squared is between 0.22 and 0.36, i.e. the covariates explain only between 22 and 36 percent of the variance in the growth rate of the first quintile.

Adding secondary education, government consumption, and inflation to debt indicators in the system GMM approach, the findings change only slightly change with respect to estimations controlling only for regional dummy variables (compare table 10 to table 9). One important reason is the fact that the additional variables are almost always statistically insignificant.[88] So we also find a Laffer curve effect of EDT/GDP to a high significance level for the first and second quintile (compare table 10 equations 1 and 3 with table 8 equations 1 and 3). A surge of EDT/GDP at low levels would increase the first and second quintile, but this effect is reversed and become negative at a certain threshold. The turning points are now lower at 83 and 100 percent of external debt to GDP, respectively, for the first and second quintile share. Interpreting the system GMM approach as a level equation, a one percentage points increase of EDT/GDP at a level of 40 percent for EDT/GDP would here raise the first quintile share by only 0.26 percent. One import difference to specifications with regional dummy variables is the fact that the Laffer curve effect is also significant for the first quintile share in the adjusted approach (compare table 10 equations 1 to 4 with table 8 equations 1 to 4).[89]

Controlling for TDS/XGS the Laffer curve effect of EDT/GDP is only confirmed in the unadjusted approach for the first quintile with a turning point of 100 percent for EDT/GDP (compare table 10 equations 5 with equations 6 to 8).[90] Finally, we find again small positive impact (0.004) of TDS/XGS on the first quintile (compare table 10 equations 9 and 10 to table 8 equations 9 and 10). Findings on the Laffer curve effect in the system GMM estimation have to be interpreted

within-country variation of the fixed effects estimator, few time series observations in many countries. We therefore present results for pooled OLS regressions, even if inconsistency may be a problem.

[88] One exception is the significant positive effect of government consumption on the second quintile share (table 10 equation 2).

[89] The coefficient of EDT/GDP, however, is insignificant for the second quintile share in the adjusted approach (table 10 equation 4).

with care, due to the fact that tests on first-order serial correlation are failed in more than half of the cases.

5.3.2 Debt indicators and pro-poor growth: total effect

Taking into account trade-offs between the distribution effect and the growth effect of debt indicators on the income of the poor we also test the total effect of the debt indicators on the mean income of the 20 and 20 to 40 percent poorest. We choose to measure the total effect and derive possible trade-offs between the distribution and growth effect, because our panel is highly irregular and unbalanced, and tests on the growth effect of the debt indicators would therefore suffer from major data limitations and could better be answered in samples without restrictions on income inequality data.

Controlling for budget deficit, financial development, secondary education, inflation, and initial inequality in the growth equation, we test our eight equations for the first and second quintile.[91] None of the debt indicators, however, are significant in regressions with or without outliers for the first and second quintile share (table 13).[92] To compare results with the distribution effect we present estimated coefficients for the nonlinear effect of EDT/GDP on the growth rate of the mean income of first quintile share (table 11). Even if statistical tests indicate no significant impact, the sign and size of the coefficients for EDT/GDP, EDT/GDP^2 and TDS/XGS remain almost identical in regressions without outliers (compare table 11 equations 2 and 4 with table 9 equations 2 and 4). Thus the reverse Laffer curve effect of EDT/GDP on the growth rate of the income of the poorest 20 percent is primarily driven by the distribution effect. A related conclusion is that EDT/GDP does not affect the growth rate nonlinearily in our sample. On the contrary, the impact of all control variables is increased in regressions on the total effect. Thus a one percentage point increase in budget surplus would now raise the growth rate of the mean income of the first quintile share by 0.33 percentage points, compared to 0.28 percentage points in regressions for the distribution effect (compare table 11 equations 2 and 4 with table 9 equations 2 and 4). Thus the distribution and growth effect work in the same direction and budget deficit would be especially bad for the poorest 20 percent.

In the system GMM approach we control for secondary education, government consumption, inflation, and additionally civil liberties, life expectancy and terms-of-trade.[93] Concerning external debt to GDP ratio, we find a significant Laffer curve effect only for the mean income of the poorest 20 percent in the unadjusted approach (compare table 12 equations 1 to 4 with tabe 10 equations 1 to 4). An increase of EDT/GDP at low level would raise the mean income of the

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[90] However, coefficients for EDT/GDP^2 are significantly negative, suggesting a Laffer curve effect (table 10 equations 6 to 8).

[91] We also tested initial per capita income as convergence term in total effects regressions of the growth equation. However, we omit inital per capita income, since its coefficient was never statistically significant

[92] Since we omit observations with incredible high growth rates for SSA in regressions without outliers, the results are not biased due to the problematic high growth rates in SSA (table 5).

[93] In addition to the outliers mentioned above, we identify one outlier for terms-of-trade (Nigeria 1985: 262 %).

first quintile, but this effect becomes negative at a threshold. The turning point would be around 63 percent of EDT/GDP. Interpreting the system GMM approach as level equation, a one percentage point increase of EDT/GDP at a level of 40 percent for EDT/GDP would here raise the mean income for the first quintile share 0.18 percent. As the size of the coefficients are very similar to the distribution effect, the total effect is mainly driven by the distribution effect in this case and there appears to be no trade-off between the growth and distribution effect.[94] This conclusion is also true adding TDS/XGS, as insignificant coefficients for EDT/GDP and EDT/GDP^2 are very similar to the distribution effect (compare table 12 equations 5 to 8 with table 10 equations 5 to 8).

If we add TDS/XGS to a linear effect of EDT/GDP, total external debt to GDP now affects significantly negative the first and second quintile share (compare table 12 equations 9 to 12 with table 10 equations 9 to 12).[95] In addition, we find a highly significant negative effect of EDT/XGS on the mean income of first and second quintile if we add TDS/XGS (table 12 equations 13 to 16). Interpreting the system GMM approach as level equation, a 10 percentage points rise in EDT/GDP would diminsh the mean income of the second quintile by 2 percent, while a 10 percentage points rise in EDT/XGS decreases the mean income of the first and second quintile by 1 percent (Table 12 equations 9 to 16). Furthermore, we find again significant positive impact of TDS/XGS on the mean income of the first quintile and second quintile share. A 10 percentage point increase in TDS/XGS would amazingly raise the mean income of the first and second quintile between 4 and 10 percent (table 12 equations 9 to 16). As the size of the coefficients differ considerably from the almost zero distribution effects, the total effect is here driven by the growth effect.[96] Thus a negative linear effect of EDT/GDP and EDT/XGS on the mean income of the first and second quintile share is mainly caused by its effect on overall economic growth.

All additional macroeconomic variables affect the income of the poor in the way expected. Higher secondary education, life expectancy and terms of trade foster the income of poor, while increased government consumption, inflation, and less civil liberties, measured as a high value on a scale between one and seven, worsen the income of the poor (table 12).[97] Furthermore, coefficients for additional macroeconomic variables are now statistically significant, leaving only inflation insignificant (compare table 12 with table 10). A one year rise of the average years of secondary schooling would increase the mean income of the first and second quintile between 31 and 37 percent (table 12). As the mean of average years of secondary education is at 1.11 years and the minimum and maximum values in our sample are 0.10 and 3.21 years,

[94] This conclusion is also true for the mean income of the first quintile (adjusted approach) and the mean income of the second quintile (adjusted and unadjusted approach), as coefficients are very similar to the distribution effect (compare table 13 equations 2 to 4 with table 11 equations 2 to 4).
[95] The coefficient of EDT/GDP for the mean income of the first quintile in the unadjusted approach, however, is insignificant (table 13 equation 9).
[96] One exception is the coefficient of TDS/XGS in combination with EDT/GDP for the mean income of the first quintile where the distribution effect is very similar to the total effect (compare table 13 equations 9 and 10 with table 11 equations 9 and 10).

respectively, a one year change in secondary schooling seems to be a very ambitious policy target (table 4). A more realistic interpretation would be that if education policy achieves a change of 0.1 in average years of secondary schooling, the mean income of the first and second quintile share would rise, roughly speaking, by 3 percent. Apparently, this education effect works primarily through the growth effect, as the coefficients for secondary education are small and insignificant with respect to the distribution effect (table 10). In addition, a one year increase in life expectancy would raise the mean income of the first and second quintile by 3 percent. As secondary education and life expectancy are almost always negatively correlated with the debt indicators, part of a negative effect of higher external debt on the income of the poor may be captured by reduced investment in education and health confirming the budgetary process' effect (table 6). Finally, a one unit rise of civil liberties measured in a scale from one to seven with one indicating the most favorable state would diminish the mean income for the first and second quintile between 5 to 8 percent.

6. Conclusion

The empirical results of the impact of external debt on pro-poor growth have to be interpreted carefully due to inconsistent results of the sensitivity analyses. First, EDT/GDP, EDT/XGS and TDS/XGS are insignificant in almost all eight combinations in the growth equation (table 13). We only have weak evidence for a reverse Laffer curve effect of external debt to GDP ratio with respect to the growth rate of the first quintile. While our sample indicates a negative impact of EDT/GDP at most observations, the negative slope is not very steep and the result is only present in regressions without outliers. In addition, the reverse Laffer curve effect of EDT/GDP is also insignificantly present in regressions on the total effect. Thus the nonlinear effect is primarily driven by the distribution effect of EDT/GDP.

Second, we find strong evidence of a debt Laffer curve effect of EDT/GDP on the first quintile in the system GMM approach (table 14). An increase of the external debt to GDP ratio at low levels would raise the first quintile share until a threshold is reached and then worsen the situation of the poorest 20. Thus extreme levels of external debt to GDP ratio seem to be associated with lower levels of the first quintile, confirming disincentive and macroeconomic uncertainty effects. While the turning points vary between 80 and 130 percent of EDT/GDP, the curvature is in general rather small. So even at a crisis level of 200 percent of EDT/GDP, a one percentage point increase of EDT/GDP would decrease the first quintile only between 0.1 and 0.9 percent. Another problem for economic interpretation is the fact that the debt Laffer curve can never be confirmed controlling for EDT/XGS (table 14). Looking at the second quintile the debt Laffer curve for EDT/GDP is only present in the unadjusted approach and even weaker than in the first quintile (table 15). While a significant Laffer curve disappears with respect to the

[97] The variable government consumption may be seen as a proxy for nonproductive public expenditures (Barro/Sala-i-Martin 1995).

total effect in almost all estimations, no trade-off between the growth and distribution effect can be confirmed, as the size of the coefficients remain very similar.

Third, we find highly significant negative impacts of EDT/GDP and EDT/XGS on the mean income of the first and second quintile if we control additionally for TDS/XGS. Interpreting the system GMM approach as level equation, a 10 percentage points increase in EDT/XGS would diminish the mean income of the first quintile and second quintile by 1 percent. A 10 percentage points rise in EDT/GDP would decrease the mean income of the first quintile by 3 percent and the mean income of the second quintile by 2 percent. These negative total effects are mainly driven by a negative growth effect of external debt, as the corresponding distribution effects are close to zero. Thus a positive effect of external debt at low levels of economic development proposed by growth-cum-debt models or neoclassical growth models would be denied for the poorest 40 percent. One problem of this conclusion, however, is the fact that the coefficients of EDT/GDP and EDT/XGS are insignificant if we omit TDS/XGS in the system GMM estimation and in all specifications of the growth equation (table 13 to 15).

Fourth, total debt service obligations to exports ratio impacts always in the “wrong” positive direction on the poor in the growth equation and system GMM estimation. Thus the budgetary process’ and external account effects measured by TDS/XGS can not be confirmed. This conclusion, however, should be noted with caution as the effect of TDS/XGS is rather small and often insignificant. In addition, TDS/XGS measures only the scheduled payments and not the actual payments, so empirical results do not necessarily reflect the real effect.

Finally, we look at the indirect effect of high external debt via budget deficit on the poor. In the growth equation budget deficit is negative in a highly significant way. A one percentage point increase of the budget deficit would diminish the growth rate of the mean income of the first quintile between 0.33 and 0.44 percentage points and the growth rate of the first quintile between 0.28 and 0.38 percentage points.[98] If we compare the findings for the debt indicators in regressions with and without budget surplus, however, an indirect effect of high external debt via budget deficit on the poor (budgetary process’ effect) can not be confirmed.

It is difficult to draw a concise conclusion from these results with respect to debt sustainability levels and debt relief. An optimal external debt level with respect to pro-poor growth can not be derived without reserve. Even if results of system GMM estimations on EDT/GDP point to this interpretation, the whole picture of the findings do not permit such a conclusion. On the contrary, higher external debt levels are associated with negative effects on the level of the income of the poorest 40 percent without exhibiting any significant effects on the growth rates. Thus, second, a cautious conclusion would be that debt relief may affect the poor positively, but seems not to be a sufficient policy instrument for improved growth rates of the income of the poorest 40 percent. This policy proposal would be in line with calls for more poverty targeted capital inflows

as even total debt relief would release only insufficient resources for poverty reducing activities. With this interpretation, however, we abstract from political economy and bad governance issues which may prevent poverty reducing debt relief initiatives.

[98] We find weaker but similar positive coefficients for regressions on the growth rate of the second quintile.

References

Abott, George C. (1993). Debt Relief and Sustainable Development in Sub-Saharan Africa, Edward Elgar.

Agénor, Pierre – Richard (1991). Output, devaluation, and the real exchange rate in developing countries. Weltwirtschaftliches Archiv 127: 18 – 41.

Agénor, Pierre – Richard (2002). Macroeconomic Adjustment and the Poor: Analytical Issues and Cross-Country Evidence. Washington DC: The World Bank.

Agénor, Pierre – Richard, Izquierdo, Alejandro, Fofack, Hippolyte (2003). IMMPA: A Quantitative Macroeconomic Framework for the Analysis of Poverty Reduction Strategies. Washington DC: The World Bank.

Agénor, Pierre – Richard, Montiel, Peter (1996, 1999). Development Macroeconomics 1st, 2nd edition. Princeton University Press.

Aggarwal, Vinod K. (1996). Debt Games. Strategic interaction in international debt rescheduling, Cambridge University Press.

Ajayi, S. Ibi (1996). An analysis of external debt and Capital Flight in the Heavily Indebted Poor Countries of Sub-Saharan Africa, in: Iqbal, Zubair/ Kanbur, Ravi (ed.), External finance for low-income countries. Washington DC: International Monetary Fund.

Alesina, Alberto/ Rodrik, Dani (1994). Distributive Politics and Economic Growth, in: Quarterly Journal of Economics 109(2): 465 – 490.

Ames, Brian, Brown, Ward, Devarajan, Shanta, Izquierdo, Alejandro (2002). Macroeconomic Issues. Poverty Sourcebook. Washington DC: The World Bank.

Anderson, Edward, White, Howard (2001). Growth versus Distribution: Does the pattern of growth matter? University of Sussex.

Armendaríz de Aghion, Beatriz, Armendaríz de Hinestrosa, Patricia (1995). Debt relief, growth and price stability in Mexico, in: Journal of Development Economics 48(1):135 – 149.

Arellano, Manuel, Bond, Stephen (1991). Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations, in: Review of Economic Studies 58: 277 – 297.

Arellano, Manuel, Bover, Olympia (1995). Another look at the instrumental variable estimation of error-components models, in: Journal of Econometrics 68: 29 – 51.

Atkinson, Anthony B. (1993). The economics of inequality (2nd ed.).

Atkinson, Anthony B., Brandolini, Andrea (2001). Promise and pitfalls in the use of "secondary" data-sets: income inequality in OECD countries as a case study, in: Journal of Economic Literature 39: 771 – 799.

Baldacci, Emanuelle, de Mello, Luiz, Inchauste, Gabriele (2002). Financial Crisis, Poverty, and Income Distribution, Working Paper 04/2002. Washington DC: International Monetary Fund.

Barro, Robert J., Sala-i-Martin, Xavier (1995). Economic Growth, New York.

Barro, Robert J. (2000). Inequality and growth in a Panel of Countries, in: Journal of Economic Growth 5: 5 – 32.

Basu, Kanshik (1997). Analytical development economics. The less developed economy revisited, MIT Press.

Befekadu, Degefe (2001). Ethiopia's External Debt: the impact and the way forward, in: Canadian Journal of Development Studies 22(2): 377 – 416.

Blundell, Richard/ Bond, Stephen (1998). Initial conditions and moment restrictions in dynamic panel data models, in: Journal of Econometrics 87: 115 – 143.

Borensztein, Eduardo (1990). Debt Overhang, Credit Rationing and Investment, in: Journal of Development Economics 32: 315 – 335.

Bourguignon, François (2001). The pace of economic growth and poverty reduction, Paper presented at CES-ifo Conference on Inequality and Growth, May 18-20, 2001 Munich: Cesifo.

Breen, Richard, Garcia-Peñalosa, Cecilia (1999). Income inequality and macroeconomic volatility: an empirical investigation. European University Institute, Oxford.

Chen, Shaohua, Ravallion, Martin (1997). What can new survey data tell us about recent changes in distribution and poverty?, in: World Bank Economic Review 11(2): 357 – 382.

Chen, Shaohua, Ravallion, Martin (2000). How did the world's poorest fare in the 1990s?, Working Paper 2409. Washington DC: The World Bank.

Chen, Shaohua, Ravallion, Martin (2001). Measuring Pro-Poor Growth, Washington DC. The World Bank.

Chenery, Hollis B., Strout, Alan M (1966). Foreign Assistance and Economic Development, in: American Economic Review Vol. 56(4): 679 - 710.

Claessens, Stjin, Detragiache, Enrica, Kanbur, Ravi, Wickham, Peter (1996). Analytical aspects of debt problems, in: Iqbal, Zubair, Kanbur, Ravi (ed.), External finance for low-income countries. Washington DC: International Monetary Fund.

Claessens, Stijn, Diwan, Ishac (1989). Liquidity, Debt Relief, and Conditionality, in: Husain, Ishrat, Diwan, Ishac (ed.), Dealing with the Debt Crisis: 213 – 225.

Cohen, Daniel (1993). Low Investment and Large LDC Debt in the 1980's, in: American Economic Review 83(3): 437 – 449.

Cohen, Daniel (1997). Growth and External Debt: A New Perspective on the African and Latin American Tragedies, Centre of Economic Policy Discussion Paper, No. 1753.

Cohen, Daniel (1998). The sustainability of African Debt, in: Cohen, Daniel, Contemporary Economic Issues Vol. 3 (Congress, IEA Tunis), London.

Corden, W. Max. (1989). Debt Relief and Adjustment Incentives, in: Frenkel, Jacob A., Dooley, Michael P., Wickham, Peter (ed.), Analytical Issues in Debt: 242 – 257.

Cornia, Andrea Giovanni (2002). The impact of liberalization and globalisation on income inequality in developing and transitional economies. Paper presented at the CESifo Conference on Globalisation, Inequality and Well-Being, 8 – 9 November 2002, Munich.

Czerkawski, Chris (1991). Theoretical and policy-oriented aspects of the external debt economics, Springer.

Davoodi, Hamid R., Tiongson, Erwin R., Asawanuchit, Sawitree S. (2003). How useful are benefit incidence analyses of public education and health spending? Working Paper 03/227. Washington DC: International Monetary Fund.

Deaton, Angus (1997). The analysis of household surveys. A microeconometric approach to development policy. Washington DC: The World Bank.

Deininger, Klaus, Squire, Lyn (1996). A new Data Set Measuring Income Inequality, The World Bank Review 10(3): 565 – 591.

Deininger, Klaus, Squire, Lyn (1998a). Second Version of the Deininger and Squire Dataset. Washington DC: The World Bank.

Deininger, Klaus, Squire, Lyn (1998b). New Ways of looking at old issues: inequality and growth, in: Journal of Development Economics 57: 259 – 287.

Dent, Martin, Peters, Bill (1998). Poverty and Debt in the Third World: Confronting a Global Crisis, Conflict Studies 310, Research Institute for the study of Conflict and Terrorism.

Deshpande, Ashwini (1997). The debt overhang and the disincentive to invest, in: Journal of Development Economics Vol. 52: 169 – 187.

Dollar, David, Kraay, Aart (2001). Growth is good for the poor. Working Paper 2587. Washington DC: The World Bank.

Dornbusch, Rüdiger (1989). Reducing Transfers from Debtor Countries, in: Dornbusch, Rüdiger/ Matwin, John M. / Howe, David (ed.), Alternative Solutions to developing-country debt problems: 21 – 42.

DPD98 for Gauss. www.cemfi.es/~arellano/

Eaton, Jonathan (1989). Foreign public capital flows, in: Chenery, Hollis/Srinivasan, T.N. (ed.), Handbook of Development Economics (Vol. II), North Holland Amsterdam: 1305 – 1386.

Eastwood, Robert, Lipton, Michael (2001). Pro-poor growth and pro-growth Poverty: Meaning, Evidence, and Policy Implications, in: Asian Development Review 19(1): 1 – 37.

Easterly, William, Fisher, Stanley (2001). Inflation and the poor. Journal of Money, Credit and Banking 33: 160 – 178.

Edwards, Sebastian (1989). Real Exchange Rate, Devaluation, and Adjustment. Exchange Rate Policy in Developing Countries. MIT Press Cambridge, Mass.

Elbadawi, Ibrahim A., Ndulu, Benno J., Ndung'u, Njuguna (1997). Debt Overhang and Economic Growth in Sub-Saharan Africa, in: Iqbal, Zubair/Kanbur, Ravi (ed.), External Finance for Low-Income Countries.

Epaulard, Anne (2003). Macroeconomic Performance and Poverty Reduction, Working Paper 72/2003. Washington DC: International Monetary Fund.

EURODAD (2001). Putting Poverty Reduction First, www.eurodad.org.

EURODAD (2002). Putting sustainable development first. Why countries' ability to sustain debt should be assessed from a sustainable development perspective, www.eurodad.org.

Forbes, Kristin J. (2000). A reassessment of the relationship between inequality and growth, in: American Economic Review 90(4): 869 – 887.

Gallup, John Luke, Radelet, Steven, Warner, Andrew (1999). Economic Growth and the Income of the Poor, CAER II Discussion Paper 36, Harvard Institute for International Development.

Ghei, Nita, Hinkle, Lawrence E. (1999). A note on nominal devaluation, inflation, and the real exchange ratte. In: Hinkle, Lawrence E., Montiel, Peter J., Exchange rate misalignment. Concepts of Measurement for developing countries. Oxford University Press.

Ghura, Dhaneshwar, Leite, Carlos A., Tsangarides, Charalambos (2002). Is growth enough? Macroeconomic Policy and Poverty Reduction, Working Papers 118/2002. Washington DC: International Monetary Fund.

Global Poverty Monitoring (continually updated). www.worldbank.org/research/povmon/index.

Grün, Carola, Klasen, Stephan (2001). Growth, income distribution and well-being in transition countries. Economics of Transition 9/2: 359 – 394.

Gugerty, Mary Kay, Timmer, Peter C. (1999). Growth, Inequality, and Poverty Alleviation: Implications for Development Assistance, CAER II Discussion Paper 50 December 1999, Harvard Institute for International Development, Cambridge, Mass.

Helpman, Elhanan (1989). Voluntary Debt Reduction: Incentives and Welfare, in: Frenkel, Jacob A., Dooley, Michael P., Wickham, Peter (ed.), Analytical Issues in Debt: 279 – 310.

Heston, Alan/ Summers, Robert (1991). The Penn World Table (Mark 5): An Expanded Set of International Comparisons, 1950 – 1988, Quarterly Journal of Economics 106: 327 – 368.

Heston, Alan, Summers, Robert, Aten, Bettina (2002). Penn World Tables Version 6.1, Center for International Comparisons at the University of Pennsylvania (CICUP), October 2002.

Hjertholm, Peter (2000). Analytical History of Heavily Indebted Poor Country (HIPC) Debt Sustainability Targets, University of Copenhagen: Institute of Economics Discussion Papers 3/2000.

Kakwani, Nanak, Pernia, Ernesto M. (2000). What is Pro-poor growth?, in: Asian Development Review 18(1): 1 – 16.

Kakwani, Nanak, Son, Hyun H., Khandker, Shahidur (2003). Poverty equivalent growth rate: with applications to Korea and Thailand.

Kamin, Steve B., Klau, Marc (1998). Some multi-country evidence on the effects of real exchange rates on output. International Finance Discussion Papers 611. Board of Governors of the Federal Reserve System.

Klasen, Stephan (2003). In Search of The Holy Grail*:* How to Achieve Pro-Poor Growth? in: Stern, N., Tuggoden, B. (ed.) Towards pro-poor policies: Proceedings of the Annual Bank Conference on Development Economics – Europe. Washington DC: The World Bank.

Krugman, Paul (1988). Financing vs. Forgiving a Debt Overhang, in: Journal of Development Economics 29: 253 – 268.

Krugman, Paul, Taylor, Lance (1978). Contractionary Effects of devaluation. Journal of International Economics 8: 445 – 56.

Li, Hongyi, Zou, Heng-fu (1998). Income Inequality is not harmful for growth: Theory and evidence, in: Review of Development Economics 2(3): 318 – 334.

Loko, Boileau, Mlachila, Montfort, Nallari, Raj, Kalonji, Kadima (2003). The impact of external indebtedness on poverty in low-income countries, Working Paper 61/2003. Washington DC: International Monetary Fund.

Lundberg, Mattias, Squire, Lyn (2001). The simultaneous evolution of growth and inequality. Washington DC: The World Bank.

Mankiw, N. Gregory, Romer, David, Weil, David N. (1992). A Contribution to the Empirics of Economic Growth, in: Quarterly Journal of Economics 107: 407 – 437.

Meier, Gerald M. (1989). Misconceptions about external debt, in: Singer, H.W-./ Sharma, Soumitra (ed.), Economic Development and World Debt, London: 27 – 32.

Meier, Gerald M. (1995). Leading Issues in Economic Development. 6th edition.

Montiel, Peter (2003). Macroeconomics in emerging markets. Cambridge University Press.

Morisset, Jacques (1990). Can Debt-Reduction Restore Economic Growth in Highly Indebted Countries?, in: Revue d'économie politique, 101(4): 639 – 666.

Nikbakht, Ehsan (1984). Foreing loans and economic performance. The experience of the less developed countries, New York.

Pattillo, Catherine, Poirson, Hélène, Ricci, Luca (2002). External Debt and Growth, Working Paper 69/2002. International Monetary Fund.

Perotti, Roberto (1996). Growth, Income Distribution, and Democracy: What the Data Say, in: Journal of Economic Growth 1(2):149 – 187.

Pitchford, John (1995). The current account and foreign debt, Routledge.

Ravallion, Martin (2000). Inequality Convergence. Working paper 2645. Washington DC: The World Bank.

Ravallion, Martin (2001a). Measuring aggregate welfare in developing countries: How well do national accounts and surveys agree? Washington DC: The World Bank.

Ravallion, Martin (2003). Pro – poor Growth: A Primer. Working Paper 3242. Washington DC: The World Bank.

Rogers, John H., Kamin, Steve B. (2000). Output and the real exchange rate in developing countries: an application to Mexico. Journal of development economics 61: 85 - 109.

Romer, Christina D., Romer, David H. (1998). Monetary Policy and the well-being of the poor. Working Paper 6793. NBER.

Sachs, Jeffrey D. (1989). The Debt overhang of developing countries, in: Calvo, Guillermo/ Findlay, Ronald, Kouri, Pentti, Brage de Macedo, Jorge (ed.), Debt, Stabilization and Development Essays in Memoriam of Carlos Díaz- Alejandro.

Schinke, Rolf (1994). Armut und Verschuldung: Der Einfluß des Ressourcentransfers auf die Entwicklung der Preise handelbarer und nicht handelbarer Güter, in: Schäfer, Hans-Bernd (Hrsg.), Schriften des Vereins für Socialpolitik, Band 234, Berlin: 227 – 265.

Serieux, John E. (2001a). Debt of the poorest countries: Anatomy of a crisis kept on hold, in: Canadian Journal of Development Studies 22(2): 289 – 295.

Serieux, John E. (2001b). The enhanced HIPC initiative and poor countries: prospects for a permanent exit, in: Canadian Journal of Development Studies 22(2): 527 – 548.

Temple, J. R. W. (1999). The New Growth Evidence, in: Journal of Economic Literature 37: 112 – 156.

Timmer, Peter. (1997). How well do the poor connect to the growth process?, CAER II Discussion Paper 17, Harvard Institute for International Development.

UNU/WIDER (2000). UNU/WIDER-UNDP World Income Inequality Database, Version 1.0, 12 September 2000.

World Bank (2000). Global Development Finance. Washington DC: The World Bank.

World Bank (2001). World Development Indicators. Washington DC: The World Bank.

World Bank (2002). World Development Indicators. Washington DC: The World Bank.

Wooldridge, Jeffrey M. (2000). Introductory Econometrics, Southern-Western College.

Table 1: Coverage of the data set

Region	Country	Observation dates	Source	No. of spells
East Asia Pacific (EAP)	China	1982, 85, 88, 91 1994, 97	UNU GPM	3 1
	Indonesia	1976, 80, 84, 87, 90 1993, 96, *99*	UNU GPM, *WDI*	4 2
	Korea	1970, 76, 80, 85, 88	UNU	4
	Malaysia	1970, 76, 79, 84 1987, 92, 95	UNU GPM	3 2
	Philippines	1971, 85, 88, 91 1994, 97	UNU UNU	3 1
	Thailand	1975, 81, 86, 90 1992, 98	UNU UNU	3 1
Eastern Europe and Central Asia (ECA)	Bulgaria	1991, 93	UNU	1
	Belarus	1993, 95	GPM	1
	Estonia	1992, 95	UNU	1
	Hungary	1977, 82, 87 1989, 93	UNU GPM	2 1
	Latvia	1995, 98	GPM	1
	Poland	1982, 85, 90, 93	UNU	3
	Romania	1989, 92	UNU	1
	Russia	1994, 98	GPM	1
	Slovakia	1988, 92	UNU	1
Latin America and Caribbean (LAC)	Brazil	1970, 76, 80, 86 1988, 93, 96	UNU GPM	3 2
	Chile	1989, 92	UNU	1
	Colombia	1971, 78, 88 1988, 91, 95	UNU UNU	2 2
	Costa Rica	1971, 77 1981, 86, 89 1993, 96	UNU UNU GPM	1 2 1
	Dominican Republic	1989, 96	GPM	1
	Ecuador	1988, 95	GPM	1
	El Salvador	1989, 95, *98*	GPM, *WDI*	2
	Guatemala	1987, 89	UNU	1
	Honduras	1989, 92, 96	GPM	2
	Jamaica	1988, 91 1991, 96	UNU UNU	1 1
	Mexico	1984, 89 1989, 95*, 98*	UNU GPM, *WDI*	1 2

Table 1: continued

	Panama	1979, 89 1991, 95	UNU GPM	1 1
	Paraguay	1995, *98*	GPM, *WDI*	1
	Peru	1986, 94	UNU	1
	Trinidad & Tobago	1971, 76, 81 1988, 92	UNU GPM	2 1
	Venezuela	1971, 81, 87 1987, 93, 96	UNU GPM	2 2
Middle East and North Africa (MNA)	Algeria	1988, 95	GPM	1
	Egypt	1991, 95	UNU	1
	Jordan	1980, 87, 91 1991, 97	UNU UNU	2 1
	Morocco	1984, 91 1991, 99	UNU UNU	1 1
	Tunisia	1985, 90, *95*	GPM, *WDI*	2
	Turkey	1973, 87 1987, 94	UNU GPM	1 1
	Yemen	1992, *98*	GPM, *WDI*	1
South Asia (SA)	Bangladesh	1973, 77, 81, 86 1988, 91, 95	UNU GPM	3 2
	India	1972, 77, 83, 86, 89, 92 1994, 97	UNU UNU	5 1
	Pakistan	1971, 79, 85, 88 1991, 96	UNU UNU	3 1
	Sri Lanka	1973, 79, 87 1990, 95	UNU UNU	2 1
Sub-Saharan Africa (SSA)	Côte d'Ivoire	1985, 88 1988, 95	UNU UNU	1 1
	Ethiopia	1981, 95	GPM	1
	Gabon	1975, 77	UNU	1
	Ghana	1987, 92 1992, 97	GPM UNU	1 1
	Guinea	1991, 94	UNU	1
	Kenya	1992, 94	UNU	1
	Lesotho	1986, 93	GPM	1
	Madagascar	1980, 93, *99*	GPM, *WDI*	2
	Mali	1989, 94	GPM	1
	Mauretania	1988, 95	UNU	1
	Mauritius	1986, 91	UNU	1

Table 1: continued

	Niger	1992, 95	UNU	1
	Nigeria	1985, 97	GPM	1
	Senegal	1991, 95	UNU	1
	Uganda	1989, 92, *96*	GPM, *WDI*	2
	Zambia	1993, 96	UNU	1
	No. of countries	No. of observations		No. of spells
Total	58	209		127

UNU: UNU/WIDER-UNDP World Income Inequality Database
GPM: Global Poverty Monitoring
WDI: World Development Indicators

Note:

Pooled OLS estimation:

As all observations within each line have the same income/reference unit, spells are formed only within each line (e.g. Panama 1979, 89, 91, 95 results in two spells: 1979 – 89, 91 - 95). Thus two observations for the same year in one country (e.g. Jordan 1991) indicate different income/reference unit definitions (e.g. Jordan 91: net expenditure, person/ expenditure, household per capita).

System GMM estimation:

If the countries are split by the same income definition (e.g. Côte d'Ivoire 1: 1985, 88; Côte d'Ivoire 2: 1988, 95; i.e the number of cross-section units increases), first-differenced equations are formed only within each line.

If the countries are not split by the same income definition, first-differenced equations are formed by all observations per country using the adjusted first and second quintile share. In this case we omit one of the two observations for the same year in one country (Côte d'Ivoire 88/1, Colombia 88/1, Ghana 92/1, Jamaica 91/1, Jordan 91/2, Mexico 89/1, Morocco 91/1, Turkey 87/1, Venezuela 87/2). The number behind the year indicates, whether we omit the first or second observation as ordered in the table.

Table 2: Adjustment regression for first/second quintile income shares and Gini coefficients

Dep. Var.	First quintile share of income	Second quintile share of income	Gini coefficient
	(1)	(2)	(3)
Income (unknown tax treatment)	-0.0149***	-0.0127***	5.71***
	(0.0043)	(0.0049)	(1.90)
Income, net	0.0046	0.0046	-1.81
	(0.0036)	(0.0040)	(1.52)
Income, gross	-0.0071**	-0.0008	1.32
	(0.0046)	(0.0035)	(1.36)
Family	-0.0036	-0.0014	0.60
	(0.0023)	(0.0031)	(0.82)
Person	0.0119***	0.0185***	-6.62***
	(0.0026)	(0.0033)	(1.20)
Household per capita	0.0108***	0.0159***	-5.43***
	(0.0032)	(0.0041)	(1.51)
Equivalized	0.0265***	0.008***	-5.61***
	(0.0033)	(0.0029)	(0.96)
EAP	-0.0045**	-0.0248***	8.85***
	(0.0022)	(0.0029)	(0.97)
ECA	0.0196***	0.001	-1.00
	(0.005)	(0.0051)	(1.96)
LAC	-0.0272***	-0.0519***	18.86***
	(0.0024)	(0.0032)	(1.09)
MNA	-0.0117***	-0.0328***	12.00***
	(0.0036)	(0.0043)	(1.67)
SA	0.0081***	-0.0128***	4.65***
	(0.0027)	(0.0032)	(1.25)
SSA	-0.0199***	-0.0407***	16.00***
	(0.0042)	(0.0055)	(2.14)
Constant	0.0662***	0.123***	33.03***
	(0.0033)	(0.0036)	(1.34)
N	371	371	371
R-Squared	0.6647	0.6716	0.6997

Note: This table reports the results of pooled OLS Regression for the indicated inequality measures on the indicated variables. * denotes significance at the 90% level, ** at the 95% level, and *** at the 99% level (two-sided alternative). Heteroscedasticity adjusted standard errors in parentheses.

Table 3: Data Sources

Variable	Source	Comments
Share of Income: First/Second Quintile	UNU/WIDER-UNDP World Income Inequality Database, Version 1.0 (12 September 2000), Global Poverty Monitoring, World Bank Chen/Ravallion (2000), World Development Indicators (2002), Deininger/Squire (1996, 98a)	for selection procedure see section 3
Real GDP Per Capita	Penn World Tables, Version 6.1 (October 2002)	Constant 1996 US dollars using the Chain index
EDT/GDP	Easterly, Sedaweh (2002): Global Development Network Growth Database, World Bank	Total external debt to GDP (%) EDT consists of public and publicly guaranteed long-term debt, private nonguaranteed long-term debt, IMF credit and estimated short-term debt.
EDT/XGS	Global Development Finance (2000) (DT.DOD.DECT.EX.ZS)	Total external debt to exports of goods and services (including workers' remittances) (%)
TDS/XGS	Global Development Finance (2000) (DT.TDS.DECT.EX.ZS)	Total debt service to exports of goods and services (including workers' remittances) (%) TDS shows the debt service payments on total long-term debt (public and publicly guaranteed and private non-guaranteed), IMF credit, and interest on short-term debt only. Debt service payments are the sum of principal repayments and interest payments.

Table 3: continued

Gini coefficient	UNU/WIDER-UNDP World Income Inequality Database, Version 1.0 (12 September 2000), Global Poverty Monitoring, World Bank Chen/Ravallion (2000), World Development Indicators (2002), Deininger/Squire (1996, 98a)	for selection procedure see section 3
Government Consumption	Penn World Tables, Version 6.1 (October 2002)	Constant 1996 US dollars
Secondary Education	Barro and Lee (2000)	Average years of secondary schooling in total population aged 25 and over Due to limited data availability for secondary education, values are linearily interpolated between the years prior and after the observation.
M2 to GDP	Word Development Indicators (2001) (FM.LBL.MOMY.GD.ZS)	Money and quasi money (M2) to GDP
ln(1+inflation/100)	World Development Indicators (2001) (NY.GDP.DEFL.KD.ZG)	Inflation, GDP deflator (annual) (%)
	(FP.CPI.TOTL.ZG)	for missing values: Inflation, consumer prices (Laspeyres) (annual %) (Belarus 93, 95; Ethiopia 81; Poland 90)
Overall Budget Surplus (+)/ Deficit (-) to GDP	World Development Indicators (2001) (GB.BAL.OVRL.GD.ZS)	Overall Budget, including grants
	Easterly, Sewadeh (2002): Global Development Network Growth Database, World Bank	for missing values: Data on overall budget/deficit from IMF Government Financial Statistics (Tunisia 1990; Latvia 1995)

Table 3: continued

Life expectancy	World development indicators (2001) (SP.DYN.LE00.IN)	life expectancy at birth, total (years) Values calcutated by linear interpolation for Guatemala 1989, India 1994, Kenya 1994
	World Population Prospects: The 2002 Revision Population Database	for missing value: Jordan 1980
Terms-of-Trade	Easterly, Sedaweh (2002): Global Development Network Growth Database, World Bank	Terms of Trade (goods and services, 1995 = 100)
Civil Liberties	Freedom House	Measured on a scale for 1 to 7. (1 indicates the most liberal country)

Table 4: Descriptive Statistics

Variable	Observ.	Mean	Std. Dev.	Min.	Max.
Q20	209	0.059	0.024	0.019	0.119
Adjusted Q20	209	0.055	0.021	0.015	0.115
Q40	209	0.101	0.025	0.041	0.158
Adjusted Q40	209	0.091	0.024	0.039	0.150
Income Q20	209	1176	1045	161	7182
Adjusted Income Q20	209	1117	973	102	6197
Income Q40	209	2038	1529	287	9342
Adjusted Income Q40	209	1834	1385	239	7954
Real GDP per capita	209	4078	2537	528	12000
Growth Q20	127	0.051	5.665	-17.45	25.26
Growth Q40	127	0.094	3.67	-9.048	18.50
Growth income Q20	127	1.69	6.78	-23.83	26.45
Growth income Q40	127	1.73	5.06	-15.80	20.94
Growth real GDP per capita	127	1.64	3.37	-9.39	9.42
EDT/GDP	207	62.95	47.85	0.30	249.30
EDT/XGS	191	230.73	181.31	6.60	1473.70
TDS/XGS	194	21.45	12.71	0.28	76.58
Adjusted Gini	209	44.97	9.10	21.32	64.99
Gov. Consumption	209	20.43	10.17	3.40	69.11
Budget surplus	151	-2.91	3.98	-15.18	8.22
Secondary Education	172	1.11	0.57	0.10	3.21
Life expectancy	209	63.09	8.44	41.96	76.22
M2 to GDP	201	34.42	21.09	4.91	132.48
ln(1 + inflation/100)	209	0.22	0.42	-0.05	3.04
Terms of Trade	201	105.39	23.52	50.78	262.37
Civil liberties	197	4.03	1.41	1	7

Note: Descriptive statistics are presented for all available observations, i.e. some observations are counted twice (see table 1). Thus summary statistics for debt indicators and additional macroeconomic variables may differ for the growth equation as only initial values are used. Q20/40: first, second quintile share. Adjusted Q20/40: adjusted first, second quintile share. Income Q20/40: mean income of first, second quintile share (Q20/40 * mean income/0.2). Adjusted Income Q20/40: mean income of adjusted first, second quintile share. Growth Q20/40: average annual growth rate of first, second quintile share using only spells with identical income inequality measures (table 1). Growth income Q20/40: average annual growth rate of mean income of first, second quintile share using only spells with identical income inequality measures.

Table 5: Descriptive Statistics - Regions

Variable	EAP	ECA	LAC	MNA	SA	SSA
Q20	0.061	0.091	0.037	0.065	0.081	0.057
Adjusted Q20	0.060	0.085	0.038	0.055	0.077	0.046
Q40	0.103	0.137	0.078	0.106	0.122	0.098
Adjusted Q40	0.096	0.123	0.071	0.091	0.113	0.082
Income Q20	1082	3379	1005	1273	632	531
Adjusted Income Q20	1098	3127	1033	1090	591	433
Income Q40	1873	5029	2153	2095	947	918
Adjusted Income Q40	1767	4493	1953	1802	867	767
Real GDP per capita	3716	7300	5463	4002	1556	2002
Growth Q20	-0.22	-4.70	-0.07	1.20	-0.62	3.64[99]
Growth Q40	-0.25	-2.38	0.64	0.77	-0.58	1.35
Growth Income Q20	4.33	-6.41	1.10	1.66	2.29	3.98
Growth Income Q40	4.29	-4.09	1.81	1.22	2.33	1.69
Growth real GDP per capita	4.54	-1.71	1.17	0.45	2.91	0.34
EDT/GDP	46.59	39.83	39.10	87.17	36.36	102.53
EDT/XGS	125.84	132.04	194.36	212.49	284.79	416.12
TDS/XGS	18.59	11.36	24.22	25.11	20.64	23.57
Adjusted Gini	42.61	32.43	52.19	44.60	36.66	49.03
Government Consumption	18.20	20.54	19.32	27.91	20.65	19.91
Budget surplus	-1.57	-3.09	-1.99	-4.10	-5.67	-2.13
Secondary Education	1.29	1.33	1.22	1.18	0.88	0.61
Life expectancy	65.01	69.48	68.72	64.58	57.79	50.89
M2 to GDP	46.10	31.91	26.73	61.07	31.20	22.79
ln(1+inflation/100)	0.09	0.66	0.28	0.12	0.10	0.14
Terms of Trade	103.13	101.06	104.23	108.17	107.27	108.78
Civil liberties	4.6	3.76	2.82	4.77	4.17	4.95

Note: Descriptive statistics are presented for all available observations, i.e. some observations are counted twice (see table 1). Thus summary statistics for debt indicators and additional macroeconomic variables may differ for the growth equation as only initial values are used. Q20/40: first, second quintile share. Adjusted Q20/40: adjusted first, second quintile share. Income Q20/40: mean income of first, second quintile share (Q20/40 * mean income/0.2). Adjusted Income Q20/40: mean income of adjusted first, second quintile share. Growth Q20/40: average annual growth rate of first, second quintile share using only spells with identical income inequality measures (table 1). Growth income Q20/40: average annual growth rate of mean income of first, second quintile share using only spells with identical income inequality measures.

[99] The high average annual growth rates for the mean (income) of the first quintile in Sub-Saharan Africa stem from three spells (Guinea 1991 – 94, Kenya 1992 – 94, Senegal 1991 – 95) with values over 18 percent. If we omit these observations in regressions without outliers, the mean of the growth of the first quintile (growth Q20) is 0.59 and the mean of the growth of the mean income (growth mean Q20) 1.05. In addition, the mean of the growth of the second quintile (growth Q40) is 0.44 and the mean of the growth of the mean income (growth mean Q40) is 1.05 without the spell for Kenya 1992 – 94.

Table 6: Correlation matrix for debt indicators and additional macroeconomic variables

	EDT	EDX	TDS	Con	Bud	Edu	Life	M2	Infl	Civ	Tot	Gini
EDT	1											
EDX	0.46***	1										
TDS	0.18**	0.46***	1									
Con	0.17**	-0.01	0.13*	1								
Bud	-0.06	-0.25***	-0.13	-0.28***	1							
Edu	0.19**	-0.36***	-0.18	-0.05	0.15*	1						
Life	-0.18**	-0.61***	-0.11	0.01	0.12	0.68***	1					
M2	0.21***	-0.27***	-0.14*	0.32***	-0.03	0.36***	0.35***	1				
Infl	-0.09	0.01	-0.02	0.09	-0.22***	-0.04	0.13*	-0.19***	1			
Civ	0.06	0.19***	0.05	0.04	-0.03	-0.10	-0.42***	0.13*	-0.18**	1		
ToT	-0.14*	-0.13	0.07	0.10	-0.04	-0.09	-0.16**	-0.05	-0.03	0.09	1	
Gini	0.20***	0.06	0.16**	0	0	-0.10	0.04	-0.14**	-0.03	-0.18**	0	1

Note: * denotes significance at 90 % level, ** at 95 % level, and *** at the 99 % level. Correlation matrix is presented only for all available observations, i.e. some observations are counted twice (see table 1). Thus correlation matrix for debt indicators and additional macroeconomic variables may differ for the growth equation as only initial values are used. EDT: EDT/GDP. EDX: EDT/XGS. TDS: TDS/XGS. Con: government consumption. Bud: Budget surplus. Edu: secondary education. Life: life expectancy. M2: M2/GDP. Infl: ln(1+inflation/100). Civ: civil liberties. ToT: terms-of-trade. Gini: adjusted Gini coefficient.

Table 7: Debt indicators and regional dummy variables distribution effect (Growth equation)

Dep. Var.	**y^{q20} ols**	**y^{q20o} ols**	**y^{q20} ols**	**y^{q20o} ols**	**y^{q20} ols**	**y^{q20o} re**	**y^{q20} ols**	**y^{q20o} ols**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
EDT/GDP	0.007	0	-0.01	**-0.07***	0.002	-0.009	-0.02	**-0.09****
	(0.01)	(0.02)	(0.03)	(0.04)	(0.01)	(0.01)	(0.03)	(0.05)
EDT/GDP^2			0	**0.0005***			0	**0.0006****
			(0)	(0.0003)			(0)	(0.0003)
TDS/XGS					0.03	**0.06***	0.04	**0.08****
					(0.03)	(0.03)	(0.03)	(0.03)
EAP	4.80**	4.83**	4.96**	-5.50**	5.85**	5.55***	5.92***	6.01***
	(2.11)	(2.06)	(2.12)	(2.12)	(2.26)	(1.69)	(2.23)	(2.20)
LAC	4.81**	4.99**	5.06**	5.56**	5.93**	5.66***	6.09**	5.95***
	(2.29)	(2.28)	(2.33)	(2.27)	(2.39)	(1.67)	(2.36)	(2.27)
MNA	5.90**	6.00***	6.08***	6.88***	6.66***	6.56***	6.77***	7.39***
	(2.30)	(2.24)	(2.31)	(2.29)	(2.43)	(2.06)	(2.39)	(2.40)
SA	4.45**	4.42**	4.54**	4.97**	5.51**	5.10***	5.47***	5.33***
	(2.01)	(1.95)	(1.99)	(1.97)	(2.13)	(1.77)	(2.08)	(2.02)
SSA	8.31***	5.06*	8.55***	5.63**	10.16***	6.44***	10.30***	6.67***
	(3.11)	(2.64)	(3.07)	(2.63)	(3.15)	(1.92)	(3.09)	(2.30)
Constant	-5.29***	-5.02***	-4.86***	-3.95**	-6.62***	-6.45***	-6.07***	-5.07**
	(1.89)	(1.82)	(1.87)	(1.90)	(2.14)	(1.52)	(2.10)	(2.13)
Breusch Pagan - test						3.46*		
Wald-test						23.53***		
F-test	3.31***	1.95*	4.94***	2.55**	3.11***		4.36***	2.78***
R-squared	0.15	0.10	0.15	0.13	0.22	0.20	0.22	0.23
N	125	119	125	119	112	105	112	105

* denotes significance at the 90% level, ** at the 95% level, and *** at the 99% level (two-sided alternative). Heteroscedasticity adjusted standard errors in parentheses. F-test/Wald-test indicates the F-statistic/Wald-statistic for the test on the overall significance of the regression. Ramsey Reset test is used to test for omitted variables. While in equations 1 and 2, the Ramsey Reset test for omitted variables is only passed when powers of the right-hand side variables are considered, the Ramsey Reset test is passed in equations 3, 4, 5, 7 and 8. Breusch-Pagan is a Lagrange multiplier test for the random effects model, distributed as chi-squared under the null of no random effects. y^{q20}: average annual growth rate of the first quintile share. y^{q20o}: average annual growth rate of the first quintile share (regressions without outliers). ols: results for pooled OLS estimation, re: results for random effects estimation.

Table 7: continued.

Dep. Var.	y^{q20} **ols**	y^{q20o} **re**	y^{q20} **ols**	y^{q20o} **re**	y^{q20} **ols**	y^{q20o} **re**	y^{q20} **ols**	y^{q20o} **re**
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
EDT/XGS	-0.002	-0.001	0.0003	-0.0004	-0.004	-0.004	-0.004	-0.01
	(0.003)	(0.004)	(0.006)	(0.01)	(0.003)	(0.005)	(0.007)	(0.01)
EDT/XGS^2			0	0			0	0
			(0)	(0)			(0)	(0)
TDS/XGS					0.06	0.07	0.06	0.08
					(0.04)	(0.04)	(0.04)	(0.05)
EAP	5.51***	5.51***	5.50***	5.50***	4.98***	4.91***	4.98***	4.87***
	(1.98)	(1.55)	(2.00)	(1.56)	(1.86)	(1.60)	(1.86)	(1.60)
LAC	5.97***	5.90***	5.86***	5.89***	5.23***	5.13***	5.22***	5.17***
	(2.06)	(1.49)	(2.15)	(1.52)	(1.96)	(1.57)	(2.00)	(1.58)
MNA	6.82***	6.73***	6.68***	6.72***	6.08***	6.29***	6.08***	6.46***
	(1.99)	(1.83)	(2.12)	(1.88)	(1.93)	(1.89)	(2.00)	(1.92)
SA	5.43***	5.29***	5.24**	5.28**	5.27***	5.24**	5.26**	5.33***
	(1.97)	(1.74)	(2.16)	(1.76)	(1.87)	(1.74)	(2.06)	(1.75)
SSA	10.62***	6.57***	10.47***	6.57***	10.35***	6.36***	10.34***	6.23***
	(3.05)	(1.87)	(3.09)	(1.89)	(3.00)	(1.87)	(3.03)	(1.89)
Constant	-5.39***	-5.51***	-5.60***	-5.54***	-5.66***	-5.69***	-5.67***	-5.20***
	(1.79)	(1.36)	(1.80)	(1.60)	(1.76)	(1.37)	(1.73)	(1.61)
Breusch Pagan - test		4.47**		4.48**		4.71**		4.69**
Wald - test		20.26***		20.06***		22.57***		22.77***
F - test	3.45***		3.31***		3.23***		3.67***	
R-squared	0.21	0.17	0.21	0.17	0.22	0.19	0.22	0.19
N	114	108	114	108	114	107	114	107

* denotes significance at the 90% level, ** at the 95% level, and *** at the 99% level (two-sided alternative). Heteroscedasticity adjusted standard errors in parentheses. F-test/Wald-test indicates the F-statistic/Wald-statistic for the test on the overall significance of the regression. Ramsey Reset test is used to test for omitted variables. While in equations 13 and 15, the Ramsey Reset test for omitted variables is only passed when powers of the right-hand side variables are considered, the Ramsey Reset test is passed in equations 9 and 11. Breusch-Pagan is a Lagrange multiplier test for the random effects model, distributed as chi-squared under the null of no random effects. y^{q20}: average annual growth rate of the first quintile share. y^{q20o}: average annual growth rate of the first quintile share (regressions without outliers). ols: results for pooled OLS estimation, re: results for random effects estimation.

Table 8: Debt indicators and regional dummy variables distribution effect (System GMM estimation)

Dep. Var.	Y^{q20s}	Y^{q20c}	Y^{q40s}	Y^{q40c}	Y^{q20s}	Y^{q20c}
	(1)	(2)	(3)	(4)	(5)	(6)
EDT/GDP	**0.003***** (0.001)	0.001 (0.001)	**0.0015*** (0.0008)	0.0005 (0.0008)	0.002 (0.001)	0.0006 (0.001)
EDT/GDP^2	**-0.00001***** (0.000004)	-0.000007 (0.000004)	**-0.000006**** (0.000003)	-0.000003 (0.000003)	**-0.00001*** (0.000005)	-0.000005 (0.000005)
TDS/XGS					0.003 (0.002)	0.003 (0.002)
EAP	-0.39*** (0.14)	-0.30* (0.16)	-0.29*** (0.09)	-0.26*** (0.10)	-0.38*** (0.13)	-0.30** (0.15)
LAC	-0.92*** (0.13)	-0.80*** (0.15)	-0.58*** (0.07)	-0.58*** (0.09)	-0.92*** (0.12)	-0.82*** (0.15)
MNA	-0.35*** (0.13)	-0.39** (0.16)	-0.27*** (0.07)	-0.31*** (0.09)	-0.29** (0.13)	-0.38** (0.16)
SA	-0.06 (0.12)	-0.04 (0.14)	-0.10 (0.07)	-0.09 (0.08)	-0.06 (0.12)	-0.05 (0.14)
SSA	-0.52*** (0.14)	-0.65*** (0.18)	-0.38*** (0.09)	-0.44*** (0.11)	-0.47*** (0.13)	-0.62*** (0.18)
Constant	-0.94*** (0.11)	-0.95*** (0.14)	-0.44*** (0.06)	-0.50*** (0.08)	-0.98*** (0.11)	-0.99*** (0.14)
m1	-1.03	-1.22	-0.61	-2.21**	-1.00	-1.58
m2	-1.14	-0.70	-0.12	0.30	0.60	0.88
N	199	190	199	190	182	175
1 – RSS/TSS	0.56	0.51	0.49	0.49	0.58	0.53

* denotes significance at the 90% level, ** at the 95% level, and *** at the 99% level (two-tailed test). Results for one-step estimation are obtained using DPD98 for GAUSS. Heteroscedasticity adjusted asymptotic standard errors in parentheses. m1 and m2 are tests for first-order and second-order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. 1 – RSS/TSS: 1 – residual sum of squares/ total sum of squares. $Y^{q20/40s}$: $\ln(Q^{20,40}/0.2)$ unadjusted approach (regressions without outliers). $Y^{q20/40c}$: $\ln(Q^{20,40}/0.2)$ adjusted approach (regressions without outliers).

Table 8: continued.

Dep. Var.	Y^{q40s}	Y^{q40c}	Y^{q20s}	Y^{q20c}	Y^{q20s}	Y^{q20c}
	(7)	(8)	(9)	(10)	(11)	(12)
EDT/GDP	0.001 (0.001)	0.00002 (0.001)	0.00003 (0.0005)	-0.0004 (0.0006)		
EDT/GDP^2	-0.000005 (0.000003)	-0.000002 (0.000004)				
EDT/XGS					0.0002 (0.0002)	0.00004 (0.0003
TDS/XGS	0 (0.01)	0.001 (0.002)	**0.004**** (0.002)	**0.004*** (0.002)	**0.004*** (0.002)	0.004 (0.003)
EAP	-0.28*** (0.08)	-0.26*** (0.09)	-0.38*** (0.13)	-0.30** (0.15)	-0.42*** (0.12)	-0.24** (0.13)
LAC	-0.56*** (0.07)	-0.57*** (0.10)	-0.90*** (0.12)	-0.81*** (0.15)	-0.94*** (0.11)	-0.86*** (0.13)
MNA	-0.24*** (0.07)	-0.31*** (0.09)	-0.28** (0.12)	-0.37** (0.16)	-0.32*** (0.11)	-0.43*** (0.15)
SA	-0.09 (0.07)	-0.09 (0.08)	-0.06 (0.11)	-0.06 (0.14)	-0.11 (0.32)	-0.09 (0.13)
SSA	-0.32*** (0.08)	-0.40*** (0.11)	-0.45*** (0.13)	-0.62*** (0.17)	-0.54*** (0.13)	-0.74*** (0.18)
m1	-1.61	-2.80***	-1.07	-1.69*	-1.42	-1.99**
m2	1.15	2.37**	-0.87	1.02	0.70	1.36
N	182	175	182	175	173	170
1 – RSS/TSS	0.52	0.50	0.42	0.53	0.60	0.56

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* denotes significance at the 90% level, ** at the 95% level, and *** at the 99% level (two-tailed test). Results for one-step estimation are obtained using DPD98 for GAUSS. Heteroscedasticity adjusted asymptotic standard errors in parentheses. m1 and m2 are tests for first-order and second-order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. 1 – RSS/TSS: 1 – residual sum of squares/ total sum of squares. $Y^{q20/40s}$: $\ln(Q^{20,40}/0.2)$ unadjusted approach (regressions without outliers). $Y^{q20/40c}$: $\ln(Q^{20,40}/0.2)$ adjusted approach (regressions without outliers).

Table 8: continued.

Dep. Var.	Y^{q20s}	Y^{q20c}	Y^{q40s}	Y^{q40c}
	(13)	(14)	(15)	(16)
EDT/XGS	-0.0003 (0.0008)	-0.001 (0.0009)	-0.0006 (0.0005)	**-0.001**** (0.0005)
EDT/XGS^2	0.000001 (0.000001)	0.000002 (0.000002)	0.000001 (0.000001)	**0.000002**** (0.000001)
TDX/XGS	**0.004*** (0.002)	**0.005*** (0.003)	0.002 (0.002)	0.003 (0.002)
EAP	-0.42*** (0.11)	-0.35*** (0.13)	-0.30*** (0.07)	-0.28*** (0.08)
LAC	-0.94*** (0.11)	-0.85*** (0.13)	-0.57*** (0.07)	-0.58*** (0.08)
MNA	-0.31*** (0.12)	-0.40*** (0.15)	-0.24*** (0.07)	-0.30*** (0.08)
SA	-0.10 (0.11)	-0.07 (0.13)	-0.10 (0.07)	-0.07 (0.08)
SSA	-0.54*** (0.13)	-0.75*** (0.18)	-0.34*** (0.09)	-0.45*** (0.10)
m1	-1.48	-2.03**	-1.82*	-2.92***
m2	0.81	1.87*	1.60	2.90***
N	173	167	173	167
1 – RSS/TSS	0.60	0.56	0.53	0.53

* denotes significance at the 90% level, ** at the 95% level, and *** at the 99% level (two-tailed test). Results for one-step estimation are obtained using DPD98 for GAUSS. Heteroscedasticity adjusted asymptotic standard errors in parentheses. m1 and m2 are tests for first-order and second-order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. 1 – RSS/TSS: 1 – residual sum of squares/ total sum of squares. $Y^{q20/40s}$: $\ln(Q^{20,40}/0.2)$ unadjusted approach (regressions without outliers). $Y^{q20/40c}$: $\ln(Q^{20,40}/0.2)$ adjusted approach (regressions without outliers).

Table 9: Debt indicators and macroeconomic variables distribution effect (Growth equation)

Dep. Var.	**y^{q20} ols**	**y^{q20o} re**	**y^{q20} ols**	**y^{q20o} re**
	(1)	(2)	(3)	(4)
EDT/GDP	0.03	**-0.10***	0.001	**-0.14***
	(0.03)	(0.06)	(0.03)	(0.07)
EDT/GDP^2	0	**0.0008***	0	**0.001****
	(0)	(0.004)	(0)	(0.0005)
TDS/XGS			0.01	0.05
			(0.04)	(0.05)
Secondary Education	-0.24	0.56	-0.05	0.97
	(1.35)	(0.98)	(1.42)	(1.19)
Budget Surplus	**0.38*****	**0.28****	**0.39*****	**0.26***
	(0.12)	(0.14)	(0.12)	(0.15)
Adjusted Gini coefficient	**0.34****	**0.18***	**0.34****	**0.23****
	(0.14)	(0.10)	(0.15)	(0.11)
ln(1+inflation)	**1.41****	3.56	**1.36***	1.14
	(0.68)	(4.10)	(0.73)	(5.00)
M2/GDP	0.02	0.02	0.02	0.02
	(0.03)	(0.03)	(0.03)	(0.04)
EAP	-3.50	-0.88	-3.62	-2.01
	(2.95)	(3.96)	(3.13)	(4.30)
LAC	-7.11	-3.54	-7.03	-4.86
	(4.38)	(4.51)	(4.57)	(4.90)
MNA	-3.20	0.10	-3.18	-0.74
	(3.35)	(4.22)	(3.42)	(4.57)
SA	-0.42	0.59	-0.12	0.19
	(1.87)	(3.78)	(1.99)	(4.08)
SSA	0.93	1.77	1.04	0.91
	(3.22)	(4.33)	(3.33)	(4.64)
Constant	-10.81***	-5.06	-11.25***	-6.48
	(3.75)	(4.81)	(4.24)	(5.32)
Breusch-Pagan		6.63***		7.78***
Wald – test		17.49		16.48
F-test	22.96***		20.75***	
R – squared	0.39	0.24	0.38	0.24
N	73	69	69	65

* denotes significance at the 90% level, ** at the 95% level, and *** at the 99% level (two-sided alternative). Heteroscedasticity adjusted standard errors in parentheses. F-test/Wald-test indicates the F-statistic/Wald-statistic for the test on the overall significance of the regression. In equations 1 and 3 the Ramsey Reset test for omitted variables is only passed when powers of the right-hand side variables are considered. Breusch-Pagan is a Lagrange multiplier test for the random effects model, distributed as chi-squared under the null of no random effects. y^{q20}: average annual growth rate of the first quintile share. y^{q20o}: regressions without outliers. ols: results for pooled OLS estimation, re: results for random effects estimation.

Table 10: Debt indicators, regional dummy variables and macroeconomic variables - distribution effect (System GMM estimation)

Dep. Var.	Y^{q20s}	Y^{q20c}	Y^{q40s}	Y^{q40c}	Y^{q20s}	Y^{q20c}
	(1)	(2)	(3)	(4)	(5)	(6)
EDT/GDP	**0.005***** (0.002)	**0.003**** (0.001)	**0.002*** (0.001)	0.001 (0.001)	**0.004*** (0.002)	0.003 (0.002)
EDT/GDP^2	**-0.00003***** (0)	**-0.00003***** (0.000007)	**-0.00001***** (0.000004)	**-0.00001**** (0.000005)	**-0.00002**** (0.00001)	**-0.00002***** (0.00001)
TDS/XGS					0.003 (0.002)	0.002 (0.002)
Secondary Education	0.05 (0.06)	0.04 (0.06)	0.05 (0.04)	0.05 (0.05)	0.07 (0.05)	0.06 (0.06)
Government Consumption	0.006 (0.004)	0.002 (0.004)	**0.005*** (0.003)	0.003 (0.003)	0.005 (0.004)	0.001 (0.004)
Ln(1+inflation)	-0.05 (0.11)	-0.02 (0.12)	-0.07 (0.07)	-0.03 (0.07)	-0.09 (0.12)	-0.02 (0.12)
EAP	-0.61**** (0.10)	-0.50*** (0.07)	-0.40*** (0.07)	-0.35*** (0.06)	-0.55*** (0.09)	-0.48*** (0.07)
LAC	-1.11*** (0.08)	-0.99*** (0.06)	-0.66*** (0.05)	-0.65*** (0.05)	-1.04*** (0.06)	-0.96*** (0.06)
MNA	-0.56*** (0.11)	-0.60*** (0.11)	-0.34*** (0.06)	-0.37*** (0.06)	-0.42*** (0.13)	-0.56*** (0.14)
SA	-0.28*** (0.09)	-0.24*** (0.06)	-0.21*** (0.06)	-0.17*** (0.05)	-0.20** (0.09)	-0.20*** (0.06)
SSA	-0.60*** (0.10)	-0.69*** (0.11)	-0.37*** (0.07)	-0.41*** (0.07)	-0.52*** (0.09)	-0.65*** (0.11)
Constant	-0.91*** (0.12)	-0.88*** (0.11)	-0.48*** (0.08)	-0.53 (0.07)	-1.01*** (0.12)	0.95*** (0.12)
m1	-1.13	-1.52	-1.01	-2.77***	-1.11	-1.86*
m2	-1.34	-0.65	-0.70	-0.06	-1.15	1.12
N	158	153	158	153	143	140
1 – RSS/TSS	0.63	0.63	0.56	0.57	0.65	0.64

* denotes significance at the 90% level, ** at the 95% level, and *** at the 99% level (two-tailed test). Results for one-step estimation are obtained using DPD98 for GAUSS. Heteroscedasticity adjusted asymptotic standard errors in parentheses. m1 and m2 are tests for first-order and second-order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. 1 – RSS/TSS: 1 – residual sum of squares/ total sum of squares. $Y^{q20/40s}$: $\ln(Q^{20,40}/0.2)$ unadjusted approach (regressions without outliers). $Y^{q20/40c}$: $\ln(Q^{20,40}/0.2)$ adjusted approach (regressions without outliers).

Table 10: continued.

Dep. Var.	Y^{q40s}	Y^{q40c}	Y^{q20s}	Y^{q20c}	Y^{q40s}	Y^{q40c}
	(7)	(8)	(9)	(10)	(11)	(12)
EDT/GDP	0.001 (0.001)	0.001 (0.001)	-0.0004 (0.0008)	-0.001 (0.0008)	-0.0004 (0.0005)	-0.0008 (0.0005)
EDT/GDP^2	**-0.000009*** (0.000006)	**-0.00001*** (0.000006)				
TDS/XGS	0.001 (0.01)	0.0002 (0.002)	**0.005**** (0.002)	**0.004*** (0.002)	0.002 (0.002)	0.001 (0.002)
Secondary Education	0.05 (0.04)	0.05 (0.05)	0.08 (0.05)	0.08 (0.06)	0.06 (0.04)	0.06 (0.05)
Government Consumption	**0.005*** (0.003)	0.002 (0.003)	0.005 (0.004)	0.001 (0.004)	**0.005*** (0.003)	0.002 (0.003)
Ln(1+inflation)	-0.09 (0.07)	-0.03 (0.07)	-0.16 (0.13)	-0.08 (0.13)	-0.12 (0.07)	-0.05 (0.07)
EAP	-0.37*** (0.06)	-0.35*** (0.06)	-0.57*** (0.09)	-0.50*** (0.07)	-0.38*** (0.06)	-0.36*** (0.06)
LAC	-0.62*** (0.05)	-0.63*** (0.05)	-1.05*** (0.06)	-0.98*** (0.06)	-0.62*** (0.05)	-0.64*** (0.05)
MNA	-0.28*** (0.07)	-0.37*** (0.07)	-0.40*** (0.13)	-0.54*** (0.15)	-0.27*** (0.07)	-0.35*** (0.08)
SA	-0.17*** (0.06)	-0.16*** (0.06)	-0.23*** (0.08)	-0.23*** (0.06)	-0.19*** (0.05)	-0.17*** (0.05)
SSA	-0.33*** (0.001)	-0.40*** (0.07)	-0.53*** (0.09)	-0.67*** (0.10)	-0.24*** (0.06)	-0.41*** (0.07)
Constant	-0.50*** (0.08)	-0.54*** (0.09)	-0.91*** (0.11)	-0.84*** (0.11)	-0.46*** (0.07)	-0.49*** (0.08)
m1	-1.71*	-3.03***	-0.98	-1.74*	-1.65*	-2.99***
m2	-0.26	2.63***	-1.07	0.84	-0.04	2.36**
N	143	140	143	140	143	140
1 – RSS/TSS	0.57	0.57	0.63	0.63	0.57	0.57

* denotes significance at the 90% level, ** at the 95% level, and *** at the 99% level (two-tailed test). Results for one-step estimation are obtained using DPD98 for GAUSS. Heteroscedasticity adjusted asymptotic standard errors in parentheses. m1 and m2 are tests for first-order and second-order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. 1 – RSS/TSS: 1 – residual sum of squares/ total sum of squares. $Y^{q20/40s}$: $\ln(Q^{20,40}/0.2)$ unadjusted approach (regressions without outliers). $Y^{q20/40c}$: $\ln(Q^{20,40}/0.2)$ adjusted approach (regressions without outliers).

Table 11: Debt indicators and macroeconomic variables total effect (Growth equation)

Dep. Var.	y^{p20}	y^{p20o}	y^{p20}	y^{p20o}
	(1)	(2)	(3)	(4)
EDT/GDP	-0.05 (0.04)	-0.12 (0.08)	-0.05 (0.04)	-0.15 (0.10)
EDT/GDP^2	0.0002 (0.0002)	0.0007 (0.0006)	0.0002 (0.0002)	0.0009 (0.0007)
TDS/XGS			-0.00003 (0.05)	0.04 (0.07)
Secondary Education	1.13 (1.73)	1.76 (1.67)	1.53 (1.81)	2.50 (1.82)
Budget Surplus	**0.44***** (0.15)	**0.33*** (0.17)	**0.46***** (0.16)	**0.33*** (0.18)
Adjusted Gini Coefficient	**0.33*** (0.17)	0.21 (0.20)	**0.33*** (0.17)	0.21 (0.20)
ln(1+inflation)	**1.75*** (0.90)	0.56 (4.26)	**1.80*** (0.98)	-1.49 (6.14)
M2/GDP	0.01 (0.04)	0.003 (0.04)	0.02 (0.05)	0.01 (0.05)
EAP	4.66 (3.64)	6.45 (4.27)	4.39 (3.85)	6.25 (4.36)
LAC	-2.26 (5.33)	0.42 (6.37)	-2.07 (5.55)	0.70 (6.48)
MNA	1.82 (4.30)	4.15 (5.06)	1.73 (4.37)	4.29 (5.03)
SA	6.56*** (2.39)	6.90** (2.81)	7.21*** (2.51)	7.53** (2.94)
SSA	6.97* (4.10)	7.34* (4.08)	7.24* (4.21)	7.62* (4.13)
Constant	-13.39*** (4.27)	-8.66* (5.17)	-14.10*** (5.00)	-9.41* (5.36)
F-test	65.98***	42.06***	56.12***	37.50***
R-squared	0.39	0.33	0.39	0.34
N	73	69	69	65

* denotes significance at the 90% level, ** at the 95% level, and *** at the 99% level (two-sided alternative). All equations estimated with pooled OLS. Heteroscedasticity adjusted standard errors in parentheses. F-test indicates the F-statistic for the test on the overall significance of the regression. While in equations 3 and 4, the Ramsey Reset test for omitted variables is only passed when powers of the right-hand side variables are considered, the Ramsey Reset test is not passed in any other equations. y^{p20}: average annual growth of mean income of first quintile share. y^{p20o}: regressions without outliers.

Table 12: Debt indicators, regional dummy variables and macroeconomic variables - total effect (System GMM estimation)

Dep. Var.	Y^{p20s}	Y^{p20c}	Y^{p40s}	Y^{p40s}	Y^{p20s}	Y^{p20c}
	(1)	(2)	(3)	(4)	(5)	(6)
EDT/GDP	**0.005****	0.004	0.002	0.002	0.004	0.002
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
EDT/GDP^2	**-0.00004*****	**-0.00003*****	**-0.00002****	**-0.00002***	**-0.00003*****	**-0.00003****
	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)
TDS/XGS					0.004	0.004
					(0.003)	(0.003)
Secondary Education	**0.34*****	**0.32*****	**0.31*****	**0.31*****	**0.37*****	**0.34*****
	(0.09)	(0.11)	(0.10)	(0.10)	(0.09)	(0.10)
Government Consumption	**-0.01***	**-0.01****	**-0.01***	**-0.01****	**-0.01****	**-0.02*****
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Ln(1+inflation)	-0.02	-0.04	-0.01	0.01	-0.08	-0.04
	(0.19)	(0.20)	(0.14)	(0.14)	(0.19)	(0.18)
Civil liberties	**-0.05***	**-0.07****	**-0.07****	**-0.08*****	**-0.07****	**-0.07****
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Life expectancy	**0.03****	**0.03****	**0.03****	**0.03****	**0.03****	**0.03****
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Terms of Trade	**0.005*****	**0.005*****	**0.005*****	**0.005*****	**0.005*****	**0.005*****
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
EAP	-1.46***	-1.33***	-1.23***	-1.18***	-1.42***	-1.29***
	(0.15)	(0.13)	(0.14)	(0.14)	(0.16)	(0.13)
LAC	-1.69***	-1.60***	-1.27***	-1.26***	-1.63***	-1.56***
	(0.13)	(0.10)	(0.11)	(0.08)	(0.12)	(0.09)
MNA	-0.98***	-1.05***	-0.79***	-0.83***	-0.94***	-1.06***
	(0.11)	(0.09)	(0.11)	(0.08)	(0.11)	(0.07)
SA	-1.61***	-1.56***	-1.52***	-1.49***	-1.51***	-1.49***
	(0.21)	(0.17)	(0.18)	(0.16)	(0.24)	(0.18)
SSA	-1.76***	-1.82***	-1.49***	-1.52***	-1.61***	-1.73***
	(0.35)	(0.31)	(0.33)	(0.30)	(0.34)	(0.31)
Constant	5.91***	5.96***	6.29***	6.23***	5.46***	5.77***
	(0.73)	(0.72)	(0.67)	(0.68)	(0.73)	(0.75)
m1	-0.85	-1.05	-1.16	-1.64	-0.83	-1.00
m2	0.91	-0.91	1.06	-0.27	0.31	-0.29
N	141	140	141	140	135	134
1 – RSS/TSS	0.78	0.81	0.83	0.83	0.79	0.81

* denotes significance at the 90% level, ** at the 95% level, and *** at the 99% level (two-tailed test). Results for one-step estimation are obtained using DPD98 for GAUSS. Heteroscedasticity adjusted asymptotic standard errors in parentheses. m1 and m2 are tests for first-order and second-order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. 1 – RSS/TSS: 1 – residual sum of squares/ total sum of squares. $Y^{p20/40s}$: $\ln(Q^{20,40} * Y/0.2)$ unadjusted approach (regressions without outliers). $Y^{p20/40c}$: $\ln(Q^{20,40} * Y/0.2)$ adjusted approach (regressions without outliers).

Table 12: continued.

Dep. Var.	Y^{p40s}	Y^{p40c}	Y^{p20s}	Y^{p20c}	Y^{p40s}	Y^{p40c}
	(7)	(8)	(9)	(10)	(11)	(12)
EDT/GDP	0.001 (0.003)	0.001 (0.003)	-0.0017 (0.001)	**-0.003**** (0.001)	**-0.002*** (0.001)	**-0.002**** (0.001)
EDT/GDP^2	-0.00002 (0.00001)	-0.00002 (0.00001)				
TDS/XGS	0.003 (0.002)	0.003 (0.002)	**0.006**** (0.003)	**0.006**** (0.003)	**0.005**** (0.002)	**0.004*** (0.002)
Secondary Education	**0.32***** (0.09)	**0.32***** (0.10)	**0.35***** (0.09)	**0.33***** (0.10)	**0.31***** (0.09)	**0.32** (0.10)
Government Consumption	**-0.01**** (0.006)	**-0.01**** (0.007)	**-0.01**** (0.006)	**-0.02**** (0.006)	**-0.01**** (0.006)	**-0.01**** (0.007)
Ln(1+inflation)	-0.08 (0.13)	-0.06 (0.12)	-0.15 (0.20)	-0.09 (0.21)	-0.13 (0.15)	-0.09 (0.14)
Civil Liberties	**-0.08***** (0.03)	**-0.08***** (0.03)	**-0.06*** (0.03)	**-0.07**** (0.03)	**-0.07***** (0.03)	**-0.08***** (0.03)
Life Expectancy	**0.03**** (0.01)	**0.03**** (0.01)	**0.03***** (0.01)	**0.03***** (0.01)	**0.03***** (0.01)	**0.03***** (0.01)
Terms of Trade	**0.005***** (0.001)	**0.005***** (0.002)	**0.005***** (0.001)	**0.005***** (0.001)	**0.005***** (0.001)	**0.005***** (0.002)
EAP	-1.17*** (0.15)	-1.14*** (0.14)	-1.41*** (0.14)	-1.30*** (0.13)	-1.18*** (0.14)	-1.15*** (0.14)
LAC	-1.22*** (0.11)	-1.23*** (0.08)	-1.63*** (0.11)	-1.57*** (0.09)	-1.22*** (0.11)	-1.24*** (0.08)
MNA	-0.77*** (0.10)	-0.85*** (0.05)	-0.90*** (0.10)	-1.03*** (0.07)	-0.75*** (0.09)	-0.83*** (0.05)
SA	-1.43*** (0.18)	-1.42*** (0.17)	-1.47*** (0.20)	-1.48*** (0.17)	-1.42*** (0.18)	-1.42*** (0.16)
SSA	-1.39*** (0.33)	-1.45*** (0.30)	-1.58*** (0.33)	-1.70*** (0.30)	-1.37*** (0.31)	-1.43*** (0.29)
Constant	6.12*** (0.68)	6.12*** (0.71)	5.48*** (0.75)	5.67*** (0.74)	6.04*** (0.67)	6.05*** (0.69)
m1	-0.96	-1.44	-0.57	-0.73	-0.82	-1.25
m2	0.87	0.60	0.63	-0.45	0.86	0.41
N	135	134	135	134	135	134
1 – RSS/TSS	0.83	0.83	0.78	0.81	0.83	0.83

* denotes significance at the 90% level, ** at the 95% level, and *** at the 99% level (two – tailed test). Results for one-step estimation are obtained using DPD98 for GAUSS. Heteroscedasticity adjusted asymptotic standard errors in parentheses. m1 and m2 are tests for first-order and second-order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. 1 – RSS/TSS: 1 – residual sum of squares/ total sum of squares. $Y^{p20/40s}$: $\ln(Q^{20,40} * Y/0.2)$ unadjusted approach (regressions without outliers). $Y^{p20/40c}$: $\ln(Q^{20,40} * Y/0.2)$ adjusted approach (regressions without outliers).

Table 12: continued.

Dep. Var.	**Y^{p20s}**	**Y^{p20c}**	**Y^{p40s}**	**Y^{p40c}**
	(13)	(14)	(15)	(16)
EDT/XGS	**-0.001***	**-0.001*****	**-0.001*****	**-0.001*****
	(0.0004)	(0.0004)	(0.0004)	(0.0004)
TDS/XGS	**0.01*****	**0.01*****	**0.01*****	**0.01*****
	(0.003)	(0.003)	(0.003)	(0.003)
Secondary Education	**0.34*****	**0.30*****	**0.31*****	**0.31*****
	(0.10)	(0.11)	(0.10)	(0.10)
Government Consumption	**-0.01***	**-0.02****	**-0.01***	**-0.02****
	(0.006)	(0.007)	(0.006)	(0.007)
Ln(1+inflation)	-0.07	-0.03	-0.11	-0.07
	(0.15)	(0.17)	(0.11)	(0.12)
Civil Liberties	-0.03	-0.04	**-0.05***	**-0.06****
	(0.03)	(0.03)	(0.03)	(0.03)
Life Expectancy	**0.03****	**0.03****	**0.03****	**0.03**
	(0.01)	(0.01)	(0.01)	(0.01)
Terms of Trade	**0.005*****	**0.005*****	**0.005*****	**0.005*****
	(0.001)	(0.001)	(0.002)	(0.002)
EAP	-1.18***	-1.04***	-1.00***	0.93***
	(0.19)	(0.21)	(0.17)	(0.21)
LAC	-1.33***	-1.24***	-0.97***	-0.95***
	(0.18)	(0.20)	(0.14)	(0.17)
MNA	-0.67***	-0.79***	-0.57***	-0.62***
	(0.16)	(0.19)	(0.13)	(0.16)
SA	-1.14***	-1.09***	-1.14***	-1.09***
	(0.26)	(0.27)	(0.22)	(0.24)
SSA	-1.32***	-1.45***	-1.17***	-1.22***
	(0.38)	(0.38)	(0.35)	(0.36)
Constant	5.36***	5.53***	6.15***	6.15***
	(0.79)	(0.84)	(0.72)	(0.75)
m1	-0.98	-1.14	-1.25	-1.60
m2	0.22	-0.79	1.47	0.99
N	134	133	134	133
1 – RSS/TSS	0.76	0.78	0.81	0.81

* denotes significance at the 90% level, ** at the 95% level, and *** at the 99% level (two – tailed test). Results for one-step estimation are obtained using DPD98 for GAUSS. Heteroscedasticity adjusted asymptotic standard errors in parentheses. m1 and m2 are tests for first-order and second-order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. 1 – RSS/TSS: 1 – residual sum of squares/ total sum of squares. $Y^{p20/40s}$: $\ln(Q^{20,40} * Y/0.2)$ unadjusted approach (regressions without outliers). $Y^{p20/40c}$: $\ln(Q^{20,40} * Y/0.2)$ adjusted approach (regressions without outliers).

Table 13: First Quintile and Debt Indicators (Growth equation)

Combinations:	**EDT**	**EDT EDT^2**	**EDX**	**EDX EDX^2**	**EDT TDS**	**EDT EDT^2 TDS**	**EDX TDS**	**EDX EDX^2 TDS**
1) Distribution effect								
Specifications:								
y^{q20} = regional dummies	-	-	-	-	-	-	-	-
y^{q20o} = regional dummies	-	EDT* EDT^2*	-	-	TDS*	EDT** EDT^2* TDS**	-	-
y^{q20} = regional dummies + macro-economic variables	-	-	-	-	-	-	-	-
y^{q20o} = regional dummies + macro-economic variables	-	EDT* EDT^2*	-	-	-	EDT* EDT^2*	-	-
2) Total effect								
Specifications:								
y^{p20} = regional dummies + macro-economic variables	-	-	-	-	-	-	-	-
y^{p20o} = regional dummies + macro-economic variables	-	-	-	-	-	-	-	-

Note: Under the rubric "specifications" we denote the different basic equations which are tested with eight different combinations of the debt indicators. E.g. y^{q20} = regional dummies means that the growth rate of the first quintile share is regressed on regional dummy variables and eight different combinations (e.g. EDT/GDP alone or plus EDT/GDP and EDT/GDP^2 etc.). In the matrix we indicate significant debt indicators. * denotes signficance at 90 % level, ** at the 95 % level, and *** at the 99 % level (two-sided alternative).
y^{q20}: average annual growth rate of first quintile share. y^{q20o}: regressions without outliers for growth rate of first quintile. y^{p20}: average annual growth rate of mean income of first quintile. y^{p20o}: regressions without outliers for growth rate of mean income of first quintile. EDT: EDT/GDP. EDX: EDT/XGS. TDS: TDS/XGS.

Table 14: First Quintile and Debt Indicators (System GMM estimation)

Combinations:	**EDT**	**EDT EDT^2**	**EDX**	**EDX EDX^2**	**EDT TDS**	**EDT EDT^2 TDS**	**EDX TDS**	**EDX EDX^2 TDS**
1) Distribution effect								
Specifications:								
Y^{q20s} = regional dummies	-	EDT*** EDT^2***	-	-	TDS*	EDT^2*	TDS*	TDS*
Y^{q20c} = regional dummies	-	-	-	-	TDS*	-	-	TDS*
Y^{q20s} = regional dummies + macro-economic variables	-	EDT*** EDT^2***	EDX*	EDX*	TDS**	EDT* EDT^2**	-	-
Y^{q20c} = regional dummies + macro-economic variables	-	EDT** EDT^2***	-	-	TDS*	EDT^2***	-	-
2) Total effect								
Specifications:								
Y^{p20s} = regional dummies + macro-economic variables	-	EDT** EDT^2***	-	-	TDS**	EDT^2***	EDX* TDS***	TDS***
Y^{p20c} = regional dummies + macro-economic variables	EDT*	EDT^2***	-	-	EDT** TDS**	EDT^2**	EDX*** TDS***	EDX* TDS***

Note: Under the rubric specifications we denote the different basic equations which are tested with eight different combinations of the debt indicators. E.g. Y^{q20} = regional dummies means that the first quintile share is regressed on regional dummy variables and eight different combinations (e.g. EDT/GDP alone or plus EDT/GDP and EDT/GDP^2 etc.). In the matrix we indicate significant debt indicators. * denotes signficance at 90 % level, ** at the 95 % level, and *** at the 99 % level (two-sided alternative). Y^{q20s}: logarithm of first quintile share divided by 0.2 (unadjusted approach, regressions without outliers). Y^{q20c}: logarithm of first quintile divided by 0.2 (adjusted approach, regressions without outliers). Y^{p20s}: logarithm of mean income of 20 percent poorest (unadjusted approach, regressions without outliers). Y^{p20s}: logarithm of mean income of 20 percent poorest (adjusted approach, regressions without outliers). EDT: EDT/GDP. EDX: EDT/XGS. TDS: TDS/XGS.

Table 15: Second Quintile and Debt Indicators (System GMM estimation)

Combinations:	**EDT**	**EDT EDT^2**	**EDX**	**EDX EDX^2**	**EDT TDS**	**EDT EDT^2 TDS**	**EDX TDS**	**EDX EDX^2 TDS**
1) Distribution effect								
Specifications:								
Y^{q40s} = regional dummies	-	EDT* EDT^2**	-	-	-	-	-	-
Y^{q40c} = regional dummies	-	-	-	-	-	-	-	EDX** EDX^2**
Y^{q40s} = regional dummies + macro-economic variables	-	EDT* EDT^2***	-	-	-	EDT^2*	-	-
Y^{q40c} = regional dummies + macro-economic variables	-	EDT^2**	-	-	-	EDT^2*	-	EDX*
2) Total effect								
Specifications:								
Y^{p40s} = regional dummies + macro-economic variables	-	EDT^2**	-	-	EDT* TDS**	-	EDX*** TDS***	EDX* TDS***
Y^{p40c} = regional dummies + macro-economic variables	EDT*	EDT^2*	-	-	EDT** TDS*	-	EDX*** TDS***	EDX*** TDS***

Note: Under the rubric specifications we denote the different basic equations which are tested with nine different combinations of the debt indicators. E.g. Y^{q20} = regional dummies means that the first quintile share is regressed on regional dummy variables and eight different combinations (e.g. EDT/GDP alone or plus EDT/GDP and EDT/GDP^2 etc.). In the matrix we indicate significant debt indicators. * denotes signficance at 90 % level, ** at the 95 % level, and *** at the 99 % level (two-sided alternative). Y^{q40s}: logarithm of second quintile share divided by 0.2 (unadjusted approach, regressions without outliers). Y^{q40c}: logarithm of second quintile divided by 0.2 (adjusted approach, regressions without outliers). Y^{p40s}: logarithm of mean income of 20 to 40 percent poorest (unadjusted approach, regressions without outliers). Y^{p40s}: logarithm of mean income of 20 to 40 percent poorest (adjusted approach, regressions without outliers). EDT: EDT/GDP. EDX: EDT/XGS. TDS: TDS/XGS.