Macroeconomic Policy for Pro-Poor Growth

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Macroeconomic Policy for Pro-Poor Growth

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Table of Contents

General Introduction 1

Part I: External Debt and Pro-Poor Growth 6

1. Introduction 8

2. External debt and pro-poor growth 8

2.1 Literature review 8
2.2 Effects of external debt on pro-poor growth 13

3. Data sources and descriptive statistics 17

3.1 Data on income inequality measures 17
3.2 Debt indicators and additional macroeconomic variables 19

4. Pro-poor growth 22

5. Econometric specifications and estimations 23

5.1 Econometric specifications 23
5.1.1 System GMM estimation: level and first differenced equation 24
5.1.2 Growth equation: pooled OLS, fixed effects or random effects estimation 26

5.2 Econometric issues 27

5.3 Estimation strategy and results 30
5.3.1 Debt indicators and pro-poor growth: distribution effect 30
5.3.2 Debt indicators and pro-poor growth: total effect 36

6. Conclusion 38

References 41

Tables 46

Part II: Exchange Rate Regimes and Pro-Poor Growth 71

1. Introduction 73

2. Exchange rate regimes and pro-poor growth 74

2.1 Literature review 74
2.2 Effects of exchange rate regimes and pro-poor growth 77

3. Data sources and descriptive statistics 80

3.1 Data on income inequality measures 80
3.2 Classifications of exchange rate regimes and descriptive statistics 83
3.3 Data on additional macroeconomic variables 87

4. Pro-poor growth 88

5. Econometric specifications and estimations 90

5.1 Econometric specifications 90
5.1.1 System GMM estimation: level and first differenced equation 90
5.1.2 Growth equation: pooled OLS, fixed effects or random effects estimation 92

5.2 Econometric issues 94

5.3 Estimation strategy and results 96
5.3.1 Exchange rate regimes and pro-poor growth: distribution effect 97
5.3.2 Exchange rate regimes, pro-poor growth, currency crises and capital controls: distribution effect 101
5.3.3 Exchange rate regimes, pro-poor growth, inflation and output volatility: distribution effect 102
5.3.4 Exchange rate regimes, pro-poor growth, and additional macroeconomic variables: distribution effect 103
5.3.5 Exchange rate regimes, pro-poor growth, and additional macroeconomic variables: total effect 105

6. Conclusion 108

References 111

Tables 117

Part III: Trade Policy and Pro-Poor Growth 152

1. Introduction 153

2. Trade Policy and Pro-Poor Growth 155

2.1 Channels of trade liberalization on poverty 155
2.2 Empirical evidence 159

3. Data 161

3.1 Indicators of trade policy and openness 161
3.2 Data on income inequality measures and additional macroeconomic variables 163

4. Pro-Poor Growth 167

5. Econometric Specifications and Estimation 169

5.1 Econometric Specifications 169
5.1.1 System GMM estimation: level and first differenced equation 169
5.1.2 Growth equation: pooled OLS, fixed effects or random effects estimation 171

5.2 Econometric issues 172

5.3 Estimation strategy and results 175
5.3.1 Openness indicators and pro-poor growth: distribution effect 175
5.3.2 Openness indicators, interaction term and pro-poor growth: distribution effect 177
5.3.3 Openness indicators and pro-poor growth: total effect 180
5.3.4 Openness indicators, interaction term and pro-poor growth: total effect 183

6. Conclusion 184

References 188

Tables 192

General Conclusion 229

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General Introduction

The search for poverty-reducing growth strategies is a perennial question in economics. While economic growth is supposed to be one of the most critical determinant of poverty reduction, growth-enhancing development strategies differ considerably with respect to its poverty effects. Thus growth determinants should be examined by its poverty-reducing quality. The importance of a pro-poor growth focus, however, is in stark contrast to its weak integration into macroeconomic theory. Most models simply abstract from poverty issues of growth determinants, looking only on aggregate effects. Since empirical evidence shows a remarkable heterogeneity of poverty effects in the growth process of different countries, omitting poverty aspects in the discussion of growth determinants is a rather euphemistic assumption.

Historically, the idea of pro-poor growth is preceded by discussions on broad-based growth at the beginning of the nineties (World Development Report 1990), even if the idea of poverty-focused growth dates back to the seventies (Chenery/Ahluwalia/Bell/Duloy/Jolly 1974). In general, the term pro-poor refers to the idea that economic growth should be good for the poor in terms of income, disposable resources or capabilities. However, there is considerable ongoing discussion on an appropriate definition and measurement of pro-poor growth (Kakwani/Pernia 2000, Anderson/White 2001, Bourguignon 2001, Eastwood/Lipton 2001, Chen/Ravallion 2001, Kakwani/Son/Khandker 2003, Klasen 2003, Ravallion 2003). While none of the proposed measures has so far set an international accepted standard, most pro-poor concepts are income-based. As poverty is a complex and multidimensional phenomenon (health, education, gender equity), income-based definitions would restrict the focus of poverty. However, income-based measures of poverty can be justified due to mutual causality between income poverty and most non-income measures of well-being, even if these linkages are not at all perfect (Klasen 2003).

Pro-poor growth based on absolute poverty lines could be defined as a high (negative) growth elasticity of a specific poverty measure with respect to per capita income or consumption expenditure (Chen/Ravallion 1997, Bourguignon 2001, Ravallion 2001, Datt/Ravallion 2002) or as a pro-poor growth index greater than one (Kakwani/Pernia 2000, Christiaensen/Demery/Paternostro 2002). To compare pro-poor growth across countries, an international standard poverty line would be necessary. International comparable poverty lines, however, are only limited available and severely criticized by their construction (Pogge/Reddy 2002). In addition, the estimated poverty reduction would be sensitive to the value of the absolute poverty line (Bourguignon 2001, Ravallion 2001, Chen/Ravallion 1997).

Another part of the literature measures poverty as the share of income of the poorest 20 per cent. While the incidence of poverty is fixed in this approach, the variation of the share of income of the poorest 20 percent has to be explained. Pro-poor growth can be defined here as an elasticity greater than one of the mean income of the poor with respect to overall mean income (Timmer 1997, Gallup/Radelet/Warner 1999, Gugerty/Timmer 1999, Dollar/Kraay 2001, Eastwood/Lipton 2001, Anderson/White 2001, Ghura/Leite/Tsangarides 2002).[1] Restricting pro-poor growth to a pure distribution effect, however, would hide the impact of an equiproportionate growth effect on poverty reduction (Ravallion 2003). Thus in our research we estimate both the distribution effect and the total effect, i.e. the distribution and growth effect, on the 20 and 20 to 40 percent poorest. Choosing this approach, we are additionally able to capture potential trade-offs between poverty effects through overall economic growth and via distribution effects.

In our research we analyze three possible determinants of pro-poor growth: external indebtedness, exchange rate regimes, and trade policy. At international economic summits, NGOs and the anti-globalization movement call for total debt relief initiatives. Unsustainable external debt levels are supposed to be responsible for major setbacks in development activities and continuing poverty traps. Theoretical models, however, are oddly silent on possible transmission mechanisms between high external debt and income poverty. In addition, the effect of high external indebtedness on poverty reduction seems not to be well explored empirically.

Second, and related, developing and transitional countries are often hit by devastating currency crises. While the exchange rate regime is not the only reason for financial crises, there is considerable ongoing discussion on the choice of an optimal exchange rate regime. Theoretical and empirical literature, however, do not cover the effect of different exchange rate regimes on pro-poor growth. This lack of interest may be especially problematic due to the high vulnerability of the poor to external shocks and currency crises. However, the issue of an optimal exchange rate regime for pro-poor growth is also important if we abstract from the financial crises perspective.

Finally, trade liberalization and integration into international goods markets is assumed to be one critical determinant to foster economic growth and reduce poverty. While the effect of trade policy on absolute poverty is assumed to be mainly driven by the impact of openness on economic growth, empirical evidence on the openness-growth nexus is ambiguous and has been severely criticized. In addition, recent cross-country studies provide only mixed results on the distribution effect of trade liberalization.

To reveal poverty effects of external indebtedness, exchange rate regimes and trade liberalization, the thesis is splitted into three parts. The basic structure of the three chapters, however, is identical with respect to the econometric methodology and the underlying data set

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[1] One may also require pro-poor growth to be in absolute rather than proportionate terms, i.e. absolute per capita income gains to the poor should exceed absolute per capita income gains. A simple example may explain the difference. Equiproportionate growth means that a 1 percent increase in growth increases the income of the poorest 20 percent (and all others) by 1 percent. Given two persons with 100 $ and 100 000 $ income, equiproportionate growth by 1 percent would be 101 $ and 101 000 $, respectively. If one requires equal growth in absolute terms, incomes of both persons should increase by the same amount, e.g. person 1: 100 $ + 100 $ and person 2: 100 000$ + 100 $. Pro-poor

on poverty measures. Data on the first and second quintile share are drawn from four sources: the UNU/WIDER-UNDP World Income Inequality Database, Version 1.0, 12 September 2000, the Deininger and Squire (1996, 1998a) database, the Global Poverty Monitoring described in Chen and Ravallion (1997, 2000), and the World Development Indicators 2002 Table 2.8. Due to limited availability and incomparability problems of income inequality data we select an irregular and unbalanced panel of time-series cross-country observations, resulting in a basic sample of 371 observations with 81 countries, 231 observations for developing countries, 27 for transitional and 113 for industrial countries in the period 1950 to 1999. Since data for indicators of external debt, exchange rate regimes and trade openness have to be availabe, the data sets vary considerably between the three parts. Concerning the econometric methodology, we apply in all chapters a growth equation estimating pooled OLS, random or fixed effects models and a system GMM estimator.

In part I we analyze the impact of external debt on the poorest 20 and 20 to 40 percent. We test the linear and non-linear distribution and total effects of the external debt to GDP ratio and the external debt to exports ratio. In addition, equations are extended by the debt services to exports ratio as additional regressor to distinguish budgetary process' (crowding-out hypothesis) and external account effects from the effects of the accumulated debt stock. Finally, we apply different robustness checks to confirm our findings, i.e. we estimate results without outliers, with mean income and with adjusted and unadjusted inequality income measures in the system GMM estimations.

In part II we explore the relationship between exchange rate regimes and pro-poor growth. The paper is related to the debate on unsustainable intermediate exchange rate regimes ('hollowing-out' hypothesis) in developing countries. To answer the question of an optimal exchange regime for pro-poor growth, we use two recently proposed de facto exchange rate arrangement classifications: Levy-Yeyati/Sturzenegger (2002) and Reinhart/Rogoff (2003). We estimate poverty effects of different exchange rate regimes for all countries and, separately, for developing and industrial countries due to considerable differences in access to international capital markets and soundness of domestic financial systems. Again, we execute several robustness checks to confirm our results.

In Part III we look at the effect of trade openness on pro-poor growth. To capture this issue, we test six adjusted trade sector indicators (agricultural raw materials exports and imports, food exports and imports, manufactures exports and imports) and two tariff indicators (export duties and import duties). Poverty effects of trade policy are estimated in regressions for all countries, and, separately, for developing/transitional countries and industrial countries due to considerable differences in economic structure. In addition, poverty effects of trade openness

growth would be reached if the poor person earns more than 100 $. Even if this approach seems justified in terms of equality, the obvious strong redistributive aspect lessens its reasonable application in empirical research.

are estimated with respect to the level of the countries' development. Finally, empirical findings are examined in several robustness tests.

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Part I

External Debt and Pro-Poor Growth

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.[2] 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.[3]

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).[4]

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.[5] 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).[6]

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[2] For literature and conceptual shortcomings of the debt dynamics approach, see Hjertholm (2000).

[3] For a related discussion of sustainability of private sector foreign indebtedness, see Pitchford (1995).

[4] 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).

[5] 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).

[6] 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.[7] Empirical evidence of this effect, however, remains uncertain (Morriset 1990, Desphande 1997, Cohen 1993).[8] 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).

[7] 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)

[8] 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).[9] 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.[10] At low levels debt stimulates growth, but beyond a certain threshold, accumulated debt impacts negatively on growth.[11] 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.[12] 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.[13] 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

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[9] 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).

[10] 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)

[11] The growth maximizing debt to GDP ratio is calculated at 97 percent (Elbadawi, Ndulu, Ndung'u 1997)

[12] The probability of rescheduling depending positively on the debt-to-GDP ratio is used as a proxy for the risk of debt crisis.

[13] 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.[14] 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.[15]

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

[14] 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).
[15] 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.[16] 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.[17] 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.[18] 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).

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[16] The need to mobilize additional domestic resources due to higher debt service payments is also called the internal transfer problem (Meier 1995).

[17] In addition, access to international credit markets may be impossible, if high external debt is perceived as an insolvency problem by creditors.

[18] 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.[19] 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).[20]

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).[21] 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.[22] 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

[19] Curtailing government expenditures may also lead to increased poverty via cuts in real wages and layoffs of employees in the public sector (Agénor 2002).
[20] So cuts in social spending may nevertheless lead to reduced poverty, if social expenditures are better targeted to the poor (Agénor 2002).
[21] 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).
[22] 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.[23] 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.[24] 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).

[23] 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).[25] 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.[26] 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

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[24] 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).

[25] The probability of rescheduling depending positively on the debt-to-GDP ratio is used as a proxy for the risk of debt crisis.

[26] 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).[27] 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)[28] 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

[27] see for further details UNU/WIDER–UNDP World Income Inequality Database, Version 1.0, 12 September 2000, User guide; Atkinson/Brandolini (2001).
[28] 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.[29] 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.[30] In addition, the income concept and income recipients (reference unit) have to be identical for each spell.[31]

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.[32] 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.[33] 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.[34] 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.[35] The adjusted

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[29] *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).

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

[31] 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.

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

[33] 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.

[34] 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.

[35] 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).[36] 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.[37]

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).[38]

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.[39] 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 pro-

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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.

[36] 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).

[37] 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).

[38] 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.

[39] 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.

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.[40] 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.[41] 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.[42] 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.[43] 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.[44] 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.[45] Furthermore, we use terms-of-trade to capture external environment effects with expected positive impact (Barro/Salah-i-Martin 1995,

[40] 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).
[41] 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).
[42]. In developing countries social expenditures often benefit more the middle class and the rich (Dollar, Kraay 2001, Davoodi, Tiongson, Asawanuchit 2003).
[43] 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.
[44] 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.
[45] 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).[46] 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.[47] 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).

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[46] 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.

[47] 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 [48]:

$$\partial Y^{p20/40}_{it} / \partial D_{jit} = \partial \ln(Y_{it})/\partial D_{jit} + [\partial Y^{q20/40}_{it}/\partial \ln(Y_{it}) * \partial \ln(Y_{it})/\partial D_{jit} + \partial Y^{q20/40}_{it} / \partial D_{jit}]$$
$$= \rho_j + [(\alpha_1 - 1) * \rho_j + \gamma_j] \quad (1)$$

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.[49]

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:

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

[48] 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).

[49] 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 $\partial Y^{p20/40}_{it} / \partial D_{jit} > 0$:

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

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.[50]

[50] 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 and 20 to 40 per cent poorest on the mean income, debt indicators, and variants of additional variables.

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

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
$\mu_{it} + \varepsilon_{it}$:	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 [51]:

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

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

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

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

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).[52] 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.[53] 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 γ_j * 100 percent.

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[52] 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.

[53] 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: [54]

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

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.

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

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:

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

[54] 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 $100/z^* \ [\ln(Q^{20/40}_{i,t+z}) - \ln(Q^{20/40}_{it})]$ [55]

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.[56]

Finally, we estimate also the total effect in using variants of the following equation[57]:

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

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.[58] 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 we can not reject the null hypothesis in both tests, pooled OLS is the appropriate method.

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

[56] 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}.

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

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

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).[59] 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).[60] 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.[61]

Fourth, in estimating level and first difference equations (5), (6) or the growth equation (9) simultaneity might be an issue.[62] 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.[63] 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.[64]

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[59] 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).

[60] 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).

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

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

[63] 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.

[64] 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.[65] 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.[66] 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).[67] 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 ε_{it+z} - ε_{it} of equation (6) are reported. If disturbances ε_{it} are not serially correlated, first order serial correlation in first differenced residuals ε_{it+z} - ε_{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).

[65] Biased estimates might also be possible due to joint causation (Timmer 1997, Eastwood/Lipton 2001).
[66] 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).
[67] 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).[68]

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.[69]

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

[68] 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.[70] 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.[71] 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).[72]

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).[73] 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.[74] 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.[75] 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.[76] Adding TDS/XGS, the threshold would increase to around 79 percent for EDT/GDP (table 7 equation 8).[77] Thus the effect of EDT/GDP

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[69] We indentify outliers from graphical analysis and descriptive statistics without a strict rule (table 4).
[70] Therefore we present only results for the first quintile share in table 13.
[71] In our sample, however, only countries of Eastern Europe are part of the ECA dummy variable (table 1).
[72] 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.
[73] While this result is also confirmed for regressions for the second quintile, we do not present findings due to insignificant debt indicators.
[74] As for the reasons for widening inequality in transitional countries, see Grün/Klasen (2001).
[75] 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).
[76] 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).
[77] 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.[78]

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).[79] 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.[80] 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).[81] 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.[82]

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

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[78] 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.

[79] 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.

[80] 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.

[81] 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.[83]

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

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[82] 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).
[83] 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).[84] 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).[85] 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.[86]

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).[87] 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).[88]

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[84] 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.

[85] 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 %).

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

[87] 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).

[88] 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.[89] 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).[90]

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).[91] 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

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.

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

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

10). Findings on the Laffer curve effect in the system GMM estimation have to be interpreted 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.[92] None of the debt indicators, however, are significant in regressions with or without outliers for the first and second quintile share (table 13).[93] 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.[94] 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

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[91] However, coefficients for EDT/GDP^2 are significantly negative, suggesting a Laffer curve effect (table 10 equations 6 to 8).
[92] 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
[93] 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).
[94] In addition to the outliers mentioned above, we identify one outlier for terms-of-trade (Nigeria 1985: 262 %).

equations 1 to 4). An increase of EDT/GDP at low level would raise the mean income of the 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.[95] 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).[96] 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.[97] 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).[98] 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

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[95] 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).
[96] The coefficient of EDT/GDP for the mean income of the first quintile in the unadjusted approach, however, is insignificant (table 13 equation 9).
[97] 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).

years and the minimum and maximum values in our sample are 0.10 and 3.21 years, 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

[98] The variable government consumption may be seen as a proxy for nonproductive public expenditures (Barro/Sala-i-

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.[99] 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

Martin 1995).

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

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.

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Table 1: Coverage of the data set

Region	Country	Observation dates	Source	No. of spells
East Asia Pacific (EAP)	China	1982, 85, 88, 91	UNU	3
		1994, 97	GPM	1
	Indonesia	1976, 80, 84, 87, 90	UNU	4
		1993, 96, *99*	GPM, *WDI*	2
	Korea	1970, 76, 80, 85, 88	UNU	4
	Malaysia	1970, 76, 79, 84	UNU	3
		1987, 92, 95	GPM	2
	Philippines	1971, 85, 88, 91	UNU	3
		1994, 97	UNU	1
	Thailand	1975, 81, 86, 90	UNU	3
		1992, 98	UNU	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	UNU	2
		1989, 93	GPM	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	UNU	3
		1988, 93, 96	GPM	2
	Chile	1989, 92	UNU	1
	Colombia	1971, 78, 88	UNU	2
		1988, 91, 95	UNU	2
	Costa Rica	1971, 77	UNU	1
		1981, 86, 89	UNU	2
		1993, 96	GPM	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	UNU	1
		1991, 96	UNU	1
	Mexico	1984, 89	UNU	1
		1989, 95, *98*	GPM, *WDI*	2

Table 1: continued

	Panama	1979, 89	UNU	1
		1991, 95	GPM	1
	Paraguay	1995, *98*	GPM, *WDI*	1
	Peru	1986, 94	UNU	1
	Trinidad & Tobago	1971, 76, 81	UNU	2
		1988, 92	GPM	1
	Venezuela	1971, 81, 87	UNU	2
		1987, 93, 96	GPM	2
Middle East and North Africa (MNA)	Algeria	1988, 95	GPM	1
	Egypt	1991, 95	UNU	1
	Jordan	1980, 87, 91	UNU	2
		1991, 97	UNU	1
	Morocco	1984, 91	UNU	1
		1991, 99	UNU	1
	Tunisia	1985, 90, *95*	GPM, *WDI*	2
	Turkey	1973, 87	UNU	1
		1987, 94	GPM	1
	Yemen	1992, *98*	GPM, *WDI*	1
South Asia (SA)	Bangladesh	1973, 77, 81, 86	UNU	3
		1988, 91, 95	GPM	2
	India	1972, 77, 83, 86, 89, 92	UNU	5
		1994, 97	UNU	1
	Pakistan	1971, 79, 85, 88	UNU	3
		1991, 96	UNU	1
	Sri Lanka	1973, 79, 87	UNU	2
		1990, 95	UNU	1
Sub-Saharan Africa (SSA)	Côte d'Ivoire	1985, 88	UNU	1
		1988, 95	UNU	1
	Ethiopia	1981, 95	GPM	1
	Gabon	1975, 77	UNU	1
	Ghana	1987, 92	GPM	1
		1992, 97	UNU	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[100]
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.

[100] 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.	$\mathbf{Y^{q20s}}$	$\mathbf{Y^{q20c}}$	$\mathbf{Y^{q40s}}$	$\mathbf{Y^{q40c}}$	$\mathbf{Y^{q20s}}$	$\mathbf{Y^{q20c}}$
	(1)	(2)	(3)	(4)	(5)	(6)
EDT/GDP	**0.003*****	0.001	**0.0015***	0.0005	0.002	0.0006
	(0.001)	(0.001)	(0.0008)	(0.0008)	(0.001)	(0.001)
EDT/GDP^2	**-0.00001*****	-0.000007	**-0.000006****	-0.000003	**-0.00001***	-0.000005
	(0.000004)	(0.000004)	(0.000003)	(0.000003)	(0.000005)	(0.000005)
TDS/XGS					0.003	0.003
					(0.002)	(0.002)
EAP	-0.39***	-0.30*	-0.29***	-0.26***	-0.38***	-0.30**
	(0.14)	(0.16)	(0.09)	(0.10)	(0.13)	(0.15)
LAC	-0.92***	-0.80***	-0.58***	-0.58***	-0.92***	-0.82***
	(0.13)	(0.15)	(0.07)	(0.09)	(0.12)	(0.15)
MNA	-0.35***	-0.39**	-0.27***	-0.31***	-0.29**	-0.38**
	(0.13)	(0.16)	(0.07)	(0.09)	(0.13)	(0.16)
SA	-0.06	-0.04	-0.10	-0.09	-0.06	-0.05
	(0.12)	(0.14)	(0.07)	(0.08)	(0.12)	(0.14)
SSA	-0.52***	-0.65***	-0.38***	-0.44***	-0.47***	-0.62***
	(0.14)	(0.18)	(0.09)	(0.11)	(0.13)	(0.18)
Constant	-0.94***	-0.95***	-0.44***	-0.50***	-0.98***	-0.99***
	(0.11)	(0.14)	(0.06)	(0.08)	(0.11)	(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	-0.001	-0.0006	**-0.001****
	(0.0008)	(0.0009)	(0.0005)	(0.0005)
EDT/XGS^2	0.000001	0.000002	0.000001	**0.000002****
	(0.000001)	(0.000002)	(0.000001)	(0.000001)
TDX/XGS	**0.004***	**0.005***	0.002	0.003
	(0.002)	(0.003)	(0.002)	(0.002)
EAP	-0.42***	-0.35***	-0.30***	-0.28***
	(0.11)	(0.13)	(0.07)	(0.08)
LAC	-0.94***	-0.85***	-0.57***	-0.58***
	(0.11)	(0.13)	(0.07)	(0.08)
MNA	-0.31***	-0.40***	-0.24***	-0.30***
	(0.12)	(0.15)	(0.07)	(0.08)
SA	-0.10	-0.07	-0.10	-0.07
	(0.11)	(0.13)	(0.07)	(0.08)
SSA	-0.54***	-0.75***	-0.34***	-0.45***
	(0.13)	(0.18)	(0.09)	(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.	$\mathbf{y^{q20}}$ **ols**	$\mathbf{y^{q20o}}$ **re**	$\mathbf{y^{q20}}$ **ols**	$\mathbf{y^{q20o}}$ **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	-0.24	0.56	-0.05	0.97
Education	(1.35)	(0.98)	(1.42)	(1.19)
Budget	**0.38*****	**0.28****	**0.39*****	**0.26***
Surplus	(0.12)	(0.14)	(0.12)	(0.15)
Adjusted Gini	**0.34****	**0.18***	**0.34****	**0.23****
coefficient	(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	-0.0004	-0.001	-0.0004	-0.0008
	(0.001)	(0.001)	(0.0008)	(0.0008)	(0.0005)	(0.0005)
EDT/GDP^2	**-0.000009***	**-0.00001***				
	(0.000006)	(0.000006)				
TDS/XGS	0.001	0.0002	**0.005****	**0.004***	0.002	0.001
	(0.01)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Secondary Education	0.05	0.05	0.08	0.08	0.06	0.06
	(0.04)	(0.05)	(0.05)	(0.06)	(0.04)	(0.05)
Government Consumption	**0.005***	0.002	0.005	0.001	**0.005***	0.002
	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.003)
Ln(1+inflation)	-0.09	-0.03	-0.16	-0.08	-0.12	-0.05
	(0.07)	(0.07)	(0.13)	(0.13)	(0.07)	(0.07)
EAP	-0.37***	-0.35***	-0.57***	-0.50***	-0.38***	-0.36***
	(0.06)	(0.06)	(0.09)	(0.07)	(0.06)	(0.06)
LAC	-0.62***	-0.63***	-1.05***	-0.98***	-0.62***	-0.64***
	(0.05)	(0.05)	(0.06)	(0.06)	(0.05)	(0.05)
MNA	-0.28***	-0.37***	-0.40***	-0.54***	-0.27***	-0.35***
	(0.07)	(0.07)	(0.13)	(0.15)	(0.07)	(0.08)
SA	-0.17***	-0.16***	-0.23***	-0.23***	-0.19***	-0.17***
	(0.06)	(0.06)	(0.08)	(0.06)	(0.05)	(0.05)
SSA	-0.33***	-0.40***	-0.53***	-0.67***	-0.24***	-0.41***
	(0.001)	(0.07)	(0.09)	(0.10)	(0.06)	(0.07)
Constant	-0.50***	-0.54***	-0.91***	-0.84***	-0.46***	-0.49***
	(0.08)	(0.09)	(0.11)	(0.11)	(0.07)	(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	-0.12	-0.05	-0.15
	(0.04)	(0.08)	(0.04)	(0.10)
EDT/GDP^2	0.0002	0.0007	0.0002	0.0009
	(0.0002)	(0.0006)	(0.0002)	(0.0007)
TDS/XGS			-0.00003	0.04
			(0.05)	(0.07)
Secondary Education	1.13	1.76	1.53	2.50
	(1.73)	(1.67)	(1.81)	(1.82)
Budget Surplus	**0.44*** **	**0.33***	**0.46*** **	**0.33***
	(0.15)	(0.17)	(0.16)	(0.18)
Adjusted Gini Coefficient	**0.33***	0.21	**0.33***	0.21
	(0.17)	(0.20)	(0.17)	(0.20)
ln(1+inflation)	**1.75***	0.56	**1.80***	-1.49
	(0.90)	(4.26)	(0.98)	(6.14)
M2/GDP	0.01	0.003	0.02	0.01
	(0.04)	(0.04)	(0.05)	(0.05)
EAP	4.66	6.45	4.39	6.25
	(3.64)	(4.27)	(3.85)	(4.36)
LAC	-2.26	0.42	-2.07	0.70
	(5.33)	(6.37)	(5.55)	(6.48)
MNA	1.82	4.15	1.73	4.29
	(4.30)	(5.06)	(4.37)	(5.03)
SA	6.56***	6.90**	7.21***	7.53**
	(2.39)	(2.81)	(2.51)	(2.94)
SSA	6.97*	7.34*	7.24*	7.62*
	(4.10)	(4.08)	(4.21)	(4.13)
Constant	-13.39***	-8.66*	-14.10***	-9.41*
	(4.27)	(5.17)	(5.00)	(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	**0.34*****	**0.32*****	**0.31*****	**0.31*****	**0.37*****	**0.34*****
Education	(0.09)	(0.11)	(0.10)	(0.10)	(0.09)	(0.10)
Government	**-0.01***	**-0.01****	**-0.01***	**-0.01****	**-0.01****	**-0.02*****
Consumption	(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	**0.03****	**0.03****	**0.03****	**0.03****	**0.03****	**0.03****
expectancy	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Terms of	**0.005*****	**0.005*****	**0.005*****	**0.005*****	**0.005*****	**0.005*****
Trade	(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*** (0.0004)	**-0.001***** (0.0004)	**-0.001***** (0.0004)	**-0.001***** (0.0004)
TDS/XGS	**0.01***** (0.003)	**0.01***** (0.003)	**0.01***** (0.003)	**0.01***** (0.003)
Secondary Education	**0.34***** (0.10)	**0.30***** (0.11)	**0.31***** (0.10)	**0.31***** (0.10)
Government Consumption	**-0.01*** (0.006)	**-0.02**** (0.007)	**-0.01*** (0.006)	**-0.02**** (0.007)
Ln(1+inflation)	-0.07 (0.15)	-0.03 (0.17)	-0.11 (0.11)	-0.07 (0.12)
Civil Liberties	-0.03 (0.03)	-0.04 (0.03)	**-0.05*** (0.03)	**-0.06**** (0.03)
Life Expectancy	**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***** (0.001)	**0.005***** (0.002)	**0.005***** (0.002)
EAP	-1.18*** (0.19)	-1.04*** (0.21)	-1.00*** (0.17)	0.93*** (0.21)
LAC	-1.33*** (0.18)	-1.24*** (0.20)	-0.97*** (0.14)	-0.95*** (0.17)
MNA	-0.67*** (0.16)	-0.79*** (0.19)	-0.57*** (0.13)	-0.62*** (0.16)
SA	-1.14*** (0.26)	-1.09*** (0.27)	-1.14*** (0.22)	-1.09*** (0.24)
SSA	-1.32*** (0.38)	-1.45*** (0.38)	-1.17*** (0.35)	-1.22*** (0.36)
Constant	5.36*** (0.79)	5.53*** (0.84)	6.15*** (0.72)	6.15*** (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)

1) Distribution effect

Specifications:	EDT	EDT EDT^2	EDX	EDX EDX^2	EDT TDS	EDT EDT^2 TDS	EDX TDS	EDX EDX^2 TDS
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:	EDT	EDT EDT^2	EDX	EDX EDX^2	EDT TDS	EDT EDT^2 TDS	EDX TDS	EDX EDX^2 TDS
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.

Part II

Exchange Rate Regimes and Pro-Poor Growth

Abstract

This paper extends the ongoing discussion on optimal exchange rate regimes to the issue of pro-poor growth. To analyze empirically the poverty effects of exchange rate regimes, we estimate the distribution effects of different exchange rate arrangements on the poorest 20 and 20 to 40 percent. In addition, we test the total effect, i.e. the distribution and growth effect, to capture potential trade-offs between poverty effects through overall economic growth and distribution.

To analyze this question, we collect an irregular and unbalanced panel of time-series cross-country data on the first and second quintile share from 76 countries and use two recently proposed de facto exchange rate regime classifications, Levy-Yeyati/Sturzenegger (2002) and Reinhart/Rogoff (2003). To cover econometric issues, cross-country variation and dynamic aspects of within-country changes of the income of the poor, we apply two econometric specifications, a growth equation and a system GMM estimation. We estimate the poverty effects of different exchange rate regimes for all countries and, separately, developing and industrial countries due to considerable differences in economic structure, access to international capital markets and soundness of domestic financial systems.

Empirical findings vary considerably with respect to three aspects. First, findings for the Levy-Yeyati/Sturzenegger (2002) and Reinhart/Rogoff (2003) classification differ significantly with respect to similar exchange rate categories. Thus the classification process of exchange rate regimes affects critically the policy conclusions. Second, statistically significant exchange rate regimes in the Reinhart/Rogoff (2003) classification impact positively on the poor in developing countries, but negatively on the poor in industrial countries. Thus exchange rate regimes affect very differently the poor in developing and industrial countries in the Reinhart/Rogoff (2003) classification. Third, statistical significance of exchange rate regimes in the system GMM approach differs considerably for adjusted and unadjusted income inequality measures.

Due to these varying and only weakly robust empirical findings, a concise policy recommendation with respect to poverty-reducing exchange rate regimes is difficult. Nevertheless, positive effects of intermediate regimes of the Reinhart/Rogoff (2003) classification in developing countries should be emphasized, showing at least a tendency to not negative and possible positive effects of intermediate regimes on the poorest 40 percent in developing countries.

1. Introduction

In the 1990s developing and transitional countries were hit by devastating financial crises and speculative attacks resulting in an ongoing debate on the optimal exchange rate regime. In recent discussions, the ‘hollowing out’ hypothesis, i.e. intermediate regimes between hard pegs and free floating are unsustainable, gained prominent proponents (Fisher 2001). Critics, however, emphasized the dependence of optimal exchange rate regimes on country-specific circumstances justifying also intermediate regimes (Frankel 1999, Mussa/Masson/Swoboda /Jadresic/Mauro/Berg 2000). In addition, empirical evidence seems not to confirm the bipolar view for all developing countries (Calvo/Reinhart 2000, Husain/Mody/Rogoff 2004). Thus different exchange rate arrangements may be appropriate in countries with different structural characteristics (Isard 1995).

While the debate on optimal exchange rate regimes has often changed its focus since the early 60s, the theoretical and empirical literature is peculiarly silent on the impact of exchange rate arrangements on pro-poor growth or poverty reduction (Isard 1995). This lack of integration of poverty effects in macroeconomic modelling on exchange rate regimes is especially problematic due to the high vulnerability of the poor to external shocks and currency crises. Even without a financial crisis perspective, the question of an optimal exchange rate regime for pro-poor growth would be an important one (Lustig 2000). Thus, to analyze empirically poverty effects of different exchange rate arrangements, we estimate both the distribution and the total effect, i.e. the distribution and growth effect, of different exchange rate regimes on the poorest 20 and 20 to 40 percent in a growth equation and a system GMM estimation.

To uncover the effects of different exchange rate regimes on the income of the poor we have a short look at the literature in section 2. As the poverty issue is not very well integrated in macroeconomic models, the possible effects are given more implicitly in economic theory. In section 3 we present the data coverage and data sources used in the estimations, which encompasses a discussion of the discrepancies between the official statement of exchange rate regimes and its factual application, the de jure/de facto issue. In addition, descriptive statistics and some stylized facts of exchange rate regimes are presented. While in section 4 we discuss our concept of pro-poor growth, we explain our econometric approach in section 5 to estimate the possible impact of different exchange rate arrangements on pro-poor growth followed by an interpretation of the results. Finally, we conclude in section 6 with major findings.

2. Exchange rate regimes and pro-poor growth

2.1 Literature Review

The relationship between exchange rate regimes and pro-poor growth is only rarely discussed in the literature (Lustig 2000).[101] Thus we look at the impact of exchange rate regimes on overall economic growth, the discussion of real exchange rate misalignment and contractionary devaluation for possible different effects of exchange rate arrangements on the income of the poor.

Historically, discussions on optimal exchange rate arrangements evolved from debates on the stabilizing effect of flexible exchange rates under international capital mobility, types of structural characteristics (e.g. exposure to shocks, financial development) decisive for the choice of an appropriate exchange rate regime to issues of credibility of monetary policy and nominal anchors to cover inflation bias, optimal currency area hypothesis, endogeneity of structural characteristics and speculative attacks. Resulting from these discussions, different exchange rate regimes may be optimal for countries with different structural characteristics, types of exogenous shocks, and different macroeconomic and political environments which may change over time (Isard 1995, Frankel 1999).[102] This view is emphasized especially for developing and transitional countries caused by their heterogeneous economical situation (Mussa/Masson/Swoboda/Jadresic/Mauro/Berg 2000). While the two corner solution is recently proposed for developing countries (Krueger 1999, Fisher 2001), critics opt for adjustable pegs to balance the conflict of macroeconomic stability and economic growth (Hausknecht 2001).

In line with the debate on the optimal exchange rate system, the impact of different exchange rate arrangements on economic growth is ambiguously discussed in economic theory. Refering to the growth accounting approach, exchange rate regimes could impact on economic growth through the rate of factor accumulation (investment, labor) or total factor productivity. Fixed exchange rate arrangements may promote investment and trade by reduced price uncertainties and relative price volatility, lowered real interest rates and decreased real exchange rate volatility which in turn may increase growth.[103] In addition, fixed exchange rate regimes may foster growth by lower inflation and less vulnerability to speculative exchange rate fluctuations if the peg is credible (Levy-Yeyati/Sturzenegger 2001, Levy-Yeyati/Sturzenegger 2002a, Bailliu/Lafrance/Perrault 2002).

On the other side, fixed exchange rate regimes could also diminish the efficiency of a given stock of capital since external trade may be reduced due to higher protectionist pressure in the

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[101] On a dynamic macro-micro modelling of the impact of macroeconomic policy and variables on poverty in a CGE framework, see the IMMPA program of the Worldbank (Agénor/Fofack/Izquierdo 2003).
[102] For a detailed survey of advantages and disadvantages of nine alternative exchange rate regimes, see Edwards/Savastano (1999).
[103] This reasoning assumes a positive effect of higher trade on economic growth.

absence of exchange rate adjustments (Gosh/Gulde/Ostry/Wolf 1997).[104] Furthermore, investment can be impeded by increased real interest rates and uncertainty which may result from expectations of a regime switch due to negative external shocks or weak macroeconomic fundamentals (Montiel 2003). While the lack of adjustment and the possibility of frequent external shocks under a fixed exchange rate regime may imply increased output volatility, the impact on long-run growth is less obvious (Levy-Yeyati/Sturzenegger 2001).

Empirical evidence on the impact of different exchange rate regimes on economic growth is ambiguous.[105] In the World Economic Outlook (1997) no clear relationship between exchange rate regimes and economic growth is found for developing countries, while inflation is typically lower and less volatile in countries with pegged rates than in countries with flexible rates. Gosh/Gulde/Ostry/Wolf (1997) estimate the different impact of fixed, intermediate and flexible exchange rate regimes on growth, inflation and output volatility using de jure exchange rate regimes (official IMF classification) for 136 countries in the period 1960 - 1980. While growth varies only slightly across different exchange rate arrangements, fixed exchange rate regimes compared with flexible regimes tend to increase output volatility, but are associated with lower inflation. Levy-Yeyati/Sturzenegger (2002a) measure the impact of fixed, intermediate and flexible exchange rate regimes on growth and output volatility using de facto exchange rate regimes for 183 countries in the period 1974 – 1999. Fixed exchange rate arrangements are connected with slower growth rates and higher output volatility for non-industrial countries. However, Levy-Yeyati/Sturzenegger (2001) found an inflation-growth tradeoff for 'long' pegs in non-industrial countries, i.e. fixed exchange rate regimes with a duration of at least 5 years are associated with lower inflation in addition to slower growth. Furthermore, there is evidence for negative announcement value of short pegs with respect to economic growth, i.e. countries running a de facto peg often avoid a formal commitment to a fixed regime due to potential speculative attacks in introducing a legal peg. However, no different impact of hard pegs (currency boards or countries without separate legal tender) compared with conventional pegs on economic growth could be confirmed. On the other side, in Gosh/Gulde/Wolf (2003) currency boards are associated with higher output growth and lower inflation in developing countries. Edwards (2001) and Edwards/Magendzo (2001) find lower growth rates for dollarized countries compared with non-dollarized countries, while Edwards/Magendzo (2003), using a treatment regression analysis, could not confirm different growth rates. Accounting for different monetary policy frameworks, Bailliu/Lafrance/Perrault (2002) estimate a panel-data set of 60 countries over the period from 1973 to 1998 using a dynamic GMM estimator and find that intermediate and flexible exchange rate regimes without an anchor hinder economic growth. Finally, Husain/Mody/Rogoff (2004) test the growth and inflation impact of exchange rate regimes drawn from a new de facto exchange rate regime classification for the period 1970 to 1999. While fixed regimes are more sustainable and less inflationary in developing countries without liberal capital

[104] This line of argument would assume positive productivity effects of increased trade.
[105] Connected to this issue Baxter/Stockmann (1989) found that the cyclical behavior of real macroeconomic aggregates (output, consumption, etc.) does not depend systematically on exchange rate regimes.

markets, pegged regimes are more crisis prone in emerging markets. In addition, flexible regimes are more sustainable in advanced economies combined with slightly higher growth rates.

Another point of departure for possible differences of exchange rate systems on poverty are the effects of real exchange rate misalignment, i.e. difference between actual and equilibrium real exchange rate (RER) [106], and nominal devaluations on real output. While the construction of an appropriate measure assessing RER misalignment is controversially discussed in the literature (Hinkle/Montiel 1999, Razin/Collins 1999) [107], persistent RER misalignment may be associated with fixed exchange rate regimes assuming nominal rigidities (Gosh/Gulde/Ostry/Wolf 1997, World Bank 2001a, Bailliu/Lafrance/Perraul 2002, Montiel 2003).[108] Alberola/López/Servén (2004) find a considerable impact of the hard peg (curreny board) on the overvaluation of the RER in Argentina.

RER misalignment is important in our context for at least three reasons. First, RER misalignment can cause inefficient allocation of resources across sectors and price distortions (Gosh/Gulde/Ostry/Wolf 1997). Second, severe or persistent RER misalignment (e.g. overvaluation) may lead to adjustment expectations resulting in capital flight and increased likelihood of currency crisis (Bailliu/Lafrance/Perrault 2002, Montiel 2003). Third, RER misalignment may be associated with lower medium to long-run growth by influencing investment and the competitiveness of the tradable sector. While these costs of RER misalignment are assumed to be positive related to the extent of financial integration (Montiel 2003), misalignment volatility may also harm economic growth (Edwards/Savastano 1999, Razin/Collins 1999). Empirical evidence seems to confirm the negative impact of average RER misalignment and its volatility on overall economic growth (Edwards 1989, Cottani/Cavallo/Khan 1990, Ghura/Grennes 1993, Razin/Collins 1999). However, this effect might be driven by important nonlinearities, i.e. while only very high overvaluations appear to be associated with slower growth, moderate to high undervaluations seem to foster growth (Razin/Collins 1999).

Nominal devaluations are associated with different kind of pegs using the exchange rate as important policy instrument. Devaluations are usually a result of inconsistent macroeconomic policies with severe overvaluation of the real exchange rate. A nominal devaluation, however, must not necessarily translate into a real devaluation due to inflationary pressure (Edwards 1989, Ghei/Hinkle 1999). The effects of devaluations on real output and economic growth in

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[106] *Equilibrium real exchange rate* can be defined as the real exchange rate that would prevail if the economy is simultaneously in internal and external balance. While internal balance describes an economy operating at its potential output, external balance means that the courrent account deficit equals the expected sustainable capital inflows (Razin/Collins 1999, Montiel 2003).

[107] for an overview of empirical studies of real exchange rate misaligment in developing countries, see Edwards/Savastano (1999).

[108] RER overvaluation may be caused by fixed exchange rate regimes due to difficulties to exit the peg or the failure to accommodate secular deterioration in terms-of-trade (World Bank 2001a). Generally, however, the real exchange rate is an endogenous variable, which cannot be changed directly by policy makers. Thus the exchange rate regime is only one of several fundamental macroeconomic variables in determining indirectly the level of the real exchange rate and its

developing countries are controversially discussed. A devaluation may lead to contraction caused by its effect on both aggregate demand and supply (Krugman/Taylor 1978, Agénor/Montiel 1999). Empirical evidence appears to confirm the contractionary devaluation hypothesis at least in the short run, even if the applied methodology is critisized (Edwards 1989, Agénor 1991, Kamin/Klau 1998, Agénor/Montiel 1999, Rogers/Kamin 2000).

2.2 Effects of exchange rate regimes and pro-poor growth

Relying on the literature review, the choice of the exchange rate regime may affect the income of the poor via its effect on macroeconomic volatility (shock absorption), its relation to real exchange rate misalignment, its proneness to currency crises, via devaluation and inflation.

Output volatility (shock absorption)

Macroeconomic volatility and high output fluctuation, resulting from exogenous shocks and instable policy regimes, may impact on poverty (Breen/Garcia-Peñalosa 1999). The income of the poor may be affected by a negative impact of macroeconomic volatility on investment and growth due to distorted price signals and expected rate of return. Increased precautionary savings caused by higher uncertainty about future income may also lead to either decreased or increased economic growth. In addition, credit market effects, i.e. higher incidence of credit rationing or increased risk premium and borrowing rates for private firms may negatively affect the income of the poor (Agénor 2002).

Identifying the predominant economic shocks and the structural features of a specific country and choosing the exchange rate regime which best insulates the economy against shocks could be seen as one reason for different impact of exchange rate arrangements on pro-poor growth. This reasoning would be based on the assumption that exchange rate regimes dampen or amplify the negative effects of exogenous shocks and adjustment processes (Ames/Brown/Devarajan/Izquierdo 2002, Bailliu/Lafrance/Perrault 2002, Edwards/Levy-Yeyati 2003).[109] Refering to a Mundell-Flemming framework, fixed exchange rate regimes are assumed to stabilize output in case of nominal shocks to domestic asset markets, while real shocks are more easily absorbed by flexible exchange rate regimes.[110] Structural features of an economy may determine the optimality of a regime with respect to external financial shocks (Montiel 2003).[111] Traditional analysis of exchange rate regimes, however, is confined to extreme arrangements (hard pegs or pure floats) in comparison to a broad scale of intermediated regimes used in developing countries (Montiel 2003).

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misalignment. For an useful distinction in short-run and long-run RER misalignments and their relation to exchange rate regimes, see Montiel (2003).

[109] Even if the long-run equlibrium effect may be the same for fixed and flexible regimes, the short- to medium run adjustment process may differ considerably due to different exchange rate arrangements (Lustig 2000).

[110] Gosh/Gulde/Ostry/Wolf (1997) and Levy-Yeyati/Sturzenegger (2002) find that fixed exchange rate are associated with higher output volatility.

RER misalignment and currency crises

Exchange rate regimes may impact on pro-poor growth via RER misalignment. First, inefficient allocation of resources between foreign and domestic goods and price distortions due to RER misalignment may lead to distributional effects. Second, reduced investment and competitiveness of the tradable sector due to RER misalignment may also result in additional effects for the poorest. The costs for the poor may be increased by the extent of financial integration in international capital markets (at least in the short run).[112] In addition, misalignment volatility may harm pro-poor growth even if the direction of these effects may be ambiguous and dependent on the amount of RER misalignment (Edwards/Savastano 1999, Razin/Collins 1999). Fourth, severe or persistent RER misalignment may be especially costly for the poor as they usually can not hedge against the adjustment risks and considerable RER misalignment may increase significantly the probability of a currency crisis (Bailliu/Lafrance/Perrault 2002, Montiel 2003).

Currency crises may be associated with certain types of exchange rate regimes. Relying on the 'hollowing-out' hypothesis, fixed but adjustable pegs and narrow-band systems are supposed to be unsustainable for countries highly integrated in global financial markets (Fisher 2001). Bubula/Ötker-Robe (2003) find that pegged exchange rate regimes are more prone to crises than floatings and intermediate exchange rate arrangements more than hard pegs or floating regimes for the period 1990 to 2001.[113] Looking at the two de facto exchange rate regime classifications used in our sample, currency crises are relatively prevalent in dirty floats in the Levy-Yeyati/Sturzenegger (2002b) classification. Even if relative frequency is much lower, currency crises are also present in all other classifications (table 4). While currency crises are not present for the category freely floating in the coarse Reinhart/Rogoff classification (2003), currency crises are relativey dominant in freely falling and associated with pegged regimes, limited flexbility and managed floating to a lower relative frequency (table 4).[114] If we replace freely falling by one of the four other regimes in a 4-way classification, currency crises of freely falling are mainly attributed to freely floating and managed floating.[115]

A currency crisis may impact negatively on the income of the poor by unemployment effects on low skilled labour in both the formal and informal sector. In addition, wealth effects and changes in the value of assets induced by changes in interest rates or asset prices may affect the income distribution. Furthermore, a financial crisis could lead to spending cuts in social expenditures

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[111] Structural characteristics of economies, however, may not be exogenous to the choice of exchange rate regimes (Isard 1995).

[112] While procyclical access to world capital markets of developing countries may increase macroeconomic instability, greater penetration of foreign banks may result in reduced access to loans by small and medium-size firms. In addition, financial openness may hurt the poor by credit rationing caused by increased volatility and lower growth rates due to capital flight and international risk sharing (Agénor 2003).

[113] For a detailed discussion on the feasability conditions using intermediate exchange rate regimes in developing countries in the context of capital mobility and a broad discussion on causes of currency crisis, see Montiel (2003).

[114] One reason for the prevalence of freely falling is the fact, that category freely falling is attributed to the six months immediatly following a currency crisis (Reinhart/Rogoff 2003).

[115] For reasoning and construction of the reduced 4-way RR classification, see section 3.2.

(health, education, social security) which may adversely affect the poor.[116] Baldacci/de Mello/Inchauste (2002) find evidence for this hypothesis applying a difference-in-difference methodology in a cross-country analysis. The size of the poverty effect, however, may depend critically on the initial structure and the composition of the social spending programs since social expenditures often benefit disproportionately upper-income households in developing countries (Dollar/Kraay 2001, McCulloch/Winters/Cirera 2001, Baldacci/de Mello/Inchauste 2002, Agénor 2002, Davoodi/Tiongson/Asawanuchit 2003).[117] Finally, the poor may be additionally affected by a currency crisis in the longer-run via asymmetric effects, i.e. the decrease of the income of the poor in recessions is not offset by the positive effects of expansions (Agénor 2002).[118]

Devaluation

Fixed exchange rate arrangements may entail nominal devaluations of the official exchange rate in case of overvalued RER. However, the effects of nominal devaluations on the income of the poor are ambiguous depending also on its effect on the RER (Edwards 1989, Ghei/Hinkle 1999). On the demand side, a depreciation of the RER would benefit consumers of nontradables, while it would harm consumers of imported goods. Thus the depreciation could increase domestic food prices due to higher prices of imported food. This could lead to negative effects on 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.[119] Thus RER depreciation would positively affect the poor, if they work mainly in the tradable sector, but consume nontradables (Ames/Brown/Devarajan/Izquierdo 2002, Agénor 2002). In addition, increased prices for imported intermediate input and capital goods may result in more demand for unskilled workers. Negative supply shocks are also possible, if the economy is a net importer of intermediate inputs (Agénor 2002). Empirically, RER depreciation is found to decrease real wages in the agricultural sector, while labor's share of GDP does not significantly change in the event of nominal devaluations (Edwards 1989).

Inflation

High inflation may discourage the income of the poor via disruptive effects on economic growth (Temple 1999, Montiel 2003, Epaulard 2003). In addition, the poor may be hit disproportionately by negative effects of high and variable inflation rates on their income due to its denomination in

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[116] Curtailing government expenditures may also lead to increased poverty via cuts in real wages and layoffs of employees in the public sector (Agénor 2002).
[117] Cuts in social spending may nevertheless lead to reduced poverty if social expenditures are better targeted to the poor (Agénor 2002).
[118] Parents' decision with respect to their children attending school, asymmetric changes in expectations, credit rationing to firms due to adverse selection problems or net worth effects, borrowing constraints on household consumption behavior and "labor hoarding" of skilled labor force are proposed as explanations for the asymmetric effect of contractions and expansions on the income of the poor (Agénor 2002).

nominal terms without access to indexation, a decline in real wages due to rigidity of nominal wages, impossibility of hedging inflation with other assets and the ‘inflation tax’ with effects similar to a regressive tax.[120] Empirical evidence on a 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).

Exchange rate regimes (together with monetary policy) may have different impact on inflation. Fixing the exchange rate to the currency of a country with anti-inflation reputation could increase credibility since announcing a future path of the exchange rate may serve as a commitment mechanism.[121] Thus inflation rate or inflation bias may be reduced due to the use of the exchange rate as nominal anchor. On the other hand, fixed exchange rate regimes face the risk of devaluation bias and loss of credibility which may result in higher inflation if the structural features of the economy are inappropriate to the choice of the fixed exchange rate regime and exiting the fixed exchange rate regime is difficult (Isard 1995, Ames/Brown /Devarajan/Izquierdo 2002, Montiel 2003). Empirical evidence supports the view that fixed exchange rate regimes are associated with lower and more stable inflation (World Economic Outlook 1997, Gosh/Gulde/Ostry/Wolf 1997, Levy-Yeyati/ Sturzenegger 2001).

To summarize, our discussion of the theoretical channels and empirical literature does not show a clear superiority or inferiority of one category of exchange rate regime with respect to pro-poor growth. Exchange rate arrangements may impact on pro-poor growth through various and possibly contradictory effects. However, there seems to be a tendency to attribute negative poverty effects to intermediate exchange rate regimes in developing countries with liberal capital markets due to an assumed higher likelihood of currency crises.

3. Data sources and descriptive statistics

3.1 Data on income inequality measures

Empirical tests on the impact of exchange rate arrangements 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

[119] 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).
[120] 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).
[121] On a detailed discussion of the advantages and disadvantages announcing a predetermined exchange rate path as commitment mechanism, see Montiel (2003).

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 for reasons of practical measurement, 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).[122] 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 four sources: the UNU/WIDER-UNDP World Income Inequality Database, Version 1.0, 12 September 2000, the Deininger and Squire (1996, 1998a) database, the Global Poverty Monitoring described in Chen/Ravallion (1997, 2000)[123] and the World Development Indicators (2002a) Table 2.8 (table 1). The observations are chosen by an 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 on surveys covering all area, all population, all age and fulfilling the 1 OKIN quality rating.[124] 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 five cases have we allowed for a two year distance within a spell for pragmatic reasons.[125] In addition, the income concept and income recipients (reference unit) have to be identical for each spell.[126] 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 and three extra observations could be gained due to our restriction criteria.[127] 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. In addition, actual data are drawn from

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[122] see for further details UNU/WIDER–UNDP World Income Inequality Database, Version 1.0, 12 September 2000, User guide; see also Atkinson/Brandolini (2001).

[123] The Global Poverty Monitoring is available under www.worldbank.org/research/povmon/index.htm and continually updated.

[124] *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).

[125] Bulgaria 1991 – 93, Belarus 1993 – 95, Gabon 1975 – 77, Guatemala 1987 – 89, Kenya 1992 – 94

[126] 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.

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.[128] This selection procedure has resulted in 371 observations in total, 231 for developing, 27 for transitional and 113 for industrial countries. Finally, data on exchange rate regimes have to be available for the selected country-year observations reducing the total sample further to 343 observations for 76 countries (212, 18 and 113 for developing, transitional and industrial countries, respectively).

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.[129] 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 the Gini coefficient on dummy variables for different income definitions and regional dummies.[130] The adjusted first/second quintile share and Gini coefficient 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).[131] In general, the number of observations per country varies significantly from 2 (almost all Sub-Saharan Africa and Eastern Europe countries) to 15 (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.[132]

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[127] Canada 1951, 57, 61

[128] For description of estimation method, see World Development Indicators (2002a) Table 2.8 (About the data).

[129] 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.

[130] We prefer to use regional dummy variables in the adjustment regressions since we have only 371 observations and eight different income definitions which are not equally distributed among regions. While category family and equivalized are only relevant for industrial countries, category 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 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.

[131] 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/second quintile and Gini coefficients. On critic of this adjustment procedure, see Atkinson/Brandolini (2001).

[132] 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).

3.2 Classifications of exchange rate regimes and descriptive statistics

The analysis of the impact of different exchange rate regimes on pro-poor growth needs to take into account some important issues. First, even if exchange rate regimes in developing countries might have evolved towards more flexibility since the decline of the Bretton Woods system in 1973, de facto a wide variety of managed rates is predominant in developing and transitional countries in contrast to more flexible exchange rate regimes or monetary unions in industrial countries (World Economic Outlook 1997, Agénor/Montiel 1999, Johnston et al. 1999, Mussa/Masson/Swoboda/Jadresic/Mauro/Berg 2000, Reinhart/Rogoff 2003, Husain/Mody /Rogoff 2004). Thus the empirical analysis of the optimal arrangement can be impeded by the lack of experience with flexible regimes and its 'appropriate' operational meaning in developing countries (Edwards/Savastano 1999). In addition, distinguishing the different forms of managed rates due to its different macroeconomic consequences on pro-poor growth may be important for our purposes. Second and related, quantitative restrictions on foreign exchange availability are common in developing and transitional countries leading to parallel free (il)legal exchange markets. Integrating the aspect of informal, dual or multiple exchange-rate regimes in our classification of exchange rate regimes is important due to its macroeconomic implications for both the growth and pro-poor effect as foreign exchange rationing can impact on private decision rules (e.g. private consumption, investment) (Reinhart/Rogoff 2003). Additional costs for the government (e.g. enforcement, loss of tariff revenue), loss of seignorage, distorted domestic prices, implicit tax on exports and changed transmission mechanisms of short-term macroeconomic policies caused by parallel exchange markets may affect growth and the income of the poor. Third, the assumption of perfect capital mobility is inappropriate for macroeconomic modelling in developing countries due to capital controls and immature domestic financial system (Agénor/Montiel 1999).

To cover these issues, data on exchange rate arrangements are based on two sources: Levy-Yeyati/Sturzenegger (2002b) and Reinhart/Rogoff (2003). The use of these alternative classifications is justified by the well-documented pitfalls of the old IMF classification (1975 – 1998), which only indicates the official or de jure exchange rate regime based on the public commitment of the central banks and ignores the inofficial or de facto regime and parallel exchange rates (Gosh/Gulde/Ostry/Wolf 1997, Edwards/Savastano 1999, Johnston et al. 1999, Bubula/Ötker-Robe 2002, Reinhart/Rogoff 2003, Husain/Mody/Rogoff 2004).[133] Ignoring completely the old official IMF classification, Levy-Yeyati/Sturzenegger (2002b) use the volatility of the nominal exchange rate, the volatility of its rate of change and the volatility of international reserves (indicator for the extent of foreign exchange intervention) to group annual exchange rate regimes of all 183 IMF reporting countries for the period 1974 – 2000 by cluster analysis

[133] The difference in official statement and actual management of exchange rate regimes can be caused for example by the political costs of announcing devaluations (Bubula/Ötker-Robe 2002). Reinhart and Rogoff (2003) state that the old IMF classification is almost random with respect to their reclassification.

methodology.[134] Combinations of high and low volatility of the three indicators result in a 5-way-classification (flexible, dirty float, crawling peg, fixed, inconclusives).[135]

Reinhart/Rogoff (2003) classify exchange rate regimes of 153 countries for the period 1946-2001 by incorporating monthly data on market-determined (dual, multiple or parallel) exchange rates and chronologies of the history of exchange rate arrangements and related factors, i.e. exchange controls and currency reforms.[136] Using a similar nomenclatura as the new IMF classification (January 1999), the resulting fine classification now comprises fifteen categories.[137] Due to limited availability of data in our sample, however, we use a more coarse classification which condenses the fifteen categories to six by merging the categories.[138] In their approach, Reinhart/Rogoff (2003) construct a new category freely falling by two criteria. First, the 12-month inflation rate exceeds 40 percent unless some form of pre-announced peg or narrow band have been identified. Second, the six months immediatly following a currency crisis are classified as freely falling only if the crisis has taken place by a sudden change from pegs to managed or independently floating regimes.[139] Classifying this new category, freely falling is justified by the reason that macroeconomic instability could be incorrectly attributed to pegged, intermediate or floating exchange rate regimes, i.e. exchange rate regimes would have no indepedent influence on macroeconomic outcome due to severe economic disturbances (Husain/Mody/Rogoff 2004). However, since category freely falling is not an exchange rate regime of voluntary choice and thus currency crises are not correctly attributed to the chosen de facto exchange rate arrangement, estimation results for the exchange rate categories may be misleading. To cover this issue, we also test a reduced 4-way classification replacing freely falling by one of the four categories as indicated in the chronologies (Reinhart/Rogoff 2003).[140] Critic on both the LYS and RR classifications can be based on its reliance on quantitative analysis of exchange rates and foreign exchange reserves, which may lead to false inferences about the exchange rate regime (Bubula/Ötker-Robe 2002).[141]

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[134] Using a calendar year as unit of account, the exchange rate regime classified is a combination of different official arrangements in case of changes during the year.

[135] **Flexible**: high volatility of the nominal exchange rate, high volatility of its rate of change, low volatility of international reserves. **Dirty float**: high volatility of the nominal exchange rate, high volatility of its rate of change, high volatility of international reserves. **Crawling peg**: high volatility of the nominal exchange rate, low volatility of its rate of change, high volatility of international reserves. **Fixed**: low volatility of the nominal exchange rate, low volatility of its rate of change, high volatility of international reserves. **Inconclusives**: low volatility of all three indicators.

[136] The chronologies are used to sort out countries with dual, multiple or parallel exchange rates. While the exchange rate regime of countries with unified exchange rates is classified by the volatility of the official exchange rate, the volatility of the market-determined (dual, multiple, parallel) exchange rate classifies the exchange rate regime if the parallel market premium is consistently 10 percent or higher.

[137] On the correspondance between the IMF de jure classification and the Reinhart/Rogoff 2003 classification, see Husain/Mody/Rogoff (2004).

[138] **Pegged**: no separate legal tender, pre announced peg, currency board or horizontal band (between +/-2 %), de facto peg. **Limited flexibility**: Pre announced crawling peg or band (between -/+ 2 %), de facto crawling peg or band (between -/+ 2 %). **Managed floating:** Pre announced crawling band (more than or equal to -/+ 2 %), de facto crawling band (between -/+ 5 %), Moving band (between -/+ 2%), Managed floating. **Freely floating**. **Freely falling**. **Category 6**: Dual market with missing data on parallel markets.

[139] Currency crises are defined by a monthly depreciation above twelve and one-half percent and if the preceding month's depreciation is exceeded by at least 10 percent.

[140] Reinhart/Rogoff (2003) provide also the underlying arrangement for freely falling in the chronologies, assuming that there would be no knowledge of the inflation rate. In addition, since category freely falling is only present in transitional and developing countries in our sample, estimations for industrial countries have not to be retested.

[141] For example the behavior of the exchange rate is not only affected by exchange rate policy.

In table 4 we present a two-way table of the frequency of the exchange rate regimes between the LYS and RR classification, to analyze the comparability of both exchange rate regime classifications. While pegged regimes (hard pegs) and freely floating in RR coincide mainly with fixed and flexible regimes in LYS, respectively, fixed and flexible regimes in LYS are not exclusively associated with pegs and freely floating in RR, respectively, but are also frequently present in limited flexibility and managed floating.[142] In addition, freely falling is not confined to one exchange rate regime in the LYS classification, but almost equally distributed among the different arrangements. Thus the frequency table emphasizes the significant difference in classifying exchange rate arrangements between both approaches.

Finally, we have a look at descriptive statistics to reveal some important prior results. In table 5 we present the mean of the average annual growth for the unadjusted first and second quintile share for each initial exchange rate arrangement, comparing the LYS and both RR classifications. First, observations for inconclusives and category 6 (dual market with missing data on parallel market) are very limited and often misleading, thus we omit both categories in the regressions. Second, while in the LYS classification we have 22 observations with flexible exchange rate regimes in the developing countries, there is no observation for category freely floating for developing countries in the coarse RR classification. On the other hand, we have 18 observations for freely falling, a category only present in developing and transitional countries. Observations for transitional countries, however, are very limited and the mean of the average annual growth for both quintile shares is almost always highly negative compared to other regions.[143] Concerning the 4-way RR classification, freely falling is attributed mainly to managed floating and freely floating in both developing and transitional countries. Third, regarding the sign and size of the means in the LYS classification, the regime dirty float is considerably positive for all countries compared to other arrangements if we omit the highly negative observation for transitional countries (Poland 1990/93). This result is mainly driven by nine observations in developing countries. In addition, fixed regimes are negatively correlated with the mean of the growth rate of both the first and second quintile in all and developing countries.[144] Furthermore, the growth rates of flexible regimes (LYS) or freely floating (RR) are negatively correlated for both quintile shares in industrial countries, which also indicate negative means for all countries in the RR classification (-0.58, -0.85). Finally, we emphasize the difference between the coarse and 4-way RR classification. While category freely falling is highly positively correlated with the means for first and second quintile in developing countries,

[142] These results hold even if we use the 4-way classification replacing freely falling by other exchange rate arrangments (Reinhart/Rogoff 2003) (table 4).

[143] The exception managed floating (pre-announced crawling peg, moving band and managed floating) is only dependent on observations from Hungary mostly during the communist era (1972/77, 77/82, 82/87, 89/93) and thus do only marginally reflect the effect of the transitional process on the first and second quintile share. For reasons of widening inequality in transitional countries, see Grün/Klasen (2001).

[144] The positive effect of the fixed regime for the growth rate of the first quintile becomes negative in all countries (-0.34) and the negative effect in developing countries diminishes (-0.73) if we omit an incredible high growth rate for the first quintile in Senegal 1991 – 95 (18.12 %).

this positive effect is attributed to managed floating and freely floating in the reduced classification.[145]

In table 6 we present the means of the adjusted first and second quintile share of income for each exchange rate regime comparing the LYS and RR classifications. We now have more observations since we look at the correlation between the levels of adjusted first/second quintile share and exchange rate arrangements. Again, we omit observations for inconclusives and category 6 in our regressions due to limited availability and often misleading size. Furthermore, we now have two observations in category freely floating for developing countries in the coarse RR classification with high values (Indonesia 1999, Madagascar 1999). In general, the means in the transitional countries are high in both classifications compared with developing and industrial countries, illustrating the influence and legacy of the communist era. While there seems to be no important difference of the means in the LYS classification, freely falling is considerably lower for developing countries in the coarse RR classification, a result lessened for all countries due to the high means of freely falling in transitional countries. Looking a the 4-way RR classification, freely falling is again attributed mainly to managed floating and freely floating in both developing and transitional countries. While this change is not relevant for the means in all countries, the values for freely floating are considerable diminished for developing countries in the reduced RR classification.

To look additionally on the total effect, we finally present the means of the average annual growth of mean income of the first/second quintile and the means of the mean income of the adjusted first/second quintile for the different exchange rate arrangements (table 7 and 8).[146] In industrial and developing countries the growth rate of the mean income of first/second quintile is almost always higher than the growth rate of the first/second quintile (compare table 7 to 5). Even if dirty float remains considerably positive for all countries with respect to other regimes in the LYS classification, crawling pegs and flexibles become also important for developing countries (table 7). And again, fixed regimes exhibit the lowest growth rates for the poorest 40 percent in developing countries.[147] We find a similar result for pegged regimes in the coarse RR classification for developing countries. While the growth rates of limited flexibility and managed floating here are not lower with respect to freely falling in developing countries, freely falling is again positively correlated with the means for growth rate of the mean income of the first and second quintile in developing countries (compare table 7 to 5). This positive effect is again attributed to freely floating and managed floating in the 4-way classification, resulting in low positive growth rates for freely floating in developing countries. Looking at table 8, the means of dirty float are considerably higher than in other regimes for developing countries in the LYS

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[145] In all countries the small positive effect of freely falling is mainly attributed to managed floating since freely floating becomes more negative in the 4-way RR classification, i.e. the highly negative values of transitional countries are labelled as freely floating in the reduced RR classification..

[146] For the difference between distribution effect and total effect, see section 4.

[147] The positive effect of the fixed regime for the growth rate of the mean income of the first quintile diminishes to +1.27 in all countries and to +0.70 in developing countries if we omit the incredible high growth rate of the mean income of the first quintile for Senegal 1991 – 95 (+17.69 %).

classification. In addition, freely falling is the category with the lowest means for all countries in the coarse RR classification, a result not comfirmed in developing countries. While limited flexibility remains the exchange rate regime with the highest means for developing countries in the 4-way RR classification, the values for freely floating in all countries are diminished by the highly negative values for freely floating in transitional countries in the reduced RR classification.

3.3 Data on additional macroeconomic variables

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. In addition, not all additional macroeconomic variables are used in all specifications due to insignificant coefficients.

The variables overall budget surplus to GDP and government consumption to GDP are controlled for. Budget deficit is expected at least to not 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 not necessarily support the poorest part of an economy more than other income groups.[148] 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.[149] 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.[150] 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. Furthermore, we use terms-of-trade to capture external environmental effects with expected positive impact (Barro/Sala-i-Martin 1995, Ghura/Leite/Tsangarides 2002).[151] We also controll for financial development measured by M2

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

[149] Davoodi/Tiongson/Asawanuchit (2003) collect data on education and health expenditures for 81 countries for the period 1960 to 2000. Even if the dataset is 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.

[150] 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.

[151] 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

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 motivated 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.

4. Pro-poor growth

Analytically, the impact of the exchange rate regime on the income of the poor can be distinguished in the growth and the distribution effect [152]:

$$\partial Y^{p20/40}_{it} / \partial Ex_{jit} = \partial \ln(Y_{it})/\partial Ex_{jit} + [\partial Y^{q20/40}_{it}/\partial \ln(Y_{it}) * \partial \ln(Y_{it})/\partial Ex_{jit} + \partial Y^{q20/40}_{it} / \partial Ex_{jit}]$$
$$= \rho_j + [(\alpha_1 - 1) * \rho_j + \gamma_j] \quad (1)$$

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

Ex_{jit}: dummy variable for exchange rate regimes
with $j = 1, ..., 4$ (LYS)
$j = 1, ..., 5$ (coarse RR)
$j = 1, ..., 4$ (4-way RR)

ρ_j: (equiproportionate) growth effect of exchange rate regime on mean income ($\partial \ln(Y_{it})/\partial Ex_{jit}$)

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

γ_j: distribution effect of exchange rate regime ($\partial Y^{q20/40}_{it} /\partial Ex_{jit}$)

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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.

[152] 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).

The (equiproportionate) growth effect (the first term on the right hand side of the equation) measures the effect of the exchange rate regime on mean income (ρ_j) with respect to a base group.[153] The distribution effect (second term in brackets) measures the impact of the exchange rate regime 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 exchange rate regime EX_{jit} on the first and second quintile share. Thus the income of the poor could be affected directly and indirectly through growth by exchange rate regimes and possible trade-offs of exchange rate regimes affecting economic growth and the first/second quintile share in opposite directions can be analyzed.

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): $\partial Y^{p20/40}_{it} / \partial Ex_{jit} = \rho_j$). Thus pro-poor growth could be defined by a distribution effect:

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

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 exchange rate regime would affect the growth rate negatively ($\rho_j < 0$), but this effect is diminished by an 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 exchange rate regimes 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 $\partial Y^{p20/40}_{it} / \partial Ex_{jit} > 0$:

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

This condition would require a positive impact adding the growth and distribution effect, i.e. the positive impact of the exchange rate regime on first/second quintile share has to more than offset the negative effect of the exchange rate regime through growth. On the other hand, a growth situation would be also labelled pro-poor, if the positive growth effect of an exchange rate regime 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 exchange rate regimes on the poorest 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

[153] As we outline in the next section we estimate the difference between a fixed exchange rate regime (our base group) and all other arrangements. Thus the growth and distribution effects of, for example, a flexible exchange rate regime have to be interpreted as positive or negative difference with respect to the fixed exchange rate regime.

distribution effect and growth effect is positive ($\gamma_j + \rho_j > 0$). Estimating both equations, possible 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 exchange rate regimes 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 openness 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 exchange rate regimes 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.

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, exchange rate regime dummies, and variants of additional variables.

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

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
$\mu_{it} + \varepsilon_{it}$:	composite error term including unobserved country effects
X_{kit}:	additional variables with k = 1, ... ,n
Ex_{jit}:	dummy variables for exchange rate regimes (base group omitted) with j = 1, ..., 4 (LYS) j = 1, ..., 5 (coarse RR) j = 1, ..., 4 (4-way RR)

To present more clearly the distribution effect we subtract Y_{it} from both sides:[154]

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

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

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

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) 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, second, 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) and an observation with only one year difference within a country (Netherlands 1983) (see table 1).[155] 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

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

[155] 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 (Venezuela 1981) and after (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.

form 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 exchange rate regimes on the level of first/second quintile at certain country-year observations (5) and the impact of the change of the exchange rate regime on the change of the first/second quintile share (6) between the observations within a country.[156] Combining (5) and (6) in the system GMM estimation, the coefficients of the exchange rate regimes (γ_j) and the additional regressors (β_k) capture the distribution effect. Thus relying on (2) a significant $\gamma_j > 0$ or $\gamma_j < 0$ indicates a pro- or anti-poor shift on average of the first/second quintile share associated with the chosen exchange rate regime j compared to the omitted exchange rate regime. Similar, β_k different from zero indicate pro- ($\beta_k > 0$) or anti- ($\beta_k < 0$) poor growth on average.[157] Interpreting the system GMM approach as a level equation the chosen exchange rate arrangement j would shift the first/second quintile share on average by γ_j*100 percent with respect to the base group.

Finally, to estimate the total effect we regress the mean income of the poorest 20 and 20 to 40 percent on exchange rate regimes and variants of additional regressors taking as level equation in the system GMM methodology variants of the following equation: [158]

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

Taking into account (3) a significant $(\gamma_j+ \rho_j) > 0$ indicate a pro-poor shift on average of the mean income of the first/second quintile share associated with the chosen exchange rate regime j compared to the omitted exchange rate regime (positive total effect), while $(\gamma_j+ \rho_j) < 0$ would indicate anti-poor shift on average. Similar, $\beta_k+\rho_k$ different from zero indicate pro- ($\beta_k+\rho_k > 0$) or anti- ($\beta_k+\rho_k < 0$) poor growth (total effect). 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

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[156] In the first-differenced equation the exchange rate variables have three values (1, 0 –1), which desribe the change into a regime (1), no change of a regime (0), and the change out of a regime (-1) between time t + z and t.
[157] 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 $\ln(Y_{it})$.
[158] In this approach we assume that α_1-1 equals zero.

growth rate of the mean income of the 20 and 20 to 40 per cent poorest on the annual average growth rate of mean income and initial values for dummy variabels of exchange rate regimes and additional macroeconomic variables.

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

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

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)

Ex_{jit}: dummy variables for exchange rate regimes (base group omitted)
with j = 1, ..., 4 (LYS)
j = 1, ..., 5 (coarse RR)
j = 1, ..., 4 (4-way RR)
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 the distribution effect more clearly:

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

with

$y^{q20/40}_{it}$: average annual rate of growth of the first and second quintile share defined as $100/z^* [\ln(Q^{20/40}_{i,t+z}) - \ln(Q^{20/40}_{it})]$ [159]

Again $\gamma_j > 0$, $\beta_k > 0$ indicate pro-poor growth (positive distribution effect) with respect to (2), i.e., first, the average annual growth rate of the first and second quintile share with exchange rate regime j is on average γ_j percentage points higher than the base group and, second, a one

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

percentage point increase of the additional variables would increase the average annual growth rate of the first/second quintile share by β_k percentage points.[160]

Finally, we estimate also the total effect in using variants of the following equation:[161]

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

With respect to (3) a significant $(\gamma_j+\rho_j) > 0$ indicates that the average annual growth rate of the mean income of the first/second quintile with exchange rate regime j is on average $\gamma_j+\rho_j$ percentage points higher than the omitted exchange rate regime (positive total effect), while $(\gamma_j+\rho_j) < 0$ would indicate an anti-poor shift on average. Similar, $\beta_k+\rho_k$ different from zero indicate pro- ($\beta_k+\rho_k > 0$) or anti- ($\beta_k+\rho_k < 0$) poor growth (total effect). Again, 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.

5.2 Econometric issues

In estimating variants of equations (5), (6), and (9) several econometric issues have to be mentioned. [162] 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 might 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 we can not reject the null hypothesis in both tests pooled OLS is the appropriate method. Otherwise, we present results for 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

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[160] 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}.
[161] In this approach we assume that α_1 equals one.
[162] The discussion in this section is also relevant for regressions on the total effect (equations 7 and 10).

(Ghura/Leite/Tsangarides 2002).[163] 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).[164] 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.[165]

Fourth, in estimating level and first difference equations (5), (6) or the growth equation (9) simultaneity might be an issue.[166] In case of reverse causation, estimations would be biased and inconsistent. While the choice of exchange rate regimes may depend on a broad set of variables, the (growth rate of the) first and second quintile income, however, is not proposed in the literature (Gosh/Gulde/Ostry/Wolf 1997, Levy-Yeyati/Sturzenegger 2001, 2002a). In addition, the impact of the (growth rate of) first/second quintile income on additional macroeconomic variables (X) 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 EX and X in the system GMM estimations due to limited data availability and plausibility.[167] In addition, we use only initial values for the regressors X and EX in each spell to avoid endogeneity due to explanatory variables in the growth equation.[168]

A significant impact of the (growth rate of the) mean income of the poor on the (growth rate of the) mean income might also be possible.[169] Considering equations (5), (6), and (9), reverse causation thus means impact of the (growth rate of) first/second quintile share on the (growth

[163] 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).

[164] As $y^{p20/40}$ is formed by y, i.e. the dependent variable is systematically related to an explanatory variable, a biased coefficient of y may be expected. However, remembering $y^{q20/40}$ in equation (5) this is equal to state 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).

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

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

[167] One could use lagged values of X and EX as instruments. However, as our sample is often restricted to only two observations per country, we would have to omit all these countries from the regression. The problem of endogeneity is reduced in the RR classification since longer-term regimes are indentified by a rolling five-year horizon. This approach leads to a relatively long durability of the classified exchange rate regimes (Husain/Mody/Rogoff 2004).

[168] 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).

rate of the) mean income.[170] Using only a level equation (5), contemporaneous reverse causation will 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 is 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 (7), 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 2002).[171] A Sargan test on overidentifying restrictions is 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 and t-ratios 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).

5.3 Estimation strategy and results

To measure the impact of exchange rate regimes on pro-poor growth and to cover the issues mentioned above with respect to correct classifications of exchange rate regimes and econometric specifications, we test two classifications (5-way classification: Levy-

[169] Biased estimates might also be possible due to joint causation (Timmer 1997, Eastwood/Lipton 2001).
[170] 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).
[171] 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.

Yeyati/Sturzenegger 2002b (LYS), coarse classification: Reinhart/Rogoff 2003 (RR)) in both econometric approaches using fixed (LYS) and pegged (RR) regimes (no separate legal tender, pre-announced peg, currency board or horizontal band between +/-2%) as base group. We omit inconclusives (LYS) and category 6 (RR) due to limited observations in these categories and their biasing effect in our sample (table 5 to 8). Econometric specifications are tested for all, developing and industrial countries separately.[172]

We estimate the different effects of exchange rate regimes in specifications without additional regressors, with regional dummy variables and with sets of additional macroeconomic variables. To analyze potential trade-offs between the distribution effect and the growth effect we additionally test the total effect of exchange rate regimes on the mean income of the 20 and 20 - 40 percent poorest adding macroeconomic variables. Due to our fundamentally empirical approach, we execute different robustness checks to confirm the results, i.e. we test results without outliers, with mean income and with both adjusted and unadjusted inequality income measures in the system GMM estimations.[173] Finally, we also use a reduced 4-way RR classification in which category freely falling is assigned to one of the other four categories as denoted in the chronologies (Reinhart/Rogoff 2003).

5.3.1 Exchange rate regimes and pro-poor growth: distribution effect

First, we estimate the effect of exchange rate regimes on the first and second quintile share without additional regressors. In table 9 we compare the results for the growth equation denoting the exchange rate regimes in an ascending order from more fixed (crawling peg, limited flexibility) to flexible regimes. In the LYS classification only dirty floats have a significant impact (equations 2, 10, 19, 20).[174] This effect is significantly positive for developing and all countries if we omit outliers (equations 2, 10), i.e. countries with a dirty float regime have a 2.40 percentage points higher annual average growth rate of the first quintile share with respect to the base group fixed regime (equation 10).[175] The positive impact of the dirty float regime on the second quintile in industrial countries (equations 19, 20), while robust to outliers, is not significant for all countries. However, as only 2 out of 11 observations (Italy 1987, Norway 1976) for dirty float regimes are from industrial countries (table 5), the effect on industrial countries is not very well supported.

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[172] We did not test transitional countries separately due to limited data availability.
[173] We indentify outliers from graphical analysis and descriptive statistics without a strict rule. We analyze outliers for our dependent variables with respect to the whole sample of each exchange rate regime classification and within each exchange rate regime (i.e. we also omit the incredible high growth rates of Guinea 1991 - 94, Kenya 1992 - 94, and Senegal 1991 – 95 for the growth rate of the (mean of the) first quintile and Kenya 1992 - 94 for the growth rate of the (mean of the) second quintile in regressions of the growth equation). Due to a varying number of observations of the samples used in regressions for all, developing and industrial countries, the number of outliers differ for dependent and independent variables.
[174] The F-test for all and developing countries (equation 2, 10), however, indicates no overall significance of the regressions.
[175] The low and insignificant coefficient of 0.12 in equation 1 is suspected to depend mainly on Poland 1990, as table 5 indicates (mean of average annual growth of first quintile share of income for transitional countries: -13.87).

Concerning the RR classification, freely floating and freely falling are statistically significant exchange rate regimes. While category freely floating is only present in industrial countries, freely falling is only found in developing (18 observations) and transitional countries (3 observations, table 5). Significant results for all countries (table 9 equations 6, 7, 8) are therefore driven by effects in these subgroups of countries. For the first quintile share, the coefficient of freely falling is significantly positive only without outliers. We estimate a 2.88 percentage points positive difference of the annual average growth rate of the first quintile share with respect to the base group (pegged regimes) for developing countries (table 9 equation 14). On the other hand, freely floating is significantly negative for industrial countries for the first quintile share (equations 21, 22), a result contrary to the belief of a positive impact of flexible exchange rate regimes. In addition, freely floating is also highly significantly negative for the second quintile share for industrial and all countries, -0.88 and –0.66 percentage points respectively (equations 7, 8, 23, 24). Finally, all categories are negative in equation (22) omitting only two outliers.[176] If we replace freely falling in a reduced 4-way RR classification, however, no significant effect of freely floating or other exchange rate regimes could be confirmed in regressions for all and developing countries (table 9 equations 25 to 32).

In table 10 we present our estimates for the system GMM methodology.[177] We only indicate results for the RR classification due to insignificant results for the LYS classification. As mentioned above, we estimate both an adjusted and unadjusted approach to cover the income incomparability issue. Estimations for the first and second quintile shares for all countries (table 10 equations 1 to 4) indicate that coefficients change in both approaches.[178] Category freely falling now has a negative coefficient between -0.12 and -0.16 on the first quintile share and second quintile share. Interpreting the system GMM approach as a level equation, the first quintile share in countries with freely falling exchange rate regimes is on average between 15 and 16 percents lower than in countries with pegged regimes. While freely floating and limited flexibility are significantly positive with respect to pegged regimes, this result is not confirmed for the first quintile share in the unadjusted approach. Specification-tests for the system GMM estimator, however, require significant negative first-oder serial correlation in the differenced residuals (m1) and no evidence for second-order correlation (m2), which is only fulfilled in the adjusted approach (table 10, equations 2 and 4).

Considering developing countries, the coefficient for freely floating is now highly positive on a one percent significance level (table 10 equations 5 to 8). Conclusions based on these results, however, should be drawn cautiously, as there are only two observations (Indonesia 1999, Madagascar 1999) in the category freely floating in developing countries (table 5). In addition,

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[176] Initial values for spells: Norway 1979 - 84, Denmark 1992 – 95.

[177] Coefficients, heteroscedasticity adjusted asymptotic standard errors and tests on first-order and second-order serial correlation are based on the one-step estimator. While the one-step estimator is asymptotically inefficient relative to the two-step estimator, asymptotic inference based on the one-step estimator is supposed to be more reliable indicated by simulations. However, a Sargan-test would be only based on the two-step estimator (Blundell/Bond 1998, see also Bond/Hoeffler/Temple 2001).

limited flexibility is again significantly positive for the second quintile in the adjusted approach (table 10 equation 8). Furthermore, the coefficient of category freely falling is negative, but insignificant in developing countries. Finally, only managed floating is significantly negative in industrial countries in the adjusted approach (table 10 equation 12). Again specification-tests on first-oder serial correlation are only passed in the adjusted approach (table 10, equations 6, 8, 12). If we test the reduced 4-way RR classification, the significant coefficients for freely floating and freely falling disappear in all and developing countries, but findings for limited flexibility remain significant and change only slightly in size (table 10 equations 13 to 20).

In comparing results for the growth equation and level/first-differenced equation, four facts have to be emphasized. First, the positive effect of the dirty float regime (LYS) in the growth equation can not be confirmed in the system GMM estimation. Second, coefficients of limited flexibility (RR) are positive, but insignificant for all and developing countries in the growth equation. Third, the sign of the coefficients for category freely falling and freely floating differ in both econometric approaches for all countries (coarse RR). Finally, the coefficient of freely falling is negative, but insignificant for developing countries in the system GMM estimation (table 9 and 10).

Explanation of these different findings should be based on the estimation methodology.[179] To reveal systematic differences of the estimation methodologies, we also estimate a sample used in the growth equation in a system GMM approach. As we need two observations with growth rates per country, i.e. three observations for the first and second quintile share, to apply the system GMM estimator, we dropped 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 exchange rate regimes, while in the growth equation we regress the growth rate on initial exchange rate regimes.

[178] The maximum difference of 0.054 between equation 3 and 4 is equivalent to a 5.4 percent difference for the second quintile share, for example from 0.080 to 0.084.

[179] The result of the system GMM estimation is a mixture of a level and first-differenced equation, i.e. pooled cross-section regression of the impact of exchange rate regimes on the level of first/second quintile and the impact of the change of the exchange rate regime on the change of the first/second quintile share. Concerning the level equation, a negative impact of freely falling on the first/second quintile share can be expected by its lower value with respect to other categories in all countries (table 6). In the first-differenced equation the dummy varibales for exchange rate regimes have three values (1, 0, -1), which describe the change into a regime (1), no change of a regime (0), and the change out of a regime (-1) between time t and t+z. Thus a fall of first quintile between t and t+z with a change into category freely falling would indicate a negative coefficient. In the growth equation, on the contrary, we look at the impact of the exchange rate regime at time t on the growth of the first/second quintile between t and t+z . A positive effect of freely falling can then be interpreted as a higher growth of first quintile after a freely falling regime at time t. Thus the reversed signs of the freely falling coefficients may reflect a u-turn shape of a freely falling situation, i.e. a downwards and upwards movement for first quintile share between time t-z, t and t+z with freely falling category at time t (the bottom of a possible crisis). This hypothesis, however, would indicate that category freely falling is changed at the end of a spell, which could not confirmed in our sample.

Next, we add regional dummy variables in our specifications to control for cultural, historical and economical differences of income inequality in the six regions (Cornia 2002). In general, regional dummy variables are not important in the growth equation (table 11 equations 1 to 8). Exceptions are significant negative coefficients for Latin America/Carribean and Eastern Europe/Central Asia in regressions for all countries (RR), increasing the positive impact of freely falling on the growth rate of the first quintile share (compare table 11 equation 5 with table 9 equation 6). Even if limited flexibility now affects significantly positive the growth rate of the first quintile in developing countries, regional dummy variables remain insignificant (compare table 11 equation 7 with table 9 equation 14). This result is also true, if we test the reduced 4-way RR classification (table 11 equation 11). However, exchange rate regimes remain insignificant in all other specifications in the 4-way RR classification (table 11 equations 9 to 12).

In the system GMM approach, however, estimations confirm the hypothesis of important inequality difference between regions, since most coefficients for regional dummy variables differ significantly from the base-group region, i.e. industrial countries for all countries and Sub-Saharan Africa for developing countries (table 12).[180] Adding regional dummies results in insignificant and low coefficients for freely falling and freely floating in all countries (compare table 12 equations 1 to 4 with table 10 equations 1 to 4). Thus the high values for both categories in regressions without regional dummy variables stem apparently from regional determinants different from exchange rate regimes. On the other hand, coefficients for freely floating remain highly significant and almost identical for developing countries (compare table 12 equations 5 to 8 with table 10 equations 5 to 8). Concerning limited flexibility, coefficients for the second quintile for all and developing countries remain significantly positive in the adjusted approach, but the coefficients are significantly lower (table 12 equations 4 and 8 compared with table 10 equations 4 and 8). Finally, category managed floating is now significantly positive to a 10 percent level in first and second quintile regressions for all countries (table 12 equations 1 and 3), a result not confirmed using adjusted income inequality measures. In addition, managed floating is also significantly positive in the first and second quinitle share for developing countries, a result not present in regressions without regional dummy variables (compare table 12 equations 5, 7, 8 with table 10 equations 5 to 8).[181] Again specification-tests on first-oder serial correlation are only passed in the adjusted approach (table 12, equations 2, 4, 6, 8). If we test the reduced 4-way RR classification, significant coefficients of freely floating for developing countries disappear. On the other hand, results for category managed floating do only slightly change (table 12 equations 9 to 16). Thus, while freely falling is often replaced by managed floating in the 4-way RR classification, the reclassification does no affect the coefficients of managed floating.[182] Finally, limited flexibility is now only significantly positive for the second quintile in developing countries using the unadjusted approach (table 12 equation 7).

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[180] Since we define developing countries without transitional countries, the dummy variable for Eastern Europe and Central Asia region is also omitted in regressions for developing countries.
[181] One exeception is the coefficient of managed floating for the first quintile share using the adjusted approach (table 12 equation 6).
[182] This result is in line with descriptive statistics since the means of adjusted first/second quintile in developing countries do not differ considerably for managed floating in both the coarse and the 4-way classification (table 6).

5.3.2 Exchange rate regimes, pro-poor growth, currency crises and capital controls: distribution effect

Restrictions on capital mobility are seen to be a critical variable in studying the association between exchange rate regimes and economic growth (Gosh/Gulde/Ostry/Wolf 1997).[183] In addition, the choice of a reasonable exchange rate arrangement may differ for countries open to international capital mobility and countries without access to international capital markets (Fisher 2001, Husain/Mody/Rogoff 2004). To test this hypothesis with respect to pro-poor growth, we additionally control for capital account liberalization in using a dummy variable for capital control based on various issues of the IMF Yearbook on Exchange Arrangement and Exchange Restrictions (table 3).[184] Batteries of regressions, however, could not reject the null hypothesis of no impact of capital restrictions on the first and second quintile shares.[185]

Certain exchange rate regimes may be more prone to currency crisis than others (Bubula/Ötker-Robe 2003).[186] But currency crises may also dependent on factors different from the type of exchange rate regimes (Husain/Mody/Rogoff 2004, Razin/Rubinstein 2004). Without controlling for currency crises we so far assigned these effects to the corresponding exchange rate arrangement. To control the shock effects of currency crises on pro-poor growth, we use a dummy variable indicating a currency crisis if an index of currency pressure, i.e. a weighted average of monthly real exchange rate changes and monthly (percent) reserve losses, exceeds the mean plus 2 times the country-specific standard deviation (Glick/Hutchinson 1999). Concerning the growth equation, the additional currency crisis variable has never significant effect on pro-poor growth in the LYS classification, except for the negative coefficient of the second quintile share in industrial countries, an effect driven by two spells (table 13 equation 1).[187] While this effect is also debatable due to the small sample size (N = 30), the positive effect of the dirty float regime is only slightly reduced from 1.32 to 1.19 (compare table 13 equation 1 with table 9 equation 20). Looking at the coarse RR classification, the coefficient of the currency crisis dummy variable is also negative for second quintile shares in industrial countries, while the high statistical significance of the negative coefficient of freely floating disappears (compare table 13 equation 2 and table 9 equation 24).[188] Currency crises have an amazingly positive impact on the growth rate of the second quintile share for developing countries (table 13 equation 4). Exchange rate regimes, however, are unimportant and the F-test on overall significance is not passed. Using the coarse classification the shock variable is insignificant in all other specifications. If we test the 4-way RR classification, currency crises affect again positively

[183] For an overview of empirical cross-country studies on the effect of capital account liberalization on economic performance, see Edison/Klein/Ricci/Sloek (2002).
[184] In the literature, several qualitative and quantitative indicators are proposed to measure capital account liberalization. For an overview and critic on each measure, see Edison/Klein/Ricci/Sloek (2002).
[185] We test both the growth equation and system GMM equation for all, developing and industrial countries with exchange rate regimes, without outliers, with and without regional dummies for the LYS classification and the coarse and 4-way RR classification.
[186] For a detailed discussion on the feasability conditions using intermediate exchange rate regimes in developing countries in the context of capital mobility and a broad discussion on causes of currency crisis, see Montiel (2003).
[187] New Zealand 1986/89, Sweden 1981/87.
[188] The Wald-test, however, indicates no overall significance of the regression.

the growth rate of second quintile share in developing countries (compare table 13 equations 6 and 4). Finally, curreny crises impact now significantly positive on the growth rate of the first quintile share, while findings for limited flexibility remain similar and significant (compare table 13 equations 5 and 3). Since the coefficient of currency crisis using the 4-way RR classiciation is rather similar to the coefficient of freely falling using the coarse RR classification (+2.63, +2.79 respectively), the currency crisis variable seems to capture the effect so far attributed to freely falling.

Looking at the estimates of the system GMM estimation, currency crises impact amazingly significantly positive on the second quintile share for all and industrial countries in the RR classification (table 14 equations 1, 5 and 6).[189] Interpreting the system GMM equation as level equation, a currency crisis would increase the level of the second quintile between 2.3 and 3.2 percent in industrial countries. Controlling for currency crises, however, the limited flexibility and managed floating regimes now are significantly negative for the second quintile in industrial countries using the unadjusted approach (compare table 14 equation 5 with table 10 equation 11). In addition, managed floating becomes insignificant in the unadjusted approach for the second quintile in all countries (compare table 14 equation 1 with table 12 equation 3). While currency crises are insignificant in developing countries, categories limited flexibility and managed floating now are also insignificant for the second quintile (table 14 equations 3 and 4 compared with table 12 equations 7 and 8). Finally, if we test the reduced 4-way RR classification in the system GMM estimation, currency crises and exchange rate regimes are never significant for all and developing countries.

5.3.3 Exchange rate regimes, pro-poor growth, inflation and output volatility: distribution effect

High inflation rates may negatively affect the first and second quintile share of income (Romer/Romer 1998, Easterly/Fisher 2001, Dollar/Kraay 2001, Ghura/Leite/Tsangarides 2002). To test this hypothesis with respect to exchange rate regimes, we first add the inflation rate (logarithm of 1 plus the inflation rate) with exchange rate arrangements and regional dummy variables in all specifications. While inflation is not relevant with respect to the LYS classification, the coefficient of the inflation rate is amazingly positive at a ten percent significance level in regressions of the growth rate of the first quintile share on exchange rate regimes, inflation and regional dummy variables in developing countries (coarse RR classification, table 15 equation 1). If we test 4-way RR classification, inflation is again positive for the growth rate of the first and second quintile in developing countries (table 15 equations 3 and 4).[190] The high coefficients for the inflation rate should not be misinterpreted, since only a

[189] The only exception is the regression for all countries using the adjusted approach (table 14, equation 2). We do not present results for regressions on the first quintile since the coefficient of currency crises is never significant.

[190] Wald-test on overall significance of the regression, however, is not passed for the growth rate of the second quintile (table 15 equation 4). We also find significant effect of inflation on the growth rate of the first quintile in all countries using the 4-way RR classification. Since Wald-test on overall significance is also not passed in this specification and other regressions indicate no significant impact of inflation for all countries, we do not present this result.

one unit increase of ln(1+inflation/100) would raise the growth rate of the first quintile share for example by 9.93 percentage points (table 15 equation 3). In our sample without outliers, however, the values for ln(1+inflation/100) range only between -0.01 (-1.22 % inflation rate) and 0.89 (143.61 % inflation rate). In addition, inflation is never significant in the system GMM estimation, if we omit four outliers with extreme values (Belarus 1993: 1190 %, Belarus 1995: 709 %, Brazil 1988: 651 %, Brazil 1993: 1997 % p.a.).

We also test the direct impact of the inflation rate without exchange rate regimes. In the growth equation the coefficient of the inflation rate is amazingly positive for the growth rate of the first and second quintile in developing countries (table 15 equations 5 and 6).[191] In all other regressions, however, inflation rate is never significant for both econometric approaches and all specifications omitting outliers.[192] Thus, indirect negative effects of the exchange rate arrangements through direct effects of the inflation rate on the first and second quintile share seem unlikely. In addition, a significant effect of inflation on the first quintile share could not be confirmed in the system GMM estimations omitting values of very high inflation, even if the coefficient of inflation rate is in general negative (Dollar/Kraay 2001, Ghura/Leite/Tsangarides 2002).[193]

In addition, macroeconomic volatility may impact negatively on the first and second quintile share. We add output volatility formed as three year moving standard deviation of annual real GDP per capita growth (for example Australia 1976: standard deviation of growth rates for Australia 1974, 75, 76, table 3) with exchange rate regimes and regional dummies in our basic equations. Output fluctuation, however, is almost never significant omitting outliers.[194] We also test the direct effect of output fluctuation on the first and second quintile share omitting exchange rate arrangments. The coefficient of output volatility, however, is never significant. To summarize, the effect of exchange rate regimes on the first and second quintile share seem not to work indirectly through output volatility.

5.3.4 Exchange rate regimes, pro-poor growth and additional macroeconomic variables: distribution effect

Considering the empirical literature (Romer/Romer 1998, Easterly/Fisher 2001, Eastwood/Lipton 2001, Ghura/Leite/Tsangarides 2002), macroeconomic variables are found to be relevant with respect to pro-poor growth. In the growth equation we control for budget deficit to GDP, financial development (money and quasi money to GDP), secondary education (average years of

[191] Again, the Wald-test on overall significance of the regression is not passed for the growth rate of the second quintile (table 15 equation 6).
[192] These results are in contrast to empirical evidence in the literature, which find significant negative impact of high inflation on the poor (Romer/Romer 1998, Easterly/Fisher 2001). Romer/Romer (1998), however, do not adjust data on income inequality due to incomparability issues.
[193] While in Ghura/Leite/Tsangarides (2002), inflation is found to be significantly negative, results in Dollar/Kraay (2001) are similar to our estimates as the coefficients of inflation are insignificant.

secondary schooling in total population aged 25 and over), inflation and initial Gini coefficient.[195] 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). While the Gini coefficient is 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 to us tautological as a change in inequality in the first and second quintile share is only explained by a 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.[196]

Looking at the LYS classification in the growth equation, the dirty float regime is now insignificant due to positive effects of budget surplus (compare table 16 equations 1 to 3 with table 9 equations 2 and 10), but the F-test of overall significance could not be rejected.[197] Coefficients for all other exchange rate regimes remain insignificant. Controlling for additional macroeconomic variables in the RR classification, the effects of exchange rate regimes are changed considerably. While freely falling becomes insignificant in all and developing countries, now limited flexibility impacts significantly positive on the growth rate of the first quintile share (compare table 16 equations 5 and 7 with table 11 equations 5 and 7).[198] Coefficients for all other exchange rate regimes remain insignificant. Concerning the macroeconomic variables, the adjusted Gini coefficient impacts significantly positive on the growth rate of the second quintile in all and developing countries (table 16 equations 2, 4, 6, 8). Thus the hypothesis of inequality convergence would be confirmed by these results.[199] In addition, a one percentage point increase in budget surplus would raise the growth rate of the first quintile share in all and developing countries between 0.22 and 0.30 percentage points (table 16 equations 1, 3, 7).[200] Finally, financial development affects significantly positive the growth rate of the first quintile in the coarse RR classification (table 16 equations 5 and 7). If we test the reduced 4-way RR classification, the significant coefficients for limited flexibility disappear (compare table 16 equations 9 and 11 with equations 5 and 7). Coefficients for all other exchange rate regimes remain insignificant. While the impact of broad money to GDP becomes insignificant, initial inequality affects now also positively the growth rate of the first quintile share (table 16 equations 9 to 12).

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[194] One exception is a small positive coefficient (+0.007) for the second quintile in industrial countries using the unadjusted approach in a system GMM estimation (coarse RR classication). However, this effect could not be confirmed in the adjusted approach and the test on first-order serial correlation indicates misspecifications.

[195] Adding initial inequality in the growth equation can be justified by testing the hypothesis of inequality convergence even if usually the same inequality measure, i.e. Gini coefficient or first quintile share, is used on both sides of the equation (Ravallion 2000). A positive coefficient for the initial Gini coefficient would confirm the convergence of inequality.

[196] We also omit M2 to GDP ratio due to insignificant results.

[197] Tests for industrial countries fail due to limited observations (N = 19) and are not presented.

[198] The coefficient of limited flexibility remained significantly positive in regressions on the first quintile for developing countries (compare table 15 equation 7 with table 11 equation 7). In addition, tests for industrial countries fail due to limited observations (N = 28) and are not presented.

[199] One problem with these results are the high coefficients for the adjusted initial Gini coefficients, which are present only in fixed effects estimations (table 16 equations 2 and 4). However, one should be cautious interpreting these findings, since the coefficients of the constants are incredible highly negative.

[200] One exception is the insignificant coefficient of budget surplus for the growth rate of the first quintile in the coarse RR classification for all countries (table 15 equation 5).

Adding government consumption, inflation, and secondary education to the exchange rate regimes and regional dummies in a system GMM estimation, results for the coefficients of the exchange rate regimes on the first quintile are very similar to the regressions without macroeconomic variables (compare table 17 equations 1, 2, 5, 6, 9, 10 with table 12 equations 1,2, 5, 6, and table 10 equations 9, 10). Thus managed floating is significantly positive for the first quintile in all and developing countries using the unadjusted approach. However, none of the coefficients of the macroeconomic variables are significant in these regressions. Looking at the findings for the second quintile, managed floating remains only significantly positive in developing countries using the unadjusted approach (compare table 17 equations 3, 4, 7, 8, 11, 12 with table 12 equations 3, 4, 7, 8 and table 10 equations 11 and 12). While the coefficients of limited flexibility become insignificant (compare table 17 equations 4, 8 with table 12 equations 4, 8), freely floating remain highly significantly positive in developing countries (compare table 16 equations 5 to 8 with table 12 equations 5 to 8). Finally, freely floating now affects negatively the second quintile in industrial countries using the adjusted approach (compare table 17 equation 12 with table 10 equation 12). Coefficients of the macroceonomic variables, however, are insignificant in most of the cases.[201] While the size of the significant exchange rate regimes are lower, the general effect of exchange rate regimes on pro-poor growth remain unchanged, if we test the reduced 4-way classification (compare table 17 equations 13 to 20 with table 16 equations 1 to 8). Finally, tests on first-order serial correlation are again passed only in the adjusted approach for all and developing countries, while specification tests fail completely for industrial countries.

5.3.5 Exchange rate regimes, pro-poor growth and additional macroeconomic variables: total effect

Taking into account trade-offs between the distribution effect and the growth effect of exchange rate regimes on the income of the poor, we also test for the impact of both the LYS and RR classification on the mean income of the 20 and 20-40 percent poorest, i.e. the total effect. 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 exchange rate regimes are limited by data availability and may 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 the LYS and both the coarse and 4-way RR classification.[202] In the LYS classification, however, only crawling peg is negative at a one

[201] Exceptions are the weakly positive coefficient of government consumption in all and developing countríes for the second quintile using the unadjusted approach (table 16 equations 3 and 7), and the positive effect of secondary education on the second quintile in industrial countries using the adjusted approach (table 16 equation 12).
[202] 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.

percent significance level for the growth rate of the mean income of the second quintile in all countries (table 18 equation 2). Thus this negative effect works only through the growth effect, as we do not find any significant distribution effect (compare table 18 equation 2 with table 16 equation 2). Considering the additional macroeconomic variables, the adjusted Gini coefficient is again significantly positive for the growth rate of the mean income of the second quintile (compare table 18 equations 2 and 4 with table 16 equations 2 and 4).[203] In addition, the significantly positive effect of budget surplus on the first quintile is reinforced by the growth effect (compare table 18 equations 1 and 3 with table 16 equations 1 and 3). A one percentage points increase in budget surplus would raise the growth rate of the mean income of the first quintile share between 0.36 and 0.39 percentage points compared to 0.22 percentage points in regressions for the distribution effect.

Concerning estimations for the coarse RR classification, none of the exchange rate regimes exhibits significant impact on the growth rate of the mean income of the poor (table 18 equations 5 to 8). Thus the significant positive distribution effect of limited flexibility on the first quintile is not supported by the growth effect, even if the coefficients for limited flexibility remain similar positive (compare table 18 equations 5 and 7 with table 16 equations 5 and 7). In addition, budget surplus affects positively the growth rate of the mean income of the first quintile in developing countries, a result primarily driven by the distribution effect (compare table 18 equation 7 with table 16 equation 7). While the size of the coefficients for M2 to GDP ratio remains broadly the same, higher financial development is now significantly positive for the growth rate of the mean income of the second quintile in all countries (compare table 18 equations 5 to 8 with table 16 equations 5 to 8). If we test the reduced 4-way RR classification, findings for exchange rate regimes and macroeconomic variables remain identical with respect to statistical significance (table 18 equations 9 to 12).

In the system GMM approach we control for secondary education, government consumption, inflation, and, additionally, civil liberties, life expectancy, and terms-of-trade. Estimations for all countries do not indicate any significant impact of exchange rate regimes on the mean income of the first and second quintile (table 19 equations 1 to 4). Thus the positive distribution effect of managed floating in the unadjusted approach is apparently offset by the growth effect (compare table 19 equation 1 with table 17 equation 1). Results for developing countries, however, need a closer look. First, the highly significant positive distribution effect of category freely floating could only be confirmed for the mean income of the first quintile using the unadjusted approach (compare table 19 equations 5 to 8 with table 17 equations 5 to 8). These findings, however, are not amazing if we compare descriptive statistics for the mean of the adjusted first/second

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[203] In regressions for the growth rate of the mean of the second quintile, more than 85 percent of the positive effect of the initial Gini coefficient stem from a positive distribution effect on the growth rate of the second quintile, confirming the hypothesis of inequality convergence (Ravallion 2000). However, one should be cautious interpreting these findings, since the coefficients of the constants are incredible highly negative in the fixed effects estimations. In addition, the positive total effects of initial inequality are not directly comparable to Forbes (2001), since we do not apply a first-difference methodology (GMM) to estimate our growth equation, we use a different set of additional regressors, and our Gini coefficient is adjusted in a more accurate way.

quintile and the mean of the mean income of the adjusted first/second quintile. While the mean of the first/second quintile for freely floating is highly positive with respect to other regimes (table 6), the mean of the mean income of the first/second quintiles is rather low (table 8). Second, freely falling is amazingly significantly positive for both quintiles using the unadjusted approach (compare table 19 equations 5 and 7 with table 17 equations 5 and 7). Thus category freely falling may be associated with a positive growth effect in developing countries. This result, however, could not be confirmed in the adjusted approach (table 19 equations 6 and 8). While managed floating is insignificant for the total effect, the coefficients remain positive at a lower level compared to the distribution effect (compare table 19 equations 5 to 8 with table 17 equations 5 to 8). Finally, limited flexibility is significantly positive for the mean income of the second quintile, a result primarily driven by the growth effect (compare table 19 equations 7 and 8 with table 17 equations 7 and 8). Interpreting the system GMM approach as a level equation, the mean income of the second quintile share in countries with limited flexibility (narrow crawling peg or band) is, on average, between 12.2 and 14.5 percents higher than in countries using pegged regimes. Findings for industrial countries do not change for the total effect with respect to significant exchange rate regimes. While only category freely floating is negative for the mean income of the second quintile using the adjusted approach, the size of the coefficient is almost doubled by the growth effect (compare table 19 equation 12 to table 17 equation 12). If we test the 4-way RR classification, results remain unchanged in regressions for all countries (compare table 19 equations 13 to 16 with equations 1 to 4). While the significant coefficient of category freely floating for the first quintile disappears in developing countries using the unadjusted approach (compare table 19 equation 17 with equation 5), findings for the second quintile in developing countries confirm the significantly positive impact of limited flexibility with almost unchanged size (compare table 19 equations 19 and 20 with equations 7 and 8).

Most additional macroeconomic variables impact on the income of the poor in the way expected. In all and developing countries higher life expectancy and terms-of-trade increase the income of the poor, while raised government consumption diminishes the income of the poor (table 19 equations 1 to 8, 13 to 20).[204] Thus a one percentage point rise in the ratio of government consumption to GDP would diminish the mean income of the first and second quintile around 2 percent in developing countries. In addition, improved secondary education fosters the income of the poor only in all and industrial countries (table 19 equations 1 to 4 and 9 to 12).[205] A one year rise of average years of secondary schooling would increase the mean income of the second quintile between 13 and 15 percent in all countries. While life expectancy is similar positive in industrial countries, terms-of-trade exhibit no significant effect in industrial countries (table 19 equations 9 to 12). Furthermore, the coefficient of inflation is negative in all estimations of the coarse RR classification, but only significant for the mean income of the first

[204] The variable government consumption may be seen as a proxy for nonproductive public expenditures, political corruption or bad governance (Barro/Sala-i-Martin 1995).
[205] One exception is the insignificant coefficient for secondary education in the unadjusted approach (table 18 equation 9). Another exception is the significantly positive coefficient for secondary education on the first quintile in developing countries in the unadjusted approach testing the 4-way RR classification (table 18 equation 17).

quintile in industrial countries (table 19 equations 9 and 10). Finally, the coefficient of civil liberties is negative in all estimations, indicating a positive impact of civil liberties on the income of the poor since civil liberties is measured on a scale from one to seven with one indicating the most favorable state. This result, however, is weakened by the fact that the coefficient of civil liberties is weakly significant only in few estimations (table 19 equations 4, 8, 10, 16, 19, 20). Results on the total effect, however, have the shortcoming that tests on first-order serial correlation are almost never passed.[206]

6. Conclusion

In this paper we estimated the poverty effect of different exchange rate arrangements on the poorest 20 and 20 to 40 percent. To answer this question we regressed the first and second quintile and the mean of the first and second quintile on two de facto exchange rate regime classifications, Levy-Yeyati/Sturzenegger (2002) and Reinhart/Rogoff (2003), in a growth equation and an adjusted and unadjusted system GMM approach. Empirical results, however, vary considerably due to exchange rate regime classifications and econometric specifications.

First, the classification process, i.e. the elements used to classify the de facto exchange rate regimes, affect the findings by attributing the exchange rate arrangements to different categories in the LYS and RR classification (table 4). Thus coefficients for similar categories have very different results in both the growth and system GMM equation, even if this effect may also be caused by the different number of observations and time periods covered in both classifications. While none of the exchange rate regimes in the LYS classification are significant using the system GMM approach, arrangements in both the coarse and 4-way RR classification are relevant. Thus the problem of classifying exchange rate regimes correctly is still an open question, influencing the conclusions drawn from the estimations.

Second, coefficients of exchange rate regimes differ considerably for developing and industrial countries in the RR classification.[207] In industrial countries statistically significant exchange rate regimes affect negatively the poor (table 9, 10, 14, 17, 19). On the other hand, all statistically significant regimes in developing countries exhibit positive effects on the poor with respect to the base group pegged regimes (table 9, 10, 11, 12, 13, 16, 17, 19). Thus exchange rate arrangements impact very differently on pro-poor growth in developing and industrial countries in the RR classification.[208]

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[206] Two exceptions are the estimations for the mean income of the second quintile in industrial countries (table 18 equations 11 and 12).

[207] While descriptive statistics indicate remarkable differences for transitional countries, results of regression analysis would be misleading due to limited observations. In addition, effects of exchange rate regimes are strongly superimposed by other macroeconomic shock effects in the transition period.

[208] Results for the LYS classification, however, are not so clear since category dirty float is significantly positive in developing countries for the growth rate of the first quintile and in industrial countries for the growth rate of the second quintile in regressions without outliers (table 9, 11, 13).

Considering the impact on the first and second quintile, only the poorest 20 percent are affected by exchange rate regimes in all and developing countries estimating the growth equation (table 9, 11, 13, 16). In addition, we find only significant effects for dirty float (LYS) and freely floating (RR) on the poorest 20 to 40 percent in industrial countries, if we omit any additional regressors in the growth equation (table 9).[209] Using the system GMM approach with the RR classification, again, only the second quintile in industrial countries is affected significantly by exchange rate regimes (table 10, 14, 17, 19). However, estimations do not confirm a different effect on the 20 and 20 to 40 percent poorest in all and developing countries, since estimations for both the first and second quintile share differ only modestly, and without discernable patterns (table 10, 12, 17, 19).

Fourth, empirical findings differ considerably for the growth equation and system GMM approach.[210] We assign these differences in estimation results mainly to the fact that we regress the level of the first and second quintile on exchange rate regimes in the system GMM approach, while we regress the growth rate of the first and second quintile on initial exchange rate regimes in the growth equation. Moreover, empirical findings differ often for the adjusted and unadjusted system GMM approach (table 10, 12, 14, 17, 19). Thus the statistical significance of exchange rate regimes depends critically on the solution of the incomparability problems of income inequality measures, i.e. whether we use unadjusted or adjusted first and second quintiles.

Finally, we compare results for the coarse and 4-way RR classification. If we support the view that soft pegs are unsustainable, incredible, and prone to currency crisis, we would replace category freely falling by the chosen exchange rate arrangement. In this case, significantly positive coefficients of freely floating would disappear in allmost all regressions (table 10, 12, 19).[211] In addition, statistical significance and size for coefficients of limited flexibility and managed floating change only slightly in most specifications (table 10, 11, 12, 13, 16, 17, 19).[212] Thus even if incredible soft pegs break down, this would not change the often positive effect of intermediate exchange rate regimes in developing countries. While the significantly positive effects of limited flexibility and managed floating are not robust to specifications, we do not find any significant negative poverty effects of intermediate arrangements. Thus we would cautiously conclude that the hollowing-out hypothesis could not be confirmed with respect to pro-poor growth in developing countries. If we sort out freely falling as separate arrangement, we would argue that the poverty effects of exchange rate regimes are not independently discernable in

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209 We also find a significantly positive effect of dirty float on the growth rate of the second quintile if we add currency crises (table 13).

210 To compare the estimations of the growth equations with system GMM estimations, coefficients have to be divided by 100 due to multiplication by 100 in calculating the annual average rate of growth of the first and second quintile share ($y^{q20/40}_{it} = 100/z*[\ln(Q^{20/40}_{i,t+z}) - \ln(Q^{20/40}_{it})]$).

211 Regressions with additional macroeconomic variables on the distribution effect in table 17 are one exception. The significant coefficients for freely floating in the reduced 4-way RR classification (in comparison to the insignificant coefficients in table 12) stem mainly from the different sample size, since we have to omit several observations due to missing values and outliers for the inflation rate and government consumption.

situations of severe macroeconomic instabilities. In this case we find amazingly significant positive coefficients of freely falling on the growth rate of the first quintile (table 9, 11, 13). On the other side, freely falling is significantly negative for all countries in the system GMM approach (table 10), a result not robust to other specifications. In addition, freely floating is now significantly positive in developing countries using the system GMM approach (table 10, 12, 17, 19). The positive results for freely floating, however, should be interpreted with caution since these effects are only driven by two observations.

Due to these varying and only weakly robust empirical results, it is difficult to derive a concise policy recommendation with respect to a poverty-reducing exchange rate regime choice. Notwithstanding these difficulties, the positive effects of limited flexibility and managed floating for the RR classification in developing countries should be emphasized. First, category limited flexibility is positively associated with average annual growth rate of the first quintile in developing countries (table 11, 13, 16).[213] These positive distribution effects, however, are not present for the total effect. On the other hand, limited flexibility is positively associated with the mean income of the second quintile in the system GMM estimation in both the unadjusted and adjusted approach (table 19). This total effect is only driven by the growth effect. Second, managed floating affects positively the first and second quintile share in the system GMM estimation using the unadjusted approach in developing countries (table 12, 17). These positive distribution effects, however, are almost never confirmed in the adjusted approach.[214] In addition, no significant total effect of managed floating could be estimated in the system GMM approach. In combination with the positive coefficient of dirty float on the growth rate of the first quintile in the LYS classification for developing countries (table 9, 11), these results show at least a tendency to not negative and possible positive effects of intermediate regimes on the poorest 40 percent in developing countries.

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[212] Exceptions are regressions on the second quintile in all and developing countries in the system GMM approach (table 12 equations 4, 7, 8, 12, 15, 16) and regressions on the first quintile in all and developing countries in the growth equation (table 16 equations 5, 7, 9, 11).

[213] This result can not be confirmed in regressions with additional macroeconomic variables using the 4-way classification (table 16).

[214] Two exceptions are regressions on the second quintile with regional dummy variables for the coarse and 4-way RR classification (table 12).

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Table 1: Coverage of the data set

Region	Country	Observations dates	Source	No. of spells
East Asia Pacific (EAP)	China	1982, 85, 88, 91	UNU	3
		1994, 97	GPM	1
	Hongkong	1971, 76, 81, 86, 91	UNU	4
	Indonesia	1976, 80, 84, 87, 90	UNU	4
		1993, 96, *99*	GPM, *WDI*	2
	Korea	1965, 70, 76, 80, 85, 88	UNU	5
	Malaysia	1970, 76, 79, 84	UNU	3
		1987, 92, 95	GPM	2
	Philippines	1957, 61, 65	UNU	2
		1965, 71, 85, 88, 91	UNU	4
		1994, 97	UNU	1
	Singapore	1978, 88	UNU	1
	Thailand	1962, 69, 75, 81, 86, 90	UNU	5
		1992, 98	UNU	1
Eastern Europe and Central Asia (ECA)	Bulgaria	1991, 93	UNU	1
	Belarus	1993, 95	GPM	1
	Hungary	1972, 77, 82, 87	UNU	3
		1989, 93	GPM	1
	Latvia	1995, 98	GPM	1
	Poland	1990, 93	UNU	1
	Romania	1989, 92	UNU	1
	Russia	1994, 98	GPM	1
Latin America and Caribbean (LAC)	Brazil	1960, 70, 76, 80, 86	UNU	4
		1988, 93, 96	GPM	2
	Chile	1968, 71	UNU	1
		1989, 92	UNU	1
	Colombia	1971, 78, 88	UNU	2
		1988, 91, 95	UNU	2
	Costa Rica	1961, 71, 77	UNU	2
		1981, 86, 89	UNU	2
		1993, 96	GPM	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	UNU	1
		1991, 96	UNU	1
	Mexico	1950, 57, 63, 68, 75	UNU	4
		1984, 89	UNU	1
		1989, 95, *98*	GPM, *WDI*	2
	Panama	1979, 89	UNU	1
		1991, 95	GPM	1

Table 1: continued

	Paraguay	95, *98*	GPM, *WDI*	1
	Peru	1986, 94	UNU	1
	Trinidad & Tobago	1976, 81 1988, 92	UNU GPM	1 1
	Venezuela	1962, 71, 81, 87 1987, 93, 96	UNU GPM	3 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	1968, 73, 87 1987, 94	UNU GPM	2 1
	Yemen	1992, *98*	GPM, *WDI*	1
South Asia (SA)	India	1951, 54, 57, 60, 63, 66, 69, 72, 77, 83, 86, 89, 92 1994, 97	UNU UNU	12 1
	Pakistan	1971, 79, 85, 88 1991, 96	UNU UNU	3 1
	Sri Lanka	1953, 63, 73, 79, 87 1990, 95	UNU UNU	4 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
	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

Table 1: continued

Industrial Countries (IND)	Australia	1969, 76, 79	UNU	2
		1981, 85, 89	UNU	2
		1995, 98	UNU	1
	Belgium	1979, 85, 88, 92	UNU	3
	Canada	*1951*, *57*, *61*, 65, 69, 73, 77, 81, 84, 87	*DS*/UNU	9
		1987, 91	UNU	1
	Denmark	1981, 87, 92	UNU	2
		1992, 95	UNU	1
	Finland	1978, 81, 84, 87, 91	UNU	4
		1991, 94, 97	UNU	2
	France	1979, 84	UNU	1
	Germany	1973, 78, 81, 84	UNU	3
	Greece	1974, 81, 88	UNU	2
	Ireland	1973, 80, 87	UNU	2
	Italia	1978, 81, 84, 87, 91	UNU	4
	Japan	1962, 65, 68, 71, 74, 77, 80	UNU	6
	Netherlands	1975, 79, 82	UNU	2
		1983, 87, 91	UNU	2
	Norway	1967, 73, 76, 79, 84, 91	UNU	5
	New Zealand	1973, 77, 80, 83, 86, 89	UNU	5
	Portugal	1980, 90	UNU	1
	Spain	1974, 81, 91	UNU	2
	Sweden	1967, 75, 81, 87, 92	UNU	4
	United Kingdom	1961, 64, 67, 71, 74, 77, 80, 84, 88, 91	UNU	9
	USA	1950, 53, 56, 59, 62, 65, 68, 71, 74, 77, 80, 83, 86, 89	UNU	13
	No. of countries	No. of observations		No. of spells
Total	76	343		234

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

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/second quintile share. In this case we omit one of the two observations for the same year in one country (Canada 1987/1, Côte d'Ivoire 88/1, Colombia 88/1, Denmark 92/2, Finland 91/2, Ghana 92/1, Jordan 91/2, Jamaica 91/1, Mexico 89/1, Morocco 91/1, Philippines 65/1, Turkey 87/1, Venezuela 87/2) and if the time length between observations in one country is only one year (Netherlands 1983). The number behind the year indicates, whether we omit the first or second observation as ordered in the table.

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

	(1)	(2)	(3)
Dep. Var.	**First quintile share of income**	**Second quintile share of income**	**Gini coefficient**
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
Exchange rate regimes	Levy-Yeyati/Sturzenegger (2002) (www.utdt.edu/~ely/papers.html)	5-way-classification
	Reinhart/Rogoff (March 3, 2003) www.puaf.umd.edu/faculty/papers/ reinhart/papers.htm	coarse classification
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 share of income quintile
Currency Crisis	Glick/Hutchison (1999)	dummy variable (1 = currency crisis) currency crisis, if index of currency pressure (weighted average of monthly real exchange rate changes and monthly (percent) reserve losses) exceeds the mean plus 2 times the country-specific standard deviation
Capital Control	IMF - Annual report on exchange arrangements and exchange restrictions (1968 – 2000)	dummy variable (1 = restricted, 0 = not restricted)
Government Consumption	Penn World Tables, Version 6.1 (October 2002)	Constant 1996 US dollars

Table 3: continued

ln(1+inflation/100)	World Development Indicators (2001) (NY.GDP.DEFL.KD.ZG)	Inflation, GDP deflator (annual %)
		for missing values:
	(FP.CPI.TOTL.ZG)	Inflation, consumer prices (Laspeyres) (annual %) (Belarus 1993, 95; Canada 65; Germany 1973, 78, 81, 84; Ethiopia 1981; Poland 1990; Turkey 1968)
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
Overall Budget Surplus (+)/ Deficit (-) to GDP	World Development Indicators (2001) (GB.BAL.OVRL.GD.ZS)	Overall Budget, including grants
		for missing values:
	Easterly, Sewadeh (2002): Global Development Network Growth Database, World Bank	Data on overall budget/deficit from IMF Government Financial Statistics (Germany 1973, 78, 81, 84; Tunisia 1990; Latvia 1995)
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
		for missing value:
	World Population Prospects: The 2002 Revision Population Database	Jordan 1980
Terms of Trade	Easterly, Sedaweh (2002): Global Development Network Growth Database, World Bank	Terms of Trade (goods and services, 1995 = 100)

Table 3: continued

Civil Liberties	Freedom House	Measured on a scale of 1 to 7. (1 indicates the most liberal country)
Output volatility	Penn World Tables, Version 6.1 (October 2002)	Constant 1996 US dollars using the Chain index, three year moving standard deviation of annual real GDP per capita growth (e.g. Australia 1976: standard deviation of growth rates for Australia 1974, 75, 76)

Table 4: Two-way tables of frequency

Exchange rate regimes and currency crises

Levy-Yeyati/Sturzenegger (2002) 5-way classification			Reinhart/Rogoff (2003)	Coarse classification		4-way classification	
	Currency crisis			**Currency crisis**		**Currency crisis**	
	1	0		1	0	1	0
Fixed	5	50	**Pegged**	4	34	4	35
Crawling peg	3	33	**Limited flexibility**	9	76	11	76
Dirty float	7	12	**Managed floating**	4	41	8	50
Flexible	7	43	**Freely floating**	0	4	3	7
			Freely falling	9	16		
Inconclusives	0	4	**Category 6**	1	1	1	4

Exchange rate regimes Levy-Yeyati/Sturzenegger and Reinhart/Rogoff

Levy-Yeyati/ Sturzenegger (2002):	**Fixed**	**Crawling peg**	**Dirty float**	**Flexible**	**Incon- clusives**
Reinhart/Rogoff (2003) coarse classification					
Pegged	32	4	2	3	5
Limited flexibility	17	26	10	25	0
Managed floating	10	6	2	16	0
Freely floating	0	1	0	13	0
Freely falling	5	4	5	7	0
Category 6	0	0	1	1	0
Reinhart/Rogoff (2003) 4-way classification					
Pegged	33	4	2	3	5
Limited flexibility	17	27	10	26	0
Managed floating	12	7	5	21	0
Freely floating	1	3	2	14	0
Category 6	1	0	1	1	0

Note: For description of exchange rate classifications, see section 3.2.

Table 5: Exchange rate regimes and mean of average annual growth of first and second quintile share of income

Levy-Yeyati/Sturzenegger (2002), 5 – way classification				Reinhart/Rogoff 2003, coarse classification				Reinhart/Rogoff 2003, 4-way classification		
	y^{q20}	y^{q40}	N		y^{q20}	y^{q40}	N	y^{q20}	y^{q40}	N
All countries[215]				**All countries**						
Fixed	0.11	-0.14	41	Pegged	-0.34	-0.20	75	-0.34	-0.20	75
Crawling peg	0.34	-0.34	24	Lim. flexibility	0.33	-0.08	74	0.38	-0.04	75
Dirty Float	1.50	0.45	11	Man. floating	-0.45	-0.15	50	0.08	0.30	61
Flexible	0.12	0.003	43	Freely floating	-0.58	-0.85	8	-2.16	-1.37	15
				Freely falling	0.23	0.60	21			
Inconclusives	-3.52	-3.20	3	Category 6	-1.50	-0.83	2	-0.37	-0.94	4
Developing countries				**Developing countries**						
Fixed	-0.12	-0.04	31	Pegged	-0.52	-0.23	47	-0.52	-0.23	47
Crawling peg	0.42	-0.06	17	Lim. flexibility	0.96	0.29	35	1.04	0.35	36
Dirty float	1.67	0.36	9	Man. floating	-0.63	-0.17	32	0.16	0.48	43
Flexible	0.31	0.27	22	Freely floating	.	.	0	0.62	0.35	5
				Freely falling	2.04	1.72	18			
Inconclusives	-3.52	-3.20	3	Category 6	-0.51	-0.23	1	0.98	0.30	1
Transitional countries[216]				**Transitional countries**						
				Pegged	-8.53	-2.44	2	-8.53	-2.44	2
				Lim. flexibility	.	.	0			
Dirty float	-13.87	-2.78	1	Man. floating	-0.40	-0.53	4	-0.40	-0.53	4
				Freely floating	.	.	0	-15.41	-7.73	2
				Freely falling	-10.59	-6.13	3			
				Category 6	-2.50	-1.44	1	-1.72	-2.18	2
Industrial countries				**Industrial countries**						
Fixed	0.8	-0.46	10	Pegged	0.61	0.03	26			
Crawling peg	0.14	-1.01	7	Lim. flexibility	-0.23	-0.41	39			
Dirty float	0.74	0.86	2	Man. floating	-0.03	-0.01	14			
Flexible	-0.09	-0.27	21	Freely floating	-0.58	-0.85	8			
				Freely falling	.	.	0			
Inconclusives		.	0	Category 6	.	.	0			

215 In the dirty float category we omit Poland 1990 because of its biasing effect (see transitional countries).
216 As there is only one initial exchange rate regime for transitional countries, the values are given by the spell Poland 1990 – 93.

Table 6: Exchange rate regimes and mean of adjusted first and second quintile share of income

Levy-Yeyati/Sturzenegger 2002 5 – way classification				Reinhart/Rogoff 2003, coarse classification				Reinhart/Rogoff 2003, 4-way classification		
	Q^{20ad}	**Q^{40ad}**	**N**		**Q^{20ad}**	**Q^{40ad}**	**N**	**Q^{20ad}**	**Q^{40ad}**	**N**
All countries										
Fixed	0.053	0.094	68	Pegged	0.057	0.098	97	0.057	0.098	98
Crawling peg	0.056	0.097	41	Lim. flexibility	0.063	0.108	108	0.062	0.108	110
Dirty Float	0.054	0.093	20	Man. floating	0.056	0.096	67	0.054	0.092	81
Flexible	0.057	0.100	69	Freely floating	0.063	0.117	15	0.064	0.110	25
				Freely falling	0.048	0.082	30			
Inconclusives	0.073	0.106	5	Category 6	0.069	0.113	4	0.053	0.095	7
Developing countries										
Fixed	0.048	0.083	49	Pegged	0.052	0.085	65	0.052	0.084	66
Crawling peg	0.050	0.084	29	Lim. flexibility	0.059	0.094	57	0.058	0.093	59
Dirty float	0.052	0.090	16	Man. floating	0.049	0.084	45	0.047	0.082	59
Flexible	0.051	0.085	40	Freely floating	0.066	0.10	2	0.048	0.078	7
				Freely falling	0.039	0.072	24			
Inconclusives	0.073	0.106	5	Category 6	0.089	0.127	1	0.050	0.086	3
Transitional countries										
Fixed	0.080	0.126	1	Pegged	0.086	0.128	3	0.086	0.128	3
Crawling peg	.	.	0	Lim. flexibility	.	.	0	.	.	0
Dirty float	0.062	0.096	2	Man. floating	0.096	0.132	6	0.096	0.132	6
Flexible	0.074	0.121	2	Freely floating	.	.	0	0.091	0.130	5
				Freely falling	0.082	0.122	6			
Inconclusive	.	.	0	Category 6	0.062	0.109	3	0.055	0.102	4
Industrial countries										
Fixed	0.066	0.122	18	Pegged	0.067	0.126	29			
Crawling peg	0.073	0.130	12	Lim. flexibility	0.068	0.124	51			
Dirty float	0.058	0.112	2	Man. floating	0.061	0.115	16			
Flexible	0.064	0.121	27	Freely floating	0.063	0.119	13			
				Freely falling	.	.	0			
Inconclusives		.	0	Category 6	.	.	0			

Table 7: Exchange rate regimes and mean of average annual growth of mean income of first and second quintile share

Levy-Yeyati/Sturzenegger 2002, 5 – way classification | Reinhart/Rogoff 2003, coarse classification | Reinhart/Rogoff 2003, 4-way classification

All countries[217]

Levy-Yeyati/Sturzenegger 2002, 5 – way classification	y^{p20}	y^{p40}	N	Reinhart/Rogoff 2003, coarse classification	y^{p20}	y^{p40}	N	Reinhart/Rogoff 2003, 4-way classification y^{p20}	y^{p40}	N
Fixed	1.67	1.43	41	Pegged	1.81	1.96	75	1.81	1.96	75
Crawling peg	1.92	1.25	24	Lim. flexibility	2.96	2.55	74	2.96	2.54	75
Dirty Float	4.17	3.12	11	Man. floating	2.06	2.36	50	2.24	2.46	61
Flexible	2.31	2.19	43	Freely floating	1.71	1.45	8	-1.64	-0.85	15
				Freely falling	-0.29	0.08	21			
Inconclusives	-0.15	-0.16	3	Category 6	-5.29	-4.62	2	-3.67	-4.24	4

Developing countries

Levy-Yeyati/Sturzenegger 2002, 5 – way classification	y^{p20}	y^{p40}	N	Reinhart/Rogoff 2003, coarse classification	y^{p20}	y^{p40}	N	Reinhart/Rogoff 2003, 4-way classification y^{p20}	y^{p40}	N
Fixed	1.24	1.32	31	Pegged	1.49	1.78	47	1.49	1.78	47
Crawling peg	2.27	4.66	17	Lim. flexibility	4.01	3.33	35	3.98	3.29	36
Dirty float	4.28	2.96	9	Man. floating	2.25	2.72	32	2.45	2.77	43
Flexible	2.60	2.55	22	Freely floating	.	.	0	1.64	1.38	5
				Freely falling	2.45	2.13	18			
Inconclusives	-0.15	0.16	3	Category 6	1.26	1.55	1	0.34	-0.34	2

Transitional countries[218]

Levy-Yeyati/Sturzenegger 2002, 5 – way classification	y^{p20}	y^{p40}	N	Reinhart/Rogoff 2003, coarse classification	y^{p20}	y^{p40}	N	Reinhart/Rogoff 2003, 4-way classification y^{p20}	y^{p40}	N
				Pegged	-6.45	-0.36	2	-6.45	-.36	2
				Lim. flexibility	.	.	0	.	.	0
Dirty float	-14.28	-3.19	1	Man. floating	0.91	0.79	4	0.91	0.79	4
				Freely floating	.	.	0	-23.30	-15.61	2
				Freely falling	-16.70	-12.24	3			
				Category 6	-11.84	-10.79	1	-7.67	-8.13	2

Industrial countries

Levy-Yeyati/Sturzenegger 2002, 5 – way classification	y^{p20}	y^{p40}	N	Reinhart/Rogoff 2003, coarse classification	y^{p20}	y^{p40}	N	Reinhart/Rogoff 2003, 4-way classification y^{p20}	y^{p40}	N
Fixed	3.00	1.75	10	Pegged	3.05	2.47	26			
Crawling peg	1.08	-0.07	7	Lim. flexibility	2.02	1.85	39			
Dirty float	3.69	3.81	2	Man. floating	1.96	1.97	14			
Flexible	2.01	1.82	21	Freely floating	1.71	1.45	8			
				Freely falling	.	.	0			
Inconclusives	.	.	0	Category 6	.	.	0			

[217] In the dirty float category we omit Poland 1990 because of its biasing effect (see transitional countries).
[218] As there is only one initial exchange rate regime for transitional countries, the values are given by the spell Poland 1990 – 93.

Table 8: Exchange rate regimes and mean of mean income of adjusted first and second quintile share

Levy-Yeyati/Sturzenegger 2002, 5 – way classification				Reinhart/Rogoff 2003, coarse classification				Reinhart/Rogoff 2003, 4-way classification		
	P^{20ad}	P^{40ad}	N		P^{20ad}	P^{40ad}	N	P^{20ad}	P^{40ad}	N
All countries										
Fixed	2277	4078	68	Pegged	2093	3756	97	2084	3738	98
Crawling peg	2388	4238	41	Lim. flexibility	3204	5743	108	3157	5661	110
Dirty Float	1936	3340	20	Man. floating	1989	3480	67	1830	3211	81
Flexible	2844	5295	69	Freely floating	5317	10116	15	3924	7172	25
				Freely falling	1244	2087	30			
Inconclusives	966	1430	5	Category 6	1499	2628	4	1085	2028	7
Developing countries										
Fixed	964	1670	49	Pegged	894	1489	65	899	1497	66
Crawling peg	952	1653	29	Lim. flexibility	1210	1991	57	1190	1964	59
Dirty float	1567	2640	16	Man. floating	786	1369	45	853	1501	59
Flexible	926	1608	40	Freely floating	810	1153	2	889	1486	7
				Freely falling	928	1668	24			
Inconclusives	966	1430	5	Category 6	416	593	1	225	388	3
Transitional countries										
Fixed	2736	4319	1	Pegged	2778	4126	3	2778	4126	3
Crawling peg	.	.	0	Lim. flexibility	.	.	0	.	.	0
Dirty float	2066	3240	2	Man. floating	4071	5564	6	4071	5564	6
Flexible	2178	3628	2	Freely floating	.	.	0	2746	3892	5
				Freely falling	2511	3762	6			
Inconclusive	.	.	0	Category 6	1860	3306	3	1729	3892	4
Industrial countries										
Fixed	5826	10621	18	Pegged	4709	8798	29			
Crawling peg	5859	10483	12	Lim. flexibility	5433	9937	51			
Dirty float	4756	9045	2	Man. floating	4592	8635	16			
Flexible	5736	10881	27	Freely floating	6011	11495	13			
				Freely falling	.	.	0			
Inconclusives		.	0	Category 6	.	.	0			

Table 9: Exchange rate regimes and pro-poor growth distribution effect (Growth equation)

Levy-Yeyati/Sturzenegger 2002

All countries

	(1)	(2)	(3)	(4)
Dep. Var.	y^{q20}	y^{q20o}	y^{q40}	y^{q40o}
Crawling peg	0.23	0.69	-0.19	-0.61
	(1.04)	(0.95)	(0.73)	(0.68)
Dirty Float	0.12	**1.85***	0.33	-0.09
	(1.62)	(0.98)	(0.75)	(0.70)
Flexible	0.01	0.80	0.15	-0.27
	(0.99)	(0.84)	(0.58)	(0.52)
Constant	0.11	-0.34	-0.14	0.27
	(0.86)	(0.74)	(0.48)	(0.40)
F-test	0.04	1.29	0.16	0.29
R^2	0.00	0.02	0.00	0.01
N	120	117	120	118

Developing countries

	(9)	(10)	(11)	(12)
Dep. Var.	y^{q20}	y^{q20o}	y^{q40}	y^{q40o}
Crawling peg	0.54	1.15	-0.02	-0.58
	(1.35)	(1.23)	(0.91)	(0.84)
Dirty float	1.79	**2.40****	0.40	-0.16
	(1.33)	(1.20)	(0.93)	(0.86)
Flexible	0.43	1.71	0.31	-0.25
	(1.43)	(1.15)	(0.88)	(0.80)
Constant	-0.12	-0.73	-0.04	0.52
	(1.09)	(0.93)	(0.62)	(0.51)
F-test	0.83	1.43	0.11	0.16
R^2	0.01	0.05	0.00	0.01
N	79	77	79	77

Reinhart/Rogoff 2003, coarse classification

All countries

	(5)	(6)	(7)	(8)
	y^{q20}	y^{q20o}	y^{q40}	y^{q40o}
Limited flexibility	0.67	0.58	0.12	0.12
	(0.69)	(0.55)	(0.40)	(0.36)
Managed floating	-0.10	0.15	0.04	-0.12
	(0.82)	(0.79)	(0.43)	(0.37)
Freely floating	-0.24	0.01	**-0.66****	**-0.66****
	(0.73)	(0.69)	(0.32)	(0.29)
Freely falling	0.57	**2.37****	0.80	0.36
	(1.80)	(0.93)	(1.20)	(0.74)
Constant	-0.34	-0.59	-0.20	-0.19
	(0.49)	(0.43)	(0.28)	(0.23)
F-test	0.51	1.91	2.40*	2.36*
R^2	0.01	0.03	0.01	0.01
N	228	222	228	223

Developing countries

	(13)	(14)	(15)	(16)
	y^{q20}	y^{q20o}	y^{q40}	y^{q40o}
Limited flexibility	1.48	1.17	0.52	0.51
	(1.12)	(0.78)	(0.62)	(0.57)
Managed floating	-0.11	0.29	0.06	-0.20
	(1.14)	(1.07)	(0.64)	(0.54)
Freely floating	.	.	.	.
Freely falling	2.55	**2.88*****	1.95	0.96
	(1.67)	(1.03)	(1.22)	(0.72)
Constant	-0.52	-0.92	-0.23	-0.22
	(0.69)	(0.57)	(0.41)	(0.33)
F-test	1.33	2.84*	1.02	1.03
R^2	0.04	0.05	0.04	0.03
N	132	128	132	128

* denotes significance at the 90% level, ** at the 95% level, and *** at the 99% level (two-sided alternative). Pooled – OLS estimation for all equations. Heteroscedasticity adjusted standard errors in parentheses. F-test indicates the F-statistic for the test on the overall significance of the regression. y^{q20}: average annual growth rate of the first quintile share. y^{q40}: average annual growth rate of the second quintile share. y^{q20o}: average annual growth rate of the first quintile share (regressions without outliers). y^{q40o}: average annual growth rate of the second quintile share (regressions without outliers).

Table 9: continued

Levy-Yeyati/Sturzenegger 2002

Industrial countries

	(17)	(18)	(19)	(20)
Dep. Var.	y^{q20}	y^{q20o}	y^{q40}	y^{q40o}
Crawling peg	-0.66	0.21	-0.55	0.46
	(1.20)	(0.88)	(1.09)	(0.50)
Dirty float	-0.06	0.81	**1.32****	**1.32****
	(1.26)	(0.97)	(0.55)	(0.55)
Flexible	-0.89	-0.02	0.19	0.19
	(1.08)	(0.79)	(0.43)	(0.43)
Constant	0.80	-0.07	-0.46	-0.46
	(1.08)	(0.71)	(0.38)	(0.38)
F-test	0.54	0.43	2.78*	2.55*
R^2	0.03	0.01	0.07	0.09
N	40	39	40	39

Reinhart/Rogoff 2003, coarse classification

Industrial countries

	(21)	(22)	(23)	(24)
Dep. Var.	y^{q20}	y^{q20o}	y^{q40}	y^{q40o}
Limited flexibility	-0.84	**-1.07***	-0.44	-0.07
	(0.59)	(0.54)	(0.43)	(0.36)
Managed floating	-0.64	**-1.55****	-0.05	-0.05
	(1.16)	(0.77)	(0.45)	(0.45)
Freely floating	**-1.19***	**-1.19***	**-0.88*****	**-0.88*****
	(0.67)	(0.67)	(0.32)	(0.32)
Freely falling	.	.	.	.
Constant	0.61	0.61	0.03	0.03
	(0.39)	(0.39)	(0.26)	(0.26)
F-test	1.29	2.18*	3.35**	4.29**
R^2	0.02	0.07	0.03	0.03
N	87	85	87	85

* denotes significance at the 90% level, ** at the 95% level, and *** at the 99% level (two-sided alternative). Pooled – OLS estimation for all equations. Heteroscedasticity adjusted standard errors in parentheses. F-test indicates the F-statistic for the test on the overall significance of the regression. y^{q20}: average annual growth rate of the first quintile share. y^{q40}: average annual growth rate of the second quintile share. y^{q20o}: average annual growth rate of the first quintile share (regressions without outliers). y^{q40o}: average annual growth rate of the second quintile share (regressions without outliers).

Table 9: continued

Reinhart/Rogoff 2003, 4-way classification

All countries

	(25)	(26)	(27)	(28)
Dep. Var.	y^{q20}	y^{q20o}	y^{q40}	y^{q40o}
Limited flexibility	0.72	0.63	0.15	0.05
	(0.68)	(0.55)	(0.39)	(0.35)
Managed floating	0.43	0.35	0.50	0.09
	(0.86)	(0.77)	(0.52)	(0.39)
Freely floating	-1.82	0.47	-1.17	-0.30
	(1.54)	(0.71)	(0.75)	(0.31)
Constant	-0.34	-0.59	-0.20	-0.09
	(0.49)	(0.43)	(0.27)	(0.21)
F-test	1.10	0.45	1.43	0.49
R^2	0.02	0.005	0.02	0.002
N	226	221	226	220

Developing countries

	(29)	(30)	(31)	(32)
	y^{q20}	y^{q20o}	y^{q40}	y^{q40o}
Limited flexibility	1.56	1.27	0.58	0.41
	(1.10)	(0.78)	(0.61)	(0.54)
Managed floating	0.68	0.63	0.71	0.11
	(1.17)	(1.02)	(0.74)	(0.54)
Freely floating	1.13	1.54	0.58	0.41
	(1.34)	(1.28)	(0.54)	(0.45)
Constant	-0.52	-0.92	-0.23	-0.06
	(0.69)	(0.57)	(0.41)	(0.29)
F-test	0.72	1.07	0.53	0.36
R^2	0.01	0.02	0.01	0.005
N	131	128	131	127

* denotes significance at the 90% level, ** at the 95% level, and *** at the 99% level (two-sided alternative). Pooled – OLS estimation for all equations. Heteroscedasticity adjusted standard errors in parentheses. F-test indicates the F-statistic for the test on the overall significance of the regression. y^{q20}: average annual growth rate of the first quintile share. y^{q40}: average annual growth rate of the second quintile share. y^{q20o}: average annual growth rate of the first quintile share (regressions without outliers). y^{q40o}: average annual growth rate of the second quintile share (regressions without outliers).

Table 10: Exchange rate regimes and pro-poor growth distribution effect (System GMM estimation)

Reinhart/Rogoff 2003, coarse classification

All Countries / Developing Countries

	All Countries (1)	(2)	(3)	(4)	Developing Countries (5)	(6)	(7)	(8)
Dep. Var.	Y^{q20s}	Y^{q20c}	Y^{q40s}	Y^{q40c}	Y^{q20s}	Y^{q20c}	Y^{q40s}	Y^{q40c}
Limited flexibility	0.072	**0.101****	**0.061***	**0.083****	0.083	0.103	0.058	**0.075***
	(0.054)	(0.050)	(0.036)	(0.038)	(0.068)	(0.064)	(0.041)	(0.040)
Managed floating	0.020	-0.004	0.002	-0.012	-0.003	-0.010	0.015	0.001
	(0.061)	(0.061)	(0.041)	(0.046)	(0.075)	(0.069)	(0.048)	(0.047)
Freely floating	0.048	**0.148***	**0.128****	**0.182*****	**0.281*****	**0.238*****	**0.185*****	**0.173*****
	(0.090)	(0.080)	(0.058)	(0.061)	(0.102)	(0.114)	(0.056)	(0.064)
Freely falling	**-0.152***	**-0.161***	**-0.120****	**-0.136***	-0.131	-0.142	-0.073	-0.086
	(0.088)	(0.090)	(0.060)	(0.070)	(0.091)	(0.090)	(0.060)	(0.066)
Constant	-1.28***	-1.32***	-0.67***	-0.75***	-1.38***	-1.43***	-0.79***	-0.89***
	(0.06)	(0.06)	(0.04)	(0.05)	(0.07)	(0.07)	(0.05)	(0.05)
m1	-1.60	-2.65***	-1.78*	-2.81***	-1.60	-2.56**	-1.68*	-2.59***
m2	-1.75*	-1.15	-1.95*	0.88	-1.23	-0.87	-1.91*	0.84
N	321	307	321	307	201	191	201	191
1 – RSS/TSS	0.05	0.09	0.07	0.13	0.07	0.10	0.07	0.10

Industrial Countries

	(9)	(10)	(11)	(12)
	Y^{q20s}	Y^{q20c}	Y^{q40s}	Y^{q40c}
Limited flexibility	-0.004	0.032	-0.022	-0.009
	(0.075)	(0.049)	(0.020)	(0.021)
Managed floating	0.036	-0.042	-0.039	**-0.054***
	(0.086)	(0.072)	(0.033)	(0.032)
Freely floating	-0.157	-0.033	-0.069	-0.041
	(0.102)	(0.082)	(0.049)	(0.048)
Constant	-1.11***	-1.13***	-0.45***	-0.47***
	(0.09)	(0.05)	(0.02)	(0.02)
m1	-0.77	-0.72	-1.30	-1.75*
m2	-1.19	-1.81*	-0.99	-1.35
N	111	107	111	107
1 – RSS/TSS	0.07	0.05	0.07	0.09

* 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^{q20s}/Y^{q40s}: $\ln(Q^{20/40}/0.2)$ unadjusted approach. Y^{q20c}/Y^{q40c}: $\ln(Q^{20/40}/0.2)$ adjusted approach.

Table 10: continued

Reinhart/Rogoff 2003, 4-way classification

	All Countries				**Developing Countries**			
	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Dep. Var.	Y^{q20s}	Y^{q20c}	Y^{q40s}	Y^{q40c}	Y^{q20s}	Y^{q20c}	Y^{q40s}	Y^{q40c}
Limited flexibility	0.072	**0.092***	**0.063***	**0.078****	0.080	0.087	0.059	**0.066***
	(0.053)	(0.050)	(0.036)	(0.037)	(0.067)	(0.063)	(0.041)	(0.040)
Managed floating	-0.005	-0.029	-0.013	-0.029	-0.021	-0.033	0.003	-0.012
	(0.058)	(0.057)	(0.040)	(0.042)	(0.070)	(0.064)	(0.045)	(0.042)
Freely floating	0.017	0.074	0.063	0.081	-0.002	-0.021	0.0002	-0.024
	(0.101)	(0.096)	(0.071)	(0.075)	(0.160)	(0.139)	(0.100)	(0.098)
Constant	-1.30***	-1.32***	-0.68***	-0.75***	-1.39***	-1.43***	-0.79***	-0.89***
	(0.06)	(0.05)	(0.04)	(0.05)	(0.07)	(0.07)	(0.05)	(0.05)
m1	-1.64	-2.18**	-1.81*	-2.77***	-1.56	-2.02**	-1.76*	-2.53**
m2	-1.61*	-1.76*	-1.94*	0.97	-1.08	-1.17	-1.75*	0.15
N	319	305	319	305	199	189	199	189
1 – RSS/TSS	0.02	0.04	0.04	0.06	0.03	0.04	0.03	0.05

* 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^{q20s}/Y^{q40s}: $\ln(Q^{20/40}/0.2)$ unadjusted approach. Y^{q20c}/Y^{q40c}: $\ln(Q^{20/40}/0.2)$ adjusted approach.

Table 11: Exchange rate regimes and regional dummies distribution effect (Growth equation)

	Levy-Yeyati/Sturzenegger 2002				Reinhart/Rogoff 2003, coarse classification				
	(1)	(2)	(3)	(4)		(5)	(6)	(7)	(8)
Dep. Var.	**y^{q20o} all ols**	**y^{q40o} all re**	**y^{q20o} dev ols**	**y^{q40o} dev re**		**y^{q20o} all ols**	**y^{q40o} all re**	**y^{q20o} dev ols**	**y^{q40o} dev re**
Crawling peg	0.37	-0.48	0.79	-0.43	Limited flexibility	0.44	0.08	**1.29***	0.52
	(0.95)	(0.63)	(1.26)	(0.88)		(0.49)	(0.37)	(0.73)	(0.57)
Dirty float	1.62	0.16	**2.13***	-0.12	Managed floating	0.46	-0.09	0.47	-0.32
	(0.99)	(0.82)	(1.21)	(1.07)		(0.83)	(0.42)	(1.10)	(0.61)
Flexible	0.60	-0.08	1.46	-0.22	Freely floating	-0.36	-0.64		
	(0.85)	(0.55)	(1.18)	(0.82)		(0.69)	(0.85)		
					Freely falling	**3.13*****	0.53	**3.31*****	1.01
						(1.11)	(0.63)	(1.20)	(0.77)
EAP	-0.26	0.12	1.02	-0.97		-0.82	0.05	-1.37	-0.83
	(0.86)	(0.66)	(1.72)	(1.10)		(0.73)	(0.44)	(1.60)	(0.77)
ECA		-2.66				-3.29*	-1.92**		
		(2.51)				(1.93)	(0.85)		
LAC	0.65	0.93	1.87	-0.13		-1.44*	-0.18	-1.76	-1.05
	(0.92)	(0.58)	(1.84)	(1.04)		(0.84)	(0.48)	(1.47)	(0.73)
MNA	1.01	1.05	2.27	-0.03		0.82	1.00	0.36	0.18
	(0.95)	(0.93)	(1.82)	(1.34)		(0.79)	(0.69)	(1.57)	(0.96)
SA	0.03	0.30	1.06	-0.77		0.12	-0.03	-0.37	-0.93
	(0.63)	0.98)	(1.67)	(1.43)		(0.60)	(0.55)	(1.66)	(0.86)
SSA	-1.43	1.08				0.20	0.78		
	(1.61)	(0.87)				(1.50)	(0.63)		
Constant	-0.25	-0.28	-1.88	0.86		-0.22	-0.22	-0.06	0.52
	(0.78)	(0.53)	(1.68)	(0.90)		(0.42)	(0.34)	(1.62)	(0.68)
Breusch-Pagan		6.49**		6.65***			5.51**		5.68**
F- test	0.87		1.05			1.84*		2.91***	
Wald – test		6.94		2.10			12.24		7.14
R^2	0.06	0.06	0.08	0.03		0.08	0.05	0.09	0.06
N	117	118	77	77		222	223	128	128

* 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 indicate the F-statistic/Wald-statistic for the test on the overall significance of the regression. Ramsey Reset test for omitted variables is passed in all OLS estimations (equations 1, 3, 5, 7). Breusch-Pagan is a Lagrange-multiplier test for the random effects model, distributed as chi-squared under the null of no random effects. y^{q20o}: average annual growth rate of the first quintile share (regressions without outliers). y^{q40o}: average annual growth rate of the second quintile share (regressions without outliers). ols: results for pooled OLS estimation, re: results for random effects estimation. all: all countries. dev: developing countries.

Table 11: continued

Reinhart/Rogoff 2003, 4-way classification

	(9)	(10)	(11)	(12)
Dep. Var.	**y^{q20o} all ols**	**y^{q40o} all re**	**y^{q20o} dev ols**	**y^{q40o} dev re**
Limited flexibility	0.60 (0.49)	0.12 (0.37)	**1.49**** (0.73)	0.53 (0.58)
Managed floating	0.62 (0.80)	-0.23 (0.41)	0.83 (1.04)	-0.08 (0.58)
Freely floating	0.50 (0.73)	-0.31 (0.67)	1.93 (1.36)	0.19 (1.22)
EAP	-0.76 (0.72)	0.07 (0.43)	-1.73 (1.64)	-1.56* (0.81)
ECA	-3.13 (2.17)	-0.88 (0.95)		
LAC	-0.91 (0.81)	0.25 (0.43)	-1.80 (1.57)	-1.29* (0.77)
MNA	1.09 (0.73)	1.06 (0.68)	0.16 (1.57)	-0.50 (1.00)
SA	0.24 (0.60)	0.01 (0.54)	-0.63 (1.71)	-1.61* (0.90)
SSA	0.71 (1.51)	1.50** (0.64)		
Constant	-0.40 (0.42)	-0.27 (0.33)	0.13 (1.68)	1.19 (0.73)
Breusch-Pagan		6.13**		5.62**
F-test	1.45		2.40**	
Wald-test		9.45		0.56
R^2	0.04	0.04	0.05	0.05
N	221	220	128	127

* 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 indicate the F-statistic/Wald-statistic for the test on the overall significance of the regression. Ramsey Reset test for omitted variables is passed in equation 11, but not passed in equation 9. Breusch-Pagan is a Lagrange-multiplier test for the random effects model, distributed as chi-squared under the null of no random effects. y^{q20o}: average annual growth rate of the first quintile share (regressions without outliers). y^{q40o}: average annual growth rate of the second quintile share (regressions without outliers). ols: results for pooled OLS estimation, re: results for random effects estimation. all: all countries. dev: developing countries.

Table 12: Exchange rate regimes and regional dummies distribution effect (System GMM estimation)

Reinhart/Rogoff (2003), coarse classification

	All Countries				**Developing Countries**			
Dep. Var.	Y^{q20s}	Y^{q20c}	Y^{q40s}	Y^{q40c}	Y^{q20s}	Y^{q20c}	Y^{q40s}	Y^{q40c}
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Limited flexibility	0.044	0.052	0.026	**0.030***	0.063	0.052	0.045	**0.046***
	(0.043)	(0.036)	(0.019)	(0.017)	(0.051)	(0.049)	(0.028)	(0.025)
Managed floating	**0.083***	0.041	**0.045***	0.026	**0.099***	0.069	**0.076****	**0.056***
	(0.043)	(0.039)	(0.025)	(0.023)	(0.053)	(0.048)	(0.032)	(0.029)
Free floating	-0.037	0.044	0.014	0.029	**0.280*****	**0.247*****	**0.186*****	**0.172*****
	(0.090)	(0.073)	(0.051)	(0.048)	(0.061)	(0.044)	(0.032)	(0.029)
Freely falling	0.030	-0.013	0.011	-0.005	0.043	-0.004	0.031	0.010
	(0.056)	(0.064)	(0.039)	(0.046)	(0.062)	(0.069)	(0.043)	(0.049)
Eap	-0.13	-0.07	-0.22***	-0.25***	0.08	0.38***	0.06	0.20**
	(0.08)	(0.06)	(0.05)	(0.05)	(0.09)	(0.10)	(0.07)	(0.08)
Eca	0.39***	0.40***	0.14***	0.10***				
	(0.08)	(0.05)	(0.03)	(0.03)				
Lac	-0.61***	-0.55***	-0.51***	-0.58***	-0.40***	-0.10	-0.23***	-0.13*
	(0.08)	(0.06)	(0.04)	(0.05)	(0.08)	(0.10)	(0.06)	(0.08)
Mna	-0.08	-0.20**	-0.20***	-0.32***	0.13	0.26**	0.08	0.13*
	(0.10)	(0.08)	(0.05)	(0.04)	(0.11)	(0.12)	(0.07)	(0.07)
Sa	0.19**	0.11**	-0.03	-0.12***	0.41***	0.58***	0.25***	0.33***
	(0.10)	(0.05)	(0.05)	(0.03)	(0.11)	(0.10)	(0.07)	(0.07)
Ssa	-0.21**	-0.45***	-0.28***	-0.44***				
	(0.09)	(0.10)	(0.06)	(0.06)				
Constant	-1.16***	-1.16***	-0.40***	-0.51***	-1.38***	-1.63***	-0.79***	-0.98***
	(0.07)	(0.04)	(0.02)	(0.02)	(0.07)	(0.10)	(0.06)	(0.07)
m1	-1.61	-2.20**	-1.75*	-2.68***	-1.49	-2.09**	-1.63	-2.47**
m2	-1.47	-1.05	-2.14**	-0.39	-1.01	-0.39	-2.05**	-0.26
N	321	307	321	307	201	191	201	191
1 – RSS/TSS	0.50	0.55	0.60	0.68	0.49	0.52	0.44	0.47

* 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^{q20s}/Y^{q40s}: $\ln(Q^{20/40}/0.2)$ unadjusted approach. Y^{q20c}/Y^{q40c}: $\ln(Q^{20/40}/0.2)$ adjusted approach.

Table 12: continued

Reinhart/Rogoff (2003), 4-way classification

	All Countries				**Developing Countries**			
Dep. Var.	Y^{q20s}	Y^{q20c}	Y^{q40s}	Y^{q40c}	Y^{q20s}	Y^{q20c}	Y^{q40s}	Y^{q40c}
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Limited flexibility	0.047	0.042	0.029	0.026	0.067	0.037	**0.050***	0.038
	(0.043)	(0.036)	(0.020)	(0.018)	(0.052)	(0.050)	(0.029)	(0.026)
Managed floating	**0.075***	0.034	**0.042***	0.023	**0.090***	0.054	**0.070****	**0.048***
	(0.040)	(0.038)	(0.024)	(0.021)	(0.049)	(0.046)	(0.031)	(0.026)
Freely floating	-0.006	0.030	0.014	0.012	0.122	0.073	0.074	0.040
	(0.075)	(0.069)	(0.044)	(0.046)	(0.116)	(0.117)	(0.072)	(0.079)
Eap	-0.13	-0.08	-0.22***	-0.25***	0.06	0.37***	0.05	0.19**
	(0.07)	(0.06)	(0.05)	(0.05)	(0.09)	(0.11)	(0.07)	(0.08)
Eca	0.40***	0.38***	0.14***	0.09***				
	(0.08)	(0.05)	(0.03)	(0.02)				
Lac	-0.61***	-0.57***	-0.51***	-0.59***	-0.43***	-0.13	-0.25***	-0.15*
	(0.08)	(0.06)	(0.05)	(0.05)	(0.08)	(0.10)	(0.07)	(0.08)
Mna	-0.08	-0.20**	-0.20***	-0.32***	0.11	0.24**	0.06	0.12
	(0.10)	(0.08)	(0.05)	(0.04)	(0.11)	(0.12)	(0.07)	(0.07)
Sa	0.20**	0.11**	-0.03	-0.12***	0.39***	0.56***	0.24***	0.32***
	(0.10)	(0.05)	(0.05)	(0.03)	(0.11)	(0.10)	(0.07)	(0.07)
Ssa	-0.19**	-0.44***	-0.27***	-0.44***				
	(0.09)	(0.10)	(0.06)	(0.07)				
Constant	-1.16***	-1.15***	-0.50***	-0.51***	-1.36***	-1.60***	-0.78***	-0.96***
	(0.07)	(0.04)	(0.02)	(0.02)	(0.07)	(0.10)	(0.06)	(0.07)
m1	-1.63	-2.10**	-1.77*	-2.77***	-1.50	-1.94*	-1.66*	-2.60***
m2	-1.56	-1.01	-2.20**	-0.58	-1.14	-0.56	-2.10**	0.02
N	319	305	319	305	199	189	199	189
1 – RSS/TSS	0.50	0.55	0.60	0.68	0.49	0.53	0.44	0.46

* 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^{q20s}/Y^{q40s}: $\ln(Q^{20/40}/0.2)$ unadjusted approach. Y^{q20c}/Y^{q40c}: $\ln(Q^{20/40}/0.2)$ adjusted approach.

Table 13: Exchange rate regimes and currency crises distribution effect (Growth Equation)

Levy-Yeyati/ Sturzenegger 2002		Reinhart/ Rogoff 2003:	coarse classification			4-way classification	
	(1)		(2)	(3)	(4)	(5)	(6)
Dep. Var.	**y^{q40o} indu ols**		**y^{q40o} indu re**	**y^{q20o} dev ols**	**y^{q40o} dev re**	**y^{q20o} dev re**	**y^{q40o} dev re**
Crawling Peg	0.33	Limited	-0.25	**2.04***	1.22	**2.15***	0.83
	(0.49)	flexibility	(0.56)	(1.08)	(0.82)	(1.21)	(0.85)
Dirty Float	**1.19****	Managed	-0.37	1.68	0.72	1.84	0.90
	(0.54)	floating	(0.60)	(1.47)	(0.97)	(1.26)	(0.88)
Flexible	0.55	Freely floating	-1.06			0.69	-0.05
	(0.45)		(0.94)			(2.12)	(1.47)
		Freely falling		**2.79***	1.16		
			(1.42)	(0.95)			
Currency	**-1.27***	Currency	**-1.05****	1.77	**1.65***	**2.63****	**1.67***
Crisis	(0.65)	Crisis	(0.55)	(1.31)	(0.86)	(1.34)	(0.89)
Constant	-0.33	Constant	0.29	-1.50	-1.01	-1.65*	-0.61
	(0.35)		(0.50)	(0.94)	(0.68)	(1.00)	(0.71)
F-test	2.70*	F-test		2.45*			
		Wald-test	5.01		6.59	6.65	4.47
Breusch-Pagan		Breusch-Pagan	4.13**		10.28***	3.64*	9.29***
R^2	0.22	R^2	0.11	0.10	0.08	0.08	0.06
N	30	N	44	80	81	80	80

* 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 indicate the F-statistic/Wald-statistic for the test on the overall significance of the regression. Ramsey Reset test for omitted variables is passed in all OLS estimations (equations 1 and 3). Breusch-Pagan is a Lagrange multiplier test for the random effects model, distributed as chi-squared under the null of no random effects. y^{q20o}: average annual growth rate of the first quintile share (regressions without outliers). y^{q40o}: average annual growth rate of the second quintile share (regressions without outliers). ols: results for pooled OLS estimation. re: results for random effects estimation. dev: developing countries. indu: industrial countries.

Table 14: Exchange rate regimes and currency crises distribution effect (System GMM estimation)

Reinhart/Rogoff (2003), coarse classification

	All Countries		**Developing Countries**		**Industrial Countries**	
Dep. Var.	Y^{q40s}	Y^{q40c}	Y^{q40s}	Y^{q40c}	Y^{q40s}	Y^{q40c}
	(1)	(2)	(3)	(4)	(5)	(6)
Limited flexibility	0.008	0.029	0.023	0.043	**-0.063****	-0.030
	(0.026)	(0.025)	(0.032)	(0.031)	(0.030)	(0.034)
Managed floating	0.021	0.010	0.054	0.037	**-0.083****	**-0.078****
	(0.027)	(0.028)	(0.034)	(0.035)	(0.043)	(0.039)
Freely floating	0.045	**0.082*****			-0.024	0.023
	(0.029)	(0.030)			(0.025)	(0.032)
Freely falling	-0.045	-0.054	-0.028	-0.038		
	(0.044)	(0.053)	(0.062)	(0.055)		
Currency Crisis	**0.040***	0.029	0.047	0.028	**0.032****	**0.023*****
	(0.023)	(0.028)	(0.034)	(0.040)	(0.013)	(0.008)
EAP	-0.23***	-0.26***	0.03	-0.14**		
	(0.05)	(0.05)	(0.06)	(0.07)		
ECA	0.12***	0.08***				
	(0.04)	(0.02)				
LAC	-0.49***	-0.58***	-0.24***	-0.18**		
	(0.05)	(0.06)	(0.06)	(0.07)		
MNA	-0.18***	-0.31***	0.08	-0.10		
	(0.04)	(0.05)	(0.05)	(0.06)		
SA	0.002	-0.09**	0.26***	0.32***		
	(0.02)	(0.04)	(0.04)	(0.07)		
SSA	-0.25***	-0.40***				
	(0.05)	(0.06)				
Constant	-0.47***	-0.51***	-0.74***	-0.92***	-0.40***	-0.45***
	(0.03)	(0.03)	(0.04)	(0.06)	(0.02)	(0.03)
m1	-2.22**	-2.58***	-2.11**	-2.50**	-1.70*	-1.32
m2	1.51	1.97**	1.38	1.82*	-1.71*	-0.41
N	201	194	127	124	67	63
1 – RSS/TSS	0.67	0.73	0.51	0.51	0.14	0.19

* 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^{q20s}/Y^{q40s}: $\ln(Q^{20/40}/0.2)$ unadjusted approach. Y^{q20c}/Y^{q40c}: $\ln(Q^{20/40}/0.2)$ adjusted approach.

Table 14: continued

Reinhart/Rogoff (2003), 4-way classification

	All Countries		Developing Countries	
Dep. Var.	Y^{q40s}	Y^{q40c}	Y^{q40s}	Y^{q40c}
	(7)	(8)	(9)	(10)
Limited flexibility	0.011	0.019	0.028	0.031
	(0.026)	(0.027)	(0.034)	(0.035)
Managed floating	0.014	-0.005	0.036	0.012
	(0.024)	(0.025)	(0.029)	(0.031)
Free floating	-0.012	-0.006	-0.028	-0.030
	(0.064)	(0.073)	(0.092)	(0.100)
Currency Crisis	0.027	0.011	0.031	0.006
	(0.021)	(0.027)	(0.031)	(0.040)
EAP	-0.23***	-0.27***	0.01	0.12*
	(0.05)	(0.05)	(0.06)	(0.07)
ECA	0.12***	0.07***		
	(0.04)	(0.02)		
LAC	-0.51***	-0.60***	-0.27***	-0.21***
	(0.05)	(0.06)	(0.06)	(0.07)
MNA	-0.19***	-0.32***	0.05	0.07
	(0.04)	(0.05)	(0.05)	(0.07)
SA	-0.004	-0.10**	0.24***	0.29***
	(0.02)	(0.04)	(0.05)	(0.07)
SSA	-0.24***	-0.39***		
	(0.05)	(0.06)		
Constant	-0.47***	-0.49***	-0.72***	-0.89***
	(0.03)	(0.03)	(0.05)	(0.06)
m1	-2.07*	-2.20**	-1.94*	-2.30**
m2	1.11	1.84*	1.31	1.87*
N	199	192	125	122
1 – RSS/TSS	0.67	0.73	0.51	0.51

* 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^{q20s}/Y^{q40s}: $\ln(Q^{20/40}/0.2)$ unadjusted approach. Y^{q20c}/Y^{q40c}: $\ln(Q^{20/40}/0.2)$ adjusted approach.

Table 15: Exchange rate regimes and inflation distribution effect (Growth equation)

Reinhart/Rogoff 2003:	coarse classification		4-way classification			
	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var.	**y^{q20o} dev ols**	**y^{q40o} dev re**	**y^{q20o} dev re**	**y^{q40o} dev re**	**y^{q20o} dev re**	**y^{q40o} dev re**
Limited flexibility	1.11 (0.75)	0.43 (0.61)	1.15 (1.01)	0.37 (0.61)		
Managed floating	0.48 (1.12)	-0.61 (0.65)	0.24 (1.04)	-0.58 (0.64)		
Freely floating			-2.13 (2.71)	-1.65 (1.65)		
Freely falling	0.82 (1.80)	-0.41 (1.11)				
ln(1+inflation)	**7.31*** (4.00)	3.60 (2.28)	**9.93***** ** (3.42)	**3.91*** (2.09)	**7.06***** (2.68)	**3.28*** (1.70)
EAP	-0.73 (1.52)	-0.72 (0.80)	-1.12 (1.35)	-1.46* (0.83)	-0.38 (1.23)	0.57 (0.78)
ECA						
LAC	-1.49 (1.45)	-0.76 (0.77)	-2.23* (1.29)	-1.24 (0.80)	-1.26 (1.19)	0.60 (0.76)
MNA	0.93 (1.54)	0.49 (1.00)	0.64 (1.66)	-0.25 (1.02)	1.38 (1.53)	1.64* (0.97)
SA	-0.51 (1.61)	-1.15 (0.95)	-0.96 (1.57)	-1.89 (0.97)	-0.23 (1.43)	0.30 (0.91)
SSA						
Constant	-0.99 (1.62)	0.16 (0.76)	-0.80 (1.20)	0.90 (0.78)	-0.70 (1.11)	-1.03 (0.70)
Breusch-Pagan		8.69***	4.59**	8.86***	4.19**	6.13**
F- test	2.38**					
Wald – test		9.27	14.26*	10.10	10.04*	6.66
R^2	0.11	0.08	0.12	0.09	0.08	0.05
N	117	117	117	116	123	123

* 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 indicate the F-statistic/Wald-statistic for the test on the overall significance of the regression. Ramsey Reset test for omitted variables is passed in OLS estimation (equation 1). Breusch-Pagan is a Lagrange-multiplier test for the random effects model, distributed as chi-squared under the null of no random effects. y^{q20o}: average annual growth rate of the first quintile share (regressions without outliers). y^{q40o}: average annual growth rate of the second quintile share (regressions without outliers). ols: results for pooled OLS estimation, re: results for random effects estimation. dev: developing countries.

Table 16: Exchange rate regimes and macroeconomic variables distribution effect (Growth equation)

Levy-Yeyati/Sturzenegger 2002					Reinhart/Rogoff 2003, coarse classification				
	(1)	(2)	(3)	(4)		(5)	(6)	(7)	(8)
Dep. Var.	y^{q20o} **all/ols**	y^{q40o} **all/fe**	y^{q20o} **dev/ols**	y^{q40o} **dev/fe**		y^{q20o} **all/ols**	y^{q40o} **all/re**	y^{q20o} **dev/ols**	y^{q40o} **dev/re**
Crawling peg	-0.38	-0.88	0.09	-0.69	Limited flexibility	**1.34***	0.81	**1.53****	0.82
	(1.15)	(1.34)	(1.31)	(1.80)		(0.80)	(0.82)	(0.79)	(0.90)
Dirty float	0.69	2.47	1.22	1.84	Managed floating	0.64	0.25	-0.69	-0.51
	(1.23)	(1.54)	(1.53)	(2.04)		(1.54)	(1.02)	(1.16)	(1.25)
Flexible	-0.03	1.60	0.64	1.59	Freely floating	0.16	0.59		
	(1.10)	(1.13)	(1.25)	(1.24)		(1.49)	(1.54)		
					Freely falling	1.35	0.71	-0.38	-0.71
						(2.50)	(1.58)	(2.44)	(1.80)
M2/GDP 0.02	-0.02	0.03	-0.02			**0.03****	0.03	**0.04***	0.03
	(0.02)	(0.06)	(0.02)	(0.08)		(0.02)	(0.02)	(0.02)	(0.03)
Budget	**0.22****	-0.18	**0.22****	0.07		0.17	0.04	**0.30****	0.12
Surplus	(0.10)	(0.16)	(0.11)	(0.32)		(0.13)	(0.09)	(0.13)	(0.11)
Secondary	-0.24	-1.26	-0.53	-1.01		-0.15	-0.57	-0.41	-0.89
Education	(0.34)	(1.27)	(1.01)	(3.00)		(0.47)	(0.43)	(0.92)	(0.73)
Adjusted Gini	-0.002	**1.01*****	-0.02	**1.07*****		0.13	**0.16****	0.09	**0.15***
Coefficient	(0.055)	(0.16)	(0.08)	(0.24)		(0.09)	(0.07)	(0.09)	(0.08)
Ln(1+inflation)	1.27	0.22	2.72	2.85		1.91	1.98	6.74	6.53
	(3.58)	(7.90)	(4.61)	(12.12)		(5.59)	(4.20)	(5.55)	(5.05)
EAP						-1.08	-1.64	-3.65***	-1.56
						(1.67)	(1.21)	(1.30)	(1.87)
ECA						-1.29	0.05		
						(2.07)	(2.74)		
LAC						-2.00	-3.07*	-3.72**	-2.72
						(2.05)	(1.69)	(1.46)	(1.86)
MNA						-0.71	-1.80	2.30*	-1.21
						(1.88)	1.54	(1.32)	(2.01)
SA						-0.20	-1.22	-2.35	-0.81
						(1.38)	(1.27)	(1.54)	(2.09)
SSA						1.29	-0.78		
						(1.83)	(1.83)		
Constant	0.66	-41.18***	0.97	-47.73***		-6.32*	-6.13**	2.38	-5.89
	(2.88)	(6.77)	(3.49)	(10.25)		(3.72)	(3.05)	(4.09)	(4.04)
Breusch-Pagan		6.54**		3.32*			10.22***		11.91***
Hausmann		52.81***		44.43***					
F-test	1.32	7.16***	1.04	5.98***		25.16***		2.71***	
Wald-test							15.00		10.79
R^2	0.10	0.07	0.12	0.06		0.13	0.16	0.21	0.18
N	72	73	52	53		94	94	63	63

* 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 indicate the F-statistic/Wald-statistic for the test on the overall significance of the regression. Ramsey Reset test for omitted variables is passed in all OLS estimations (equations 1, 3, 5, 7). Breusch-Pagan is a Lagrange multiplier test for the random effects model, distributed as chi-squared under the null of no random effects. Hausmann is a test on fixed or random effects estimation, distributed as chi-squared under the null of no difference. y^{q20o}: average annual growth rate of the first quintile share (regressions without outliers). y^{q40o}: average annual growth rate of the second quintile share (regressions without outliers). ols: results for pooled OLS estimation, re: results for random effects estimation, fe: results for fixed effects estimation. all: all countries. dev: developing countries.

Table 16: continued

Reinhart/Rogoff 2003, 4-way classification

	(9)	(10)	(11)	(12)
Dep. Var.	**y^{q20o} all/re**	**y^{q40o} all/re**	**y^{q20o} dev/re**	**y^{q40o} dev/re**
Limited flexibility	1.12	0.94	1.32	0.85
	(1.19)	(0.85)	(1.18)	(0.96)
Managed floating	0.15	0.76	-1.53	0.18
	(1.39)	(1.00)	(1.57)	(1.28)
Freely floating	-0.91	0.47	-3.91	-0.59
	(1.92)	(1.38)	(2.95)	(2.40)
M2/GDP	0.03	0.03	0.04	0.03
	(0.03)	(0.02)	(0.03)	(0.03)
Budget Surplus	0.20	0.07	**0.36****	0.16
	(0.13)	(0.09)	(0.15)	(0.12)
Adjusted Gini Coefficient	**0.25****	**0.19*****	**0.22****	**0.20****
	(0.10)	(0.07)	(0.10)	(0.08)
Ln(1+inflation)	4.18	1.48	**9.74***	4.25
	(4.54)	(3.25)	(5.31)	(4.32)
EAP	-2.06	1.57	-5.02**	-1.37
	(1.75)	(1.25)	(2.54)	(2.07)
ECA	0.12	0.37		
	(3.95)	(2.83)		
LAC	-4.51*	-2.83*	-6.65***	-2.68
	(2.40)	(1.72)	(2.54)	(2.07)
MNA	-1.63	-1.80	-3.43	-1.16
	(2.21)	(1.58)	(2.70)	(2.20)
SA	-0.29	-0.75	-2.61	0.02
	(1.83)	(1.31)	(2.77)	(2.26)
SSA	1.08	-0.73		
	(2.64)	(1.89)		
Constant	-10.41	-7.88	-6.59	-8.41
	(4.29)	(3.07)	(5.16)	(4.20)
Breusch-Pagan	4.63**	8.41***	2.98*	8.30***
Hausmann	.	.	.	.
Wald-test	14.70	16.73	16.72	10.87
R^2	0.16	0.17	0.25	0.18
N	95	95	64	64

* denotes significance at the 90% level, ** at the 95% level, and *** at the 99% level (two-sided alternative). Heteroscedasticity adjusted standard errors in parentheses. Wald-test indicate the Wald-statistic for the test on the overall significance of the regression. Breusch-Pagan is a Lagrange multiplier test for the random effects model, distributed as chi-squared under the null of no random effects. Hausmann is a test on fixed or random effects estimation, distributed as chi-squared under the null of no difference. y^{q20o}: average annual growth rate of the first quintile share (regressions without outliers). y^{q40o}: average annual growth rate of the second quintile share (regressions without outliers). re: results for random effects estimation. all: all countries. dev: developing countries.

Table 17: Exchange rate regimes and macroeconomic variables distribution effect (System GMM estimation)

Reinhart/Rogoff 2003, coarse classification

	All Countries				Developing Countries			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dep. Var.	Y^{q20s}	Y^{q20c}	Y^{q40s}	Y^{q40c}	Y^{q20s}	Y^{q20c}	Y^{q40s}	Y^{q40c}
Limited flexibility	0.043	0.034	0.011	0.008	0.050	0.035	0.019	0.016
	(0.046)	(0.040)	(0.020)	(0.019)	(0.061)	(0.058)	(0.029)	(0.028)
Managed floating	**0.089***	0.038	0.041	0.017	**0.105***	0.072	**0.066****	0.041
	(0.046)	(0.040)	(0.026)	(0.023)	(0.056)	(0.050)	(0.032)	(0.030)
Freely floating	-0.032	0.001	-0.024	-0.023	**0.348*****	**0.247*****	**0.190*****	**0.145*****
	(0.206)	(0.009)	(0.057)	(0.051)	(0.049)	(0.051)	(0.025)	(0.031)
Freely falling	0.054	-0.010	0.006	-0.022	0.071	0.008	0.026	-0.003
	(0.068)	(0.079)	(0.042)	(0.055)	(0.069)	(0.082)	(0.042)	(0.055)
Ln(1+inflation)	-0.05	-0.02	0	0.04	-0.09	-0.03	-0.02	0.02
	(0.13)	(0.16)	(0.086)	(0.10)	(0.13)	(0.17)	(0.09)	(0.10)
Secondary Education	-0.03	0.01	0.016	0.02	0.03	0.01	0.05	0.04
	(0.03)	(0.03)	(0.017)	(0.02)	(0.05)	(0.05)	(0.03)	(0.03)
Government Consumption	-0.002	-0.003	**0.004***	0.003	0.007	0.002	**0.006****	0.004
	(0.004)	(0.003)	(0.002)	(0.002)	(0.005)	(0.005)	(0.003)	(0.003)
EAP	-0.19**	-0.07	-0.21***	-0.22***	-0.01	0.26**	-0.01	0.12*
	(0.09)	(0.07)	(0.05)	(0.06)	(0.11)	(0.12)	(0.06)	(0.07)
ECA	0.38***	0.41***	0.17***	0.11***				
	(0.09)	(0.05)	(0.04)	(0.03)				
LAC	-0.66***	-0.55***	-0.49***	-0.55***	-0.48***	-0.21*	-0.29***	-0.21***
	(0.10)	(0.08)	(0.05)	(0.05)	(0.09)	(0.12)	(0.06)	(0.07)
MNA	-0.21	-0.21*	-0.19**	-0.28***	0.01	0.13	0.02	0.07
	(0.17)	(0.12)	(0.08)	(0.07)	(0.15)	(0.15)	(0.08)	(0.08)
SA	0.12	-0.12	-0.04	-0.10**	0.30***	0.48***	0.16**	0.25**
	(0.12)	(0.08)	(0.06)	(0.05)	(0.12)	(0.12)	(0.07)	(0.07)
SSA	-0.21*	-0.34***	-0.21***	-0.35***				
	(0.12)	(0.12)	(0.06)	(0.07)				
Constant	-1.08***	-1.21***	-0.59***	-0.61***	-1.43***	-1.54***	-0.88***	-0.99***
	(0.13)	(0.07)	(0.05)	(0.04)	(0.13)	(0.14)	(0.09)	(0.09)
m1	-1.78*	-2.23**	-2.06**	-2.64***	-1.51	-1.88*	-1.84*	-2.31**
m2	-1.78*	-1.46	-1.74*	-0.81	-1.13	-0.81	-1.62	-0.47
N	277	267	277	267	165	159	165	159
1 – RSS/TSS	0.51	0.57	0.64	0.72	0.53	0.53	0.52	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^{q20s}/Y^{q40s}: $\ln(Q^{20/40}/0.2)$ unadjusted approach (regressions without outliers). Y^{q20c}/Y^{q40c}: $\ln(Q^{20/40}/0.2)$ adjusted approach (regressions without outliers).

Table 17: continued

Reinhart/Rogoff 2003, coarse classification

Industrial Countries

	(9)	(10)	(11)	(12)
Dep. Var.	Y^{q20s}	Y^{q20c}	Y^{q40s}	Y^{q40c}
Limited flexibility	-0.004	0.015	-0.033	-0.026
	(0.065)	(0.048)	(0.024)	(0.025)
Managed floating	0.006	-0.050	-0.051	-0.064
	(0.075)	(0.072)	(0.041)	(0.041)
Free floating	-0.103	-0.066	-0.081	**-0.073***
	(0.120)	(0.083)	(0.054)	(0.041)
Ln(1+inflation)	-0.03	0.15	0.20	0.27
	(0.36)	(0.27)	(0.21)	(0.21)
Secondary Education	-0.06	0.02	0.01	**0.02***
	(0.04)	(0.02)	(0.02)	(0.01)
Government Consumption	-0.004	0.002	0.001	0.002
	(0.005)	(0.004)	(0.002)	(0.002)
Constant	-0.90***	-1.22***	-0.49***	-0.58***
	(0.15)	(0.06)	(0.05)	(0.03)
m1	-0.46	-0.82	-0.28	-1.12
m2	-1.45	-1.82*	-1.06	-1.50
N	107	103	107	103
1 – RSS/TSS	0.14	0.08	0.08	0.17

* 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^{q20s}/Y^{q40s}: $\ln(Q^{20/40}/0.2)$ unadjusted approach (regressions without outliers). Y^{q20c}/Y^{q40c}: $\ln(Q^{20/40}/0.2)$ adjusted approach (regressions without outliers).

Table 17: continued

Reinhart/Rogoff 2003, 4-way classification

	All Countries				**Developing Countries**			
	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Dep. Var.	Y^{q20s}	Y^{q20c}	Y^{q40s}	Y^{q40c}	Y^{q20s}	Y^{q20c}	Y^{q40s}	Y^{q40c}
Limited flexibility	0.051 (0.046)	0.029 (0.041)	0.018 (0.020)	0.008 (0.019)	0.057 (0.062)	0.022 (0.060)	0.027 (0.029)	0.011 (0.030)
Managed floating	**0.073*** (0.043)	0.026 (0.039)	0.034 (0.024)	0.011 (0.020)	**0.093*** (0.051)	0.055 (0.047)	**0.058**** (0.029)	0.034 (0.026)
Freely floating	0.042 (0.085)	0.044 (0.075)	0.012 (0.043)	0.002 (0.041)	**0.247***** (0.087)	**0.185***** (0.068)	**0.125***** (0.046)	**0.093***** (0.032)
Ln(1+inflation)	0.01 (0.13)	0.004 (0.14)	0.02 (0.09)	0.04 (0.08)	-0.08 (0.12)	-0.05 (0.15)	-0.03 (0.09)	0.003 (0.08)
Secondary Education	-0.04 (0.03)	0.01 (0.02)	0.01 (0.02)	0.02 (0.02)	0.03 (0.05)	0.01 (0.05)	0.05 (0.03)	0.04 (0.03)
Government Consumption	0.002 (0.004)	0.003 (0.003)	**0.004*** (0.002)	0.003 (0.002)	0.007 (0.005)	0.002 (0.005)	**0.006**** (0.003)	0.004 (0.003)
EAP	-0.19** (0.09)	-0.07 (0.07)	-0.21*** (0.05)	-0.22*** (0.06)	-0.04 (0.10)	0.23* (0.12)	-0.03 (0.06)	0.10 (0.07)
ECA	0.39*** (0.09)	0.42*** (0.05)	0.18*** (0.04)	0.11*** (0.03)				
LAC	-0.67*** (0.10)	-0.56*** (0.08)	-0.49*** (0.05)	-0.56*** (0.05)	-0.51*** (0.08)	-0.26** (0.11)	-0.31*** (0.06)	-0.24*** (0.07)
MNA	-0.22 (0.17)	-0.21* (0.13)	-0.20** (0.08)	-0.28*** (0.07)	-0.02 (0.15)	-0.09 (0.15)	-0.002 (0.08)	0.04 (0.08)
SA	0.12 (0.12)	-0.12 (0.07)	-0.04 (0.06)	-0.10** (0.05)	0.26** (0.11)	0.44*** (0.11)	0.14** (0.06)	0.23*** (0.06)
SSA	-0.17 (0.13)	-0.30** (0.12)	-0.19*** (0.06)	-0.33*** (0.07)				
Constant	-1.07*** (0.13)	-1.20*** (0.07)	-0.58*** (0.06)	-0.61*** (0.04)	-1.40*** (0.13)	-1.50*** (0.14)	-0.86*** (0.09)	-0.97*** (0.09)
m1	-1.76*	-2.13**	-2.06**	-2.72***	-1.56	-1.83*	-2.01**	-2.48**
m2	-1.87*	-1.25	-1.94*	-0.75	-1.27	-0.77	-1.77*	-0.48
N	275	265	275	265	163	157	163	157
1 – RSS/TSS	0.51	0.56	0.64	0.72	0.54	0.53	0.53	0.54

* 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^{q20s}/Y^{q40s}: $\ln(Q^{20/40}/0.2)$ unadjusted approach (regressions without outliers). Y^{q20c}/Y^{q40c}: $\ln(Q^{20/40}/0.2)$ adjusted approach (regressions without outliers).

Table 18: Exchange rate regimes and macroeconomic variables total effect (Growth equation)

Levy-Yeyati/Sturzenegger 2002					Reinhart/Rogoff 2003, coarse classification				
	(1)	(2)	(3)	(4)		(5)	(6)	(7)	(8)
Dep. Var.	y^{p20o} all/ols	y^{p40o} all/fe	y^{p20o} dev/ols	y^{p40o} dev/fe		y^{p20o} all/ols	y^{p40o} all/ols	y^{p20o} dev/ols	y^{p40o} dev/ols
Crawling peg	-1.40	**-3.74***	-1.11	-3.29	Limited flexibility	1.69	0.60	1.25	0.21
	(1.53)	(1.79)	(1.88)	(2.57)		(1.03)	(0.79)	(1.01)	(0.74)
Dirty float	1.72	1.00	1.90	-0.53	Managed floating	2.52	1.33	1.74	1.04
	(1.79)	(2.03)	(2.19)	(2.94)		(1.72)	(1.16)	(1.61)	(1.54)
Flexible	0.43	-0.34	0.73	-0.78	Freely floating	1.11	0.71		
	(1.47)	(1.50)	(1.74)	(1.84)		(1.97)	(1.28)		
					Freely falling	2.81	1.32	1.64	0.28
						(2.62)	(2.26)	(2.81)	(2.63)
M2/GDP	-0.01	0.12	-0.03	0.07		0.04	**0.05*****	0.02	0.04
	(0.04)	(0.11)	(0.06)	(0.15)		(0.03)	(0.02)	(0.04)	(0.03)
Budget Surplus	**0.36****	**0.40***	**0.39****	-0.27		0.19	-0.06	**0.32***	0.01
	(0.10)	(0.22)	(0.17)	(0.50)		(0.17)	(0.10)	(0.18)	(0.12)
Secondary Education	-0.35	-1.65	0.06	3.11		-0.02	-0.38	0.43	0.05
	(0.69)	(1.67)	(1.69)	(4.30)		(0.70)	(0.53)	(1.47)	(0.98)
Adjusted Gini Coefficient	0.14	**0.88*****	0.11	**0.96****		0.17	0.15	0.13	0.13
	(0.14)	(0.25)	(0.17)	(0.41)		(0.13)	(0.10)	(0.14)	(0.11)
Ln(1+inflation)	-4.72	11.31	-4.32	-4.48		-2.55	-1.59	-0.03	1.51
	(5.08)	(10.62)	(6.13)	(18.20)		(6.88)	(5.37)	(7.78)	(6.42)
EAP	0.11		3.05			1.81	1.96	0.75	1.89
	(3.05)		(2.27)			(2.71)	(1.93)	(2.20)	(1.99)
ECA						-7.47	-5.93***		
						(2.29)	(1.48)		
LAC	-4.27		-1.39			-3.28	-3.06	-4.24**	-3.33*
	(3.64)		(2.20)			(3.30)	(2.34)	(2.00)	(1.96)
MNA	-3.18		0.37			-2.72	-1.54	-2.55	-0.98
	(3.43)		(2.86)			(3.29)	(1.77)	(2.20)	(1.44)
SA	2.04		5.04**			1.96	0.89	1.32	1.04
	(1.88)		(2.18)			(1.93)	(1.36)	(2.59)	(1.90)
SSA	-2.51					0.91	0.20		
	(2.48)					(2.65)	(1.65)		
Constant	0.85	-35.44***	-1.13	-46.11**		-6.58	-6.20	-2.98	-4.86
	(4.71)	(9.23)	(5.85)	(15.83)		(4.73)	(3.73)	(6.08)	(4.94)
Breusch-Pagan		0.49		0.14					
Hausmann		28.58***		17.90**					
F-test	1.97**	4.52***	1.47	2.60*		62.03***	87.05***	1.84*	3.69***
R – squared	0.26	0.67	0.28	0.70		0.24	0.35	0.24	0.31
N	72	72	52	55		94	93	63	62

* 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 indicate the F-statistic for the test on the overall significance of the regression. Ramsey Reset test for omitted variables is only passed in equation 6, when powers of the right-hand side variables are considered (and not passed in all other OLS regressions). Breusch-Pagan is a Lagrange-multiplier test for the random effects model, distributed as chi-squared under the null of no random effects. Hausmann is a test on fixed or random effects estimation, distributed as chi-squared under the null of no difference. y^{p20o}: average annual growth rate of the mean income of the first quintile share (regressions without outliers). y^{q40o}: average annual growth rate of the mean income of the second quintile share (regressions without outliers). ols: results for pooled OLS estimation, fe: results for fixed effects estimation. all: all countries. dev: developing countries.

Table 18: continued

Reinhart/Rogoff 2003, 4-way classification

	(9)	(10)	(11)	(12)
Dep. Var.	**y^{p20o} all/ols**	**y^{p40o} all/ols**	**y^{p20o} dev/ols**	**y^{p40o} dev/ols**
Limited flexibility	1.65 (1.00)	0.62 (0.78)	1.20 (1.02)	0.20 (0.74)
Managed floating	2.56 (1.58)	1.20 (1.13)	1.59 (1.61)	0.92 (1.57)
Freely floating	0.87 (1.50)	1.19 (1.24)	-1.30 (2.57)	0.93 (2.53)
M2/GDP	0.04 (0.03)	**0.05**** (0.02)	0.02 (0.04)	0.03 (0.03)
Budget Surplus	0.19 (0.16)	-0.05 (0.09)	**0.34*** (0.18)	0.005 (0.12)
Adjusted Gini Coefficient	0.17 (0.13)	0.15 (0.10)	0.12 (0.14)	0.13 (0.12)
Ln(1+inflation)	-0.82 (4.49)	-1.33 (3.49)	2.17 (5.81)	-0.09 (5.10)
EAP	1.91 (2.68)	1.91 (1.94)	-0.17 (2.18)	1.99 (2.08)
ECA	-7.56*** (2.28)	-5.94*** (1.52)		
LAC	-3.15 (3.26)	-3.04 (2.43)	-5.07** (1.96)	-3.35 (2.07)
MNA	-2.57 (3.22)	-1.55 (1.77)	-3.43 (2.28)	-0.92 (1.62)
SA	2.15 (1.92)	-0.80 (1.35)	0.50 (2.73)	1.10 (2.09)
SSA	1.53 (2.55)	0.26 (1.64)		
Constant	-6.97 (4.79)	-5.90* (3.46)	-2.11 (6.18)	-4.77 (5.03)
F-test	63.60***	92.46***	2.08**	3.69***
R^2	0.16	0.35	0.25	0.31
N	95	93	63	62

* denotes significance at the 90% level, ** at the 95% level, and *** at the 99% level (two-sided alternative). Heteroscedasticity adjusted standard errors in parentheses. Ramsey Reset test for omitted variables is only passed in equations 10, when powers of right-hand side variables are considered (and not passed in all other OLS regressions). y^{p20o}: average annual growth rate of the mean income of the first quintile share (regressions without outliers). y^{p40o}: average annual growth rate of the mean income of the second quintile share (regressions without outliers). ols: results for pooled OLS estimation. all: all countries. dev: developing countries.

Table 19: Exchange rate regimes and macroeconomic variables total effect (System GMM estimation)

Reinhart/Rogoff 2003: coarse classification

	All Countries				**Developing Countries**			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dep. Var.	Y^{p20s}	Y^{p20c}	Y^{p40s}	Y^{p40c}	Y^{p20s}	Y^{p20c}	Y^{p40s}	Y^{p40c}
Limited flexibility	0.074	0.077	0.068	0.060	0.145	0.134	**0.145****	**0.122***
	(0.077)	(0.077)	(0.060)	(0.059)	(0.091)	(0.094)	(0.071)	(0.074)
Managed floating	0.044	-0.021	-0.005	-0.049	0.116	0.058	0.073	0.010
	(0.103)	(0.099)	(0.086)	(0.085)	(0.116)	(0.118)	(0.103)	(0.107)
Freely floating	0.010	-0.007	-0.026	-0.006	**0.203****	0.096	0.052	-0.014
	(0.101)	(0.096)	(0.073)	(0.069)	(0.094)	(0.096)	(0.079)	(0.088)
Freely falling	0.154	0.062	0.116	-0.049	**0.222***	0.114	**0.187***	-0.101
	(0.121)	(0.128)	(0.099)	(0.102)	(0.125)	(0.136)	(0.102)	(0.109)
Civil liberties	-0.02	-0.04	-0.03	**-0.04***	-0.02	-0.03	-0.05	**-0.05***
	(0.02)	(0.03)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)
Secondary	**0.09***	**0.14*****	**0.13*****	**0.14*****	0.19	0.13	0.16	0.14
Education	(0.05)	(0.05)	(0.04)	(0.04)	(0.13)	(0.14)	(0.12)	(0.12)
Government	**-0.014****	**-0.01****	**-0.012****	**-0.013****	**-0.018****	**-0.024*****	**-0.018****	**-0.021****
Consumption	(0.006)	(0.006)	(0.005)	(0.006)	(0.008)	(0.009)	(0.008)	(0.009)
Life	**0.05*****	**0.05*****	**0.05*****	**0.05*****	**0.04*****	**0.05*****	**0.05*****	**0.05*****
Expectancy	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Ln(1+inflation)	-0.15	-0.04	-0.13	-0.03	-0.15	-0.03	-0.13	-0.04
	(0.23)	(0.28)	(0.18)	(0.21)	(0.23)	(0.29)	(0.17)	(0.21)
Terms of	**0.003****	**0.003****	**0.003****	**0.003****	**0.005*****	**0.005*****	**0.004*****	**0.005*****
Trade	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
EAP	-0.94***	-0.81***	-0.94***	-0.95***	0.27	0.48*	0.25	0.33
	(0.19)	(0.19)	(0.18)	(0.19)	(0.27)	(0.28)	(0.25)	(0.26)
ECA	0.33**	0.44***	0.16	0.15				
	(0.14)	(0.13)	(0.12)	(0.12)				
LAC	-1.32***	-1.19***	-1.12***	-1.16***	-0.10	0.10	0.06	0.11
	(0.14)	(0.14)	(0.11)	(0.12)	(0.32)	(0.32)	(0.31)	(0.31)
MNA	-0.61***	-0.64***	-0.64***	-0.73***	0.61**	0.59*	0.53*	0.52*
	(0.17)	(0.17)	(0.14)	(0.15)	(0.31)	(0.32)	(0.29)	(0.30)
SA	-1.07***	-1.05***	-1.24***	-1.27***	0.14	0.28	-0.04	0.03
	(0.26)	(0.25)	(0.23)	(0.23)	(0.22)	(0.22)	(0.20)	(0.21)
SSA	-1.21***	-1.31***	-1.21***	-1.31***				
	(0.36)	(0.38)	(0.36)	(0.36)				
Constant	4.44***	4.57***	5.22***	5.21***	3.44***	3.19***	4.06***	3.87***
	(0.86)	(0.88)	(0.81)	(0.84)	(0.74)	(0.77)	(0.69)	(0.73)
m1	-0.88	-0.92	-0.40	-0.75	-0.54	-0.21	-0.44	-0.53
m2	0.83	-0.70	-0.04	-0.75	0.62	-0.87	1.53	-0.44
N	215	212	215	212	127	127	127	127
1 – RSS/TSS	0.90	0.90	0.93	0.93	0.67	0.71	0.75	0.75

Notes: see next page

Table 19: continued

Reinhart/Rogoff 2003, coarse classification

Industrial Countries

	(9)	(10)	(11)	(12)
Dep. Var.	Y^{p20s}	Y^{p20c}	Y^{p40s}	Y^{p40c}
Limited flexibility	-0.062	0.041	-0.086	-0.076
	(0.088)	(0.090)	(0.063)	(0.065)
Managed floating	-0.022	-0.108	-0.100	-0.118
	(0.127)	(0.125)	(0.082)	(0.082)
Freely floating	-0.157	-0.144	-0.129	**-0.130***
	(0.111)	(0.105)	(0.081)	(0.076)
Civil liberties	-0.01	**-0.04***	-0.01	-0.02
	(0.04)	(0.02)	(0.02)	(0.02)
Secondary Education	0.04	**0.13*****	**0.13*****	**0.15*****
	(0.04)	(0.04)	(0.03)	(0.03)
Government Consumption	-0.007	-0.003	-0.005	-0.004
	(0.005)	(0.006)	(0.004)	(0.004)
Life Expectancy	**0.06*****	**0.04***	**0.04*****	**0.04*****
	(0.02)	(0.02)	(0.01)	(0.01)
Ln(1+inflation)	**-1.16****	**-0.75****	-0.58	-0.45
	(0.46)	(0.38)	(0.38)	(0.36)
Terms of Trade	0.003	0.002	0.002	0.002
	(0.002)	(0.002)	(0.002)	(0.002)
Constant	4.59***	5.91***	5.96***	6.23***
	(1.41)	(1.42)	(1.01)	(0.97)
m1	-1.19	-1.19	-1.72*	-1.74*
m2	0.16	-1.59	-1.06	-0.53
N	83	80	83	80
1 – RSS/TSS	0.38	0.49	0.63	0.65

* 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^{p20s}/Y^{40s}: logarithm of mean income of first/second quintile (unadjusted approach, regressions without outliers). Y^{p20c}/Y^{p40c}: logarithm of mean income of first/second quintile (adjusted approach, regressions without outliers).

Table 19: continued

Reinhart/Rogoff 2003, 4-way classification

	All Countries				Developing Countries			
	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Dep. Var.	Y^{p20s}	Y^{p20c}	Y^{p40s}	Y^{p40c}	Y^{p20s}	Y^{p20c}	Y^{p40s}	Y^{p40c}
Limited flexibility	0.072	0.069	0.066	0.058	0.136	0.112	0.139**	0.113*
	(0.076)	(0.074)	(0.059)	(0.056)	(0.089)	(0.088)	(0.069)	(0.069)
Managed floating	0.051	-0.011	0.016	-0.028	0.135	0.065	0.104	0.037
	(0.094)	(0.089)	(0.078)	(0.075)	(0.100)	(0.100)	(0.084)	(0.087)
Freely floating	0.076	0.034	0.047	0.010	0.210	0.133	0.111	0.052
	(0.114)	(0.105)	(0.083)	(0.076)	(0.171)	(0.164)	(0.125)	(0.122)
Civil liberties	-0.02	-0.04	-0.04	-0.04*	-0.03	-0.04	-0.05*	-0.05*
	(0.02)	(0.03)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)
Secondary Education	0.09*	0.15***	0.14***	0.15***	0.22*	0.16	0.19	0.17
	(0.05)	(0.05)	(0.03)	(0.04)	(0.12)	(0.13)	(0.11)	(0.12)
Government Consumption	-0.015***	-0.015**	-0.013**	-0.014**	-0.019**	-0.025***	-0.019**	-0.022**
	(0.006)	(0.006)	(0.005)	(0.006)	(0.008)	(0.009)	(0.008)	(0.009)
Life Expectancy	0.05***	0.04***	0.05***	0.05***	0.04***	0.04***	0.04***	0.04***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Ln(1+inflation)	0.07	0.14	0.06	0.13	0.08	0.14	0.08	0.13
	(0.25)	(0.25)	(0.19)	(0.18)	(0.25)	(0.27)	(0.19)	(0.19)
Terms of Trade	0.002*	0.003**	0.002*	0.003**	0.004***	0.005***	0.004***	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
EAP	-0.94***	-0.80***	-0.94***	-0.94***	0.24	0.45*	0.23	0.31
	(0.18)	(0.19)	(0.18)	(0.19)	(0.26)	(0.26)	(0.24)	(0.25)
ECA	0.32**	0.43***	0.15	0.13				
	(0.14)	(0.12)	(0.11)	(0.11)				
LAC	-1.32***	-1.19***	-1.11***	-1.16***	-0.12	0.06	0.05	0.09
	(0.14)	(0.14)	(0.11)	(0.12)	(0.31)	(0.32)	(0.30)	(0.30)
MNA	-0.61***	-0.64***	-0.63***	-0.72***	0.60**	0.57*	0.53*	0.50*
	(0.16)	(0.16)	(0.14)	(0.14)	(0.30)	(0.31)	(0.28)	(0.29)
SA	-1.07***	-1.04***	-1.24***	-1.27***	0.12	0.25	-0.05	0.01
	(0.26)	(0.25)	(0.22)	(0.23)	(0.21)	(0.21)	(0.20)	(0.20)
SSA	-1.17***	-1.26***	-1.19***	-1.27***				
	(0.36)	(0.36)	(0.35)	(0.36)				
Constant	4.63***	4.76***	5.39***	5.36***	3.84***	3.57***	4.37***	4.16***
	(0.82)	(0.84)	(0.78)	(0.81)	(0.67)	(0.72)	(0.66)	(0.72)
m1	-0.78	-0.87	-0.41	-0.63	-0.57	-0.15	-0.55	-0.42
m2	0.78	-0.59	-0.16	-0.80	0.70	-0.79	1.48	-0.46
N	213	210	213	210	125	125	125	125
1 – RSS/TSS	0.90	0.90	0.93	0.93	0.65	0.69	0.73	0.74

* 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^{p20s}/Y^{40s}: logarithm of mean income of first/second quintile (unadjusted approach, regressions without outliers). Y^{p20c}/Y^{p40c}: logarithm of mean income of first/second quintile (adjusted approach, regressions without outliers).

Part III

Trade Policy and Pro-Poor Growth

Abstract

This paper analyzes empirically the impact of trade policy and sector specific openness on pro-poor growth in a cross-country approach to answer the question, whether the poorest 20 and 20 to 40 percent benefit from trade openness. To capture this issue, we estimate the distribution effect of eight different openness indicators, six adjusted trade sector indicators (agricultural raw materials exports and imports, food exports and imports, manufactures exports and imports) and two tariff indicators (export duties and imports duties). In addition, we estimate the total effect, i.e. the distribution and growth effect, to analyze potential trade-offs between the impact of trade liberalization on poverty via overall economic growth and 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 share in 72 countries for the period 1971 to 1999 and apply two econometric specifications, a growth equation and a system GMM equation. We estimate the poverty effects of trade policy for all countries and, separately, for developing/transitional and industrial countries due to considerable differences in economic structure. Finally, we estimate poverty effects of trade liberalization with respect to the level of the countries' development.

Combining empirical findings of the system GMM estimation for both the distribution and total effect, estimation results suggest the importance of sector specific trade policy for the poorest 20 and 20 to 40 percent. First, liberalization in agricultural raw material exports is very important for the poorest 40 percent of low income developing countries due to both the distribution and total effect. In addition, liberalizing imports in agricultural raw materals is highly positively related to the mean income of the poor without changing the distribution. Second, trade reforms in food exports affect negatively the mean income of the poorest 40 percent in low income developing countries through the growth effect. However, higher food imports are associated with positive distribution effects, but without total effects on the poorest 20 percent in low income developing countries. Third, promotion of manufactures exports lead to a positive total effect on the poorest 40 percent in developing countries via the growth effect, while trade reforms in manufactures imports are never relevant. Finally, reduced export and import duties affect positively the mean income of the poorest 40 percent in low income developing countries, an effect primarily driven by the growth effect. Findings for agriculture exports, food exports, export and import duties, however, are only relevant if we exploit information on both the cross-country and within-country variation of the income of the poor in a system GMM estimator. In addition, results of the growth equation suggest positive total effects of agriculture imports on the poorest 20 and 20 to 40 percent in development countries driven by the growth effect alone.

Thus, empirical findings suggest the following policy recommendations with respect to poverty-reducing trade reforms in low-income developing countries. While results are not always consistent between the growth equation and the system GMM estimation, liberalization of agricultural raw material exports and imports seems to be the most promising approach. On the other hand, liberalization in food markets and manufactures imports are not associated with poverty alleviation in low-income developing countries. Finally, a promotion of manufactures exports and a reduction of export and import duties seem to increase mean income of the poorest 40 percent in low-income developing countries only via the growth effect.

1. Introduction

Trade policy and its integration into international markets, a topic heavily discussed in the literature, is assumed to be one critical element to promote economic growth and alleviate poverty. Nevertheless, empirical evidence of the openness - growth link is mixed and has been severely criticized on econometric issues (Rodriguez/Rodrik 2000). The effect of trade reforms on poverty, while neglected in the past, is receiving considerable attention in recent publications (Bannister/Thugge 2001, McCulloch/Winters/Cirera 2001, Reimer 2002, Berg/Krueger 2003, Goldberg/Pavcnik 2004). Methodological approaches encompass microsimulations of specific trade policies, macro–micro synthesis, i.e. general equilibrium simulation with post-simulation of effects on representative households, and cross-country studies of openness indicators (Reimer 2002). While the cross-country approach is heavily criticized because of econometric issues, inappropriate indicators of openness (Rodriguez/Rodrik 2000) and the case-specific implications of liberalization on poverty (McCulloch/Winters/Cirera 2001), the strength of cross-section regressions lies in the statistical testing and generalization of the results and the possible coverage of dynamic aspects (Reimer 2002).

In general, the effect of trade policy on absolute poverty is assumed to be mainly driven by the impact of openness on economic growth (Bannister/Thugge 2001, Berg/Krueger 2003). Nevertheless a small part of literature analyses also the question of distributional effects of trade policy and openness on the income of the poor in a cross-country framework (Edwards 1997, Gugerty/Roemer 1997, Gallup/Radelet/Warner 1999, Lundberg/Squire 2001, Dollar/Kraay 2001a, Ghura/Leite/Tsangarides 2002, Winters/McCulloch/McKay 2002, Lopez 2003, Milanovic 2003). In combining both approaches we extend the literature in four ways.

First, we select an irregular and unbalanced panel of data on first and second quintile share in the most consistent way to capture the problem of incomparability of income inequality measures. Second, we apply two econometric specifications, a growth equation and a system GMM equation, to cover econometric issues, cross country variation and dynamic aspect of within-country change of the income of the poor. Third, we choose eight different openness indicators, six trade sector indicators (agricultural raw materials exports and imports, food exports and imports, manufactures exports and imports) and two tariff indicators (export duties and imports duties). The underlying hypothesis is that the poor may be affected differently by trade in agriculture raw materials, food and manufactures, i.e. sector specific trade policy may improve pro-poor growth. We test this hypothesis for all countries and in subsamples of developing/transitional and industrial countries to reveal important differences in the impact of trade policy on poverty in countries with different economic structures. Finally, we estimate both the distribution and total effect, i.e. the distribution and growth effect, of the trade openness indicators on the poorest 20 and 20 - 40 percent to analyze potential trade-offs between the impact of trade liberalization on poverty via overall economic growth and distribution. Thus, we analyze empirically the impact of trade policy and sector specific openness on pro-poor growth in a cross-country approach to answer the question, whether the poorest 20 and 20 - 40 percent benefit from trade liberalization.

This paper is structured as follows. In section 2 we present six possible channels of trade liberalization on poverty and empirical evidence on the distribution effect from cross - country studies. In section 3 we describe the data coverage and data sources used in the estimations, which encompasses a discussion on the measurement problem of openness indicators. While we debate our concept of pro-poor growth in section 4, we explain econometric specifications and econometric issues in section 5, followed by an interpretation of the results. Finally, we present major findings in the conclusion in section 6.

2. Trade policy and pro-poor growth

2.1 Channels of trade liberalization on poverty

Considering the theoretical and empirical literature, six channels are proposed for how trade policy may affect poverty (Winters 2000a/b, McCulloch/Winters/Cirera 2001, Bannister/Thugge 2001, Berg/Krueger 2003, Agénor 2003) .

Economic Growth

The openness – growth link is relevant because economic growth has been to found to be a key element in reducing absolute poverty (Gugerty/Roemer 1997, Gallup/Radelet/Warner 1999, Gugerty/Timmer 1999, Dollar/Kraay 2001a, Ghura/Leite/Tsangarides 2002).

Concerning economic theory, trade liberalization may foster economic growth due to a more efficient allocation of resources by efficiency effects on investment.[219] Improved access to intermediate capital goods may also increase technical efficiency by technology embodied in capital imports (Berg/Krueger 2003, Baldwin 2003). Thus trade liberalization in manufactures may impact on the poor mainly through growth and productivity effects (McCulloch/Winters/Cirera 2001). In addition, access to larger markets may promote innovation by openness to new ideas or spillover effects of technologies as proposed by endogenous growth models (Grossman/Helpman 1991). A poverty reducing effect of trade reforms, however, depends critically on complementary macroeconomic and structural policies and institutions at the domestic level (Bannister/Thugge 2003). Institutions, however, could also be positively influenced by openness and thus foster growth since trade liberalization may impose discipline on bad government policies as corruption (Ades/Di Tella 1999). From a static point of view, trade restrictions could also be argued for in presence of market distortions, externalities or

[219] As long as an economy is not in the steady-state, openness also raises the growth rate due to a more efficient allocation of resources.

imperfect competition (Helpman/Krugman 1991). One possible example would be the infant industry argument in which protection for not-yet-competitive industries is supported.

Empirical results, while indicating a positive impact of openness on growth (Sachs/Warner 1995, Frankel/Romer 1996, Dollar/Kraay 2001b, Baldwin 2003, Wacziarg/Welch 2003), are severely critisized on indicators of openness, instruments and specifications used in cross-country regressions (Rodriguez/Rodrik 2000, Rodrik 2000).[220] In addition, cross-country studies have been heavily attacked by their weak theoretical foundations, data reliability and inappropriate econometric techniques (Srinivasan, Bhagwati 2001).

Price transmission

Reduction of tariffs and trade restrictions could affect the income of the poor via its effect on the price of tradable products demanded and supplied by the poor. Considering a tariff reduction in a single good, the import price would be lowered for poor consumers and producers. On the other side, if export duties are abolished and the good is sold to a stable world market price, poor producers would gain more income from exports.[221] The price transmission, however, is heavily influenced by the competitive structure of the distribution sector, a working infrastructure and the regulation and operation of government institutions at the national, regional and local level (e.g. marketing organization). Thus the poor could also be hurt by trade liberalization, if they are protected by initial patterns of trade restrictions. In addition, the net effects on the poor may be ambiguous if many goods are liberalized simultaneously. Furthermore, adjustment effects of trade policy, i.e. switching consumption or production to other markets due to changed relative prices, may stimulate important indirect effects of trade liberalization depending also on the domain of trade.[222]

The price effects of trade liberalization in agriculture and food are likely more important than in manufactures as a high part of the poor’s consumption is devoted to food expenditures (Goldberg/Pavcnik 2004). In addition, trade liberalization in agriculture may benefit all rural (and urban) poor by positive spill-overs to non-farmers.[223] Even if trade liberalization in agriculture and food is widely accepted as important for poverty reduction, however, price effects depend also on internal reforms since the agriculture sector is heavily regulated in developing and industrial countries.[224] Distorted domestic markets, however, may inhibit the possibility for the

[220] For a survey of empirical literature on the effect of openness on growth and productivity, see Winters/McCulloch/McKay (2002).
[221] However, fluctuating world market prices in agricultural products could significantly diminish poverty reducing effects of reduced tariffs (Hoekman/Michalopoulos/Schiff/Tarr 2002).
[222] For a survey of empirical literature on the transmission of border-price shocks, market creation and destruction and the possibility of the poor to capture opportunities of price effects of trade liberalization with respect to production and consumption, see Winters/McCulloch/McKay (2002).
[223] For a survey of empirical literature on spillover effects of trade liberalization in agriculture, see Winters/McCulloch/McKay (2002).
[224] The poverty effects of trade liberalization in agriculture and food are also dependent on the economic situation of the poor, i.e. whether they are net producers or net consumers of agricultural goods.

poor to capture liberalization-induced opportunities.[225] Furthermore, poverty effects of trade reforms in the agriculture sector are not independent from policies in other sectors and countries. First, in developing countries import manufacturing tariffs exhibit strong bias against agriculture due to increased domestic prices of manufactures relative to agriculture products. Second, tariff escalation for agriculture products in industrial countries encourages trade only in agricultural raw materials (Winters 2001a/b, McCulloch/Winters/Cirera 2001).[226] Finally, high export subsidies of commodities in industrial countries could constrain agriculture exports in developing countries (Hoekman/Michalopoulos/Schiff/Tarr 2002).

Wages and employment

Trade liberalization also works on the income of the poor via wage and employment effects.[227] Relying on the Stolper-Samuelson theorem, a rise in the relative price of exportable goods intensively produced by unskilled labour would increase wages of unskilled labour and thus reduce poverty if the poor are mainly unskilled workers (Bannister/Thugge 2001). The Stolper-Samuelson argument would be especially important with respect to agricultural liberalization in developing countries since the majority of the labour force is employed in farming and so less-skilled workers in rural areas would likely benefit the most (Winters 2001a/b, McCulloch/Winters/Cirera 2001).

On the other side, lower trade restrictions may also reduce the demand for unskilled labour because unskilled labour may not be the most intensively used factor in producing tradable goods and trade liberalization may be associated with introduction of higher-level technology requiring more skilled labour (Agénor 2003, Goldberg/Pavcnik 2004).[228] This situation could be relevant for manufacturing liberalization in developing countries when the production in manufacturing is intensive in skilled labour. [229] Finally, the predictions of the Stolper-Samuelson theorem are also criticized by its restrictive and unrealistic assumptions as perfect labour mobility and perfectly competitive goods and factor markets (Bannister/Thugge 2001, Winters 2000b).

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[225] Important reform areas are e.g. the structure of land ownership within society, social norms and institutions at the local level, centralized agricultural marketing organizations and markets for credits and insurance to the poor (McCulloch/Winters/Cirera 2001).

[226]Tariff escalation discourages foreign processing activities since the import tariff increases with more processed agriculture goods (McCulloch/Winters/Cirera 2001).

[227] Additional proposals of liberalization-induced labour market effects on poverty are changed in compliance with minimum wages, increase of informal sector and positive or negative effects on child labour (Goldberg/Pavcnik 2004).

[228] The effect could be especially damaging for the poor, if imperfect credit markets prevent the ability of the unskilled workers to finance the accumulation of human capital (Agénor 2003).

[229] Concerning wage inequality effects of trade liberalization in developing countries, additional theoretical explanations have been proposed. First, a higher skill premium is explained by increased globalisation of production, i.e. the shift of skill-intensive intermediate goods production to developing countries raises the demand for skilled labour force. Second, openness may promote technology progress which may increase the demand for skilled employees, i.e. a skill-biased technological change. Third, trade liberalization may lead to a "quality" upgrading of firms or products which may increase demand for skilled workers relative to unskilled labour. Finally, trade liberalization could increase wage inequality by extending the informal sector if wages in the informal sector are lower. Wage inequality, however, is only one part of the distribution effect of trade liberalization on income or consumption of the poor (Cornia 2002, Goldberg/Pavcnik 2004).

While in the Stolper-Samuelson theorem total labour supply is assumed to be fixed, one could also imagine the opposite, i.e. a perfectly elastic supply of labour. In this case, increased prices of exportable goods due to trade liberalization would result in a surge in employment (not in wages), which could largely improve the situation of the poor with no alternative sources of income. In reality a mixture of both extremes may be realistic dependent on the possible segmentation of the labour market due to skills, gender and location (Winters 2001a/b, McCulloch/Winters/Cirera 2001).[230] In addition, initial patterns of protection and disappearance of whole markets due to trade reforms can significantly influence the way the poor are affected by trade liberalization (Bannister/Thugge 2001). Finally, employment and wage effects on the poor hinge also on the flexibility of the labour market, the overall reform package and the importance of the sectors being liberalized. The proportion of the manufacturing industry of a country's GDP varies considerably in developing countries (McCulloch/Winters/Cirera 2001).[231]

Taxes and government spending

Trade reforms may also cause falling revenues restraining government spending on social expenditures (health, education, social security) and public investment.[232] As trade taxes in some developing countries cover up to 50 percent of the total government revenue, reduction of trade tariffs could lead to severe budget constraints. This effect may be especially relevant for liberalization in manufactures since manufacturing tariffs cover close to 70 percent of tariff revenues for developing countries in 1995 (Hertel, Martin 1999). In general, however, the effect of trade liberalization on government revenue is far from certain depending on the reforms implemented, the initial economic situation, the effect of lower tariffs on the trade volume and the changes in the taxation system. In addition, lower government revenues do not necessarily translate into reduced social programs if trade reform is properly managed (Bannister/Thugge 2001, McCulloch/Winters/Cirera 2001).[233] Furthermore, the final poverty effect depends critically on the initial structure of the social spending programs and how the poor are affected by new taxes. Therefore, social expenditures often benefit disproportionately the upper-income households in developing countries (Dollar/Kraay 2001a, McCulloch/Winters/Cirera 2001, Baldacci/de Mello/Inchauste 2002, Agénor 2002, Davoodi/Tiongson/Asawanuchit 2003).[234]

Volatility and external shocks

In general, trade liberalization leads to a deeper integration into world markets, which could increase the volatility of the terms of trade or the output fluctuation. Theoretically, the openness

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[230] Considering the poor in developing countries, the elasticity of labour supply in rural and urban informal sectors is typically high. Thus adjustments to trade reforms will likely affect the poor mainly by changes in employment.

[231] On a survey of the empirical literature of the trade liberalization effects on wage, employment and wage inequality, see Winters/McCulloch/McKay (2002).

[232] Curtailing government expenditures may also lead to increased poverty via cuts in real wages and layoffs of employees in the public sector (Agénor 2002).

[233] On a survey of the empirical literature covering trade liberlization effects on government revenue and poverty effects of falling tariff revenues, see Winters/McCulloch/McKay (2002).

– volatility link is argued for due to a specialization effect of trade liberalization, which may increase the proneness to sector-specific shocks. In addition, higher exposure to external shocks can also aggravate the overall level of risk (McCulloch/Winters/Cirera 2001).[235] The poor may be vulnerable to external shocks and macroeconomic volatility (Glewwe/Hall 1998, Breen/Garcia-Peñalosa 1999). First, the variability of the poor's income could be increased due to dependence on more flexible world market prices. Second, increased precautionary savings caused by higher uncertainty about future income may raise 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 negatively affect the poor via fallen labour demand (Agénor 2002). The effect of external shocks and the dependence on world market prices, however, is crucially influenced by the institutions (e.g. distribution networks and government regulations) transmitting the shocks and prices throughout the economy to the poor. In addition, the net poverty effect depends on the possibility of the poor to cope with unanticipated shocks. So trade liberalization could also entail improved business opportunities for the poor, which may offset higher levels of risk (McCulloch/Winters/Cirera 2001).[236]

Short-term adjustment

While trade liberalization may benefit an economy in the long run, the shock of trade reform could nevertheless lead to a period of adverse adjustment effects on poverty. The poor may be affected by a changed employment situation and the speed of the adjustment process in rigid labour markets. Increased poverty due to short term effects of trade reforms may also depend on the initial level of protection in specific sectors, the way firms can react to higher competitive pressure, the size of the external shock, and the initial level of assets available for the households to smooth the consumption during transitional unemployment. In addition, possible economics of scale and learning-by-doing effects of trade openness are more relevant for countries already producing high-technology goods. Thus temporary adverse effects on growth and poverty may be possible in an adjustment period of economies exporting initially low-technology goods or (agriculture) raw materials (Winters 2001a/b, McCulloch/Winters/Cirera 2001, Winters/McCulloch/McKay 2002, Agénor 2003).

2.2 Empirical evidence

Analytically, the impact of trade openness on the income of the poor can be discerned in the growth effect and the distribution effect.[237] Concerning the distribution effect of trade policy, recent cross-country studies provide only mixed results depending also on the limited availability

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[234] Cuts in social spending may nevertheless lead to reduced poverty if social expenditures are better targeted to the poor (Agénor 2002).

[235] Concerning the empirical evidence, however, results for both terms of trade and output volatility due to trade liberalization are not consistent (McCulloch/Winters/Cirera 2001, Winters/McCulloch/McKay 2002).

[236] For a survey of the empirical literature on the effect of trade liberalization on the vulnerability of the poor via portfolio choice of households, variability of existing income sources or prices and poverty traps, see Winters/McCulloch/McKay 2002).

of inequality and poverty data in the past years. Edwards (1997) tests the impact of average tariffs on the change of the Gini coefficient with a positive coefficient indicating increased inequality for countries with trade distortions. On the other side, trade reforms seem not to significantly affect changes in income distribution. Gugerty/Roemer (1997) use data on the poorest 20 and 40 percent from the Deininger/Squire dataset for 26 developing countries. The distribution effect of openness measured by the Sachs-Warner Index is statistically insignificant in several specifications. A similar result is reached by Gallup/Radelet/Warner (1999), which regress the growth rate of the first quintile share on openness measured by the Sachs-Warner Index and additional variables in a cross–section study with 54 countries. Lundberg/Squire (2001) examine joint determinants of growth and inequality in a model of simultaneous equations using adjusted Gini coefficients as inequality indicator. Statistical tests reveal a trade-off between growth and distribution for openness measured by the Sachs–Warner index, i.e. a 10 percent increase of the openness indicator (increasing the proportion of time in a given period in which the Sachs-Warner criteria are fulfilled) improves the growth rate by 10 percent and increases inequality by 1 percent.

Spilimbergo/Londoño/Székely (1999) collect panel data on Gini coefficients and factor endowments over the period 1965 to 1992 to regress the trade volume corrected for factor endowments and other variables on the inequality measure. While the openness index reduces inequality in capital-abundant countries, inequality is increased in skill–abundant countries. Using a panel of Gini coefficients, Barro (2000) tests the effect of a filtered trade volume measure on inequality with significant positive association. Anderson/White (2001), however, find no impact of the Sachs-Warner index on the poorest 20 and 40 percent, while growth regressions of quintile incomes on openness and additional variables result in positive coefficients of the Sachs-Warner index except in the top quintile. Dollar/Kraay (2001a) collect the most comprehensive dataset based on four sources. However, no systematic correlation between six openness indicators (trade volume, adjusted trade volume, Sachs-Warner index, collected import taxes to total import ratio, dummy for WTO membership and dummy for capital controls) and the share of income of the poorest 20 percent is found. Relying on the dataset and econometric specification of Dollar/Kraay (2001a) Ghura/Leite/Tsangarides (2002) extend the Dollar/Kraay (2001a) approach to account for model uncertainty issues using a Bayesian-type robust estimation. Again, trade openness measured as trade volume and collected import taxes to total import ratio remains statistically insignificant. Lopez (2003) uses as openness measure the volume of trade adjusted by country size (area, population), whether a country is landlocked or oil exporter. Using the unadjusted Dollar/Kraay (2001a) dataset inequality measures, averages of non-overlapping five year periods from 1960 to 2000 are constructed. Trade openness is found to increase inequality and growth resulting in a trade-off of both effects on poverty. While in the short run trade openness seems to worsen poverty, the net long-run growth elasticity of poverty with respect to trade openness is negative. In addition, Milanovic (2003) finds evidence that the effect of trade volume and foreign direct investment on the poor is

[237] See section 4.

dependent on the country's average income level, i.e. in poor countries the rich benefit from openness, but this effect is reversed in richer countries. Kraay (2003) tests the direct impact of the trade volume on the Gini index and four poverty measures (headcount, poverty gap, squared poverty gap and Watts index) on a sample of developing countries. Estimated coefficients, however, are never statistically significant. Finally, Agénor (2003) examines the effect of globalization on poverty in regressing the poverty gap on the ratio of import duties to total import, the ratio of foreign direct investment to GDP and a 'composite' index of globalization. Empirical results indicate an inverted U-shape relationship between globalization and poverty, i.e. beyond a threshold of the globalization index integration in the world market seems to help the poor.

To summarize our discussion on poverty effects of trade liberalization, empirical results suggest an ambiguous effect of openness on pro-poor growth. In addition, poverty effects of openness may depend on a possible trade-off between a growth effect and a distribution effect. Finally, the impact of trade liberalization on the poor may differ with respect to the country's level of development. Thus we conclude from this section, that we have to test these hypotheses for the 20 and 20 to 40 percent poorest.

3. Data

3.1 Indicators of trade policy and openness

In our research the question of the effect of openness on pro-poor growth is restricted to trade openness and policy in contrast to broader concepts of openness concerning increased labour or capital mobility. Notwithstanding this restriction, measuring trade openness is heavily debated in the literature. Broadly, two different approaches to trade openness are discerned: outcome-based and policy-based measures.

First, trade liberalization can be measured with respect to the trade outcome (e.g. the trade dependency ratio, i.e. the ratio of exports plus imports to GDP). Thus trade openness would measure the importance of trade on poverty looking only indirectly at the possible reasons and policies responsible for changed trade volumes. As the trade volume is also dependent on other factors (e.g. economic development, geography, factor endowments) also adjusted trade openness indicators are applied by taking residuals of a regression of the trade volume on structural characteristics. Methodological shortcomings of this procedure, however, concern the atheoretic or ad hoc nature of the adjustment process and the possible weak correlation between trade distortions and unexplained variation in the trade dependency ratio (Pritchett 1996, Spilimbergo/Londoño/Székely 1999, Berg/Krueger 2003).

Second, focusing more on trade reform openness can also be measured by trade policy under direct control of the government. Examples for the second category are tariff averages, i.e. the simple/trade-weighted average of tariff levels, or the coverage of quantitative restrictions. (Pritchett 1996, Spilimbergo/Londoño/Székely 1999, Rodriguez/Rodrik 1999, McCulloch/Winters/Cirera 2001). Policy measures, however, are criticized with respect to aggregation, quantification and implementation problems (Berg/Krueger 2003). Considering the relationship between both approaches countries may be open with respect to the trade dependency ratio, but nevertheless impose high tariff rates. So various indicators of openness are not necessarily correlated with each other and may measure different aspects of trade policy with opposite effects (Pritchett 1996, Harrison 1996, Spilimbergo/Londoño/Székely 1999). Thus it is important to specify clearly what is assumed to be measured by the openness indicator (McCulloch/Winters/Cirera 2001). In addition, it seems necessary to test different measures of trade liberalization to gain a more comprehensive insight into the effects of trade openness on pro-poor growth (Edwards 1997).

In our approach we, first, extend the recent literature on the impact of trade liberalization on poverty in testing the effect of trade liberalization in the primary and secondary sector.[238] The underlying hypothesis is that the poor may benefit differently from trade in specific sectors or commodities, i.e. targeted trade policy may be necessary to achieve higher pro-poor growth. Thus we choose six outcome measures, i.e. agricultural raw materials exports to GDP, agricultural raw material imports to GDP, food exports to GDP, food imports to GDP, manufactures exports to GDP and manufactures imports to GDP.[239] The six outcome measures were formed by three basic variables, i.e. a trade structure measure (e.g. food exports to merchandise exports) is multiplied by total merchandise exports and divided by GDP in current US dollars (table 3). Subsequently, the outcome variables, e.g. food exports to GDP, are regressed on area, population and an oil exporter dummy to control for structural determinants of trade (table 4).[240] The estimated residuals from the regressions form our six openness indicators. Thus we assume that all differences in trade sectors, which do not depend on the size of the country, population and difference between countries due to oil exports, are trade policy driven and measure policy openness. Second, we also test two more trade policy oriented measures, i.e. export duties to total exports, and import duties to total imports.[241] Due to data limitations our sample covers the period 1980 to 1999 for the trade sector openness indicators and the period 1971 to 1999 for the duties variables.

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[238] We also thought of measuring the impact of trade in services especially for developing countries (Whalley 2003). Data of total and decomposed indicators of trade in services, however, are based mainly on balance of payments statistics and are flawed by severe inconsistencies (World Development Indicators 2001). Thus we restricted our research on trade in the primary and secondary sector.

[239] The six openness indicators capture only in a very crude way the trade with respect to poverty. More specific outcome-based measures for trade in goods produced or consumed by the poor would be more convincing. Cross–country data on exports and imports, however, are not filtered with respect to its relevance for the poor. On the other side, trade in products not directly relevant for the poor may also affect the income of the poor via the wage and employment channel and trade in different products may be relevant for the poor in different countries.

[240] We also tested other adjustment procedures including ln(Y) and $\ln(Y)^2$ in the regression. While the correlation matrix of residuals (our openness indicators) differs, the results of the estimation regressions with respect to pro-poor growth do not change considerably. In addition, including mean income in the adjustment regression is not necessarily convincing. For a discussion of different adjustment methodologies, see Pritchett (1996), Harrison (1996), Frankel/Romer (1996), Spilimbergo/Londoño/Székely (1999), Rodriguez/Rodrik (2000).

[241] We also tried other openness measures: the trade dependency ratio and an adjusted version (using area, population and an oil exporter dummy for the adjustment), and an price distortion index (Dollar 1992). In our sample, however, they turned out to be insignificant.

To have a look on the relationship between the openness measures, we present a correlation matrix of all eight indicators (table 5). While one would expect a negative correlation between the policy and outcome measures as higher duties should prevent trade flows, food exports and imports are significantly positive correlated with imports duties (and exports duties in one case). The correlations are significantly negative only in three cases (agriculture imports and exports duties, manufactures exports and exports duties, and manufactures exports and import duties). The correlations between the outcome measures, however, are mostly positive and thus in the assumed direction.

Finally, if we interpret higher adjusted trade sector openness indicators as measures for less restricted or more open trade policy, regional disaggregation reveals important differences in trade sector openness between the regions (table 7). While trade is relatively open in East Asia and the Pacific in all sectors and with respect to duties on trade, the food sector seems to be especially protected in Eastern Europe and Industrial countries. In addition, trade in agriculture and manufactures is heavily restricted in Latin America and the Caribbean. While exports for all sectors are more restricted than imports in Middle East and North Africa due to the outcome variables, the duties variables, however, indicate the opposite result. Finally, trade in manufactures imports is the most regulated in South Asia, whereas trade in the food sector seems to be the most open in Sub-Saharan Africa. Concerning export and import duties, South Asia and Sub-Saharan Africa are the regions which rely the most on revenues from trade taxes.

3.2 Data on income inequality measures and additional macroeconomic variables

Empirical tests on the impact of trade policy on pro-poor growth are limited by data availability of income inequality. 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 for reasons of practical measurement, especially for rural (poor) households (Deaton 1997, Atkinson 1993). In addition, data on income distribution can be based on different sources (national household surveys, income tax records, social security/labour market agency records).[242] 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 cannot be restricted to completely comparable samples due to limited data availability, samples

[242] see for further details UNU/WIDER–UNDP World Income Inequality Database, Version 1.0, 12 September 2000, User guide; Atkinson/Brandolini (2001).

should only 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 four 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)[243] 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 on surveys covering all area, all population, all age and fulfilling the 1 OKIN quality rating.[244] 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 three cases have we allowed for a two year distance within a spell for pragmatic reasons.[245] In addition, the income concept and income recipients (reference unit) have to be identical for each spell.[246]

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. 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.[247] This selection procedure has resulted in 371 observations in total, 231 for developing, 27 for transitional and 113 for industrial countries. Finally, data on openness indicators have to be available, reducing the total sample further to 266 observations for 72 countries (166, 15, 85 for developing, transitional and industrial countries, respectively) in the period 1971 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.[248] 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

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[243] The Global Poverty Monitoring is available under www.worldbank.org/research/povmon/index.htm and continually updated.
[244] *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).
[245] Bulgaria 1991 – 93, Guatemala 1987 – 89, Kenya 1992 – 94
[246] 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.
[247] For description of estimation methods see World Development Indicators 2002 Table 2.8.

possible spells in each country we regress the first/second quintile share and the Gini coefficient on dummy variables for different income definitions and regional dummies.[249] The adjusted first/second quintile share and Gini coefficient 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).[250] In general, the number of observations per country varies significantly from 2 (almost all Sub-Saharan Africa and Eastern Europe countries) to 8 (e.g. Finland).

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.[251]

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 rate of the mean income of the first/second quintile vary considerably in the different regions (table 7). Thus the growth rate of the first quintile in Eastern Europe is on average highly negative (-5.36 percent). Second, we emphasize the differences between changes in distribution and overall economic growth. We have a low positive growth rate of the first quintile share in East Asia and Pacific (0.39 percent), but a high positive growth rate for the mean income of the first quintile (+4.83 percent). Thus this positive effect stems mainly from the positive growth rate of real GDP per capita (+4.44).

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

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[248] 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.

[249] We prefer to use regional dummy variables in the adjustment regressions since we have only 371 observations and eight different income definitions which are not equally distributed among regions. While category family and equivalized are only relevant for industrial countries, category 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 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.

[250] 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 their coefficients from the unadjusted first/second quintile and Gini coefficients. On critic of this adjustment procedure, see Atkinson/Brandolini 2001.

[251] 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 (2001a). For a further discussion of discrepancies between national accounts and household survey measures of living standards, see Ravallion (2001a).

restrict the size of the sample due to the econometric specification (table 6). In addition, not all additional macroeconomic variables are used in all specifications due to insignificant coefficients.

The variables overall budget surplus to GDP and government consumption to GDP are controlled for. Their use is motivated by the impact of trade reform on the poor via public sector financing. Budget deficit is expected at least to not 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.[252] In addition, government size can also negatively impact 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.[253] 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.[254] 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. Furthermore, we use terms-of-trade to capture external environmental effects with expected positive impact (Barro/Sala-i-Martin 1995, Ghura/Leite/Tsangarides 2002).[255] 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

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

[253] 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.

[254] 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.

[255] 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

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.[256]

4. Pro-poor growth

Analytically, the impact of openness on the income of the poor can be distinguished in the growth and the distribution effect [257]:

$$\partial Y^{p20/40}_{it} / \partial Op_{jit} = \partial \ln(Y_{it})/\partial Op_{jit} + [\partial Y^{q20/40}_{it}/\partial \ln(Y_{it}) * \partial \ln(Y_{it})/\partial Op_{jit} + \partial Y^{q20/40}_{it} / \partial Op_{jit}]$$
$$= \rho_j + [(\alpha_1 - 1) * \rho_j + \gamma_j] \quad (1)$$

with

$Y^{p20/40}_{it}$:	mean income of the 20 percent/20 - 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
Op_{jit}:	openness indicators with j = 1, ... , 8
ρ_j:	(equiproportionate) growth effect of openness indicator on mean income ($\partial \ln(Y_{it})/\partial Op_{jit}$)
$(\alpha_1 - 1)$:	distribution effect of mean income ($\partial Y^{q20/40}_{it}/\partial \ln(Y_{it})$)
γ_j:	distribution effect of openness indicator ($\partial Y^{q20/40}_{it} / \partial Op_{jit}$)

The (equiproportionate) growth effect (the first term on the right hand side of the equation) measures the effect of the openness indicator on mean income (ρ_j). The distribution effect (second term in brackets) measures the impact of the openness 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 openness indicator Op_{jit} on the first and second quintile share. Thus the income of the poor could be affected directly and indirectly through growth by openness. In

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.

[256] To cover the omitted variable issue we also controlled for other additional macroeconomic variables, i.e. we used the 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.

[257] 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).

addition, possible trade-offs of the openness indicator affecting economic growth and the first/second quintile share in opposite directions can be analyzed.[258]

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): $\partial Y^{p20/40}_{it} / \partial Op_{jit} = \rho_j$). Thus pro-poor growth could be defined by a distribution effect:

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

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 openness 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 openness 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 $\partial Y^{p20/40}_{it} / \partial Op_{jit} > 0$:

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

This condition would require a positive impact of a total effect, adding the growth and distribution effect. A positive impact of the openess indicator on first/second quintile share has to more than offset the negative effect of the openness indicator through growth. On the other hand, a growth situation would be also labelled pro-poor, if the positive growth effect of an openness 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 openness indicators on the poorest 20 and 20 – 40 percent. 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, possible 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 openness 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 openness indicator on the income of the poor has to be positive ($\rho_j > 0$).

[258] In the discussion of our concept of pro-poor growth we abstract from the inclusion of an interaction term to simplify

5. Econometric specifications and estimation

5.1 Econometric specifications

To measure the impact of openness 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.[259]

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, trade openness indicators, and variants of additional variables.

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

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
$\mu_{it} + \varepsilon_{it}$:	composite error term including unobserved country effects
X_{kit}:	additional variables with k = 1, ... ,n
Op_{jit}:	trade openness indicators with j = 1, ... , 8

To present more clearly the distribution effect we subtract Y_{it} from both sides:[260]

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

with

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

the analysis.

[259] In the discussion of our concept of pro-poor growth we abstract from the inclusion of an interaction term to simplify the analysis.

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

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

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

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) and using only the unadjusted income definition. While the number of cross-section units is now increased, the number of oberservations 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, second, 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) and an observation with only one year difference within a country (Netherlands 1983) (see table 1).[261] 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 openness indicators on the level of first/second quintile at certain country-year observations (5) and the impact of the change of the openness 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 openness 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 average.[262]

[261] 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 (Venezuela 1981) and after (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.

[262] This interpretation would apply equivalently to $\alpha_1 - 1$. As $\alpha_1 - 1$, however, is almost never significant, we present only results for the system GMM estimation of equations (5) and (6) omitting $\ln(Y_{it})$.

Interpreting the system GMM approach as a level equation e.g. a one percentage points increase in the openness indicators would change the first/second quintile share by γ_j*100 percent.

Finally, to estimate the total effect we regress the mean income of the poorest 20 and 20 to 40 percent on the openness indicators and variants of additional regressors taking as level equation in the system GMM methodology variants of the following equation: [263]

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

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 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 and 20 - 40 per cent poorest on the annual average growth rate of mean income and initial values for the openness indicators and additional macroeconomic variables.

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

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)
Op_{jit}:	openness indicators with j = 1, ..., 8; 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 the distribution effect more clearly:

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

with

$y^{q20/40}_{it}$: average annual rate of growth of the first and second quintile share defined as $100/z^* \; [\ln(Q^{20/40}_{i,t+z}) - \ln(Q^{20/40}_{it})]$ [264]

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 openness indicators 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.[265]

Finally, we also estimate the total effect in using variants of the following equation:[266]

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

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), (9), several econometric issues have to be mentioned.[267] 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 2001a, 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 2001a). 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)

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

[264]
$$\begin{aligned} y^{q20/40}_{it} = y^{p/20/40}_{it} - y_{it} &= 100/z^* \; ([\ln(Q^{20/40}_{i,t+z} {}^*Y_{i,t+z}/0.2) - \ln(Q^{20/40}_{it} {}^*Y_{it}/0.2)] - [\ln(Y_{i,t+z}) - \ln(Y_{it})]) \\ &= 100/z^* \; ([\ln(Q^{20/40}_{i,t+z}) + \ln(Y_{i,t+z}) - \ln 0.2 - \ln(Q^{20/40}_{it}) - \ln(Y_{it}) + \ln(0.2) \\ &\qquad - \ln(Y_{i,t+z}) + \ln(Y_{it})]) \\ &= 100/z^* \; [\ln(Q^{20/40}_{i,t+z}) - \ln(Q^{20/40}_{it})] \end{aligned}$$

[265] 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}.

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

by pooled OLS, the estimated coefficients might 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 Lagrange multiplier test for random effects to cover this issue. If we can not reject the null hypothesis in both tests pooled OLS is the appropriate method. Otherwise, we present results for 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 founded in ad hoc considerations and plausible reasoning, model uncertainty problems might arise (Ghura/Leite/Tsangarides 2002).[268] 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 only biases in case of systematic correlation with regressors (Wooldridge 2000).[269] Measurement error in explanatory variables, however, may lead to inconsistent estimates. Varying definitions and accuracy in data collection, for example, cause measurement errors especially present in data on developing countries.[270]

Fourth, in estimating level and first difference equations (5), (6) or the growth equation (9) simultaneity might be an issue.[271] 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, Op), however, is controversially discussed. While, on the one hand, endogeneity is denied due to pragmatic reasons (Dollar/Kraay 2001a), 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 Op in the system GMM estimations due to limited data availability and plausibility.[272] Finally, only initial values for each

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

[268] 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).

[269] 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 2001a). On the issue of biased estimates in case of identical data sources, see Chen/Ravallion (1997).

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

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

[272] 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.

spell are used for the regressors X and Op to avoid endogeneity due to explanatory variables in the growth equation.[273]

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.[274] Considering equations (5), (6), and (9), reverse causation thus means impact of the (growth rate of) first/second quintile share on the (growth rate of the) mean income.[275] Using only a level equation (5) contemporaneous reverse causation will 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 is 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 (7), 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 2001a, Ghura/Leite/Tsangarides).[276] A Sargan test on overidentifying restrictions is 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 1 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 and t-ratios 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 ε_{it+z} - ε_{it} of equation (6) are reported. If disturbances ε_{it} are not serially correlated, first order serial correlation in first differenced residuals ε_{it+z} - ε_{it} have to be

273 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).
274 Biased estimates might also be possible due to joint causation (Timmer 1997, Eastwood/Lipton 2001).
275 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) is found (Barro 2000).
276 Example: given the first difference equation Brazil 1960 – 1970 we use the 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.

significant negative (m1), and second order serial correlation in the first differenced residuals insignificant (m2) (Arrelano/Bond 1991, Bond/Blundell 1998).

5.3 Estimation strategy and results

To measure the impact of trade policy on pro- poor growth, we estimate separately the impact of the eight openness indicators on the first and second quintile share for all, developing and industrial countries applying the system GMM estimator and the growth equation. 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 eight openness indicators on the mean income of the 20 and 20 to 40 percent poorest adding macroeconomic variables. Due to our fundamentally empirical approach, we execute different robustness checks to confirm the results, i.e. we test results only without outliers, with and without mean income, and adjusted and not adjusted inequality income measures in the system GMM estimations.[277] Finally, we test also for the effect of an interaction term with mean income for all eight openness indicators in all and developing countries.

To present a general overview of our results, we indicate matrices of significant coefficients of openness indicators in table 16 to 22.[278] In the rows we indicate the different specifications applied. The eight columns denote the eight different openness indicators we test in each specification. In table 22 we present results for the distribution and total effect of the openness indicators with interaction term. In row 1 we see findings regressing the first quintile on regional dummies and the eight openness indicators using the unadjusted approach in the system GMM estimation. Coefficients for agriculture exports and food imports seem to be highly statistically significant (table 22).

5.3.1 Openness indicators and pro-poor growth: distribution effect

Relying on this overview we emphasize that openness indicators have no distribution effect on the growth rate of the poorest 20 and 20 to 40 percent in all, developing or industrial countries (table 16, 17). In the system GMM estimation we find weak positive effect of manufactures exports on the first quintile for all, and less robust for developing countries (table 18, 19).

First, we regress the first and second quintile on the eight openness indicators and regional dummy variables to control for cultural, historical and economical differences of income inequality in the seven regions (Cornia 2002). In the system GMM approach estimations confirm

[277] We indentify outliers from graphical analysis and descriptive statistics without a strict rule (table 6). Due to a varying number of observations of the samples used in regressions for developing, and industrial countries, and in the growth equation and system GMM estimation, the number of outliers differ in these regressions for dependent and independent variables.

the hypothesis of important inequality difference between regions as almost all coefficients for regional dummy variables differ to a high significance level from the region omitted, i.e. industrial countries in all countries and Eastern Europe and Central Asia in developing countries (table 8). This result is in line with the regional difference of the mean of the (adjusted) first and second quintile (table 7). Concerning openness indicators, only manufactures exports and import duties are weakly significantly positive (table 8 equatons 1, 2, and 5).[279] Failed tests on first order serial correlations, however, do not confirm the findings and emphasize the weakness of the results.[280]

Considering the empirical literature (Romer/Romer 1998, Easterly/Fisher 2001, Eastwood/Lipton 2001, Ghura/Leite/Tsangarides 2002), macroeconomic variables are found to be relevant with respect to pro-poor growth. Thus we additionally 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 growth equation.[281] The eight openness indicators, however, remain insignificant in the growth equation approach. 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). While the Gini coefficient is 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 to us 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 informations on the determinants of inequality are added in this specification. Thus we omit the Gini coefficient in the system GMM estimations.

Considering the openness indicators, manufactures exports affect positively the first quintile share for all countries and the first and second quintile share for industrial countries (table 9 equations 1 to 6). Furthermore, agriculture exports and food exports impact negatively on the first quintile share in industrial countries, a result not confirmed in either the adjusted or unadjusted approach (table 9, equations 7 to 12). In addition, secondary education is amazingly negative (-0.12) to a one percent significance level on the first quintile share for industrial countries (table 9, equations 7 and 9). Specification tests on first-order serial correlation, however, are not passed in all regressions presented.

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278 Results for industrial countries in the growth equation are not presented since coefficients are either insignificant or the size of the sample is under 30 observations.

279 Coefficients, heteroscedasticity adjusted asymptotic standard errors and tests on first-order and second-order serial correlation are based on the one-step estimator. While the one-step estimator is asymptotically inefficient relative to the two-step estimator, asymptotic inference based on the one-step estimator is supposed to be more reliable indicated by simulations (Blundell/Bond 1998, see also Bond/Hoeffler/Temple 2001).

280 In addition, table 8 equation 4 is only significant in the adjusted income approach, while table 8 equation 5 is only significant in the unadjusted approach.

281 Adding initial inequality in the growth equation can be motivated by testing the hypothesis of inequality convergence even if usually the same inequality measure, i.e. Gini coefficient or first quintile share, is used on both sides of the equation (Ravallion 2000). A positive coefficient for the initial Gini coefficient would confirm the convergence of inequality.

Putting the eight openness indicators separately as exogenous regressors on the right hand side in both the growth equation and system GMM estimation, empirical findings suggest only weak evidence on a distributional effect of trade policy on the poorest 20 and 20 - 40 percent. Thus we provisionally conclude that either there is only small distributional effect of trade on the poor or our model is not correctly specified and thus does not correctly describe the real economic situation.

5.3.2 Openness indicators, interaction term and pro-poor growth: distribution effect

To capture the issue posed in the last section, we next introduce an interaction term for all eight openness indicators using the mean income. Including openness indicators alone may be criticized by the fact that the effect of trade on the first and second quintile depends also on the level of the country's development. Relying on the Stolper-Samuelson effect, a theoretical explanation could be based on the reasoning that increased openness could tend to benefit low-skilled workers in poorer countries due to a boost for low-skill-intensive industries, while low-skilled workers in richer countries could lose income due to increased foreign competition and cheaper imported low-skill-intensive products. Thus more openness could increase inequality in countries relatively highly endowed in human and physical capital, while inequality may decrease in countries relatively highly endowed in unskilled labour. As we have no information on the skill composition in the first and second quintile share, we use the income level of the country as interaction term with our openness indicators to capture in a very crude way the countries' relative abundance in skilled labour (Barro 2000, Ravallion 2001b, Dollar/Kraay 2001a, Milanovic 2003).

Thus one may expect the following effects with respect to our openness indicators. First, the positive coefficients of liberalization in agriculture and food should decrease with respect to an increase in the income level of the country if the majority of the labour force is employed in the agriculture and food sector in low-income countries. Second, trade reforms in manufactures imports should lead to positive effects on the unskilled labour, decreasing with rising income levels. However, distribution effects may also be negative in low-income developing countries, if liberalization in manufactures is associated with a skilled-biased technological change (Goldberg/Pavcnik 2004). Finally, the effect of export and import duties should increase with rising income level. We test these hypotheses also for developing countries alone since the level of income and the economic structure of developing countries may differ significantly with respect to abundancy in labour and capital in our sample (table 7).

We first estimate the effect of the openness indicators on the first and second quintile share adding regional dummy variables. Considering the growth equation, the effect of agriculture exports on the annual average rate of growth of the second quintile share for all and developing countries surges with respect to an increasing initial mean income (table 10 equations 1 and

2).[282] Looking at the result for developing countries, agriculture exports affect negatively the growth rate of the second quintile share for mean income below 4150, but impact positively in countries with an income level higher than 4150 (table 10 equation 2).[283] Thus the negative effect of agriculture exports on annual average rate of growth of the poorest 20 to 40 percent worsens with lower economic development. This result, however, is in contrast to the explanation proposed above. In addition, as the median in this sample is 3890 for the mean income, within-country distribution is aggravated in more than 50 percent of the countries by agriculture exports. Finally, also manufactures imports affect significantly the growth rate of the first quintile share in developing countries, i.e. manufactures imports are negative for very low income countries, but this effect decreases with rising economic development and becomes positive above a value of 3720 for the mean income (table 10 equation 3).

If we add regional dummy variables to the openness indicators with interaction term in the system GMM estimation, only agriculture exports are significant for the first and second quintile in all countries using the adjusted approach (table 11 equations 2, 4). In addition, agriculture exports and food imports are significant in developing countries (table 11 equations 5 to 12). A positive effect on very low income countries decreases with rising economic development and turns negative at some level of mean income. Agriculture exports are positive for the first quintile share in developing countries below a value around 5100 for the mean income, which means that higher agriculture exports increase the first quintile in more than 90 percent of the developing countries in our sample (table 11 equation 5). Food imports impact positively on the first quintile share in developing countries below a value of 4100 for the mean income, i.e. higher food imports decrease the first quintile in more than 50 percent of the developing countries in our sample (table 11 equation 9). However, regressions on the effect of openness indicators almost never pass specification tests on first-order serial correlation.

One important result is that empirical findings suggest no distribution effect of agriculture imports, food exports, manufactures exports, and import and exports duties in both the growth equation and system GMM estimation if we add an interaction term in specifications without macroceonomic variables (table 16, 17 21, 22). A second important result is an opposite effect of agriculture exports if we compare the findings in the growth equation with the system GMM estimations (table 16, 17, 21, 22). While the positive effect of agriculture exports at very low income levels decreases with surging economic development for the second quintile share in developing countries, the effect of the initial agriculture exports on subsequent growth rate of the second quintile share is negative at low income levels (compare table 11 equations 7, 8 with table 10 equations 2).

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

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[282] Results are robust to the inclusion of annual average rate of growth of the mean income on the right hand side of the regression.

with growth rates per country, i.e. 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 test 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 openness indicators in the system GMM estimation, while we regress the growth rate on the level of the openness indicators in the growth equation.

Again, we control for budget deficit to GDP, financial development, secondary schooling, inflation and initial inequality in the growth equation. Batteries of regressions, however, could not confirm any significance of one of the eight openness indicators (table 16, 17).[284] Concerning the system GMM estimation, we control for secondary education, government consumption and inflation as additional macroeconomic variables. Looking at the overview, only import duties are relevant in all countries, but the coefficients of agriculture exports become insignificant compared to regressions without macroeconomic variables (table 21).

Considering the results for developing countries (table 22), the effect of agriculture exports on the first and second quintile share is highly significant and increased with respect to regressions excluding macroeconomic variables (compare table 12 equations 1 to 4 with table 11 equations 5 to 8). Thus a higher positive effect on very low income countries decreases more sharply with rising economic development. Taking the regression for the first quintile share in developing countries, the turning point to a negative impact is at a value around 5200 for the mean income (Costa Rica 1989), while in the regression without macroeconomic values the turning point is at a value around 5050 (compare table 12 equation 1, 2 with table 11 equation 5). In addition, significant results are confirmed by passed specification tests on first-order serial correlation in the unadjusted approach (table 12 equations 1 and 3).

While coefficients of food imports for the second quintile become insignificant in developing countries in specifications with macroeconomic variables (table 22), the effect of food imports on the first quintile in developing countries is analogue to the result controlling only for regional dummy variables (compare table 12 equation 5 and 6 with table 11 equations 9 and 10). The findings are confirmed by passed specification test on first-order serial correlation in the unadjusted approach (compare table 12 equation 5 with table 11 equation 9).

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[283] The level of initial mean income is calculated by $-5.00 + 0.60 * \ln(Y) = 0$.

[284] We test the eight openness indicators for all, developing and industrial countries without outliers and with/without the growth rate of mean income.

Finally, agriculture imports affect the first quintile in developing countries and import duties the first quintile in all countries at low significance levels. Even if specification tests on first-order serial correlation are passed, the results are not robust using the unadjusted or adjusted income inequality measure approach (table 12 equations 5 and 8). Thus we emphasize the weakness of the findings for agriculture imports and import duties, as the coefficients for additional macroeconomic variables are either insignificant or, in case of a negative coefficient for secondary education (table 12 equation 7), in the opposite direction to estimations in the literature (Ghura, Leite, Tsangarides 2002) and are very singular with respect to robustness checks and tests in other specifications (table 21 and 22). Concerning additional macroeconomic variables, coefficients are almost never significant. Only in regressions on agriculture exports, secondary education and government consumption affect positively the second quintile share in developing countries (table 12 equation 3 and 4).[285]

Including mean income as interaction term for all eight openness indicators seems to describe more detailed the economic situation. In the system GMM estimations agriculture exports and food imports impact positively at very low income levels in developing countries, but this effect is diminished and becomes negative above a certain threshold. Empirical findings for agriculture imports and import duties, however, do not allow a clear conclusion. Finally, food exports, manufactures exports and export duties are found to be insignificant in both the growth equation and system GMM estimations using an interaction term (table 16, 17, 21, 22).

5.3.3 Openness indicators and pro – poor growth: total effect

Taking into account trade-offs between the distribution effect and the growth effect of openness on the income of the poor, we also test for the impact of our eight openness indicators on the mean income of the 20 and 20 - 40 percent poorest, i.e. the total effect. 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 openness indicators are limited by data availability 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, only agriculture imports are relevant in the growth equation (table 16, 17), i.e. agriculture imports impact significantly positive on the mean income of the second quintile in all countries and the first and second quintile in developing countries (table 13 equations 1 to 3).[286] Thus the positive effect of agriculture imports on the income of the poorest 20 and 20 to 40 percent works only through the growth effect, as we do not find any distribution effect (table 16

[285] While the positive coefficient of secondary education is in line with empirical findings for the first quintile share, the very low but positive effect of government consumption is not present in the adjusted approach and not confirmed in the literature (Ghura/Leite/Tsangarides 2002).

[286] 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

and 17).[287] In addition, the adjusted initial Gini coefficient is positive at a highly significant way (between 0.34 and 0.45), i.e. higher initial inequality would lead to a higher growth rate for the mean income of the poorest 20 and 20 to 40 percent.[288]

The picture changes considerably if we add secondary education, government consumption, inflation and, additionally, civil liberties, life expectancy and terms-of-trade in the system GMM approach. Relying on our overview, agriculture imports, food exports, manufactures export, export and import duties are now significant openness indicators with respect to the total effect (table 18 to 20). Agriculture imports impact highly significantly positive on the mean income of poorest 20 and 20 - 40 percent in all and developing countries (table 14 equations 1 to 8). Interpreting the system GMM estimation as level equation, a one percentage point rise in agriculture imports would increase the mean income of the first and second quintile between 20 and 26 percent. As the estimated residuals for agriculture imports vary only between -1.11 and +1.67 in our sample without outliers (table 6), however, a 0.1 percentage point rise of agriculture imports by trade reforms would be a more realistic perspective. This positive effect, however, is only present in regressions on the mean income of the poor and thus results from the growth effect alone (table 18 and 19).

Food exports affect negatively the mean income of the first and second quintile in all countries, the mean income of the poorest 20 percent in developing countries (table 14 equations 9 to 16) and the mean income of the first and second quintile in industrial countries using the unadjusted approach (table 14 equations 31 to 34). A one percentage point increase in food exports would diminish the mean income of the poorest 20 and 20 to 40 percent between 2 and 3 percent. The negative effect, however, is only present in regressions on the mean income of the poor and thus results from the growth effect alone (table 18 and 19).

Manufactures exports affect highly significantly positive the mean income of the first and second quintile in all and developing countries (table 14 equations 17 to 24) and the mean income of the first quintile in industrial countries applying the unadjusted approach (table 14 equation 35). Interpreting the system GMM estimation as level equation, a one percentage point rise in manufactures exports would increase the mean income of the first and second quintile between 1.1 to 2.1 percent in all and developing countries. As either only the total effect is significant or the total effect is more than doubled with respect to the distribution effect (table 18 and 19), manufacture exports work mainly through the growth effect on the income of the poor

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[287] Concerning the result for the growth of the mean income of the first quintile (table 13 equation 2), we have to correct this statement, as we do find a positive coefficient (+2.20) to a 5 percent significance level in the random effects model for the growth of the first quintile. Thus part of the high positive value seems to stem from a distribution effect. The Hausmann specification test, however, is rejected to a 5 percent significance level, thus a fixed effects model has to be applied. The coefficient of agriculture imports is positive (+4.42), but insignificant in the fixed effects model.

[288] In regressions for the growth rate of the mean of the second quintile, around 70 percent of the positive effect of the initial Gini coefficient stem from a positive distribution effect on the growth rate of the second quintile, confirming the hypothesis of inequality convergence (Ravallion 2000). We do not present the results for the distribution effect due to insignificant openness indicators. The positive total effects of initial inequality are not directly comparable to Forbes (2001), since we do not apply a first-difference methodology (GMM) to estimate our growth equation, we use a different set of additional regressors, and our Gini coefficient is adjusted in a more accurate way.

in all and developing countries. This conclusion, however, can not be drawn for industrial countries as the small positive coefficient for the mean income of the first quintile is similar to the distribution effect (compare table 14 equation 35 to table 9 equations 3)

Export duties affect negatively the mean income of the poorest 20 percent in all and developing countries, and, amazingly, affect positively the mean income of the second quintile in industrial countries (table 14 equations 25 to 30). A one percentage point surge in export duties would decrease the mean income of the first quintile by 3 percent in all and developing countries, but increase the mean income of the poorest 20 - 40 percent by 11 percent in industrial countries. The positive coefficient should not be overinterpreted as coefficients are significant only to a ten percent level. In addition, the values for export duties vary only between 0 and 1.12 in industrial countries with a mean of 0.10 (table 7) and more than 70 percent of the observations have a value of zero. Thus the positive coefficient is only due to few observations with positive exports duties. Finally, import duties impact negatively on the mean income of the first quintile in industrial countries (table 14 equations 37 and 38). A one percentage points rise in import duties would diminish the mean income of the poorest 20 percent between 1.8 and 2.4 percent. This negative effect, however, results mainly from the distribution effect (table 9 equations 13 and 14).

Most additional macroeconomic variables impact on the income of the poor in the way expected. In all and developing countries higher secondary education, life expectancy and terms of trade increase the income of the poor, while raised government consumption and less civil liberties diminish the income of the poor (table 14 equations 1 to 28).[289] In addition, coefficients for additional macroeconomic variables are almost always statistically significant. Only the coefficient of inflation is amazingly positive, but almost never significant in developing and all countries. A one year rise of average years of secondary schooling would increase the mean income of the first and second quintile between 22 and 33 percent in developing countries. As the mean of average years of secondary education is at 1.21 years and the minimum and maximum values for developing countries are 0.12 and 3.52 years, respectively, a one year change in secondary schooling would be a very ambitious policy objective. A more realistic interpretation is a change of 0.1 in average years of secondary schooling that would increase the mean income of the first and second quintile between 2 and 3 percent. In addition, a one year increase in life expectancy would raise the mean income of the first and second quintile between 2 to 6 percent in all and developing countries. 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. While results for industrial countries point in the same direction, the coefficient of inflation is highly negative, terms of trade equals zero and only few coefficients are significant (table 14 equations 29 to 38). In addition, secondary education is only significant for income of the first quintile using

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[289] The variable government consumption may be seen as a proxy for nonproductive public expenditures, political corruption or bad governance (Barro/Sala-i-Martin 1995).

the adjusted approach in industrial countries (table 15 equation 31, 32, 35, 36, 37, 38). Results on the total effect in general, however, have the shortcoming that tests on first order serial correlation are never passed.

5.3.4 Openness indicators, interaction term and pro–poor growth: total effect

Controlling for an interaction term, budget deficit, financial development, secondary education, inflation and initial inequality in the growth equation, we find no significant effects in the growth equation (table 16, 17). Concerning the system GMM estimation, we add secondary education, government consumption, inflation, civil liberties, life expectancy and terms of trade to the interaction term of our eight openness indicators. An important finding is that the set of significant openness indicators has changed with respect to the distribution effect. First, agriculture exports now affect also the mean income of the poorest 20 and 20 - 40 percent in all countries. Second, food exports, export and import duties impact significantly on the mean income of first and second quintile in all and developing countries. Finally, food imports become irrelevant with respect to the total effect, i.e. the distribution effect of food imports is completely absorbed by an opposite growth effect (table 21 and 22).

The coefficients of agriculture exports are significant in all and developing countries with expected effect, i.e. a positive effect on very low income countries decreases with rising economic development and turns negative at some level of mean income (table 15 equations 1 to 8).[290] Agriculture exports are positive for the first quintile share in developing countries in the unadjusted approach below a value around 6000 for the mean income, which means that higher agriculture exports would increase the first quintile in more than 70 percent of the developing countries in our sample (table 15 equation 5). The total effect of agriculture exports is dependent on the growth effect alone in all countries as we find no distribution effect (table 21). In developing countries, however, the significant distribution effect is raised by the growth effect (table 22). Thus there is no trade-off between the distribution and growth effect, but both work in the same direction.

Food exports, however, affect the mean income of the first and second quintile in the opposite direction. A negative effect at low levels of economic development diminishes and becomes positive with rising mean income in all and developing countries (table 15 equations 9 to 16). Food exports are positive for the income of the first quintile in developing countries in the unadjusted approach above a value around 5300 for the mean income (table 15 equation 13). In developing countries this effect is steeper than in all countries as a higher negative effect on very low income countries increases more sharply with rising economic development. The total

[290] Exceptions are regressions on the mean income of the first quintile in the adjusted approach (table 15 equations 2 and 6).

effect of food exports, however, is only driven by the growth effect as we do not find significant distribution effects for food exports (table 21 and 22).[291]

Concerning export and import duties, a negative impact at low levels of economic development diminishes and becomes positive with rising mean income in all and developing countries (table 15 equations 17 to 32), i.e. increased exports and import duties worsen the mean income of the poorest in low to middle income countries, while they are positive for the poor in high income countries. Exports duties are negative for the income of the poorest 20 percent in developing countries in the adjusted approach below a value around 5750 for the mean income (table 15 equation 22). Increased import duties, however, already affect positively the income of the first quintile at a value around 2100 for the mean income (table 15 equation 29 and 30). For both exports and import duties this effect is steeper in developing countries than in all countries as a higher negative effect on very low income countries increases more sharply with rising economic development. In addition, the growth effect is alone responsible for the impact of export and import duties on the mean income of the poorest 20 and 20 - 40 percent as almost all distribution effects are insignificant (table 21 and 22).[292]

Finally, the impact of the additional macroeconomic variables is very similar to regressions on the total effect without interaction term (compare table 15 with table 14). Interpretation of the results on the total effect in general, however, are weakened by failed tests on first order serial correlation in most regressions (table 15).

6. Conclusion

We departed from the question whether the poorest 20 and 20 to 40 percent benefit from trade openness in the agriculture, food and manufactures sector or in export and import duties. To answer this question we regressed the first and second quintile and the mean income of the first and second quintile on eight different openness indicators, interaction terms and additional macroeconomic variables in a growth equation and an adjusted and unadjusted system GMM approach (table 16 to 22).

Only a few openness indicators exhibit significant distribution effects on the poorest 40 percent. First, manufactures exports are weakly positive for the first quintile in all countries applying the system GMM estimator (table 18), a result mainly driven by effects in industrial countries (table 19 , 20) and not supported in the growth equation (table 16, 17). Second, liberalizing agricultural

[291] A negative distribution effect of food exports at low levels of economic development could be explained in the context of the Stolper-Samuelson theorem, if we assume that the food sector is the most protected sector producing intensively with unskilled labour and if tariffs are reduced the most in the food sector during trade reforms. Since trade liberalization is focused on the unskilled-labour intensive food sector, returns to unskilled labour should decrease. Thus sectoral protection patterns before trade liberalizations may significantly affect the impact of trade reforms (Goldberg/Pavcnik 2004). This explanation, however, seems to be irrelevant in our context since the total effect is only driven by the growth effect.

raw exports leads to a significant positive distribution effect on the first and second quintile share in low-income developing countries. The positive effect decreases with rising economic development and becomes negative at a higher level of income, supporting the Stolper–Samuelson theorem (table 22). The results, however, are neither present in regressions for all countries (table 21), nor in the growth equation (table 16, 17).[293] Finally, increased food imports impact positively on the first quintile share only at low income level in developing countries (table 22).[294] However, this effect becomes negative in higher income developing countries and is not confirmed in regressions for all countries (table 21) and the growth equation (table 16, 17). To summarize, only trade liberalization in agricultural raw materials exports and food imports leads to significant positive distribution effects in low income developing countries applying the system GMM approach. In addition, trade reforms in manufactures does not lead to any negative distribution effect in low income countries as proposed by the literature on wage inequality.[295]

Considering the total effect, we find more relevance of trade reforms on the income of the poorest 40 percent. First, trade liberalization in agricultural raw material imports, export duties, and promotion of manufactures exports lead to significant positive effects using the system GMM estimation, while higher food exports impact negatively on the mean income of the poorest 20 percent in all and developing countries (table 18, 19). Similar findings are confirmed for the mean income of the poorest 20 - 40 percent for agriculture imports, manufacture exports and food exports in all countries and agriculture imports and manufacture exports in developing countries (table 18, 19). Thus trade liberalization in agriculture imports, food exports, export duties, and promotion of manufactures exports work only through the growth effect on the income of the poor. In addition, these results are mainly relevant for developing countries since findings for industrial countries deviate in most of the cases.[296] In industrial countries higher export duties affect positively the mean income of the second quintile share to a low significance level and import duties are negative for the mean income of the poorest 20 percent, a result mainly driven by the distribution effect (table 20). Of all these effects, however, only the positive total effect of trade liberalization in agriculture imports can be confirmed in the growth equation (table 16, 17).

Second, trade liberalization in agricultural raw material exports, food exports, export duties and import duties affects the mean income of the 40 percent poorest if we control for an interaction

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[292] One exception is the effect of import duties on the first quintile for all countries using the unadjusted approach (compare table 15 equation 25 with table 12 equation 7). While the distribution effect would indicate a reverse impact, the total effect is insignificant in the unadjusted approach.

[293] The result, however, is present in regressions for all countries on the first and second quintile, if we control only for regional dummy variables and use the adjusted approach in the system GMM estimation (table 21). In addition, the result is reversed in regressions for the growth rate of the second quintile share in the growth equation controlling only for regional dummy variables (table 16, 17).

[294] We also find a similar result for the regression on the second quintile, if we control only for regional dummy variables and use the unadjusted approach (table 22).

[295] One exception is the negative impact of manufacture imports on the growth rate of the first quintile in very low income countries (table 17).

[296] Exceptions are the regressions for food exports on the mean income of the first and second quintile and manufactures exports on the mean income of the poorest 20 percent using the unadjusted approach (table 20).

term. Liberalizing agriculture exports leads to a significant positive total effect on the first and second quintile share in low income developing countries.[297] The positive effect decreases with rising economic development and becomes negative at a higher level of income supporting the Stolper–Samuelson theorem (table 21, 22). While the total effect of agriculture exports is dependent on the growth effect alone in all countries (table 21), the significant distribution effect is raised by the growth effect in developing countries (table 22). Food exports, however, affect the mean income of the poorest 40 percent in the opposite direction, i.e. a negative effect at low levels of economic development diminishes and become positive with rising mean income in all and developing countries (table 21, 22). The total effect of food exports, however, is only driven by the growth effect due to insignificant distribution effects for food exports (table 21 and 22). Finally, export and import duties affect the mean income of the first and second quintile in the expected way, i.e. a negative impact at low levels of economic development diminishes and becomes positive with rising mean income in all and developing countries (table 21, 22). The growth effect is alone responsible for the impact of export and import duties on the mean income of the poorest 20 and 20 to 40 percent as almost all distribution effects are insignificant (table 21 and 22).[298]

Combining empirical findings of the system GMM estimation for both the distribution effect and the total effect estimation results suggest the importance of sector specific trade policy for the poorest 20 and 20 to 40 percent. Accepting higher adjusted trade sector openness indicators as measures for less restricted or more open trade policy, the findings suggest the conclusion that liberalizing agricultural raw material exports is very important for the poorest 40 percent of low income developing countries due to both the distribution effect and the total effect (table 22). In addition, liberalizing imports in agricultural raw materials is highly positively related to the mean income of the poor without changing the distribution (table 18, 19). Thus liberalized trade in agricultural raw materials, i.e. hide, rubber, cork, wood, waste paper, textile fibres or crude animal and vegetable material, is highly positively relevant for the income of the poorest 20 and 20 to 40 percent in (low-income) developing countries for the period 1980 to 1999.

In contrast, trade reforms in food exports affect negatively the mean income of the poorest 40 percent in low-income developing countries, a result only driven by the growth effect (table 22). Furthermore, higher food imports seem to have a positive distribution effect on the poorest 20 percent in low-income developing countries, an effect which is completely offset by the growth effect (table 22). Concerning trade in manufactures, exports exhibits a positive total effect on the poorest 40 percent in developing countries via the growth effect (table 19), while trade reforms in manufactures imports are never relevant. Finally, reduced export and import duties affect positively the mean income of the poorest 40 percent in low-income developing countries, an effect primarily driven by the growth effect (table 22). Findings for agriculture exports, food

[297] Exceptions are regressions on the mean income of the first quintile in the adjusted approach (table 21, 22).
[298] One exception is the effect of import duties on the first quintile for all countries using the unadjusted approach (table 21). While the distribution effect would indicate a reverse impact, the total effect is insignificant in the unadjusted approach.

exports, export and import duties, however, are only relevant if we exploit information on both the cross-country and within-country variation of the income of the poor in the system GMM estimation. In addition, results of the growth equation suggest positive total effects of agriculture imports on the poorest 20 and 20 to 40 percent in development countries driven by the growth effect alone (table 17).

Thus, empirical findings suggest the following policy recommendations with respect to poverty-reducing trade reforms in low-income developing countries. While results are not always consistent between the growth equation and the system GMM estimation, liberalization of agricultural raw material exports and imports seems to be the most promising approach. On the other hand, liberalization in food markets and manufactures imports are not associated with poverty alleviation in low-income developing countries. Finally, a promotion of manufactures exports and a reduction of export and import duties seem to increase mean income of the poorest 40 percent in low-income developing countries only via the growth effect.

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Table 1: Coverage of the data set

Region	Country	Observations dates	Source	No. of spells
East Asia Pacific (EAP)	China	1988, 91	UNU	1
		1994, 97	GPM	1
	Hongkong	1981, 86, 91	UNU	2
	Indonesia	1980, 84, 87, 90	UNU	3
		1993, 96, *99*	GPM, *WDI*	2
	Korea	1976, 80, 85, 88	UNU	3
	Malaysia	1976, 79, 84	UNU	2
		1987, 92, 95	GPM	2
	Philippines	1985, 88, 91	UNU	2
		1994, 97	UNU	1
	Singapore	1978, 88	UNU	1
	Thailand	1975, 81, 86, 90	UNU	3
		1992, 98	UNU	1
Eastern Europe and Central Asia (ECA)	Bulgaria	1991, 93	UNU	1
	Hungary	1982, 87	UNU	1
		1989, 93	GPM	1
	Latvia	1995, 98	GPM	1
	Poland	1985, 90, 93	UNU	2
	Romania	1989, 92	UNU	1
	Russia	1994, 98	GPM	1
Latin America and Caribbean (LAC)	Brazil	1980, 86	UNU	1
		1988, 93, 96	GPM	2
	Chile	1989, 92	UNU	1
	Colombia	1971, 78, 88	UNU	2
		1988, 91, 95	UNU	2
	Costa Rica	1981, 86, 89	UNU	2
		1993, 96	GPM	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	UNU	1
		1991, 96	UNU	1
	Mexico	1984, 89	UNU	1
		1989, 95, *98*	GPM, *WDI*	2
	Panama	1979, 89	UNU	1
		1991, 95	GPM	1
	Paraguay	1995, *98*	GPM, *WDI*	1

Table 1: continued

	Peru	1986, 94	UNU	1
	Trinidad & Tobago	1976, 81	UNU	1
		1988, 92	GPM	1
	Venezuela	1971, 81, 87	UNU	2
		1987, 93, 96	GPM	2
Middle East and North Africa (MNA)	Algeria	1988, 95	GPM	1
	Egypt	1991, 95	UNU	1
	Jordan	1980, 87, 91	UNU	2
		1991, 97	UNU	1
	Morocco	1984, 91	UNU	1
		1991, 99	UNU	1
	Tunisia	1985, 90, *95*	GPM, *WDI*	2
	Turkey	1987, 94	GPM	1
	Yemen	1992, *98*	GPM, *WDI*	1
South Asia (SA)	Bangladesh	1973, 77, 81, 86	UNU	3
		1988, 91, 95	GPM	2
	India	1977, 83, 86, 89, 92	UNU	4
		1994, 97	UNU	1
	Pakistan	1979, 85, 88	UNU	2
		1991, 96	UNU	1
	Sri Lanka	1979, 87	UNU	1
		1990, 95	UNU	1
Sub-Saharan Africa (SSA)	Côte d'Ivoire	1985, 88	UNU	1
		1988, 95	UNU	1
	Ethiopia	1981, 95	GPM	1
	Ghana	1987, 92	GPM	1
		1992, 97	UNU	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
	Mauritius	1986, 91	UNU	1
	Nigeria	1985, 97	GPM	1
	Senegal	1991, 95	UNU	1
	Zambia	1993, 96	UNU	1
Industrial Countries (IND)	Australia	1976, 79	UNU	1
		1981, 85, 89	UNU	2
		1995, 98	UNU	1

Table 1: continued

	Belgium	1979, 85, 88, 92	UNU	3
	Canada	1973, 77, 81, 84, 87	UNU	4
		1987, 91	UNU	1
	Denmark	1981, 87, 92	UNU	2
		1992, 95	UNU	1
	Finland	1978, 81, 84	UNU	2
		1987, 91	UNU	1
		1991, 94, 97	UNU	2
	France	1979, 84	UNU	1
	Germany	1973, 78, 81, 84	UNU	3
	Greece	1981, 88	UNU	1
	Ireland	1980, 87	UNU	1
	Italia	1978, 81, 84, 87, 91	UNU	4
	Japan	1977, 80	UNU	1
	Netherlands	1975, 79, 82	UNU	2
		1983, 87, 91	UNU	2
	Norway	1976, 79, 84, 91	UNU	3
	New Zealand	1973, 77, 80, 83, 86, 89	UNU	5
	Portugal	1980, 90	UNU	1
	Spain	1981, 91	UNU	1
	Sweden	1975, 81, 87, 92	UNU	3
	United Kingdom	1971, 74, 77, 80, 84, 88, 91	UNU	6
	USA	1974, 77, 80, 83, 86, 89	UNU	5
	No. of countries	No. of observations		No. of spells
Total	72	266		165

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. (First-differenced equations for Morocco 1991 – 99, Ghana 1992 – 97, Guinea 1991 – 94, Madagascar 1993 – 99, Mali 1989 - 94, Zambia 1993 – 1996 and level equations for Morocco 1999, Ghana 1997, Guinea 1994, Madagascar 1999, Mali 1994, and Zambia 1996 could not be formed as the openness indicators are not available for the end period, a problem not present in the growth equation where we use only the initial values).

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/second quintile share. In this case we omit one of the two observations for the same year in one country (Canada 1987/1, Côte d'Ivoire 88/1, Colombia 88/1, Denmark 92/2, Finland 91/2, Jamaica 91/1, Jordan 91/2, Mexico 89/1, Morocco 91/1, Venezuela 87/2) and if the time length between observations in one country is only one year (Netherlands 1983). The number behind the year indicates whether we omit the first or second observation as ordered in the table.

Table 2: Adjustment regressions 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)	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
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)	for selection procedure see share of income quintile
Import duties	World Development Indicators (2001) (GB.TAX.IMPT.BM.ZS)	Import duties (% of imports) All levies collected on goods at the point of entry into the country.
Export duties	World Development Indicators (2001) (GB.TAX.EXPT.BX.ZS)	Export duties (% of exports) All levies collected on goods at the point of export.
Agriculture imports	World Development Indicators (2001) (TM.VAL.AGRI.ZS.UN)	Agricultural raw materials imports (% of merchandise imports) Agricultural raw materials comprise SITC section 2 (crude materials except fuels) excluding division 22 (oil seeds, oil nuts, oil kernels), 27 (crude fertilizers and minerals excluding coal, petroleum, and precious stones), and 28 (metalliferous ores and scrap).
Agriculture exports	World Development Indicators (2001) (TX.VAL.AGRI.ZS.UN)	Agricultural raw materials exports (% of merchandise exports)

Table 3: continued

Food imports	World Development Indicators (2001) (TM.VAL.FOOD.ZS.UN)	Food imports (% of merchandise imports) Food comprises the commodities in the SITC sections 0 (food, live animals), 1 (beverage, tobacco), 22 (oil seeds, oil nuts, oil kernels), and 4 (animal and vegetable oils and fats).
Food exports	World Development Indicators (2001) (TX.VAL.FOOD.ZS.UN)	Food exports (% of merchandise exports)
Manufactures imports	World Development Indicators (2001) (TM.VAL.MANF.ZS.UN)	Manufactures imports (% of merchandise imports) Manufactures comprise commodities in SITC sections 5 (chemicals), 6 (basic manufactures), 7 (machinery and transport equipment) and 8 (miscellaneous manufactured goods), excluding division 68 (non-ferrous metals)
Manufactures exports	World Development Indicators (2001) (TX.VAL.MANF.ZS.UN)	Manufactures exports (% of merchandise exports)
GDP	World Development Indicators (2001) (NY.GDP.MKTP.CD)	GDP in current US dollars
Oil exporter	World Development Indicators (2001) (TX.VAL.FUEL.ZS.UN)	Dummy variable equals one if fuel exports (% of merchandise exports) greater than 30
Government Consumption	Penn World Tables, Version 6.1 (October 2002)	Constant 1996 US dollars
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 %) (Germany 73, 78, 81, 84; Ethiopia 81; Poland 90)

Table 3: continued

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
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 (Germany 1973, 78, 81, 84; Tunisia 1990; Latvia 1995)
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)
Area	Statistical Yearbook (Germany)	km^2

Table 4: Adjustment regressions for openness indicators

Dependent Variable:	**Agriculture exports to GDP**	**Agriculture imports to GDP**	**Food exports to GDP**	**Food imports to GDP**
ln(area)	0.19*	-0.24***	0.26	-0.60***
	(0.10)	(0.05)	(0.23)	(0.12)
ln(population)	-0.37***	0.14***	-1.60***	-0.38***
	(0.10)	(0.05)	(0.31)	(0.14)
Oil exporter	-0.97***	-0.02	-3.39***	0.65
	(0.24)	(0.10)	(0.75)	(0.54)
Constant	2.56***	2.35***	17.97***	14.74***
	(0.82)	(0.41)	(1.93)	(1.22)
N	210	208	210	208
R - Squared	0.09	0.26	0.24	0.33

Dependent Variable:	**Manufactures exports to GDP**	**Manufactures imports to GDP**
ln(area)	-5.28***	-4.17***
	(1.48)	(1.37)
ln(population)	2.59**	-0.47
	(1.06)	(0.93)
Oil exporter	-6.67***	-1.93
	(1.55)	(1.68)
Constant	54.72	76.79
	(11.24)	(10.81)
N	210	208
R-Squared	0.30	0.34

Note: This table reports the results of pooled OLS regression for sector specific exports and imports. The measure of trade openness is constructed by the residuals of the regressions. * denotes significance at the 90% level, ** at the 95% level, and *** at the 99% level (two-sided alternative). Heteroscedasticity adjusted standard errors in parentheses.

As we have some double observations per country per year (see table 1), the adjustment process may be biased. We checked for differences, but could not confirm any significant problem due to counting several observations of the openness indicators twice.

Table 5: Correlation matrix for adjusted openness indicators

	Imdu	Exdu	Agim	Agex	Foim	Foex	Maim	Maex
Imports duties	1							
Exports duties	**0.141** (0.036)	1						
Agriculture Imports	-0.105 (0.178)	**-0.193** (0.012)	1					
Agriculture Exports	-0.071 (0.363)	0.105 (0.176)	0.041 (0.554)	1				
Food imports	**0.182** (0.019)	-0.046 (0.557)	**0.264** (0)	0.021 (0.765)	1			
Food exports	**0.265** (0)	**0.229** (0.003)	-0.094 (0.179)	**0.194** (0.005)	0.051 (0.463)	1		
Manufactures imports	-0.076 (0.329)	-0.124 (0.111)	**0.524** (0)	**0.312** (0)	**0.434** (0)	0.036 (0.217)	1	
Manufactures exports	**-0.301** (0)	**-0.209** (0.006)	**0.625** (0)	**0.226** (0.001)	**0.205** (0.003)	-0.114 (0.10)	**0.831** (0)	1

Note: P–values of each correlation coefficient in parentheses. Correlation matrix is presented only for all available observations, i.e. some observations are counted twice (see table 1). Thus correlation matrix for openness indicators may differ for the growth equation as only initial values are used. Imdu/Exdu: Import/Export duties. Agim/Agex: Agriculture imports/exports. Foim/Foex: Food imports/exports. Maim/Maex: Manufactures imports/exports.

Table 6: Descriptive Statistics

Variable	Observ.	Mean	Std. Dev.	Min.	Max.
Q20	266	0.061	0.021	0.019	0.116
Adjusted Q20	266	0.058	0.018	0.015	0.113
Q40	266	0.108	0.024	0.050	0.156
Adjusted Q40	266	0.101	0.025	0.039	0.153
Income Q20	266	2689	2457	175	11266
Adjusted Income Q20	266	2658	2437	102	8501
Income Q40	266	4946	4424	287	15194
Adjusted Income Q40	266	4754	4424	245	14863
Real GDP per capita	266	8535	6767	528	26279
Growth Q20	165	0.17	4.71	-17.45	25.26
Growth Q40	165	-0.02	2.94	-9.05	18.50
Growth income Q20	165	1.81	5.64	-23.83	26.45
Growth income Q40	165	1.61	4.03	-15.42	16.85
Growth real GDP per capita	165	1.64	2.64	-9.35	9.42
Agriculture exports	210	0	1.71	-2.57	11.19
Agriculture imports	208	0	0.56	-1.11	3.02
Food exports	210	0	4.51	-7.21	24.59
Food imports	208	0	2.30	-3.62	11.35
Manufactures exports	210	0	12.59	-20.48	68.48
Manufactures imports	208	0	11.68	-20.03	77.94
Export duties	224	1.56	4.79	0	46.04
Import duties	223	9.09	9.33	0	50.84
Adjusted Gini	266	41.35	9.33	23.06	64.36
Gov. Consumption	266	17.95	9.82	3.40	69.11
Budget surplus	229	-3.43	4.00	-15.18	8.22
Secondary Education	240	1.82	1.12	0.12	5.09
Life expectancy	266	67.59	8.26	41.96	78.63
M2 to GDP	213	38.87	21.09	4.91	132.48
ln(1 + inflation/100)	266	0.16	0.30	-0.05	3.04
Terms of Trade	254	102.51	19.72	50.78	262.37
Civil liberties	260	3.11	1.74	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 openness indicators (residuals) and additional macroeconomic variables differ for the growth equation as only initial values are used (table 1). 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 7: Descriptive Statistics - Regions

Variable	EAP	ECA	LAC	MNA	SA	SSA	IND
Q20	0.059	0.085	0.037	0.066	0.081	0.058	0.068
Adjusted Q20	0.060	0.080	0.037	0.056	0.076	0.047	0.067
Q40	0.102	0.133	0.079	0.107	0.122	0.100	0.126
Adjusted Q40	0.096	0.120	0.071	0.092	0.112	0.084	0.123
Income Q20	1612	3085	1023	1305	652	536	5782
Adjusted Income Q20	1699	2889	1024	1107	605	433	5761
Income Q40	2820	4754	2201	2126	975	949	10788
Adjusted Income Q40	2728	4274	1986	1817	887	793	10609
Real GDP per capita	5579	7156	5504	4017	1602	1832	17218
Growth Q20	0.39	-5.36	0.03	1.05	-0.46	0.36[299]	-0.19
Growth Q40	0.05	-2.68	0.33	0.72	-0.52	0.78	-0.40
Growth Income Q20	4.83	-7.31	0.75	1.32	2.69	-0.05	1.69
Growth Income Q40	4.49	-4.63	1.05	0.99	2.64	0.48	1.48
Growth real GDP p.cap.	4.44	-1.95	0.72	0.27	3.16	-0.39	1.88
Agriculture exports	1.31	0.36	-0.70	-0.97	0.06	0.16	0.05
Agriculture imports	0.50	0.10	-0.30	0.48	-0.52	-0.10	-0.01
Food exports	1.18	-2.06	1.25	-1.04	-0.16	3.76	-1.82
Food imports	0.27	-0.88	-0.75	3.11	-0.06	1.74	-0.86
Manufactures exports	11.24	1.22	-5.62	-1.72	-9.61	-3.65	2.92
Manufactures imports	12.11	-2.47	-2.88	2.01	-7.41	0.90	-2.19
Export duties	1.33	0.61	1.64	0.19	4.83	6.83	0.10
Imports duties	7.69	5.17	10.25	15.45	23.40	20.53	2.25
Adjusted Gini	42.77	33.85	52.20	44.32	36.92	48.70	32.91
Government Consumption	16.45	20.97	18.97	29.29	20.29	19.71	13.49
Budget surplus	-1.16	-3.40	-1.99	-4.24	-5.68	-1.77	-4.57
Secondary Education	1.50	1.41	1.26	1.24	0.91	0.64	2.94
Life expectancy	66.94	69.22	69.10	65.79	58.17	51.98	74.69
M2 to GDP	50.16	33.43	27.22	62.36	31.72	25.94	48.92
Ln(1+inflation)	0.09	0.46	0.29	0.13	0.10	0.12	0.07
Terms of Trade	102.53	99.34	102.23	107.69	104.46	111.97	93.13
Civil liberties	4.53	3.69	2.79	4.85	4.22	4.96	1.33

Note: Descriptive statistics are presented for all available observations, i.e. some observations are counted twice (see table 1). Thus summary statistics for openness indicators (residuals) and additional macroeconomic variables differ in the growth equation as only initial values are used (table 1). 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.

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299 We present mean for growth Q20 and growth income Q20 in SSA without Guinea 1991 – 94, Kenya 1992 – 94, and Senegal 1991 – 95 and mean for growth Q40 and growth income Q40 in SSA without Kenya 1992 – 94. We omit these observations in regressions of the growth equation due to their incredible high growth rates, which may result from measurement errors.

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

Dep. Var.	**Y^{q20s} all**	**Y^{q20c} all**	**Y^{q20s} dev**	**Y^{q20c} dev**		**Y^{q20s} dev**	**Y^{q20c} dev**
	(1)	(2)	(3)	(4)		(5)	(6)
Manufacture Exports	**0.004***	**0.005****	0.004	**0.005***	Import duties	**0.005***	0.004
	(0.002)	(0.002)	(0.003)	(0.003)		(0.003)	(0.003)
EAP	-0.06	-0.08	-0.42***	-0.41***		-0.34*	-0.22
	(0.09)	(0.08)	(0.10)	(0.09)		(0.19)	(0.26)
ECA	0.36***	0.33***					
	(0.08)	(0.06)					
LAC	-0.56***	-0.55***	-0.92***	-0.89***		-0.81***	-0.69***
	(0.09)	(0.07)	(0.09)	(0.08)		(0.18)	(0.25)
MNA	0.03	-0.13*	-0.33***	-0.47***		-0.23	-0.31
	(0.08)	(0.07)	(0.08)	(0.09)		(0.18)	(0.26)
SA	0.32***	0.24***	-0.04	-0.10		-0.09	-0.02
	(0.07)	(0.05)	(0.07)	(0.07)		(0.18)	(0.25)
SSA	-0.25***	-0.44***	-0.61***	-0.78***		-0.48**	-0.65**
	(0.07)	(0.07)	(0.08)	(0.09)		(0.22)	(0.30)
Constant	-1.13***	-1.15***	-0.78***	-0.81***		-0.95***	-1.03***
	(0.05)	(0.03)	(0.06)	(0.06)		(0.17)	(0.25)
m1	-1.42	-1.20	-1.42	-1.47		-1.57	-1.95*
m2	1.45	1.35	0.99	1.33		-0.94	1.61
N	181	181	124	127		121	119
1 – RSS/TSS	0.60	0.65	0.66	0.66		0.58	0.52

* denotes significance at the 90% level, ** at the 95% level, and *** at the 99% level. 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^{q20s}: $\ln(Q^{20}/0.2)$ unadjusted approach (regressions without outliers). Y^{q20c}: $\ln(Q^{20}/0.2)$ adjusted approach (regressions without outliers). all: all countries, dev: developing countries.

Table 9: Openness indicators, regional dummies and macroeconomic variables - distribution effect (System GMM estimation)

Dep. Var.	Y^{q20s} **all**	Y^{q20c} **all**	Y^{q20s} **indu**	Y^{q20c} **indu**	Y^{q40s} **indu**	Y^{q40c} **indu**		Y^{q20s} **indu**	Y^{q20c} **indu**
	(1)	(2)	(3)	(4)	(5)	(6)		(7)	(8)
Manufacture Exports	**0.007*****	**0.006****	**0.010*****	**0.007*****	**0.004****	**0.003****	Agriculture exports	0.004	**0.035****
	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)		(0.025)	(0.018)
Secondary Education	-0.05	0.01	**-0.12*****	-0.02	-0.03	-0.01		**-0.11*****	-0.02
	(0.04)	(0.04)	(0.03)	(0.03)	(0.02)	(0.02)		(0.03)	(0.03)
Government Consumption	-0.001	-0.002	-0.007	0.001	0	0.001		-0.003	0.004
	(0.004)	(0.003)	(0.006)	(0.003)	(0.003)	(0.002)		(0.006)	(0.004)
Ln(1+inflation)	0.05	0.15	0.04	0.11	0.20	0.26		-0.43	-0.32
	(0.18)	(0.14)	(0.41)	(0.37)	(0.27)	(0.29)		(0.48)	(0.42)
EAP	-0.15	-0.06							
	(0.10)	(0.09)							
ECA	0.39***	0.44***							
	(0.08)	(0.08)							
LAC	-0.60***	-0.52***							
	(0.11)	(0.10)							
MNA	-0.09	-0.14							
	(0.14)	(0.15)							
SA	0.24**	0.28***							
	(0.09)	(0.08)							
SSA	-0.43***	-0.55***							
	(0.12)	(0.13)							
Constant	-0.97***	-1.17***	-0.70***	-1.09***	-0.42***	-0.53***		-0.72***	-1.10***
	(0.15)	(0.13)	(0.14)	(0.13)	(0.07)	(0.07)		(0.14)	(0.13)
m1	-1.36	-1.01	0.06	0.83	-1.11	0.23		0.33	0.89
m2	1.49	1.61	1.51	0.23	-0.47	1.16		0.87	0.61
N	161	161	57	54	57	54		57	54
1 – RSS/TSS	0.59	0.66	0.28	0.11	0.15	0.12		0.15	0.07

* denotes significance at the 90% level, ** at the 95% level, and *** at the 99% level. 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). all: all countries. indu: industrial countries.

Table 9: continued

Dep. Var.	**Y^{q20s} Indu**	**Y^{q20c} indu**	**Y^{q40s} Indu**	**Y^{q40c} indu**		**Y^{q20s} indu**	**Y^{q20c} indu**
	(9)	(10)	(11)	(12)		(13)	(14)
Food Exports	**-0.023****	-0.007	**-0.011****	-0.007	Import duties	**-0.030*****	**-0.016****
	(0.011)	(0.011)	(0.006)	(0.006)		(0.010)	(0.007)
Secondary Education	**-0.12*****	-0.02	-0.03	-0.005		**-0.08*****	0.003
	(0.03)	(0.04)	(0.02)	(0.02)		(0.03)	(0.02)
Government Consumption	-0.002	0.003	0.002	0.003		-0.001	0.004
	(0.004)	(0.004)	(0.002)	(0.002)		(0.005)	(0.004)
Ln(1 + inflation)	-0.53	-0.24	-0.05	0.06		0.20	0.22
	(0.50)	(0.41)	(0.29)	(0.31)		(0.51)	(0.37)
Constant	-0.75***	-1.12***	-0.44***	-0.54***		-0.79***	-1.16***
	(0.14)	(0.14)	(0.08)	(0.07)		(0.13)	(0.09)
m1	-0.07	0.72	-1.29	-0.25		-1.22	-1.02
m2	0.46	0.60	-0.40	1.76*		0.26	-0.10
N	57	54	57	54		84	80
1 – RSS/TSS	0.27	0.04	0.16	0.09		0.25	0.10

* denotes significance at the 90% level, ** at the 95% level, and *** at the 99% level. 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. $Y^{q20/40c}$: $\ln(Q^{20/40}/0.2)$ adjusted approach. all: all countries. indu: industrial countries.

Table 10: Openness indicators, interaction term and regional dummy variables – distribution effect (Growth equation)

Dep. Var.	**y^{q40} all re**	**y^{q40} dev re**		**y^{q20} dev ols**
	(1)	(2)		(3)
Agriculture Exports	**-3.36**** (1.47)	**-5.00**** (2.32)	Manufactures imports	-**0.74*** (0.42)
Agriculture Exports * Y	**0.38**** (0.17)	**0.60**** (0.29)	Manufactures imports * Y	**0.09*** (0.05)
EAP	0.85 (0.76)	1.93 (1.51)		2.85** (1.15)
ECA	-1.22 (1.24)			
LAC	0.77 (0.68)	2.08 (1.45)		3.27*** (0.86)
MNA	0.93 (0.95)	2.31 (1.64)		2.90*** (0.89)
SA	0.06 (0.93)	1.22 (1.62)		1.01 (1.01)
SSA	1.63* (0.98)	2.91* (1.66)		2.02 (1.83)
Constant	-0.57 (0.43)	-1.74 (1.32)		-2.07*** (0.54)
Breusch Pagan	17.36***	17.11***		0.44
Wald - test	11.38	8.72		
F-test				7.91***
R-squared	0.10	0.11		0.10
N	115	79		73

* 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, used to test for omitted variables in equation 3, is passed. 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 (regressions without outliers). y^{q40}: average annual growth rate of the second quintile share (regressions without outliers). ols: results for pooled OLS estimation. re: results for random effects estimation. all: all countries. dev: developing countries.

Table 11: Openness indicators, interaction term and regional dummy variables - distribution effect (System GMM estimation)

Dep. Var.	Y^{q20s} all	Y^{q20c} all	Y^{q40s} all	Y^{q40c} all	Y^{q20s} dev	Y^{q20c} dev	Y^{q40s} dev	Y^{q40c} dev
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Agriculture Exports	0.32	**0.35****	0.19	**0.22****	**0.72*****	**0.70*****	**0.52*****	**0.49*****
	(0.216)	(0.17)	(0.124)	(0.09)	(0.281)	(0.25)	(0.15)	(0.13)
Agriculture Exports * Y	-0.04	**-0.04***	-0.02	**-0.02****	**-0.08*****	**-0.08*****	**-0.06*****	**-0.06*****
	(0.024)	(0.02)	(0.014)	(0.01)	(0.032)	(0.03)	(0.02)	(0.02)
EAP	-0.09	-0.10	-0.20***	-0.26***	-0.44***	-0.41***	-0.33***	-0.33***
	(0.09)	(0.07)	(0.05)	(0.05)	(0.08)	(0.07)	(0.04)	(0.06)
ECA	0.34***	0.31***	0.13***	0.07*				
	(0.08)	(0.08)	(0.03)	(0.04)				
LAC	-0.59***	-0.58***	-0.47***	-0.56***	-0.94***	-0.91***	-0.61***	-0.65***
	(0.09)	(0.07)	(0.05)	(0.06)	(0.09)	(0.08)	(0.05)	(0.06)
MNA	0.03	-0.12	-0.14***	-0.28***	-0.32***	-0.46***	-0.28***	-0.37***
	(0.08)	(0.08)	(0.04)	(0.04)	(0.08)	(0.09)	(0.04)	(0.05)
SA	0.27***	0.17***	0.01	-0.08***	-0.08	-0.15**	-0.12***	-0.16***
	(0.07)	(0.04)	(0.03)	(0.03)	(0.07)	(0.06)	(0.02)	(0.04)
SSA	-0.25***	-0.48***	-0.28***	-0.45***	-0.59***	-0.08***	-0.41***	-0.55***
	(0.08)	(0.09)	(0.05)	(0.06)	(0.08)	(0.03)	(0.05)	(0.06)
Constant	-1.12***	-1.13***	-0.48***	-0.50***	-0.77***	-0.81***	-0.34***	-0.42***
	(0.06)	(0.04)	(0.02)	(0.02)	(0.05)	(0.06)	(0.02)	(0.03)
m1	-1.62	-1.44	-2.21**	-2.69***	-1.60	-1.58	-2.04**	-2.76***
m2	1.15	1.57	-1.00	2.78***	1.02	1.54	-0.92	2.46**
N	184	183	184	183	127	129	127	129
1 – RSS/TSS	0.59	0.65	0.65	0.70	0.66	0.67	0.63	0.62

* denotes significance at the 90% level, ** at the 95% level, and *** at the 99% level. 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). all: all countries. dev: developing countries.

Table 11: continued

Dep. Var.	Y^{q20s} dev	Y^{q20c} dev	Y^{q40s} dev	Y^{q40c} dev
	(9)	(10)	(11)	(12)
Food imports	**0.46*** **	**0.44** **	**0.219* **	**0.23* **
	(0.171)	(0.18)	(0.115)	(0.14)
Food imports *Y	**-0.06*** **	**-0.05** **	**-0.027* **	-0.03
	(0.021)	(0.02)	(0.014)	(0.02)
EAP	-0.38***	-0.37***	-0.30***	-0.30***
	(0.10)	(0.09)	(0.06)	(0.07)
LAC	-0.90***	-0.89***	-0.58***	-0.63***
	(0.08)	(0.08)	(0.05)	(0.06)
MNA	-0.28***	-0.47***	-0.24***	-0.35***
	(0.10)	(0.10)	(0.05)	(0.06)
SA	-0.01	-0.01	-0.08***	-0.13***
	(0.07)	(0.07)	(0.03)	(0.05)
SSA	-0.60***	-0.82***	-0.41***	-0.53***
	(0.15)	(0.15)	(0.09)	(0.09)
Constant	-0.83***	-0.85***	-0.38***	-0.45***
	(0.06)	(0.06)	(0.03)	(0.04)
m1	-1.53	-1.47	-1.91*	-2.54**
m2	1.01	1.03	-0.78	2.19**
N	124	128	124	128
1 – RSS/TSS	0.65	0.65	0.61	0.59

* denotes significance at the 90% level, ** at the 95% level, and *** at the 99% level. 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). dev: developing countries.

Table 12: Openness indicators, interaction term and macroeconomic variables - distribution effect (System GMM estimation)

Dep. Var.	**Y^{q20s} dev**	**Y^{q20c} dev**	**Y^{q40s} dev**	**Y^{q40c} dev**		**Y^{q20s} dev**	**Y^{q20c} dev**
	(1)	(2)	(3)	(4)		(5)	(6)
Agriculture exports	**1.02***** (0.34)	**1.02**** (0.48)	**0.75***** (0.17)	**0.76***** (0.24)	Food Imports	**0.55**** (0.24)	**0.59**** (0.28)
Agriculture exports * Y	**-0.12***** (0.04)	**-0.12**** (0.05)	**-0.09***** (0.02)	**-0.09***** (0.03)	Food imports *Y	**-0.06**** (0.03)	**-0.07**** (0.03)
Secondary Education	0.10 (0.06)	0.09 (0.06)	**0.08***** (0.04)	**0.09**** (0.04)		0.08 (0.07)	0.06 (0.07)
Government Consumption	0.005 (0.005)	-0.002 (0.004)	**0.006**** (0.003)	0.002 (0.003)		0.002 (0.005)	-0.006 (0.005)
Ln(1+inflation)	0.03 (0.18)	0.13 (0.15)	-0.03 (0.12)	0.06 (0.09)		0.10 (0.18)	0.18 (0.15)
EAP	-0.59*** (0.09)	-0.51*** (0.07)	-0.37*** (0.06)	-0.34*** (0.05)		-0.50*** (0.12)	-0.44*** (0.10)
LAC	-1.03*** (0.08)	-0.97*** (0.08)	-0.61*** (0.05)	-0.64*** (0.05)		-0.99*** (0.08)	-0.93*** (0.09)
MNA	-0.42*** (0.10)	-0.53*** (0.11)	-0.26*** (0.06)	-0.32*** (0.06)		-0.37*** (0.13)	-0.53*** (0.13)
SA	-0.16** (0.08)	-0.17*** (0.05)	-0.12** (0.06)	-0.12** (0.05)		0.07 (0.12)	-0.10 (0.10)
SSA	-0.72*** (0.07)	-0.02*** (0.09)	-0.41*** (0.05)	-0.51*** (0.05)		-0.74*** (0.23)	-1.03*** (0.25)
Constant	-0.86*** (0.13)	-0.83*** (0.13)	-0.52*** (0.07)	-0.59*** (0.09)		-0.87*** (0.14)	-0.79*** (0.14)
m1	-1.71*	-1.60	-2.06**	-2.60***		-1.69*	-1.65*
m2	1.02	1.79*	-0.91	2.33**		0.96	1.67*
N	107	109	107	109		107	110
1 – RSS/TSS	0.68	0.69	0.63	0.64		0.66	0.67

* denotes significance at the 90% level, ** at the 95% level, and *** at the 99% level. 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). dev: developing countries.

Table 12: continued

	Y^{q20s} dev	Y^{q20c} dev		Y^{q20s} all	Y^{q20c} all
	(5)	(6)		(7)	(8)
Agriculture Imports	1.04 (0.74)	**1.37*** (0.76)	Import duties	**0.039*** (0.02)	0.018 (0.021)
Agriculture Imports * Y	-0.12 (0.09)	**-0.15** (0.09)	Import duties * Y	**-0.005*** (0.003)	-0.002 (0.003)
Secondary Education	0.08 (0.07)	0.07 (0.07)		**-0.060*** (0.04)	0.005 (0.03)
Government Consumption	0.002 (0.006)	-0.005 (0.005)		0 (0.003)	0 (0.003)
Ln(1+inflation)	0.12 (0.18)	0.20 (0.15)		-0.03 (0.14)	0.08 (0.15)
EAP	-0.62*** (0.10)	-0.54*** (0.08)		-0.25** (0.10)	-0.12 (0.09)
ECA				0.40*** (0.08)	0.42*** (0.07)
LAC	-1.07*** (0.08)	-1.00*** (0.07)		-0.66*** (0.09)	-0.56*** (0.12)
MNA	-0.50*** (0.10)	-0.63*** (0.10)		-0.10 (0.15)	-0.19 (0.17)
SA	-0.10 (0.09)	-0.08 (0.07)		-0.04 (0.12)	-0.08 (0.09)
SSA	-0.71*** (0.10)	-0.91*** (0.12)		-0.28 (0.19)	-0.39* (0.20)
Constant	-0.78*** (0.14)	-0.73*** (0.14)		-0.91*** (0.12)	-1.14*** (0.08)
m1	-1.67*	-1.64*		-1.89*	-2.01**
m2	1.03	1.40		-0.43	1.31
N	106	109		184	180
1 – RSS/TSS	0.66	0.67		0.56	0.59

* denotes significance at the 90% level, ** at the 95% level, and *** at the 99% level. 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^{q20s}: $\ln(Q^{20}/0.2)$ unadjusted approach (regressions without outliers). Y^{q20c}: $\ln(Q^{20}/0.2)$ adjusted approach (regressions without outliers). all: all countries. dev: developing countries.

Table 13: Openness indicators, interaction term and macro-economic variables - total effect (Growth equation)

Dep. Var.	**y^{p40} all re**	**y^{p20} dev re**	**y^{p40} dev re**
	(1)	(2)	(3)
Agriculture Imports	**2.47**** (1.21)	**4.33***** (1.64)	**2.70*** (1.40)
Secondary Education	0.04 (0.83)	0.36 (1.56)	-0.002 (1.33)
Budget Surplus	0.09 (0.16)	0.26 (0.26)	0.27 (0.22)
Adjusted Gini coefficient	**0.40***** (0.12)	**0.34**** (0.17)	**0.38***** (0.14)
Ln(1+inflation)	-4.50 (5.27)	-3.37 (7.02)	-2.09 (5.99)
M2/GDP	-0.02 (0.03)	-0.02 (0.05)	-0.003 (0.04)
EAP	-1.48 (2.58)	5.21 (5.79)	2.25 (4.95)
ECA	-3.48 (4.40)		
LAC	-6.67** (3.11)	-0.23 (6.82)	-2.93 (5.82)
MNA	-6.00* (3.21)	0.65 (6.30)	-1.68 (5.38)
SA	2.23 (2.55)	10.23* (5.62)	7.10 (4.80)
SSA	-3.16 (3.62)	3.95 (6.67)	1.04 (5.70)
Constant	-10.98** (5.13)	-15.17** (6.52)	14.81*** (5.57)
Breusch-Pagan	11.14***	3.48*	9.52***
R-squared	0.34	0.40	0.39
N	67	50	50

* 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-tests/Wald-tests, i.e. tests on the overall significance of the regression, are passed in all equations. 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 mean of the first quintile share (regressions without outliers). y^{q40}: average annual growth rate of the mean of the second quintile share (regressions without outliers). re: results for random effects estimation. all: all countries. dev: developing countries.

Table 14: Openness indicators and macroeconomic variables total effect (System GMM estimation)

Dep. Var.	Y^{p20s} all	Y^{p20c} all	Y^{p40s} all	Y^{p40c} all	Y^{p20s} dev	Y^{p20c} dev	Y^{p40s} dev	Y^{p40c} dev
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Agriculture Imports	0.21***	0.25***	0.20***	0.21***	0.23**	0.26**	0.23**	0.24**
	(0.08)	(0.08)	(0.07)	(0.08)	(0.10)	(0.11)	(0.09)	(0.11)
Secondary Education	0.12**	0.18***	0.17***	0.19***	0.33***	0.27**	0.29***	0.28***
	(0.05)	(0.04)	(0.03)	(0.03)	(0.11)	(0.11)	(0.09)	(0.10)
Government Consumption	-0.01***	-0.01***	-0.01***	-0.01***	-0.01**	-0.02***	-0.01	-0.01*
	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.005)	(0.005)	(0.006)
Ln(1+inflation)	0.22	0.22	0.14	0.17	0.24	0.24	0.15	0.17
	(0.24)	(0.18)	(0.15)	(0.13)	(0.23)	(0.19)	(0.15)	(0.13)
Civil liberties	-0.03	-0.06*	-0.05**	-0.06**	-0.05	-0.07*	-0.06**	-0.07**
	(0.03)	(0.03)	(0.02)	(0.03)	(0.03)	(0.04)	(0.03)	(0.03)
Life expectancy	0.05***	0.04***	0.04***	0.04***	0.03***	0.03***	0.03***	0.03***
	(0.01)	(0.01)	(0.008)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Terms of Trade	0.008***	0.007***	0.006***	0.005***	0.009***	0.007***	0.007***	0.006***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
EAP	-0.99***	-0.87***	-1.04***	-1.05***	-1.40***	-1.27***	-1.19***	-1.12***
	(0.18)	(0.19)	(0.16)	(0.19)	(0.12)	(0.13)	(0.11)	(0.13)
ECA	0.31**	0.37**	0.09	0.04				
	(0.15)	(0.15)	(0.12)	(0.13)				
LAC	-1.21***	-1.10***	-1.03***	-1.10***	-1.55***	-1.46***	-1.12***	-1.13***
	(0.15)	(0.15)	(0.12)	(0.12)	(0.10)	(0.11)	(0.10)	(0.11)
MNA	-0.74***	-0.78***	-0.76***	-0.85***	-1.04***	-1.14***	-0.85***	-0.90***
	(0.20)	(0.21)	(0.17)	(0.18)	(0.09)	(0.10)	(0.09)	(0.10)
SA	-0.77***	-0.83***	-1.03***	-1.15***	-1.20***	-1.23***	-1.18***	-1.22***
	(0.22)	(0.22)	(0.20)	(0.19)	(0.15)	(0.16)	(0.15)	(0.15)
SSA	-1.20***	-1.42***	-1.14***	-1.32***	-1.60***	-1.83***	-1.29***	-1.41***
	(0.37)	(0.37)	(0.34)	(0.34)	(0.30)	(0.31)	(0.28)	(0.28)
Constant	3.86***	4.60***	5.20***	5.58***	5.10***	5.40***	5.82***	6.03***
	(0.68)	(0.69)	(0.62)	(0.61)	(0.62)	(0.65)	(0.60)	(0.59)
m1	-1.07	-0.65	-1.06	-0.69	-1.07	-0.69	-0.98	-0.69
m2	0.32	1.12	-1.19	1.29	0.91	1.48	-0.91	1.64
N	155	156	155	156	101	104	101	104
1 – RSS/TSS	0.91	0.91	0.94	0.94	0.77	0.76	0.80	0.78

* denotes significance at the 90% level, ** at the 95% level, and *** at the 99% level. 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. $Y^{p20/40s}$: logarithm of mean income of 20/20 to 40 percent poorest (unadjusted approach, regressions without outliers). $Y^{p20/40c}$: logarithm of mean income of 20/20 to 40 percent poorest (adjusted approach, regressions without outliers). all: all countries. dev: developing countries.

Table 14: continued

Dep. Var.	Y^{p20s} all	Y^{p20c} all	Y^{p40s} all	Y^{p40c} all	Y^{p20s} dev	Y^{p20c} dev	Y^{p40s} dev	Y^{p40c} dev
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Food Exports	**-0.03***	**-0.02**	**-0.02**	**-0.02**	**-0.02***	**-0.02***	-0.02	-0.02
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Secondary Education	**0.08***	**0.15**	**0.14***	**0.16***	**0.27***	**0.22**	**0.26***	**0.24**
	(0.05)	(0.05)	(0.03)	(0.03)	(0.09)	(0.10)	(0.08)	(0.10)
Government Consumption	**-0.01***	**-0.01***	**-0.01**	**-0.01**	**-0.01***	**-0.02***	**-0.01***	**-0.01**
	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.006)	(0.006)	(0.006)
Ln(1+inflation)	0.26	0.30	0.20	**0.24***	0.28	0.30	0.21	**0.24***
	(0.25)	(0.20)	(0.16)	(0.13)	(0.26)	(0.21)	(0.17)	(0.14)
Civil liberties	-0.04	**-0.06***	**-0.05**	**-0.07**	-0.04	**-0.06***	**-0.06***	**-0.07**
	(0.03)	(0.03)	(0.02)	(0.03)	(0.03)	(0.04)	(0.03)	(0.03)
Life expectancy	**0.06***	**0.05***	**0.05***	**0.05***	**0.05***	**0.05***	**0.04***	**0.04***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Terms of Trade	**0.008***	**0.007***	**0.005***	**0.004***	**0.009***	**0.008***	**0.007***	**0.006***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
EAP	-0.79***	-0.68***	-0.86***	-0.87***	-1.37***	-1.23***	-1.15***	-1.09***
	(0.20)	(0.23)	(0.10)	(0.23)	(0.15)	(0.13)	(0.15)	(0.14)
ECA	0.49***	0.55***	0.25	0.20				
	(0.17)	(0.15)	(0.15)	(0.13)				
LAC	-1.19***	-1.12***	-1.02***	-1.11***	-1.70***	-1.64***	-1.28***	-1.30***
	(0.16)	(0.17)	(0.13)	(0.14)	(0.13)	(0.10)	(0.12)	(0.08)
MNA	-0.59***	-0.59***	-0.61***	-0.69***	-1.04***	-1.13***	-0.84***	-0.89***
	(0.20)	(0.20)	(0.16)	(0.17)	(0.12)	(0.10)	(0.12)	(0.08)
SA	-0.75***	-0.83***	-1.01***	-1.14***	-1.30***	-1.36***	-1.28***	-1.34***
	(0.25)	(0.25)	(0.23)	(0.22)	(0.19)	(0.17)	(0.18)	(0.15)
SSA	-0.91*	-1.14**	-0.88**	-1.06**	-1.47***	-1.70***	-1.17***	-1.29***
	(0.47)	(0.49)	(0.44)	(0.45)	(0.41)	(0.41)	(0.39)	(0.38)
Constant	3.29***	4.03***	4.68***	5.08***	4.39***	4.76***	5.17***	5.46***
	(0.79)	(0.80)	(0.74)	(0.71)	(0.81)	(0.81)	(0.79)	(0.76)
m1	-0.97	-0.49	-1.19	-0.96	-1.06	-0.60	-1.13	-0.89
m2	0.83	0.43	-0.72	1.08	0.96	0.13	0.26	0.66
N	157	158	157	158	103	106	103	106
1 – RSS/TSS	0.91	0.90	0.94	0.93	0.75	0.74	0.79	0.76

* denotes significance at the 90% level, ** at the 95% level, and *** at the 99% level. 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. $Y^{p20/40s}$: logarithm of mean income of 20/20 to 40 percent poorest (unadjusted approach, regressions without outliers). $Y^{p20/40c}$: logarithm of mean income of 20/20 to 40 percent poorest (adjusted approach, regressions without outliers). all: all countries. dev: developing countries.

Table 14: continued

Dep. Var.	Y^{p20s} all	Y^{p20c} all	Y^{p40s} all	Y^{p40c} all	Y^{p20s} dev	Y^{p20c} dev	Y^{p40s} dev	Y^{p40c} dev
	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
Manufactures Exports	**0.014*** **	**0.017*** **	**0.011*** **	**0.013*** **	**0.017*** **	**0.021*** **	**0.015*** **	**0.017*** **
	(0.004)	(0.004)	(0.003)	(0.003)	(0.006)	(0.006)	(0.005)	(0.005)
Secondary Education	0.07	**0.13** **	**0.13*** **	**0.14*** **	**0.29** **	**0.22* **	**0.26** **	**0.24* **
	(0.05)	(0.05)	(0.04)	(0.04)	(0.12)	(0.13)	(0.12)	(0.13)
Government Consumption	**-0.01*** **	**-0.01*** **	**-0.01*** **	**-0.01*** **	**-0.01** **	**-0.02*** **	**-0.01* **	**-0.01** **
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.004)	(0.005)
Ln(1+inflation)	0.16	0.16	0.12	0.14	0.09	0.08	0.05	0.06
	(0.23)	(0.17)	(0.15)	(0.12)	(0.23)	(0.17)	(0.15)	(0.12)
Civil liberties	-0.04	**-0.07** **	**-0.05** **	**-0.07** **	**-0.06* **	**-0.08** **	**-0.07** **	**-0.08** **
	(0.03)	(0.03)	(0.02)	(0.03)	(0.03)	(0.04)	(0.03)	(0.03)
Life Expectancy	**0.04*** **	**0.03*** **	**0.04*** **	**0.03*** **	**0.03*** **	**0.02*** **	**0.03*** **	**0.02*** **
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Terms of Trade	**0.007*** **	**0.006*** **	**0.004*** **	**0.004*** **	**0.007*** **	**0.006*** **	**0.005*** **	**0.005** **
	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
EAP	-1.02***	-0.91***	-1.06***	-1.06***	-1.45***	-1.33***	-1.23***	-1.17***
	(0.19)	(0.19)	(0.18)	(0.19)	(0.11)	(0.10)	(0.11)	(0.12)
ECA	0.31**	0.38***	0.10	0.06				
	(0.14)	(0.14)	(0.12)	(0.11)				
LAC	-1.23***	-1.12***	-1.06***	-1.12***	-1.56***	-1.46***	-1.15***	-1.16***
	(0.15)	(0.15)	(0.12)	(0.13)	(0.12)	(0.10)	(0.11)	(0.09)
MNA	-0.69***	-0.71***	-0.70***	-0.78***	-0.98***	-1.08***	-0.79***	-0.84***
	(0.19)	(0.19)	(0.16)	(0.16)	(0.09)	(0.11)	(0.09)	(0.08)
SA	-0.88***	-0.92***	-1.12***	-1.21***	-1.31***	-1.31***	-1.29***	-1.30***
	(0.22)	(0.20)	(0.20)	(0.19)	(0.13)	(0.12)	(0.13)	(0.11)
SSA	-1.33***	-1.55***	-1.23***	-1.40***	-1.76***	-2.01***	-1.42***	-1.54***
	(0.37)	(0.35)	(0.35)	(0.34)	(0.28)	(0.26)	(0.27)	(0.25)
Constant	4.64***	5.34***	5.78***	6.11***	5.95***	6.26***	6.54***	6.68***
	(0.72)	(0.67)	(0.62)	(0.58)	(0.66)	(0.64)	(0.55)	(0.58)
m1	-0.69	-0.10	-1.30	-1.22	-0.92	-0.14	-1.30	-1.17
m2	-0.07	0.66	-1.67	1.05	0.15	0.66	-1.01	1.04
N	156	157	156	157	102	105	102	105
1 – RSS/TSS	0.91	0.92	0.94	0.94	0.78	0.78	0.80	0.79

* denotes significance at the 90% level, ** at the 95% level, and *** at the 99% level. 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. $Y^{p20/40s}$: logarithm of mean income of 20/20 to 40 percent poorest (unadjusted approach, regressions without outliers). $Y^{p20/40c}$: logarithm of mean income of 20/20 to 40 percent poorest (adjusted approach, regressions without outliers). all: all countries. dev: developing countries.

Table 14: continued

Dep. Var.	Y^{p20s} all	Y^{p20c} all	Y^{p20s} dev	Y^{p20c} dev	Y^{p40s} indu	Y^{p40c} indu
	(25)	(26)	(27)	(28)	(29)	(30)
Export duties	**-0.03***** (0.01)	**-0.03**** (0.01)	**-0.03***** (0.01)	**-0.03**** (0.01)	**0.11*** (0.06)	**0.11*** (0.07)
Secondary Education	0.05 (0.04)	**0.13***** (0.04)	0.08 (0.17)	0.04 (0.16)	**0.10***** (0.03)	**0.12***** (0.03)
Government Consumption	**-0.01**** (0.006)	**-0.01**** (0.006)	**-0.02*** (0.01)	**-0.03***** (0.01)	-0.003 (0.004)	-0.002 (0.004)
Ln(1+inflation)	0.16 (0.25)	0.29 (0.27)	0.23 (0.28)	0.36 (0.31)	**-0.88*** (0.52)	-0.80 (0.51)
Civil liberties	-0.02 (0.03)	**-0.07*** (0.03)	-0.03 (0.04)	**-0.07*** (0.04)	-0.003 (0.03)	-0.02 (0.03)
Life expectancy	**0.06***** (0.01)	**0.05***** (0.01)	**0.06***** (0.02)	**0.06***** (0.02)	**0.04**** (0.02)	**0.04**** (0.02)
Terms of Trade	**0.004***** (0.002)	**0.003**** (0.001)	**0.006***** (0.002)	**0.005**** (0.002)	0 (0.002)	0 (0.002)
EAP	-0.86*** (0.21)	0.67*** (0.24)	-1.14*** (0.19)	-0.99*** (0.18)		
ECA	0.30** (0.15)	0.42*** (0.14)				
LAC	-1.25*** (0.16)	-1.14*** (0.18)	-1.58*** (0.12)	-1.54*** (0.09)		
MNA	-0.69*** (0.19)	-0.68*** (0.18)	-1.00*** (0.09)	-1.13*** (0.09)		
SA	-0.91*** (0.26)	-0.91*** (0.27)	-1.12*** (0.27)	-1.10*** (0.25)		
SSA	-1.05* (0.58)	-1.18** (0.59)	-1.37*** (0.52)	-1.60*** (0.53)		
Constant	3.85*** (0.81)	4.78*** (0.80)	4.02*** (1.09)	4.60*** (1.01)	5.88*** (1.29)	6.16*** (1.23)
m1	-1.17	-1.15	-1.04	-0.80	-1.15	-1.51
m2	-1.15	-0.14	-0.80	-0.08	-1.15	-0.94
N	165	162	90	90	75	72
1 – RSS/TSS	0.90	0.90	0.72	0.73	0.54	0.56

* denotes significance at the 90% level, ** at the 95% level, and *** at the 99% level. 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. $Y^{p20/40s}$: logarithm of mean income of 20/20 to 40 percent poorest (unadjusted approach, regressions without outliers). $Y^{p20/40c}$: logarithm of mean income of 20/20 to 40 percent poorest (adjusted approach, regressions without outliers). all: all countries. dev: developing countries. indu: industrial countries.

Table 14: continued

Dep. Var.	Y^{p20s} indu	Y^{p20c} indu	Y^{p40s} indu	Y^{p40c} indu		Y^{p20s} indu	Y^{p20c} indu		Y^{p20s} indu	Y^{p20c} indu
	(31)	(32)	(33)	(34)		(35)	(36)		(37)	(38)
Food exports	-0.027**	-0.017	0.019**	-0.016	Manufactures	0.008*	0.008	Import	-0.024*	-0.018*
	(0.012)	(0.017)	(0.010)	(0.011)	Exports	(0.005)	(0.005)	duties	(0.013)	(0.009)
Secondary	0.01	0.10**	0.10***	0.11***		0.01	0.10**		0.03	0.12***
Education	(0.05)	(0.05)	(0.03)	(0.03)		(0.04)	(0.05)		(0.04)	(0.04)
Government	-0.009*	-0.002	-0.005	-0.003		-0.011**	-0.005		-0.006	0
Consumption	(0.005)	(0.005)	(0.004)	(0.004)		(0.006)	(0.005)		(0.005)	(0.005)
ln(1+inflation)	-0.90	-0.61	-0.74	-0.62		-0.18	-0.06		-0.60	-0.58
	(0.68)	(0.61)	(0.57)	(0.55)		(0.47)	(0.49)		(0.66)	(0.59)
Civil liberties	-0.03	-0.07	-0.05	-0.06*		0.02	-0.04		0.01	-0.05
	(0.06)	(0.05)	(0.03)	(0.03)		(0.06)	(0.05)		(0.07)	(0.05)
Life	0.06	0.04	0.05*	0.04		0.08*	0.06		0.04**	0.03
expectancy	(0.04)	(0.04)	(0.03)	(0.03)		(0.04)	(0.04)		(0.02)	(0.02)
Terms of	0.003	0.003	0	0		0.004	0.003		0	0
Trade	(0.003)	(0.004)	(0.002)	(0.002)		(0.003)	(0.004)		(0.002)	(0.002)
Constant	4.08	4.86*	5.55***	5.93***		2.68	4.01		5.36***	6.48***
	(2.70)	(2.53)	(2.05)	(2.05)		(3.02)	(3.04)		(1.66)	(1.34)
m1	1.07	1.33	-1.26	-1.23		1.21	1.55		-0.89	-0.89
m2	-0.27	-0.71	-1.12	0.61		-0.03	-1.01		-0.77	-1.57
N	54	52	54	52		54	52		76	73
1 – RSS/TSS	0.45	0.45	0.61	0.61		0.42	0.46		0.28	0.38

* denotes significance at the 90% level, ** at the 95% level, and *** at the 99% level. 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. $Y^{p20/40s}$: logarithm of mean income of 20/20 to 40 percent poorest (unadjusted approach, regressions without outliers). $Y^{p20/40c}$: logarithm of mean income of 20/20 to 40 percent poorest (adjusted approach, regressions without outliers). indu: industrial countries.

Table 15: Openness indicators, interaction term and macroeconomic variables - total effect (System GMM estimation)

Dep. Var.	Y^{p20s} all	Y^{p20c} all	Y^{p40s} all	Y^{p40c} all	Y^{p20s} dev	Y^{p20c} dev	Y^{p40s} dev	Y^{p40c} dev
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Agriculture	0.75**	0.64	0.60***	0.51*	1.32**	1.22	1.09**	0.99*
Exports	(0.30)	(0.44)	(0.23)	(0.29)	(0.57)	(0.76)	(0.49)	(0.58)
Agriculture	-0.08**	-0.07	-0.07***	-0.06*	-0.15**	-0.14	-0.13**	-0.11*
Exports * y	(0.03)	(0.05)	(0.03)	(0.03)	(0.07)	(0.09)	(0.06)	(0.07)
Secondary	0.10*	0.17***	0.16***	0.18***	0.37***	0.31***	0.34***	0.32***
Education	(0.05)	(0.05)	(0.04)	(0.04)	(0.10)	(0.12)	(0.10)	(0.11)
Government	-0.02***	-0.02***	-0.01***	-0.01***	-0.01***	-0.02***	-0.01**	-0.01***
Consumption	(0.004)	(0.004)	(0.04)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)
Ln(1+inflation)	0.25	0.28	0.20	0.23*	0.21	0.24	0.15	0.19
	(0.25)	(0.20)	(0.16)	(0.13)	(0.26)	(0.21)	(0.17)	(0.14)
Civil liberties	-0.03	-0.06**	-0.05**	-0.06**	-0.05*	-0.07**	-0.06**	-0.07**
	(0.21)	(0.03)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Life	0.06***	0.05***	0.05***	0.04***	0.04***	0.04***	0.04***	0.03***
expectancy	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Terms of	0.007***	0.006***	0.005***	0.004***	0.008***	0.006***	0.006***	0.005***
Trade	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
EAP	-0.87***	-0.77***	-0.93***	-0.96***	-1.40***	-1.29***	-1.18***	-1.14***
	(0.20)	(0.22)	(0.19)	(0.22)	(0.15)	(0.13)	(0.15)	(0.15)
ECA	0.45***	0.53***	0.22*	0.17				
	(0.15)	(0.15)	(0.13)	(0.12)				
LAC	-1.19***	-1.10***	-1.02***	-1.11***	-1.65***	-1.59***	-1.23***	-1.26***
	(0.16)	(0.17)	(0.12)	(0.14)	(0.13)	(0.11)	(0.12)	(0.09)
MNA	-0.49***	-0.51**	-0.54***	-0.65***	-0.90***	-1.00***	-0.72***	-0.78***
	(0.19)	(0.21)	(0.16)	(0.17)	(0.12)	(0.10)	(0.12)	(0.09)
SA	-0.69***	-0.82***	-0.97***	-1.15***	-1.22***	-1.33***	-1.21***	-1.31***
	(0.24)	(0.27)	(0.22)	(0.43)	(0.16)	(0.18)	(0.17)	(0.16)
SSA	-0.93**	-1.15**	-0.90**	-1.11***	-1.46***	-1.71***	-1.17***	-1.32***
	(0.43)	(0.48)	(0.41)	(0.43)	(0.33)	(0.36)	(0.32)	(0.33)
Constant	3.35***	4.19***	4.73***	5.28***	4.69***	5.20***	5.44***	5.87***
	(0.70)	(0.81)	(0.68)	(0.71)	(0.64)	(0.78)	(0.69)	(0.73)
m1	-0.67	-0.15	-1.07	-0.84	-0.88	-0.23	-0.91	-0.66
m2	0.88	1.13	-1.43	1.06	0.94	1.20	-0.91	0.71
N	156	156	156	156	102	104	102	104
1 – RSS/TSS	0.90	0.90	0.93	0.93	0.77	0.74	0.80	0.77

* denotes significance at the 90% level, ** at the 95% level, and *** at the 99% level. 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. $Y^{p20/40s}$: logarithm of mean income of 20/20 to 40 percent poorest (unadjusted approach, regressions without outliers). $Y^{p20/40c}$: logarithm of mean income of 20/20 to 40 percent poorest (adjusted approach, regressions without outliers). all: all countries. dev: developing countries.

Table 15: continued

Dep. Var.	Y^{p20s} all	Y^{p20c} all	Y^{p40s} all	Y^{p40c} all	Y^{p20s} dev	Y^{p20c} dev	Y^{p40s} dev	Y^{p40c} dev
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Food Exports	**-0.16*** (0.08)	**-0.19**** (0.08)	**-0.17**** (0.08)	**-0.18**** (0.08)	**-0.44***** (0.09)	**-0.40***** (0.09)	**-0.43***** (0.10)	**-0.42***** (0.10)
Food Exports * Y	0.015 (0.01)	**0.020**** (0.01)	**0.017*** (0.01)	**0.018**** (0.01)	**0.052***** (0.01)	**0.047***** (0.01)	**0.050***** (0.01)	**0.049***** (0.01)
Secondary Education	**0.08*** (0.04)	**0.15***** (0.04)	**0.15***** (0.03)	**0.16**** (0.03)	**0.31***** (0.10)	**0.26**** (0.11)	**0.29***** (0.10)	**0.27**** (0.11)
Government Consumption	**-0.01***** (0.004)	**-0.01***** (0.004)	**-0.01**** (0.004)	**-0.01**** (0.004)	**-0.01**** (0.004)	**-0.02***** (0.005)	-0.01 (0.005)	**-0.01*** (0.006)
Ln(1+inflation)	0.25 (0.26)	0.30 (0.20)	0.20 (0.16)	**0.24*** (0.14)	0.26 (0.25)	0.28 (0.21)	0.19 (0.16)	0.21 (0.14)
Civil liberties	-0.03 (0.03)	**-0.06*** (0.03)	**-0.04*** (0.01)	**-0.06**** (0.03)	-0.04 (0.03)	-0.05 (0.04)	**-0.05*** (0.03)	**-0.06**** (0.03)
Life expectancy	**0.06***** (0.01)	**0.05***** (0.01)	**0.05***** (0.01)	**0.05***** (0.01)	**0.04***** (0.01)	**0.04***** (0.01)	**0.04***** (0.01)	**0.04***** (0.01)
Terms of Trade	**0.008***** (0.002)	**0.007***** (0.001)	**0.006***** (0.002)	**0.005***** (0.001)	**0.010***** (0.002)	**0.009***** (0.002)	**0.008***** (0.002)	**0.007***** (0.002)
EAP	-0.83*** (0.20)	-0.73*** (0.23)	-0.91*** (0.20)	-0.91*** (0.23)	-1.37*** (0.12)	-1.24*** (0.13)	-1.15*** (0.13)	-1.09*** (0.14)
ECA	0.44*** (0.16)	0.49*** (0.15)	0.19 (0.14)	0.15 (0.13)				
LAC	-1.22*** (0.16)	-1.15*** (0.18)	-1.05*** (0.13)	-1.13*** (0.14)	-1.64*** (0.09)	-1.59*** (0.07)	-1.22*** (0.08)	-1.24*** (0.07)
MNA	-0.65*** (0.19)	-0.66*** (0.20)	-0.68*** (0.16)	-0.76*** (0.16)	-1.01*** (0.08)	-1.10*** (0.07)	-0.81*** (0.08)	-0.85*** (0.06)
SA	-0.82*** (0.24)	-0.91*** (0.24)	-1.10*** (0.22)	-1.20*** (0.21)	-1.38*** (0.16)	-1.41*** (0.15)	-1.36*** (0.15)	-1.39*** (0.13)
SSA	-0.95** (0.45)	-1.18** (0.46)	-0.93** (0.42)	-1.10*** (0.42)	-1.53*** (0.32)	-1.75*** (0.34)	-1.22*** (0.31)	-1.33*** (0.31)
Constant	3.30*** (0.79)	3.99*** (0.78)	4.68*** (0.72)	5.05*** (0.68)	4.58*** (0.77)	4.87*** (0.78)	5.36*** (0.74)	5.57*** (0.71)
m1	-0.98	-0.54	-1.22	-1.02	-1.05	-0.62	-1.14	-0.92
m2	0.70	0.08	-1.05	0.78	0.96	-0.29	0.57	0.43
N	157	158	157	158	103	106	103	106
1 – RSS/TSS	0.91	0.91	0.94	0.94	0.78	0.76	0.82	0.79

* denotes significance at the 90% level, ** at the 95% level, and *** at the 99% level. 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. $Y^{p20/40s}$: logarithm of mean income of 20/20 to 40 percent poorest (unadjusted approach, regressions without outliers). $Y^{p20/40c}$: logarithm of mean income of 20/20 to 40 percent poorest (adjusted approach, regressions without outliers). all: all countries. dev: developing countries.

Table 15: continued

Dep. Var.	Y^{p20s} all	Y^{p20c} all	Y^{p40s} all	Y^{p40c} all	Y^{p20s} dev	Y^{p20c} dev	Y^{p40s} dev	Y^{p40c} dev
	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
Export Duties	**-0.51*** **	**-0.41** **	**-0.45*** **	**-0.38** **	**-0.79*** **	**-0.58* **	**-0.68*** **	**-0.52** **
	(0.19)	(0.21)	(0.16)	(0.18)	(0.26)	(0.30)	(0.21)	(0.25)
Export Duties * Y	**0.058** **	**0.046* **	**0.053*** **	**0.044** **	**0.093*** **	**0.067* **	**0.081*** **	**0.062** **
	(0.02)	(0.03)	(0.02)	(0.02)	(0.03)	(0.04)	(0.03)	(0.03)
Secondary Education	0.05	**0.13*** **	**0.12*** **	**0.14*** **	0.05	0.03	0.08	0.07
	(0.04)	(0.04)	(0.03)	(0.03)	(0.15)	(0.16)	(0.13)	(0.14)
Government Consumption	**-0.01** **	**-0.02** **	**-0.01** **	**-0.01*** **	**-0.03** **	**-0.04*** **	**-0.03* **	**-0.03*** **
	(0.006)	(0.006)	(0.005)	(0.006)	(0.01)	(0.01)	(0.01)	(0.01)
Ln(1+inflation)	0.13	0.27	0.06	0.20	0.20	0.34	0.12	0.26
	(0.23)	(0.26)	(0.16)	(0.17)	(0.26)	(0.29)	(0.19)	(0.19)
Civil liberties	-0.01	**-0.06* **	-0.02	**-0.05* **	-0.02	**-0.06* **	-0.03	**-0.06* **
	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.02)	(0.03)
Life expectancy	**0.05*** **	**0.04*** **	**0.05*** **	**0.04*** **	**0.05*** **	**0.05*** **	**0.05*** **	**0.05*** **
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)	(0.01)
Terms of Trade	**0.004*** **	**0.003** **	**0.004** **	**0.002* **	**0.007*** **	**0.006*** **	**0.007*** **	**0.005*** **
	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
EAP	-0.92***	-0.71***	-0.91***	-0.88***	-1.15***	-1.01***	-0.93***	-0.86***
	(0.21)	(0.24)	(0.20)	(0.22)	(0.17)	(0.18)	(0.15)	(0.16)
ECA	0.25*	0.39***	0.08	0.06				
	(0.14)	(0.14)	(0.11)	(0.11)				
LAC	-1.29***	-1.17***	-1.06***	-1.16***	-1.57***	-1.54***	-1.16***	-1.20***
	(0.16)	(0.18)	(0.13)	(0.14)	(0.11)	(0.14)	(0.09)	(0.10)
MNA	-0.76***	-0.72***	-0.75***	-0.82***	-1.05***	-1.16***	-0.87***	-0.91***
	(0.18)	(0.17)	(0.14)	(0.14)	(0.08)	(0.08)	(0.07)	(0.05)
SA	-0.93***	-0.91***	-1.11***	-1.16***	-1.03***	-1.05***	-0.98***	-0.99***
	(0.26)	(0.26)	(0.22)	(0.23)	(0.26)	(0.25)	(0.24)	(0.22)
SSA	-1.22**	-1.30**	-1.10***	-1.22**	-1.58***	-1.75***	-1.26***	-1.33***
	(0.58)	(0.58)	(0.50)	(0.50)	(0.50)	(0.51)	(0.43)	(0.44)
Constant	4.27***	5.12***	5.03***	5.59***	4.56***	5.04***	4.80***	5.24***
	(0.79)	(0.77)	(0.74)	(0.73)	(0.98)	(0.95)	(0.92)	(0.92)
m1	-1.16	-1.12	-1.65*	-1.80*	-1.10	-0.91	-1.48	-1.30
m2	-1.53	-0.65	-1.52	-0.88	-1.31	-0.67	-0.92	-0.62
N	165	162	165	162	90	90	90	90
1 – RSS/TSS	0.90	0.90	0.93	0.93	0.75	0.75	0.79	0.80

* denotes significance at the 90% level, ** at the 95% level, and *** at the 99% level. 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. $Y^{p20/40s}$: logarithm of mean income of 20/20 to 40 percent poorest (unadjusted approach, regressions without outliers). $Y^{p20/40c}$: logarithm of mean income of 20/20 to 40 percent poorest (adjusted approach, regressions without outliers). all: all countries. dev: developing countries.

Table 15: continued

Dep. Var.	Y^{p20s} all	Y^{p20c} all	Y^{p40s} all	Y^{p40c} all	Y^{p20s} dev	Y^{p20c} dev	Y^{p40s} dev	Y^{p40c} dev
	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)
Import duties	-0.06 (0.05)	**-0.08*** (0.04)	**-0.10**** (0.04)	**-0.09**** (0.04)	**-0.13**** (0.06)	**-0.13**** (0.06)	**-0.14**** (0.06)	**-0.13**** (0.05)
Import duties * Y	0.007 (0.006)	**0.010*** (0.006)	**0.012**** (0.005)	**0.012**** (0.005)	**0.017**** (0.008)	**0.017**** (0.008)	**0.018***** (0.007)	**0.017**** (0.007)
Secondary Education	0.06 (0.05)	**0.13***** (0.05)	**0.12***** (0.03)	**0.13***** (0.04)	0.19 (0.15)	0.12 (0.15)	0.15 (0.13)	0.10 (0.13)
Government Consumption	**-0.01*** (0.006)	**-0.01*** (0.006)	-0.01 (0.005)	-0.01 (0.006)	-0.01 (0.01)	**-0.03**** (0.01)	-0.01 (0.01)	**-0.03**** (0.01)
Ln(1+inflation)	-0.04 (0.20)	0.16 (0.48)	-0.11 (0.14)	0.09 (0.15)	0.01 (0.19)	0.23 (0.25)	-0.06 (0.15)	0.15 (0.16)
Civil liberties	-0.01 (0.03)	-0.05 (0.03)	-0.03 (0.02)	**-0.04*** (0.02)	-0.01 (0.03)	-0.03 (0.03)	-0.03 (0.02)	-0.04 (0.02)
Life expectancy	**0.05***** (0.01)	**0.04***** (0.01)	**0.04***** (0.01)	**0.04***** (0.01)	**0.04*** (0.02)	**0.04**** (0.02)	**0.04**** (0.02)	**0.04***** (0.02)
Terms of Trade	**0.004***** (0.001)	**0.003**** (0.001)	**0.004***** (0.001)	**0.003**** (0.001)	**0.005***** (0.002)	**0.005**** (0.002)	**0.006***** (0.002)	**0.005***** (0.002)
EAP	-0.99*** (0.20)	-0.80*** (0.22)	-0.96*** (0.18)	-0.94*** (0.20)	-1.17*** (0.19)	-0.99*** (0.17)	-0.90*** (0.16)	-0.81*** (0.15)
ECA	0.20 (0.13)	0.29** (0.13)	-0.007 (0.10)	-0.04 (0.10)				
LAC	-1.27*** (0.13)	-1.22*** (0.17)	-1.06*** (0.10)	-1.19*** (0.12)	-1.47*** (0.10)	-1.46*** (0.12)	-1.06*** (0.09)	-1.12*** (0.09)
MNA	-0.77*** (0.18)	-0.80*** (0.18)	-0.79*** (0.14)	-0.89*** (0.14)	-1.00*** (0.14)	-1.15*** (0.14)	-0.81*** (0.12)	-0.90*** (0.10)
SA	-1.06*** (0.33)	-0.94*** (0.32)	-1.10*** (0.28)	-1.11*** (0.30)	-1.20*** (0.29)	-1.06*** (0.29)	-1.00*** (0.26)	-0.92*** (0.27)
SSA	-1.25*** (0.42)	-1.33*** (0.40)	-1.18*** (0.36)	-1.29*** (0.35)	-1.48*** (0.33)	-1.58*** (0.31)	-1.17*** (0.28)	-1.21*** (0.27)
Constant	4.51*** (0.80)	5.10*** (0.82)	5.43*** (0.70)	5.67*** (0.77)	5.28*** (1.17)	5.22*** (1.13)	5.47*** (1.03)	5.37*** (1.03)
m1	-1.01	-1.20	-1.09	-1.85*	-0.82	-0.77	-0.82	-1.24
m2	-0.81	-0.43	-1.47	-1.16	-0.56	-0.74	-0.77	-1.13
N	170	167	170	167	94	94	94	94
1 – RSS/TSS	0.90	0.90	0.93	0.94	0.73	0.75	0.80	0.80

* denotes significance at the 90% level, ** at the 95% level, and *** at the 99% level. 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. $Y^{p20/40s}$: logarithm of mean income of 20/20 to 40 percent poorest (unadjusted approach, regressions without outliers). $Y^{p20/40c}$: logarithm of mean income of 20/20 to 40 percent poorest (adjusted approach, regressions without outliers). all: all countries. dev: developing countries.

Table 16: First/Second Quintile and Openness Indicators
All countries (Growth equation)

I. Openness Indicators

	Agex	Agim	Foex	Foim	Maex	Maim	Exdu	Imdu
1) Distribution effect								
y^{q20} = regional dummies	-	-	-	-	-	-	-	-
y^{q40} = regional dummies	-	-	-	-	-	-	-	-
y^{q20} = regional dummies + macroeconomic variables	-	-	-	-	-	-	-	-
y^{q40} = regional dummies + macroeconomic variables	-	-	-	-	-	-	-	-
2) Total effect								
y^{p20} = regional dummies + macroeconomic variables	-	-	-	-	-	-	-	-
y^{p40} = regional dummies + macroeconomic variables	-	2.47**	-	-	-	-	-	-

II. Openness Indicators and interaction term

	Agex Yagex	Agim Yagim	Foex Yfoex	Foim Yfoim	Maex Ymaex	Maim Ymaim	Exdu Yexdu	Imdu Yimdu
1) Distribution effect								
y^{q20} = regional dummies	-	-	-	-	-	-	-	-
y^{q40} = regional dummies	-3.36** 0.38**	-	-	-	-	-	-	-
y^{q20} = regional dummies macroeconomic variables	-	-	-	-	-	-	-	-
y^{q40} = regional dummies macroeconomic variables	-	-	-	-	-	-	-	-
2) Total effect								
y^{p20} = regional dummies macroeconomic variables	-	-	-	-	-	-	-	-
y^{p40} = regional dummies macroeconomic variables	-	-	-	-	-	-	-	-

Note: Under the rubric specifications we denote the different basic equations which are tested with eight different combinations of the openness 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. In the matrix we indicate coefficients of significant openness indicators. * denotes signficance at 90 % level, ** at the 95 % level, and *** at the 99 % level (two-sided alternative). $y^{q20/40}$: regressions without outliers for growth rate of first/second quintile. $y^{p20/40}$: regressions without outliers for growth rate of mean income of first/second quintile. Agex/Agim: Agriculture exports/imports. Foex/Foim: Food exports/imports. Maex/Maim: Manufactures exports/imports. Exdu/Imdu: Export/Import duties. Yagex/Yagim: Agriculture exports/imports * ln(Y). Yfoex/Yfoim: Food exports/imports * ln(Y). Ymaex/Ymaim: Manufactures exports/imports * ln(Y). Yexdu/Yimdu: Export/Import duties * ln(Y).

Table 17: First/Second Quintile and Openness Indicators
Developing countries (Growth equation)

I. Openness Indicators

	Agex	Agim	Foex	Foim	Maex	Maim	Exdu	Imdu
1) Distribution effect								
y^{q20} = regional dummies	-	-	-	-	-	-	-	-
y^{q40} = regional dummies	-	-	-	-	-	-	-	-
y^{q20} = regional dummies + macroeconomic variables	-	-	-	-	-	-	-	-
y^{q40} = regional dummies + macroeconomic variables	-	-	-	-	-	-	-	-
2) Total effect								
y^{p20} = regional dummies + macroeconomic variables	-	4.33***	-	-	-	-	-	-
y^{p40} = regional dummies + macroeconomic variables	-	2.70*	-	-	-	-	-	-

II. Openness Indicators and interaction term

	Agex Yagex	Agim Yagim	Foex Yfoex	Foim Yfoim	Maex Ymaex	Maim Ymaim	Exdu Yexdu	Imdu Yimdu
1) Distribution effect								
y^{q20} = regional dummies	-	-	-	-	-	-0.74* 0.09*	-	-
y^{q40} = regional dummies	-5.00** 0.60**	-	-	-	-	-	-	-
y^{q20} = regional dummies + macroeconomic variables	-	-	-	-	-	-	-	-
y^{q40} = regional dummies + macroeconomic variables	-	-	-	-	-	-	-	-
2) Total effect								
y^{p20} = regional dummies + macroeconomic variables	-	-	-	-	-	-	-	-
y^{p40} = regional dummies + macroeconomic variables	-	-	-	-	-	-	-	-

Note: Under the rubric specifications we denote the different basic equations which are tested with eight different combinations of the openness 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. In the matrix we indicate coefficients of significant openness indicators. * denotes signficance at 90 % level, ** at the 95 % level, and *** at the 99 % level (two-sided alternative). $y^{q20/40}$: regressions without outliers for growth rate of first/second quintile. $y^{p20/40}$: regressions without outliers for growth rate of mean income of first/second quintile. Agex/Agim: Agriculture exports/imports. Foex/Foim: Food exports/imports. Maex/Maim: Manufactures exports/imports. Exdu/Imdu: Export/Import duties. Yagex/Yagim: Agriculture exports/imports * ln(Y). Yfoex/Yfoim: Food exports/imports * ln(Y). Ymaex/Ymaim: Manufactures exports/imports * ln(Y). Yexdu/Yimdu: Export/Import duties * ln(Y).

Table 18: First/Second Quintile and Openness Indicators All countries (System GMM estimation)

Openness indicators:	Agex	Agim	Foex	Foim	Maex	Maim	Exdu	Imdu
1) Distribution effect								
Specifications:								
Y^{q20s} = regional dummies	-	-	-	-	0.004*	-	-	-
Y^{q20c} = regional dummies	-	-	-	-	0.005**	-	-	-
Y^{q40s} = regional dummies	-	-	-	-	-	-	-	-
Y^{q40c} = regional dummies	-	-	-	-	-	-	-	-
Y^{q20s} = regional dummies + macroeconomic variables	-	-	-	-	0.007***	-	-	-
Y^{q20c} = regional dummies + macroeconomic variables	-	-	-	-	0.006**	-	-	-
Y^{q40s} = regional dummies + macroeconomic variables	-	-	-	-	-	-	-	-
Y^{q40c} = regional dummies + macroeconomic variables	-	-	-	-	-	-	-	-
2) Total effect								
Y^{p20s} = regional dummies + macro-economic variables	-	0.21***	-0.03***	-	0.014***	-	-0.03***	-
Y^{p20c} = regional dummies + macro-economic variables	-	0.25***	-0.02**	-	0.017***	-	-0.03**	-
Y^{p40s} = regional dummies + macro-economic variables	-	0.20***	-0.02**	-	0.011***	-	-	-
Y^{p40c} = regional dummies + macro-economic variables	-	0.21***	-0.02**	-	0.013***	-	-	-

Note: Under the rubric specifications we denote the different basic equations which are tested with openness indicators. E.g. Y^{q20} = regional dummies means that the first quintile share is regressed on regional dummy variables and eight different combinations. In the matrix we indicate coefficients of significant openness indicators. * denotes signficance at 90 % level, ** at the 95 % level, and *** at the 99 % level (two-sided alternative). $Y^{q20/40s}$: $\ln(Q^{20/40}/0.2)$ unadjusted approach. $Y^{q20/40c}$: $\ln(Q^{20/40}/0.2)$ adjusted approach. $Y^{p20/40s}$: logarithm of mean income of the 20/20 to 40 percent poorest (unadjusted approach). $Y^{p20/40c}$: logarithm of mean income of 20/20 to 40 percent poorest (adjusted approach). All regressions without outliers. Agex/Agim: Agriculture exports/imports. Foex/Foim: Food exports/imports. Maex/Maim: Manufactures exports/imports. Exdu/Imdu: Export/Import duties.

Table 19: First/Second Quintile and Openness Indicators Developing countries (System GMM estimation)

Openness indicators:	Agex	Agim	Foex	Foim	Maex	Maim	Exdu	Imdu
1) Distribution effect								
Specifications:								
Y^{q20s} = regional dummies	-	-	-	-	-	-	-	0.005*
Y^{q20c} = regional dummies	-	-	-	-	0.005*	-	-	-
Y^{q40s} = regional dummies	-	-	-	-	-	-	-	-
Y^{q40c} = regional dummies	-	-	-	-	-	-	-	-
Y^{q20s} = regional dummies + macroeconomic variables	-	-	-	-	-	-	-	-
Y^{q20c} = regional dummies + macroeconomic variables	-	-	-	-	-	-	-	-
Y^{q40s} = regional dummies + macroeconomic variables	-	-	-	-	-	-	-	-
Y^{q40c} = regional dummies + macroeconomic variables	-	-	-	-	-	-	-	-
2) Total effect								
Y^{p20s} = regional dummies + macro-economic variables	-	0.23**	-0.02*	-	0.017***	-	-0.03***	-
Y^{p20c} = regional dummies + macro-economic variables	-	0.26**	-0.02*	-	0.021***	-	-0.03**	-
Y^{p40s} = regional dummies + macro-economic variables	-	0.23**	-	-	0.015***	-	-	-
Y^{p40c} = regional dummies + macro-economic variables	-	0.24**	-	-	0.017***	-	-	-

Note: Under the rubric specifications we denote the different basic equations which are tested with openness indicators. E.g. Y^{q20} = regional dummies means that the first quintile share is regressed on regional dummy variables and eight different combinations. In the matrix we indicate coefficients of significant openness indicators. * denotes signficance at 90 % level, ** at the 95 % level, and *** at the 99 % level (two-sided alternative). $Y^{q20/40s}$: $\ln(Q^{20/40}/0.2)$ unadjusted approach. $Y^{q20/40c}$: $\ln(Q^{20/40}/0.2)$ adjusted approach. $Y^{p20/40s}$: logarithm of mean income of the 20/20 to 40 percent poorest (unadjusted approach). $Y^{p20/40c}$: logarithm of mean income of 20/20 to 40 percent poorest (adjusted approach). All regressions without outliers. Agex/Agim: Agriculture exports/imports. Foex/Foim: Food exports/imports. Maex/Maim: Manufactures exports/imports. Exdu/Imdu: Export/Import duties.

Table 20: First/Second Quintile and Openness Indicators Industrial countries (System GMM estimation)

Openness indicators:	Agex	Agim	Foex	Foim	Maex	Maim	Exdu	Imdu
1) Distribution effect								
Specifications:								
Y^{q20s} = macro-economic variables	-	-	-0.023**	-	0.010***	-	-	-0.030***
Y^{q20c} = macro-economic variables	0.035**	-	-	-	0.007***		-	-0.016**
Y^{q40s} = macro-economic variables	-	-	-0.011**	-	0.004***	-	-	-
Y^{q40c} = macro-economic variables	-	-	-	-	0.003**	-	-	-
2) Total effect								
Y^{p20s} = macro-economic variables	-	-	-0.027**	-	0.008*	-	-	-0.024*
Y^{p20c} = macro-economic variables	-	-	-	-	-	-	-	-0.018*
Y^{p40s} = macro-economic variables	-	-	-0.019**	-	-	-	0.11*	-
Y^{p40c} = macro-economic variables	-	-	-	-	-	-	0.11*	-

Note: Under the rubric specifications we denote the different basic equations which are tested with openness indicators. E.g. Y^{q20} = regional dummies means that the first quintile share is regressed on regional dummy variables and eight different combinations. In the matrix we indicate coefficients of significant openness indicators. * denotes signficance at 90 % level, ** at the 95 % level, and *** at the 99 % level (two-sided alternative). $Y^{q20/40s}$: $\ln(Q^{20/40}/0.2)$ unadjusted approach. $Y^{q20/40c}$: $\ln(Q^{20/40}/0.2)$ adjusted approach. $Y^{p20/40s}$: logarithm of mean income of the 20/20 to 40 percent poorest (unadjusted approach). $Y^{p20/40c}$: logarithm of mean income of 20/20 to 40 percent poorest (adjusted approach). All regressions without outliers. Agex/Agim: Agriculture exports/imports. Foex/Foim: Food exports/imports. Maex/Maim: Manufactures exports/imports. Exdu/Imdu: Export/Import duties.

Table 21: First/Second Quintile and Openness Indicators plus Interactions term - All countries (System GMM estimation)

Openness indicators:	**Agex Yagex**	**Agim Yagim**	**Foex Yfoex**	**Foim Yfoim**	**Maex Ymaex**	**Maim Ymaim**	**Exdu Yexdu**	**Imdu Yimdu**
1) Distribution effect								
Specifications:								
Y^{q20s} = regional dummies	-	-	-	-	-	-	-	-
Y^{q20c} = regional dummies	0.35** -0.04	-	-	-	-	-	-	-
Y^{q40s} = regional dummies	-	-	-	-	-	-	-	-
Y^{q40c} = regional dummies	0.22** -0.02**	-	-	-	-	-	-	-
Y^{q20s} = regional dummies + macroeconomic variables	-	-	-	-	-	-	-	0.039* -0.005*
Y^{q20c} = regional dummies + macroeconomic variables	-	-	-	-	-	-	-	-
Y^{q40s} = regional dummies + macroeconomic variables	-	-	-	-	-	-	-	-
Y^{q40c} = regional dummies + macroeconomic variables	-	-	-	-	-	-	-	-
2) Total effect								
Y^{p20s} = regional dummies + macro-economic variables	0.75** -0.08**	-	-0.16* 0.15	-	-	-	-0.51*** 0.058**	-
Y^{p20c} = regional dummies + macro-economic variables	-	-	-0.19** 0.02**	-	-	-	-0.41** 0.046*	-0.08* 0.010*
Y^{p40s} = regional dummies + macro-economic variables	0.60*** -0.07***	-	-0.17** 0.017*	-	-	-	-0.45*** 0.053***	-0.10** 0.012**
Y^{p40c} = regional dummies + macro-economic variables	0.51* -0.06*	-	-0.18** 0.018**	-		-	-0.38** 0.044**	-0.09** 0.012**

Note: Under the rubric specifications we denote the different basic equations which are tested with openness indicators. E.g. Y^{q20} = regional dummies means that the first quintile share is regressed on regional dummy variables and eight different combinations. In the matrix we indicate coefficients of significant openness indicators. * denotes signficance at 90 % level, ** at the 95 % level, and *** at the 99 % level (two-sided alternative). $Y^{q20/40s}$: $\ln(Q^{20/40}/0.2)$ unadjusted approach. $Y^{q20/40c}$: $\ln(Q^{20/40}/0.2)$ adjusted approach. $Y^{p20/40s}$: logarithm of mean income of the 20/20 to 40 percent poorest (unadjusted approach). $Y^{p20/40c}$: logarithm of mean income of 20/20 to 40 percent poorest (adjusted approach). All regressions without outliers. Agex/Agim: Agriculture exports/imports. Foex/Foim: Food exports/imports. Maex/Maim: Manufactures exports/imports. Exdu/Imdu: Export/Import duties. Yagex/Yagim: Agriculture exports/imports * ln(Y). Yfoex/Yfoim: Food exports/imports * ln(Y). Ymaex/Ymaim: Manufactures exports/imports * ln(Y). Yexdu/Yimdu: Export/Import duties * ln(Y).

Table 22: First/Second Quintile and Openness Indicators plus Interactions term - Developing countries (System GMM estimation)

Openness indicators:	**Agex Yagex**	**Agim Yagim**	**Foex Yfoex**	**Foim Yfoim**	**Maex Ymaex**	**Maim Ymaim**	**Exdu Yexdu**	**Imdu Yimdu**
1) Distribution effect								
Specifications:								
Y^{q20s} = regional dummies	0.72*** -0.08***	-	-	0.46*** -0.06***	-	-	-	-
Y^{q20c} = regional dummies	0.70*** -0.08***	-	-	0.44** -0.05**	-	-	-	-
Y^{q40s} = regional dummies	0.51*** -0.06***	-	-	0.22* -0.03*	-	-	-	-
Y^{q40c} = regional dummies	0.49*** -0.06***	-	-	0.23* -0.03	-	-	-	-
Y^{q20s} = regional dummies + macro-economic variables	1.02*** -0.12***	-	-	0.55** -0.06**	-	-	-	-
Y^{q20c} = regional dummies + macro-economic variables	1.02** -0.12**	1.37* -0.15*	-	0.59** -0.07**	-	-	-	-
Y^{q40s} = regional dummies + macro-economic variables	0.75*** -0.09***	-	-	-	-	-	-	-
Y^{q40c} = regional dummies + macro-economic variables	0.76*** -0.09***	-	-	-	-	-	-	-
2) Total effect								
Y^{p20s} = regional dummies + macro-economic variables	1.32** -0.15**	-	-0.44*** 0.052***	-	-	-	-0.79*** 0.093***	-0.13** 0.017**
Y^{p20c} = regional dummies + macro-economic variables	-	-	-0.40*** 0.047***	-	-	-	-0.58* 0.067*	-0.13** 0.017**
Y^{p40s} = regional dummies + macro-economic variables	1.09** -0.13**	-	-0.43*** 0.050***	-	-	-	-0.68*** 0.081***	-0.14** 0.018***
Y^{p40c} = regional dummies + macro-economic variables	0.99* -0.11*	-	-0.42*** 0.049***	-		-	-0.52** 0.062**	-0.13** 0.017**

Note: see table 21.

General conclusion

In our empirical research we have analyzed the effects of external indebtedness, exchange rate regimes and trade policy on pro-poor growth. To cover these issues, we have estimated the distribution effect and the total effect, i.e. the distribution and growth effect, on the 20 and 20 to 40 percent poorest in an irregular and unbalanced panel of time-series cross-section observations. Concerning the econometric methodology, we have applied a growth equation estimating pooled OLS, random or fixed effects models and a system GMM estimator.

Empirical findings for debt indicators do not indicate an optimal level of external debt with respect to pro-poor growth. On the other hand, higher external debt is associated with negative effects on the level of the income of the poorest 40 percent without exhibiting significant effects on the growth rates. If we abstract from political economy and bad governance issues, a cautious interpretation would be that debt relief may affect the poor positively. However, debt relief seems not to be a sufficient policy instrument for increased growth rates of the income of the poorest 40 percent.

Empirical results for exchange rate regimes differ considerably with respect to exchange rate regimes classifications, developing and industrial countries, and econometric specifications. Even if the empirical findings are only weakly robust, we emphasize the positive effects of intermediate regimes on the poorest 40 percent in developing countries for the Reinhart/Rogoff (2003) classification.

Finally, liberalization of agricultural raw material exports is very important for the poorest 40 percent of low-income developing countries due to both the distribution and total effect. In addition, liberalization in agricultural imports is highly positively related to the mean income of the poor without changing the distribution. On the other hand, liberalization in food markets and manufactures imports are not associated with poverty alleviation in low-income developing countries. Finally, a promotion of manufactures exports and reductions of export and import duties seem to increase the mean income of the poorest 40 percent in low-income developing countries only via the growth effect.

One problem of the empirical findings, however, is the fact that coefficients of our policy variables vary considerably due to robustness analyses and different econometric specifications. In addition, we often find weak or no statistically significant effects of our policy variables. Thus, to interpret these inconsistent results with respect to poverty reduction, we conclude the research with some notes on our empirical approach.

Estimating poverty effects of policy indicators is a difficult task due to the limited data availability of poverty measures. We have used unadjusted and adjusted first and second quintile share of income as basis for our pro-poor indicators. While this approach is in the tradition of quintile cross-country regressions, the average income of the poorest 20 and 20 to 40 percent measures poverty only in an aggregate way concealing changes of the economic situation for different social groups (Klasen 2003). In addition, data quality of household surveys may be weak for the lowest quintiles in developing countries due to reporting errors and sample biases (Eastwood/Lipton 2001, Winters/McCulloch/McKay 2002, Goldberg/Pavcnik 2004).[300] Furthermore, our sample is very irregular with respect to the frequency of country-specific observations due to limited availability of income inequality data, which may influence the empirical results (Eastwood/Lipton 2001).

In addition, the cross-country approach has been criticized by its weakness for our purpose. First, standard linear specifications in cross-country regressions may incorrectly simplify complex relationships between growth and poverty (Bourguignon 2002). Second, estimating only ad hoc regressions may have something unsatisfactory due to the absence of a solid theoretical framework (Srinivasan/Bhagwati 2001). Finally, cross-country regressions may generalize in estimating isolated effects only on average, which may completely offset contradictory poverty effects of policy indicators in different countries (Ravallion 2001, Bourguignon 2002).

To conclude, interpretation of statistically insignificant poverty effects of our policy indicators should be cautious, since empirical findings may be different at the country level. Thus micro-economic analysis of distributional changes and poverty effects in case studies may help to understand specific country experiences and may reveal further insights in the impact of our policy indicators on pro-poor growth.

[300] Measurements of the first and second quintile may be biased due to underreporting of the rich in household surveys in developing countries (Eastwood/Lipton 2001).

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