

Determinants of the Growth Elasticity of Poverty Reduction:

**Why the impact on poverty reduction is large in some
developing countries and small in others**

Christina Wieser

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Abstract¹

This study investigates the determinants of the growth elasticity of poverty by using the internationally designed poverty line, measured by the share of the population living below \$ 1.25 per day. We identify the determinants of changes in the poverty rate of countries using single and multiple OLS regressions as well as fixed effects. Empirical evidence underlying this study included 268 observations in 65 developing countries from 1983 to 2009. The two main results are, firstly that growth is important to poverty reduction and secondly, that the coefficient 'growth elasticity of poverty reduction' varies with human capital, openness to trade, government expenditure, institutional quality and democracy, and that additionally human capital, openness to trade and FDI are impacting poverty reduction directly without changing the elasticity significantly. The tentative policy conclusion for a developing country trying to reduce poverty is, first to focus on growth but secondly to complement this strategy by policies aimed at increasing human capital and openness.

JEL classification: E60, E62, E65, F10, F21, F23, F43, H40, I10, I20, I30, I32

Keywords: growth elasticity of poverty, poverty reduction, growth, developing countries

Christina Wieser, Vienna University of Economics and Business
Leopold Haidenstraße 22, 3233 Kilb
Tel: +43 680 3058064
christina_wieser@yahoo.com

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1. Introduction

The goal of this paper is to revisit the research field, whether and to which extent economic growth is important for poverty reduction in developing countries, using extended data sets and looking for intervening or supporting determinants for the growth-poverty relationship.

Even though the overall number of people living below the internationally recognized poverty line of \$ 1.25 per day declined from approximately 1.8 billion to 1.4 billion between 1990 and 2005 (United Nations, 2010b), countries differ drastically from one another in the degree to which they achieve poverty reductions. Reducing extreme poverty and its serious effects on individuals, countries, regions and the world; such as malnutrition vulnerability to external shocks and decreased access to basic services; is one of the most important challenges we face. Indeed, the mainstream view is that these negative effects must be countered through development that is usually driven by economic growth; however, growth does not always lead to a significant decrease in extreme poverty. It is therefore of vital concern to single out and analyze those factors that contribute to poverty reduction as a result of positive economic growth (i.e. the growth elasticity of poverty reduction, as well as to find variables which reduce poverty without changing the measures elasticity).

The research evidence on the positive effect of economic growth on poverty reduction is rich see for example Bourguignon, 2004; Dollar and Kraay, 2002; Lopez, 2006; Eastwood and Lipton, 2000; Ravallion and Chen, 1997; Chen and Ravallion 2010; Deininger and Squire, 1996. There are however alternative views in development economics as in the new 'zero growth literature' (see Jackson, 2009) who maintains or reclaims that growth is neither sufficient nor necessary for poverty reduction. The ongoing discussion is supported by a high degree of heterogeneity in empirical results concerning the extent to which growth reduces poverty. Many countries face disappointing outcomes in poverty reduction even though they achieve high growth rates (such as Georgia, Bangladesh, Peru, Lesotho, Turkey and Mali just to name a few examples) and taken alone, the size of growth does not seem to be a sufficient condition to reduce poverty. Due to this complexity in the growth-poverty relationship, it is important to understand the sources that cause divergence in poverty reduction. Numerous studies analyze the growth elasticity of poverty², the means to measure the extent to which growth contributes to poverty reduction. Ravallion and Chen (1997) for example conducted a study in which they found that a one percent increase in average per capita income leads to a 3.1 percent reduction in poverty. Additionally, Son and Kakwani (2004) found that the initial level of the development stage of countries matters and that higher levels of development and thus higher incomes imply larger poverty reductions with a given growth rate.

Because these differences in the rate of poverty reduction remain elusive, it seems desirable to discover the factors that determine the growth elasticity of poverty, the extent to which growth

² See for example Ravallion & Chen, 1997; Bourguignon, 2002; Son & Kakwani, 2004

reduces poverty. I also sought to examine the impact regional affiliation and income differences play in the performance in poverty reduction. This study does not simply summarize and conclude on the research already conducted, rather, it is an effort to contribute to the body of knowledge on the growth elasticity of poverty. As Ravallion (2004) stated, “Further research is needed on the specific factors influencing the growth elasticity of poverty” (p. 16) and this study improves the understanding of these ‘specific factors’.

The study is conducted in several steps, with a literature overview on the extensive research of poverty and growth serving as a starting point for determining the factors that influence the growth elasticity of poverty. Section 2 gives an overview of literature findings, stylized facts and explanation of the data. Section 3 describes the potential determinants of the growth elasticity of poverty. Section 4 includes the main results and is divided into six sub-sections. Section 4.1 briefly mentions the estimation method used in this study. Section 4.2 reveals the results when testing each determinant individually on its impact on poverty using single ordinary least square (OLS) regression for the same time span as the poverty spell while section 4.3 looks at the results for the five and ten year lagged variables. Each determinant is tested in combination with growth and regressed on poverty in multiple regressions in section 4.4 to single out those determinants with the largest impact on the growth elasticity of poverty. In an attempt to find whether regional affiliation or income classification play a major role in differences in the growth elasticity of poverty, data are divided according to countries’ respective regional affiliation and income classification and the impact of the most influential determinants is tested on the growth elasticity of poverty in section 4.5. After presenting the quantitative results, illustrative examples are depicted to show that the most influential determinants according to the results of the study, do indeed apply in the real world. A brief discussion on the robustness of results and shortcomings of the study are exposed in section 6 while section 7 concludes with a discussion of results and practical implications.

2. Literature, stylized facts, data

2.1 Literature and stylized facts

According to the World Bank (2011b), “poverty is pronounced deprivation in well-being, and comprises many dimensions. It includes low incomes and the inability to acquire the basic goods and services necessary for survival with dignity. Poverty also encompasses low levels of health and education, poor access to clean water and sanitation, inadequate physical security, lack of voice, and insufficient capacity and opportunity to better one’s life”. Chen and Ravallion (2001) define “someone [as] poor if she lives in a household with a per capita expenditure (whether in cash or kind) that is insufficient when judged by what ‘poverty’ typically means in the world’s poorest countries” (p. 283).

Considering the challenge of measuring the difficulty to acquire the basic goods and services necessary for survival with dignity, poverty in this study is thus referred to as a measure of absolute poverty that identifies the share of population that lacks income to grant them access to resources to cover basic needs. Households or individuals are compared to a certain threshold – the poverty line - defined as an income or expenditure level that is absolutely necessary to purchase essential basic goods, such as food, water, clothing shelter, and electricity. This paper applies the internationally recognized poverty line of \$ 1.25 per day to indicate whether individuals are able to afford basic needs of survival; below this threshold individuals are considered to live in extreme poverty. Purchasing power parities are taken into consideration to facilitate differences in prices of the same

goods across the globe. This study focuses exclusively on countries that are classified as ‘low and middle income’ or ‘developing’ countries according to the World Bank classification criterion of gross domestic product (GDP) per capita to rank economies³.

Some economists agree that increased economic growth is essential for poverty reduction; particularly long-run, sustained growth (Bourguignon, 2004; Lopez, 2006; Eastwood and Lipton, 2000; Ravallion & Chen, 1997; Deininger & Squire, 1996). A strong relationship between changes in poverty and changes in growth rates exists. As Kraay (2006) states, “between 69 percent and 97 percent of cross-country differences in poverty changes can be accounted for by growth [over longer horizons]” (p. 215). Even though there is a clear positive correlation drawn in literature between economic growth and poverty reduction, there is a high degree of heterogeneity in the empirical results concerning the extent to which economic growth reduces poverty. However, other economists do not agree that growth decreased poverty; Jackson (2009) for example states that “we have no alternative but to question growth. The myth of growth has failed us. It has failed the 1 billion people who still attempt to live on half the price of a cup of coffee each day [the bottom billion]”. And thus, many countries face disappointing results in poverty reduction even though they achieve high growth rates (for example Georgia, Bangladesh, Peru, Lesotho, Turkey and Mali) and taken alone, growth does not seem to be a sufficient condition to reduce poverty. Due to this complexity in the growth-poverty relationship, it is important to understand the sources that cause divergence in poverty reduction (Dollar & Kraay, 2002; Kraay, 2006; Loayza & Raddatz, 2010; Lin & Monga, 2010).

According to Bourguignon (2002), “the growth elasticity of poverty may be defined as the relative change in the poverty headcount for one percent growth in mean income, for constant relative inequality” (p. 12). It therefore provides us with a means to measure the extent to which growth reduces poverty though it varies across countries and methods of measurement (Bourguignon, 2002; Son & Kakwani, 2004).

According to the World Bank (2011f), the growth elasticity of poverty is defined as follows:

$$\epsilon = \frac{\partial P}{\partial Y} \frac{Y}{P}$$

where P is the poverty measures (in our case the headcount index of poverty) and Y is GDP per capita. The growth elasticity of poverty then, is the total percentage change in the headcount index from within a time frame, divided by the total percentage change in per capita GDP within the same time frame.

Table 1 gives an overview of the most important empirical studies analyzing the growth elasticity of poverty, the impact of growth on poverty or regional distribution of poverty.

Table 1: Overview of empirical studies

Topic	Author(s) & year	Region or countries & time frame	Metho- dology	Brief study descrip- tion	Main results
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³ For details on the classification method of the World Bank see <http://data.worldbank.org/about/country-classifications>

Growth elasticity of poverty	Bourguignon (2002)	50 developing and transitional countries, 1980s-1990s	OLS	Understanding the causes of cross-country heterogeneity of growth elasticity of poverty	The growth elasticity of poverty is a decreasing function of the development level of a country and of the degree of inequality of the income distribution, this function depending itself on the poverty index that is being used. The contribution of growth to changes in poverty can be divided into a growth and a distributional effect.
Growth elasticity of poverty	Son & Kakwani (2004)	Asian countries, 1990-2015		Analytical examination of how the relation between growth and poverty can change with the initial levels of economic development and inequality	Using the idea of growth elasticity of poverty, several propositions to demonstrate that the initial levels of economic development and income inequality can have significant impacts on poverty reduction are offered. The tradeoff between growth and inequality can be explained in terms of initial conditions of development and inequality.
Growth on poverty	Deininger & Squire (1996)	Data set of 682 observations for 108 countries, 1970s-1990s	Panel econometrics	Presentation of a new data set on inequality in the distribution of income	Based on the new data set created in the study, the authors do not find a systematic link between growth and changes in aggregate inequality. They do find a strong positive relationship between growth and reduction of poverty. This link supports the hypothesis that economic growth benefits the poor.
Growth on poverty	Ravallion & Chen (1997)	64 developing and transitional economies, 1981-1994	OLS	Test the claim that in recent times the poor have lost ground, both relatively and absolutely, even when average levels of living have risen	Changes in inequality and polarization were uncorrelated with changes in average living standards. Distribution improved as often as it worsened in growing economies, and negative growth was often more detrimental to distribution than positive growth. Almost always, poverty fell with growth in average living standards and rose with contraction.
Growth on poverty	De Janvry & Sadoulet (2000)	12 Latin American countries, 1970-1994	Weighted OLS and Random Effects Model	Analysis of the determinants of changes in the incidence of urban and rural poverty and in Gini coefficient over spells of years	Income growth reduces urban and rural poverty but not inequality. Furthermore, income growth is more effective in reducing urban poverty if the levels of inequality and poverty are lower and the levels of secondary education higher. There is an asymmetry in the impact of growth on poverty and inequality, with recession having strong negative effects on both poverty and inequality.
Growth on poverty	Chen & Ravallion (2001)	297 national sample surveys spanning 88 countries, 1987-1998	OLS	Assess progress in reducing consumption poverty in the developing and transition economies	There was a net decrease in the overall incidence of both absolute and relative consumption poverty. The incidence of absolute poverty fell in Asia, Latin America, and the Middle East-North Africa, while it rose in Sub-Saharan Africa and Eastern Europe-Central Asia.
Growth on poverty	Dollar & Kraay (2002)	Sample of 92 countries, 1960-2000	Generalized method of moments technique	Study of a sample of 92 countries to see whether growth influences poverty reduction	Average incomes of the poorest quintile rise proportionately with average incomes. This is because the share of income of the poorest quintile does not vary systematically with average income. It also does not vary with many of the policies and institutions that explain growth rates of average incomes, nor does it vary with measures of policies intended to benefit the poorest in society.

Growth on poverty	Lopez (2004)	137 countries (developed and developing), 1960-2000	OLS, Fixed Effects, 2SLS and GMM estimator	Empirical evaluation of the impact of a series of pro-growth policies on inequality and headcount poverty	Findings indicate that regardless of their impact on inequality, all pro-growth policies considered lead to lower poverty levels in the long run. However, there is also evidence indicating that some of these policies may lead to higher inequality and, under plausible assumptions for the distribution of income, to higher poverty levels in the short run.
Growth on poverty	Kraay (2006)	Sample of developing countries, 1980s-1990s	OLS	Decomposition of changes in poverty in (a) high growth rate of average incomes; (b) high sensitivity of poverty to growth; (c) poverty-reducing pattern of growth	In the medium- to long-run, most of the variation in changes in poverty can be attributed to growth in average incomes. Most of the remainder of the variation in changes in poverty is due to poverty-reducing patterns of growth in relative incomes, rather than differences in the sensitivity of poverty to growth in average incomes.
Growth on poverty	Arbache & Page (2007)	44 Sub-Saharan African countries, 1975-2005	Bivariate, multiple pooled OLS regression models and multiple logit models	Using the most recent purchasing power parity data for 44 sub-Saharan African countries, this paper examines the characteristics of long run growth in Africa	Low and volatile growth is the outstanding defining characteristic of Africa's growth experience since 1975, but there is no evidence that growth volatility is associated with economic performance over the long run. The 1990s may mark a turning point in Africa's growth; income distribution is becoming more unequal; formation of clubs; initial conditions matter a great deal for income distribution but not for growth; and that geography and natural resources do not seem to matter for growth.
Growth on poverty	Roemer & Gugerty (1997)	26 developing countries, 1960s-1990s	OLS	Examination of the question of whether economic growth tends to reduce poverty, where poverty is measured by the incomes of the poorest 20% and 40% of a population	An increase in the rate of GDP growth translates into a direct one-for-one increase in the rate of growth of average incomes of the poorest 40%. GDP growth of ten percent per year is associated with income growth of ten percent for the poorest 40% of the population. For the poorest 20% the elasticity of response is 0.921; GDP growth of 10% is associated with income growth of 9.21%. Growth in per capita GDP can be and usually is a powerful force in reducing poverty. In addition, the paper indicates that sound macroeconomic policies and openness to the world economy may be important in reducing poverty.
Sectoral growth on poverty	Loayza & Raddatz (2010)	55 developing countries across all regions, 1980s-1990s	Fixed Effects Estimator	Contribution to explain the cross-country heterogeneity of the poverty response to changes in economic growth	The paper finds evidence that not only the rate of economic growth but also its composition matters for poverty alleviation, with the largest contributions from unskilled labor-intensive sectors (agriculture, construction, and manufacturing).
Regional Distribution	Sumner (2010)	Low and middle income countries across all regions, 2007-2008		The problem of global poverty has changed because most of the world's poor no longer live in poor countries, meaning low income countries	Sumner estimates that in 1990 some 93 per cent of the world's poor people lived in LICs. In contrast, the authors estimate that in 2007-2008 some three-quarters of the world's approximately 1.3 billion poor people now live in MICs; only about a quarter of the poor (about 370 million) live in the remaining 39 LICs, which are mostly in Sub-Saharan Africa.

Re-gional Distribution	Chen & Ravallion (2010)	Developing countries across all regions, 1985-2005	OLS	Estimate absolute poverty measures for the developing world	25% of the population lived in poverty in 2005, as judged by what poverty typically means in the world's poorest countries. This is higher than past estimates. Substantial overall progress is still indicated—the corresponding poverty rate was 52% in 1981—but progress was very uneven across regions.
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Table 2 shows the occurrence of poverty according to the poverty line of \$ 1.25 per day in developing countries from 1981 to 2005. The share of population that lived with an income below \$ 1.25 per day decreased by about one percent per year on average from approximately 52 percent in 1981 to just over 25 percent in 2005; however, a quarter of the population in the developing world, almost 1.4 billion people, still lives below the poverty line of \$ 1.25.

Table 2: Poverty reduction from 1981 to 2005 in developing countries

Poverty headcount ratio at	1981	1984	1987	1990	1993	1996	1999	2002	2005
\$1.25 a day (PPP) (% of population)	51,9	46,7	41,9	41,7	39,2	34,5	33,7	30,5	25,2

Source: World dataBank, World Development Indicators

There are however, not only extensive differences between countries, but also between different regions as poverty is not equally distributed across the globe and certain regions face higher rates of poverty than others (see table 3). The most significant contribution to global poverty reduction is attributable to East Asia and the Pacific. Poverty according to the headcount index of \$ 1.25 per day dropped sharply from 77.7 percent in 1981 to 16.8 percent in 2005. The significant decrease in poverty in East Asia and the Pacific is mainly due to a sharp decline in poverty in China. The share of population living below \$ 1.25 per day in China took a sharp decline from 84 percent in 1981 to 15.9 percent in 2005. Considering that China's population contributes to roughly 70 percent of the population in the region of East Asia and the Pacific, the decline of the regional poverty indicator is not surprising. Sub-Saharan Africa had the highest prevalence of poverty at the \$ 1.25 per day level in 2005. Poverty increased from 1981 to 1996 and declined from 1996 to 2005. Today, 50.9 percent of the population of Sub-Saharan Africa still lives below \$ 1.25 per day. Even though South Asia notably reduced poverty from a level of 59.4 percent in 1981 to 40.3 percent in 2005, India, by far the biggest country in the region, still has a poverty rate of 41.6 percent in 2005. Yet, India's poverty according to the \$ 1.25 headcount ratio dropped from 55.5 percent in 1983 to 41.6 percent in 2005. Latin America and the Caribbean achieved a slight decrease in the prevalence of poverty from 12.9 percent in 1981 to 8.22 percent in 2005. The Middle East and North Africa halved their share of its population living below \$ 1.25 per day to 3.6 percent in 2005. The only region with developing countries that could not achieve a reduction in poverty was Europe and Central Asia; however, its poverty rate is at a very low level. Poverty according to the \$ 1.25 headcount ratio rose from 1.7 percent in 1981 to 3.7 percent in 2005. The increase of poverty is mainly due to the fall of the Soviet Union with increasing poverty rates in former soviet countries, led by a collapse of state planning.

Table 3: Share of population living below \$ 1.25 per day by region

	1981	1984	1987	1990	1993	1996	1999	2002	2005	Average
East Asia & Pacific	77.7	65.5	54.2	54.7	50.8	36	35.5	27.6	16.8	46.52

Europe & Central Asia	1.7	1.3	1.13	2	4.3	4.6	5.1	4.6	3.7	3.16
Latin America & Caribbean	12.9	15.3	13.7	11.3	10.1	10.9	10.9	10.7	8.22	11.55
Middle East & North Africa	7.87	6.1	5.72	4.31	4.07	4.1	4.22	3.56	3.6	4.84
Sub-Saharan Africa	53.4	55.8	54.5	57.6	56.9	58.8	58.4	55	50.9	55.69
South Asia	59.4	55.6	54.2	51.7	46.9	47.1	44.1	43.8	40.3	49.23

Source: PovcalNet: the on-line tool for poverty measurement developed by the Development Research Group of the World Bank, <http://iresearch.worldbank.org/PovcalNet/povcalSvy.html>

Economic growth is referred to as the increase of GDP in per capita terms for a given country. The Commission on Growth and Development (2008) states that “a growing GDP is evidence of a society getting its collective act together. As its economy grows, a society becomes more tightly organized, more densely interwoven. A growing economy is one in which energies are better directed; resources better deployed; techniques mastered, then advanced” (p. 17). Thus, GDP per capita is considered an important indicator of a society’s welfare and the standard of living in a country. Economic growth is measured as the per capita increase in GDP from one year to the next; it is the annual rate of change in GDP per capita.

Looking at the regional distribution of GDP per capita growth in developing countries between 1981 and 2009⁴, an unstable path of GDP per capita growth can be observed (see table 4).

Table 4: GDP per capita growth in developing regions

	1981	1985	1989	1993	1997	2001	2005	2009	Average
East Asia & Pacific	4.02	6.01	4.30	9.86	6.05	5.63	8.89	6.60	1.77
Europe & Central Asia				-4.67	3.41	1.52	7.08	-6.13	0.04
Latin America & Caribbean	-1.42	0.46	-0.95	1.63	3.84	-1.05	3.67	-3.03	0.11
Middle East & North Africa	-2.71	1.10	-1.63	-1.56	0.88	0.69	2.67	1.61	0.04
Sub-Saharan Africa	-0.61	-1.56	0.32	-2.07	0.80	0.91	3.12	-0.70	0.01
South Asia	3.62	3.13	3.21	2.36	1.94	2.85	7.08	6.55	1.06

Source: World dataBank, World Development Indicators

The region East Asia and the Pacific has the highest GDP per capita growth rates and a steady increase in growth, averaging about seven percent from 1981 to 2009. South Asia also follows an upward trend in growth rates with an average growth rate of approximately 3.8 percent over the 29 year period. The Middle East and North Africa follows a volatile growth path and performed at a lower level than East Asia and the Pacific as well as South Asia. The region of the Middle East and North Africa shows an average growth rate of about 1.4 percent whereas Latin America and the Caribbean shows an average growth rate of 0.8 percent during the period under consideration. Latin America and the Caribbean achieved high positive growth rates starting in 2002, but was hit hard by the financial crisis and showed a highly negative growth rate in 2009. The developing countries of Europe and Central Asia have a very interesting growth path with tremendous volatility and an average growth rate over the past 29 years of only 0.8 percent. Once the Soviet era ended, countries in Europe and Central Asia achieved significant negative growth rates from 1990 to about 1995 (average negative growth rate of five percent), fairly stable but low growth rates up to 1990 and high

⁴ Data for Europe & Central Asia does not start until 1990 due to a lack of a reliable data source during the Soviet era.

but volatile growth rates in the 2000s. This region took a hard hit during the financial crisis with a negative growth rate of over six percent in 2009. The region with the lowest average growth rate between 1981 and 2009 is Sub-Saharan Africa. Its growth rate was barely 0.2 percent and it is thus the slowest growing region of all developing countries. Sub-Saharan Africa has however achieved positive growth rates in the 2000s at low but stable level with an average growth rate of almost 2.3 percent from 2000 to 2008.

2.2 Data

The study used secondary data drawn from a variety of sources⁵. Data on extreme poverty and economic growth on developing countries were readily available and the sources used in this study for all variables rely on the databases of the World dataBank, the Barro Lee Educational Attainment Dataset, the Penn World Table and data from the Polity IV Project⁶. The sample initially included all low and middle income countries for which data on the headcount index of \$ 1.25 per day existed.⁷ However, the sample had to be corrected for data availability and adjusted for outliers as follows.

Because this study is concerned with changes in poverty over time and data on the headcount ratio of \$ 1.25 per day were only available for certain years and not consistently across countries, growth rates of poverty were calculated for each country based on the approach of Kraay (2006) and Dollar and Kraay (2002). Only countries with at least two data entries on the level of poverty were included. This resulted in 515 observations in 92 developing countries, most of which were in the 1990s and 2000s.

Based on these observations, spells of changes in poverty were constructed and annualized. All possible spells for each of the 92 countries were considered. Hereby, the approach of Dollar and Kraay (2002) was followed and data are filtered “since our interest is in [poverty] over the medium to long run, and since we do not want the sample to be dominated by those countries where [poverty] data happen to be more abundant. For each country we begin with the first available observation, and then move forward in time until we encounter the next observation subject to the constraint that at least [two] years separate observations, until we have exhausted the available data for that country” (p. 201). Poverty spells were annualized to account for the difference in years for each spell. This resulted in an unbalanced and irregularly spaced panel of 344 country-year observations on the poverty headcount ratio of \$ 1.25 per days separated by at least two years⁸, including 92 countries. The sample was further restricted to 328 observations covering 77 countries for which at least two

⁵ Table A.1 in the Appendix shows descriptive statistics for the data used

⁶ Table A.2 in the Appendix summarizes all variables and their sources used in the analysis.

⁷ The following countries did not have poverty data available and were taken out of the sample: Afghanistan, American Samoa, Antigua and Barbuda, Benin, Cuba, Dominica, Eritrea, Fiji, Grenada, Kiribati, Democratic Republic of Korea, Kosovo, Lebanon, Libya, Mauritius, Mayotte, Montenegro, Myanmar, Palau, Samoa, Solomon Islands, Somalia, St. Kitts and Nevis, St. Vincent and the Grenadine, Sudan, Tonga, Vanuatu, West Bank and Gaza, Zimbabwe.

⁸ The only exceptions to the two-year spacing were if there were less than six data entries on poverty for a specific country. Only then, a one year gap in between data points was allowed.

spaced observations on poverty were available⁹. When considering other variables and data availability, the sample was slightly smaller and varied across countries (Dollar & Kraay, 2002).

All other variables were calculated to fit with the poverty spells and were averaged across the time frame of the poverty spell. If for example the poverty spell ranged from 2002 to 2005, then all other variables were averaged over the same time period. Furthermore, for all variables, in addition to the length of the poverty spell, the previous five as well as ten years were included in the average to incorporate lagged variables. The variable for the five year lag of growth in GDP per capita for example does not only include the time of the poverty spell (in our example 2002 to 2005), but also the previous five years, thus, an average of 1997 to 2005.

Following the approach of Kraay (2006), all spells in which the “headcount measure of poverty is negligible in either the initial or final period” (p. 206) were eliminated. All countries in which the initial and final periods are below three percent were taken out of the sample.¹⁰ This resulted in a sample of 293 observations in 68 countries.

Additionally, outlier values were taken out of the sample by calculating residuals when regressing poverty spells on GDP growth per capita. Thailand was discarded as it had residuals that are far above other countries and thus Thailand as a whole was treated as an outlier.

A small number of outlier values in the poverty spells had to be discarded, however, in an attempt to keep as many countries as possible in the sample, only certain years in which the outlier occurred were discarded, i.e. if the change in poverty within one spell exceeded 100 percent.¹¹

As a result of all data adjustments, there were 268 observations including 65 developing countries between 1983 and 2009 in the sample¹². The time frame is perceived long enough to capture macroeconomic cycles and rule out the possibility of short-run noise.

Out of the 65 countries left in the sample, 22 are classified as low income, 27 as lower middle income and 16 as upper middle income countries. These countries are considered representative for their respective income classification. The World Bank has in total 40 countries classified as low income countries, more than 55 percent of which are included in the sample. Out of 56 countries classified as lower middle income countries, almost 50 percent are included in the sample of this study. Upper middle income countries are not as well represented, however, still a third of the countries in this income classification are included in the sample.

⁹ The following countries were taken out of the sample due to only one spaced observation: Algeria, Belarus, Belize, Bosnia and Herzegovina, Botswana, Djibuti, Gambia, Guyana, Malawi, Maldives, Sierra Leone, Swaziland, Tajikistan, Timor-Leste and Uzbekistan.

¹⁰ The following countries were taken out of the sample due to headcount ratios that were below three percent in the initial or final period: Albania, Argentina, Bulgaria, Jordan, Macedonia, Romania, Russian Federation, Ukraine and Uruguay.

¹¹ The following data entries for the poverty headcount ratio were taken out of the sample: Azerbaijan (2005), Bolivia (1991), Chile (2006), Honduras (1986), Jamaica (1990), Kazakhstan (2001), Moldova (1999 and 2001), Morocco (1991), Panama (1979), Peru (1986 and 1990), Turkmenistan (1988) (as there were only two poverty spells for Turkmenistan, all data points had to be removed), Venezuela (1989 and 1993) and Yemen (1992) (as there were only two poverty spells for Yemen, all data points had to be removed).

¹² See table A.3 in the Appendix for a summary of the poverty spells used in the sample

Similarly, the regional distribution is also considered representative. The World Bank categorizes 24 countries in East Asia and the Pacific, a third of which are included in the sample (eight out of 24 countries). Over a third of all countries in Europe and Central Asia (8 out of 22 countries); more than half in Latin American and the Caribbean (17 out of 30 countries); just under a third in the Middle East and North Africa (4 out of 13 countries); almost half in Sub-Saharan Africa (23 out of 47 countries); and almost two thirds in South Asia (five out of eight countries) are included in the study¹³.

3. Determinants of the growth elasticity of poverty

The list of determinants thought to show an influence on the growth elasticity of poverty is not exhaustive; it is a careful selection in the search for the most influential drivers of the growth elasticity of poverty. The determinants are human capital, openness to the world economy, foreign direct investment, government expenditure, investment rate, private sector composition, institutional quality, urbanization, democracy, and population growth. These determinants were believed to have the highest influence on the growth elasticity of poverty resulting of a literature review on growth and poverty.

3.1 Human capital

Human capital is thought of as one of the main drivers for the growth elasticity of poverty because high levels of human capital have significant effects on the responsiveness of growth and there are three main channels through which growth can achieve poverty reduction. The first channel focuses on innovations. Through a high level of human capital, the labor force is able to generate more sophisticated and better technology through innovations and thus the labor force can be increasingly employed in the development and production of technologically advanced products, creating jobs and higher incomes. Closely related is the second channel, the diffusion of technology. Through a better trained and higher educated labor force, technology diffusion can take place at an increasing rate. With increased levels of technology, jobs are created, incomes rise and poverty reduction occurs. Channel three focuses on higher productivity. Higher levels of human capital increase productivity of workers and with increased productivity a larger number of products can be produced with the same resources. This in turn increases production due to reduced costs and as a result, jobs are created.

Human capital does not only influence economic growth and poverty, but might have positive or negative effects on other variables included in this study, such as increases in agricultural productivity or prevention of diseases (Lucas & Timmer, 2006). Furthermore, as De Janvry & Sadoulet (2000) found, “the role of education in reducing poverty [...] is both direct and indirect in giving the poor greater ability of benefiting from aggregate income growth” (p. 267). The hypothesis tested is that human capital increases the growth elasticity of poverty (poverty reduction per percentage of growth), because social innovations, diffusion of knowledge, and new endogenous employment are fostered; all of which have a direct impact on poverty reduction.

3.2 Trade openness to the world economy

¹³ The data include the following regions: East Asia & Pacific, Europe & Central Asia, Latin America & Caribbean, Middle East & North Africa, Sub-Saharan Africa and South Asia. Only developing countries are included in the results and Table A.4 in the Appendix shows the countries included in their respective regional classification.

Numerous studies provide evidence that a greater degree of openness to the world economy as well as trade integration is associated with higher growth rates¹⁴. “Openness to international trade accelerates development: this is one of the most widely held beliefs in the economics profession, one of the few things on which Nobel prize winners of the both the left and the right agree” (Dollar & Kraay, 2004, p. 22). As a result, openness to the world economy reduces poverty through growth effects.

The Growth Report of the Commission on Growth and Development (2008) identifies openness to the global economy as one of the most important contributing factors to high economic growth for successful high growth economies such as Botswana, Brazil and China. The global economy is, if “properly exploited for the benefit of all citizens, [...] one of the most powerful weapons against poverty” (Commission on Growth and Development, 2008, p. 22). Successful high growth economies ‘exploit’ the world economy by importing knowledge, technology and ideas from a highly integrated, closely connected world and exporting what the world wants. In order to exploit the large and fairly stable global market, economies have to specialize according to their comparative advantage. Domestic markets of developing countries are usually too small to achieve productivity gains through specialization however, with high global demand, countries can specialize in the production of those goods for which they hold a comparative advantage and trade these on the world market (Commission on Growth and Development, 2008; Lina & Monga, 2010).

It is assumed that a higher level of trade openness, significantly contributes to the growth elasticity of poverty. Through openness to the world economy, global markets are exploited and more goods and services exported. The abundant factor of production is used in the production process to a higher extent, which in developing countries is usually labor. Through integration into the world economy, production is increased which in turn increases employment. Poor people are predominantly employed in the manufacturing sector utilizing low-skilled labor (the abundant factor of production) to a great extent, allowing poverty to be reduced through increased employment. Furthermore, through trade the import of knowledge, technology and ideas takes place which contributes to a diffusion of technology. The hypothesis tested is that openness fosters economic growth and reduces poverty because higher production increases growth and leads to complementary endogenous creation of firms and production of consumption goods for the poor.

3.3 Foreign direct investment

Growth rates in developing countries can be influenced by foreign direct investment (FDI) because “growth rates are, in part, explained by a ‘catch-up’ process in the level of technology” (Borenszten, De Gregorio & Lee, 1998). Endogenous growth theory states that sustained long-term growth depends on the extent to which technological advancement can be influenced. One of the influencing factors of technological progress is the adoption of more advanced knowledge and know-how to produce goods at a lower cost. Developing economies do not always have the capability to innovate and generate new technological advancements; necessary elements include an educated work force, appropriate infrastructure, and stable economic and social conditions. As a result, they depend on technology that originated somewhere else. Technological progress can be achieved if multinational corporations, among the most technologically advanced companies, invest in

¹⁴ See for example Dollar, 1992; Roemer & Gugerty, 1997; Dollar & Kraay, 2004; Arbache & Page, 2007; and Berg, Ostry & Zettelmeyer, 2008

developing countries and they have the ability to bring the adoption and implementation of new production technologies as well as understanding of the more advanced global markets, to the FDI-receiving economies. FDIs are therefore a major source of knowledge spillovers from a developed to a developing economy and can influence the catching up of technological processes of developing countries (Borensztein et al., 1998; Commission on Growth and Development, 2008; Bengoa & Sanchez-Robles, 2003; Alfaro, Chanda, Kalemli-Ozcan & Sayek, 2010).

An assumption in this study is that through the investment of multinational corporations, knowledge and technology spillovers take place. The inflows of FDIs allow for the adoption of more advanced technology and know-how in developing countries which in turn permits lower production costs. These lower production costs contribute to the competitiveness of products, exports are increased and growth occurs. As a result, poverty reduction takes place through increased employment. Furthermore, multinational corporations often invest in infrastructure that cannot only be used in the production of goods and services but also by society as a whole. Governments frequently provide incentives for multinational corporations to invest in a country, which does not only benefit multinational corporations but also local businesses. These investments contribute to increases in the number of local business and job creation. The hypothesis tested is that there is a significant impact of FDIs on the growth elasticity of poverty. Direct investment leads to rapid diffusion of technology and growth.

3.4 Government expenditure

Government expenditure can be a vital part that influences economic growth in developing countries because it contributes to the accumulation of infrastructure and skills needed. Understanding the relationship between government expenditure and growth is of major concern. Economists and development experts agree that a significant difference can be observed between the composition of government expenditure in developing and in developed countries and that this difference results in different outcomes of expenditure policies as well as different growth performances (Bose, Haque & Osborn, 2007). Government expenditure has the potential to crowd-in private investment and further raise economic prosperity (Saad-Filho, 2010) or crowd-out private investment if expenditure is too large and does not leave space for private businesses (Commission on Growth and Development, 2008).

This study claims that government expenditure contributes to the accumulation of infrastructure, human capital, health and other skills and crowds-in private investment. However, the percentage of government expenditure on infrastructure, education and health is the most important factor in determining the impact of government expenditure on poverty. If expenditures on education, health and infrastructure are assumed to be low according to its percentage of total government expenditure, the impact of government expenditure on poverty is believed to be negative because of a government that is big and wasteful.

Unfortunately, data on infrastructure are not available and thus only government expenditure on education and health are analyzed. Through increases in expenditure on education, the labor force increases the level of human capital and productivity rises. Furthermore, it is essential for governments of developing countries to fund education systems as most people are excluded from educational attainment due to a lack of income. Increased educational attainment also has positive spillover effects on other factors influencing poverty, such as increased health. Expenditures on health increase the productivity of workers because people with better health are able to work more,

longer and harder. Furthermore, indirect effects can be achieved through societal behavior changes such as lower birth rates. The assumption is that high government expenditure in developing countries is on the one hand necessary for the improvement of infrastructure, health, education, etc. and on the other hand can be harmful if it is not spent correctly as it might increase the costs for new firms. The structure of government expenditure is crucial for the direct effect of the growth elasticity of poverty and the hypothesis tested is that a high level of government spending on education and health increases the growth elasticity of poverty. In general, it is expected that government expenditure helps to foster complementary.

3.5 Investment rate

Developing countries are usually resource constrained and thus the effective and efficient allocation of those scarce resources is vital for economic success (Bose et al. 2009). The Commission on Growth and Development states that “strong, enduring growth requires high rates of investment. By investing resources, rather than consuming them, economies make a trade-off between present and future standards of living. [...] If the sustained, high-growth cases are any guide, it appears that overall investment rates of 25 percent of GDP or above are needed, counting both public and private expenditures” (2008, p. 34).

It is assumed that if investments are focused toward the future, rather than the present of paying off debt from the past, the growth elasticity of poverty will benefit. Investments into the future are those geared at attaining a competitive advantage and focus on skills, expertise and infrastructure needed in the future to increase development and growth. Such investments are particularly focused on the diffusion of technology, increasing human capital, particularly in the primary and secondary level of education, and creating a stable macroeconomic environment. Through increased investments, long-term goals can be achieved and gaining a competitive advantage results in increases in production and employment, all of which benefits the poor.

3.6 Private sector composition

The private sector in this study is divided into the financial, agricultural, manufacturing and service sector. Private sector composition is essential to stimulate growth and the structure of an economy varies according to its stage of development. The stages of development range from one extreme, a low income agrarian structure, to the other extreme, a high income highly industrialized structure at the other extreme with real-world stages of development lying somewhere in between. The structure of the economy and the development of its sectors are largely determined by its factor endowments and market structure. Endowment structures can come in the form of an abundance of labor, physical capital, human capital or natural resources that vary at different stages of development. In low income economies the abundant factor is often labor (and sometimes natural resources), but the endowment structure changes with differing development stages and high income economies usually have physical and human capital as their abundant factor. Thus, in early stages of development, the structure of the economy is usually labor- or resource-intensive and relies on agriculture and mining. At the other end of the spectrum, high income economies face a different endowment structure and their industries are focused on capital-intensive production. Therefore, they foster research, innovation, inventions and the introduction of new technologies. Certain levels of factor endowments are prerequisites for the development of an economy, however, factor endowments can and do change over time (Lin, 2010).

The specific aim of analyzing private sector composition is to see how the sectoral composition of growth affects poverty reduction. Growth should preferably take place in those sectors where the poor are located to lift them out of poverty. It is a partial aim of this study to discover whether growth in one sector affects poverty reduction to a greater extent than growth in another sector and thus to see if the composition of growth matters for poverty alleviation. An assumption that is also found in recent literature (see for example Loyaza & Raddatz, 2010) is that growth in labor-intensive industries has a greater effect on poverty reduction.

Furthermore, it is assumed that by shifting private sector composition, economies can slowly move from low income to high income countries. However, different sectors contribute to this phenomenon to a varying degree. Development of the financial sector for example does not only ensure savings for future investment, it also ensures access to affordable and safe credits for poor people and small business owners. Through the possibility to save and to take on credit even for the poorest members of society, private households and small business owners can invest in education, opening or extending businesses, health care and so forth. These investments positively contribute to the opportunity of increased earnings and thus reduce poverty.

Development in the agricultural sector is assumed to be particularly beneficial to reductions in poverty because increases in productivity through investments in equipment, seeds, irrigation and the like increase agricultural yields. These increased yields reduce poverty as they can either be used for people's own consumption or excess production can be sold and additional income generated. The agricultural sector in developing economies is the biggest sector and employs the vast majority of people. Developments and productivity increases in the agricultural sector are thus particularly rewarding. This assumption is supported by Dollar and Kraay (2002) who state that "greater labor productivity in agriculture relative to the rest of the economy may benefit poor people disproportionately to the extent that the poor are more likely to live in rural areas and derive their livelihood from agriculture" (p. 218).

Development in the manufacturing sector is assumed to have positive effects on poverty if labor-intensive production processes are used because low-skilled labor is the abundant factor of production in most developing countries. If production capabilities are increased, more labor is utilized and unemployment, as well as poverty, fall. However, if low labor-intensive production is predominant in an economy, poverty does not fall as the vast majority of unskilled labor is not positively affected. Furthermore, growth of the service sector reduces poverty because the service sector is usually fairly labor-intensive and employment opportunities are created.

The hypotheses tested are that with the improvements in the financial sector, the growth elasticity of poverty will decrease because even the poor gain access to money, can create business opportunities and employment. Through the expansion of the agricultural sector and increased productivity, the poor benefit, and with increases in exports of agricultural products the growth elasticity of poverty rises. Furthermore, an increase in manufacturing value added increases the growth elasticity of poverty because manufacturing does not only provide employment opportunities for low-skilled labor, but also provides new technologies, which may spread into other sectors. Increases in value add in the service sector also increase the growth elasticity of poverty because the service sector is highly labor intensive.

3.7 Institutional quality

The Commission on Growth and Development (2008) points out that “successful cases [of high economic growth] share [...] an increasingly capable, credible, and committed government. Growth at such a quick pace, over such a long period, requires strong political leadership” (p. 3) and a credible government has to have a high degree of institutional quality. Institutional quality in an economy does not only provide the basis for macroeconomic stability, a framework for openness to international trade and property rights, it also leads to increased growth in average incomes. Sound institutions are positively correlated with growth and are a vital part in explaining GDP per capita in the long run as countries with good institutions are able to reduce growth volatility (Dollar & Kraay, 2002; Kraay, 2006; Arbach & Page, 2007; Berg et al., 2008). They are also responsible for a wide variety of tasks, such as public investments (i.e. in infrastructure, health and education), policy-making and security. Governments are furthermore responsible for shaping the market system in an economy as well as defining, implementing and controlling property rights and countries with poor institutional quality entail severe economic, social and political problems.

According to Acemoglu, Johnson and Robinson (2005), “differences in economic institutions are the major source of cross-country differences in economic growth and prosperity. Economic institutions not only determine the aggregate economic growth potential of the economy, but also an array of economic outcomes, including the distribution of resources in the future (e.g. the distribution of wealth, of physical capital or human capital). In other words, they influence not only the size of the aggregate pie, but how this pie is divided among different groups and individuals in society” (p. 389). Thus, economic institutions shape economic interactions of people in society as well as the structure of economic incentives and are thus important to economic outcomes. Institutions furthermore determine important economic conditions in a society such as property rights or the allocation of resources. Institutions that facilitate and promote innovation, efficient allocation of resources, investments in infrastructure, education, health and technology are beneficial to a prosperous society (Acemoglu et al., 2005).

It is thus assumed that high institutional quality contributes to the reduction of poverty because it is the foundation for macroeconomic stability, a framework for openness to international trade and property rights only to name a few of the factors already analyzed to influence poverty reduction. Institutions are responsible for a wide variety of tasks that are absolutely necessary for a prosperous economy and for individuals, particularly the poor, to take part in the economic activity of a country. Public investments, providing education and health care, ensuring property rights and setting up a stable economic environment that attracts foreign investors are only some of the important tasks institutions have to fulfill. If institutions function properly, individuals have the opportunity to benefit from increased opportunities such as employment and improve their living conditions. The hypothesis is tested is that good institutions do not only foster growth, but also enable the spread of benefits to the poor and thus increase the growth elasticity of poverty.

3.8 Urbanization

Urbanization is the transfer of a population from rural to urban areas. As economies move forward in their development process, they move from labor-intensive agricultural production to manufacturing which is usually located in urban areas due to spillover effects and agglomeration of companies. Henderson (2005) states that “Gallup, Sacks and Mellinger (1999) [...] suggest that urbanization may ‘cause’ economic growth, rather than just emerge as part of the growth process” (p. 1558). However,

he further states that limited evidence suggests that urbanization per se does not cause economic growth.

The Commission on Growth and Development (2008) states that “it is extremely rare to achieve per capita incomes above \$10,000 (in purchasing power parity terms) before half of the population lives in the cities” (p. 57). Thus, the reason why urbanization was chosen as a determinant in this study is to understand whether growth that takes place through urbanization has a stronger effect on poverty reduction than growth that takes place in rural areas. It is assumed that urbanization is the outcome of growth that utilizes labor-intensive production processes and that this type of growth is poverty reducing. The hypothesis tested is that high urbanization levels increase the growth elasticity of poverty due to higher incomes in the manufacturing sector which is located in urban areas.

3.9 Democracy

According to the United Nations (2010a), “Democracy is defined as a system of government in which leaders periodically renew their mandates through free, fair and competitive elections. In addition, it is a system that acknowledges a set of rights – such as those of expression, organization and collective action – that allow citizens to exercise political choice and hold leaders accountable” (p. 285). Tavares and Wacziarg (2001) however, view “democracy as a political system characterized by two main features: (1) It adds the voice of the great number of poor to that of the few rich, changing the composition of the citizenry effectively influencing the political process [and] (2) It decreases the discretionary nature of power, in the sense that political decisions become more responsive to constraints beyond the control of politicians” (p. 1344).

Democracy, political and economic freedom as well as rights are viewed as essential components for development (United Nations, 2010a). However, democracies in developing countries have often had disappointing success in reducing poverty and fostering economic growth. Thus, the intriguing question of whether democratic or autocratic systems are more effective in enhancing growth and reducing poverty, has been asked and researched frequently. Research tends to come to the conclusion that democratic systems are not able to show an impressive record on growth or poverty alleviation; they do reduce poverty, but on a slow and stable path. Autocratic regimes, on the other hand, have the greatest success stories of poverty alleviation, but also show the worst performers and every stage in between (Varshney, 1999; United Nations, 2010a).

Even though literature shows differing results in the influence of democracy on growth and thus its potential positive impact on the growth elasticity of poverty, it is assumed in this study that the results show a positive but small impact of democracy on poverty. The hypothesis tested is that democracy has a small effect on the growth elasticity of poverty.

3.10 Population growth

In the early stages of growth models, population growth has taken a dominant role in explaining economic growth. Robert Solow incorporated population growth as one of the major explanatory components in his model on economic growth. He proves that countries with higher population growth tend to be poorer because it takes more capital to hold the capital intensity (the ratio of capital to labor) steady. Even though population growth increases the level of output overall, the output per worker is smaller than in economies with a lower rate of population growth. Increases in capital per capita are thus more difficult and economies tend to accumulate less capital per worker.

It is assumed that even though the impact of population growth on absolute GDP is positive, high population growth rates have a negative effect on GDP per capita and thus negatively affect poverty. The hypothesis tested is that population has a negative impact on the growth elasticity of poverty.

4. Results

4.1 Model

This study used Ordinary Least Square (OLS) estimation to analyze the unbalanced panel data. The OLS regression minimizes the sum of the squared deviation with poverty serving as the dependent variable and growth as well as the determinants described above serving as independent variables. The model used is set up in the following form:

$$y_{it} = \beta_0 + \beta_1 x_{1it} + \beta_2 x_{2it} + \epsilon_{it}$$

Where

β_0 represents the intercept

y_{it} represents the dependent variable in country i at time t , in our case poverty

x_{1it} represents the independent variable in country i at time t , in our case GDP growth per capita

β_1 represents the coefficient for the independent variable x_1

x_{2it} represents the independent variable in country i at time t , in our case one of the determinants

β_2 represents the coefficient for the independent variable x_2

ϵ_{it} represents the error term

The OLS method tries to precisely estimate the systematic or explained component ($\beta_0 + \beta_1 x_{1it}$), whereas the systematic component is supposed to be uncorrelated with the error term (ϵ_{it}). Thus, we are looking for the value of β_0 , β_1 and β_2 for which the sum of the squared deviation of the error terms is minimized.

4.2 Single regressions

In a first step, after constructing poverty spells and the equivalent averages for all explanatory variables, single OLS regressions were run, to test the impact of each of the determinants on poverty exclusively. The variables were tested during the poverty spell before including the five and ten year lags. The results show that the only influential determinants for *poverty reduction* according to the single regressions are growth, human capital, openness to the world economy and FDIs. Single regressions give us a hint on which variables might be specifically important to include in this study. They give however, only very tentative information, as the results suffer from omitted variable bias and therefore significant results can be spurious and insignificance occurs often if another variable is included.

We ask, first, whether the level of poverty decreases for every increase in a country's growth rate. In particular, countries with high levels of growth are expected to also decrease poverty. As table 5 reveals, an increase in GDP growth per capita, does in fact decrease the level of poverty. Thus, countries in the sample on average decreased poverty by 0.86 percent for every one percent

increase in their growth rate of GDP per capita with a one percent significance level ($t=-3.15$, $p=0.002$). The common view of economists and development experts that economic growth is essential for poverty reduction is thus verified by empirical evidence of this study.

It will be recalled that it is expected that human capital also significantly contributes to poverty reduction. In particular, countries with high levels of education should have lower poverty rates than countries with low levels of education. The answer is yes, a high level of human capital considerably contributes to poverty reduction. Empirical evidence on the average years of schooling and average years of secondary schooling attained shows that an additional year of schooling and an additional year of secondary schooling reduces the level of poverty by 1.70 ($t=-3.25$, $p=0.001$) and 3.28 ($t=-3.65$, $p=0.000$) percent respectively (see table 5). However, average years of tertiary schooling attained did not produce significant results ($t=-1.47$, $p=0.143$). These results are an indication that secondary education plays a more important role in poverty reduction than tertiary education in developing countries on average. The results presented suggest that the hypothesis stated - human capital reduces poverty because social innovations, diffusion of knowledge, and endogenous employment are fostered - is verified.

Another question concerning poverty reduction asks whether openness to the world economy contributes to reductions in poverty. In particular, the higher the degree of openness of developing countries, the lower is the poverty rate. As empirical evidence reveals, variables for openness to the world economy, such as exports and trade as a percentage of GDP do indeed reduce poverty. Thus, an increase in exports and trade of one percent of GDP decreases poverty by 0.17 ($t=-3.04$, $p=0.003$) and 0.08 ($t=-2.87$, $p=0.004$) percent respectively (see table 5). However, the contribution to poverty reduction, particularly for trade is rather small.

It is assumed that FDIs contribute to poverty reduction because investments of multinational corporations in developing countries contribute to knowledge and technology spillovers. The answer is yes, FDI inflows allow for the adoption of more advanced technology and know-how in developing countries. A one percent increase in FDI net inflows as a percentage of GDP decreases poverty by 0.76 percent ($t=-2.09$, $p=0.037$) (see table 5).

Private sector composition is expected to contribute to poverty reduction. In particular, growth in labor-intensive industries, and thus value added as percentage of GDP contributed to the financial, agricultural, manufacturing or service sector is expected to have a great effect on poverty reduction. As table 5 reveals, data do not show a significant contribution of either the financial, manufacturing or service sector to poverty reduction. Only the agricultural sector shows significant results (at a ten percent significance level), however, the relationship of agriculture on poverty changes is not as expected. An increase of one percent of agriculture value added increases poverty by 0.15 ($t=1.94$, $p=0.054$) percent. The assumption that development in the agricultural sector is assumed particularly beneficial to reductions in poverty because increases in productivity increase agricultural yields and reduces poverty is not verified. This might seem somewhat surprising; however, an endogeneity issue with agriculture value added arises. As stated, economies go through different stages of development, from agrarian to industrial. The further away from an agrarian structure they are, the lower the poverty level. However, the more people work in agriculture and therefore the higher the value added as a percentage of GDP, the higher the level of poverty.

Some determinants tested in single regressions do not show significant results concerning its contribution to poverty (see table 5). None of the variables for government expenditure, investment rate, institutional quality, urbanization, democracy and population growth show significant results.

Table 5: Summary of OLS estimation of variables for the poverty spell

	Significant	Not significant	t-stat	p-value	Adjusted R ²
Growth					
GDP per capita growth	-0.86***		-3.15	0.002	0.0359
Human capital					
Average years of schooling	-1.70***		-3.25	0.001	0.0441
Average years of secondary schooling	-3.28***		-3.65	0.000	0.0562
Average years of tertiary schooling		-2.64	-1.47	0.143	0.0056
Percentage of completed secondary schooling	-0.32***		-3.35	0.001	0.0471
Percentage of completed tertiary schooling		-0.44	-1.52	0.131	0.0062
Openness to world economy					
Exports	-0.17***		-3.04	0.003	0.0303
Trade	-0.08***		-2.87	0.004	0.0266
FDI					
FDI net inflows	-0.76**		-2.09	0.037	-0.0126
Government expenditure					
Government final consumption expenditure		-0.03	-0.12	0.907	0.0038
Public health expenditure		-0.22	-0.26	0.794	-0.0045
Public spending on education		-0.78	-1.04	0.298	0.0006
Investment rate					
Investment share		-0.14	-1.09	0.278	0.0007
Private sector composition					
Domestic credit to private sector		-0.05	-1.44	0.150	0.0041
Agriculture value added	0.15 *		1.94	0.054	0.0105
Manufacturing value added		-0.1	-0.67	0.503	-0.0021
Services value added		-0.05	-0.58	0.563	-0.0026
Institutional quality					
Control of Corruption		0.04	0.70	0.482	-0.0030
Government Effectiveness		0.01	0.15	0.883	-0.0058
Political Stability and Absence of Violence		-0.09	-1.55	0.123	0.0073
Regulatory Quality		0.02	0.29	0.776	-0.0055
Rule of Law		-0.05	-0.79	0.430	-0.0020
Urbanization					
Urbanization levels		-0.05	-1.09	0.277	0.0007
Democracy					
Voice and Accountability		0.03	0.45	0.655	-0.0042
Polity score		0.05	0.32	0.752	-0.0034
Population growth					
Annual population growth		1.54	1.62	0.107	0.0060

*** 1 percent significance level; ** 5 percent significance level; * 10 percent significance level

4.3. Single regressions with time lags¹⁵

As already described, the determinants were not only tested for the time period of the poverty spell, but also with a five and ten year time lag. All variables that showed significant results for the poverty spell also show significance with the five and ten year lag. The five year lag of the growth elasticity of poverty shows a higher coefficient and FDIs more than double for the ten year lag compared to the poverty spell. In addition, control of corruption and annual population growth also show significant results.

The growth elasticity of poverty increases¹⁶ for the five year lag compared to the poverty spell and decreases for the ten year lag (see table 6). The five year lag shows that for every one percent increase in growth, poverty decreases by -0.95 ($t=-3.26$, $p=0.001$) percent, slightly higher than for the poverty spell and the ten year lag shows a reduction in poverty of -0.78 ($t=-2.46$, $p=0.015$) percent. This verifies the results established in recent literature; growth of GDP per capita, particularly long-run, sustained growth, has a significant and major impact on the extent of poverty reduction.

The results for the five and ten year lag of average years of schooling and average years of secondary schooling also show that an additional year of schooling significantly contributes to poverty reduction. However, the coefficients are slightly lower than for the poverty spell (see table 6). Furthermore, openness to the world economy is poverty reducing for the five and ten year lagged variables of exports and trade with coefficients very similar to the ones for the poverty spell (see table 6).

The OLS regression of FDI net inflows shows a significant contribution to poverty reduction increasing with the time lag (see table 6). A one percent increase in FDIs as a percentage of GDP reduces poverty by 0.76 percent for the poverty spell, but more than doubles to a poverty reduction of 1.36 ($t=-3.26$, $p=0.001$) for the five year and 1.71 ($t=-3.69$, $p=0.000$) for the ten year lag respectively. Thus, FDIs become more important the longer the time lag because it takes time to fully reap the benefits of FDIs.

It will be recalled that high institutional quality is expected to contribute to poverty reduction because properly functioning institutions enable the spread of benefits to the poor. Even though none of the variables for institutional quality showed significant results for the poverty spell, the five year lag of the Control of Corruption index, that “captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as ‘capture’ of the state by elites and private interests” (Kaufmann, Kraay & Mastruzzi, 2010) shows that an improvement in the index increases poverty slightly ($t=1.67$, $p=0.097$) with a significant only at the ten percent level (see table 6). Furthermore, the number of observations ($n=102$) is significantly lower than for other variables because data collection for variables on institutional quality did not start until 1996. The results might not be representative and have to be treated with care.

It is also asked, whether high growth rates in population growth increases poverty and the answer is yes as shown by the five and ten year time lag. Even though annual population growth did not show

¹⁵ Only the most significant differences from the results for single regressions during the poverty spell are depicted.

¹⁶ The term ‘the growth elasticity of poverty increases’ refers to the growth elasticity taking on a higher negative value, i.e. a change in the coefficient from -0.6 to -0.8 is considered an ‘increase’.

significant results for the poverty spell, the variable entered significantly for the five and ten year; a one percent increase in the annual population growth *increases* poverty by 1.93 (t= , p=0.040) and 2.4 (t=2.44, p=0.015) percent for the five and ten year lag respectively (see table 6). The longer the time lag, the higher the coefficient and the hypothesis that population growth has negative effects on poverty is verified.

Table 6: Summary of OLS estimation with 5 and 10 year lagged variables¹⁷

	Coefficient	t-stat	p-value	Adjusted R ²
Growth				
GDP per capita growth 5 year lag	-0.95***	-3.26	0.001	0.0348
GDP per capita growth 10 year lag	-0.78**	-2.46	0.015	0.0185
Human capital				
Average years of schooling 5 year lag	-1.60***	-3.41	0.001	0.0426
Average years of schooling 10 year lag	-1.62***	-3.41	0.001	0.0427
Average years of secondary schooling 5 year lag	-3.09***	-3.76	0.000	0.0521
Average years of secondary schooling 10 year lag	-3.13***	-3.74	0.000	0.0514
Percentage of completed secondary schooling 5 year lag	-0.28***	-3.24	0.001	0.0383
Percentage of completed secondary schooling 10 year lag	-0.29***	-3.29	0.001	0.0394
Openness to world economy				
Exports 5 year lag	-0.17***	-2.83	0.005	0.0257
Exports 10 year lag	-0.17***	-2.77	0.006	0.0244
Trade 5 year lag	-0.07**	-2.60	0.010	0.0212
Trade 10 year lag	-0.08**	-2.53	0.012	0.0200
FDI				
FDI net inflows 5 year lag	-1.36***	-3.26	0.001	0.0350
FDI net inflows 10 year lag	-1.71***	-3.69	0.000	0.0453
Private sector composition				
Agriculture value added 5 year lag	0.13*	1.76	0.080	0.0080
Institutional quality				
Control of Corruption 5 year lag	0.15*	1.67	0.097	0.0175
Population growth				
Annual population growth 5 year lag	1.93**	2.07	0.040	0.0121
Annual population growth 10 year lag	2.4**	2.44	0.015	0.0183

*** 1 percent significance level; ** 5 percent significance level; * 10 percent significance level

4.4 Multiple regressions

Now that we have a clear picture of which determinants influence poverty directly, it is time to dedicate to the true research question of this study: What are the determining factors of the growth elasticity of poverty? Thus the determinants are now tested in combination with growth¹⁸ and

¹⁷ Only significant results are reported.

¹⁸ The five year lag of growth in GDP per capita was chosen because it showed the best results in reducing poverty in single regression

regressed on poverty to find the extent to which the determinants contribute to the growth elasticity of poverty. Table 7 shows combinations of variables that have a significant influence on poverty. Each box indicates the combination of one of the determinants with the growth variable regressed on poverty. The first line of each box indicates the growth elasticity of poverty whereas the second line shows the direct impact of the determinant on poverty in combination with growth.

Table 7: Summary of multiple regressions¹⁹

Combination of a determinant with growth	Coefficients	t-stat	p-value	Adjusted R ²
Human capital				
GDP per capita growth 5 year lag	-1.04***	-2.62	0.009	0.0705
Average years of schooling	-1.56***	-3.00	0.003	
GDP per capita growth 5 year lag	-1.14***	-2.91	0.004	0.0893
Average years of secondary schooling	-3.23***	-3.66	0.000	
GDP per capita growth 5 year lag	-0.96**	-2.39	0.018	0.0684
Percentage of completed secondary schooling	-0.28***	-2.91	0.004	
GDP per capita growth 5 year lag	-1.17***	-2.91	0.004	0.0404
Average years of tertiary schooling	-2.65	-1.50	0.135	
GDP per capita growth 5 year lag	-1.18***	-2.94	0.004	0.0418
Percentage of completed tertiary schooling	-0.45	-1.60	0.111	
Openness to world economy				
GDP per capita growth 5 year lag	-1.04***	-3.23	0.001	0.0638
Exports	-0.14***	-2.62	0.009	
GDP per capita growth 5 year lag	-1.06***	-3.26	0.001	0.0610
Trade	-0.07**	-2.46	0.015	
FDI				
GDP per capita growth 5 year lag	-0.84**	-2.50	0.013	0.0638
FDI 10 year lag	-1.37***	-2.87	0.004	
Government expenditure				
GDP per capita growth 5 year lag	-1.33***	-3.42	0.001	0.0358
Government final consumption expenditure	-0.12	-0.55	0.584	
GDP per capita growth 5 year lag	-1.33***	-3.79	0.000	0.0571
Health expenditure	0.72	-0.86	0.389	
GDP per capita growth 5 year lag	-1.47***	-3.71	0.000	0.0743
Expenditure on education	-0.96	-1.34	0.184	
Investment rate				
GDP per capita growth 5 year lag	-0.95***	-3.06	0.002	0.0311
Investment rate (ki)	0.00	0.02	0.984	
Private sector composition				
GDP per capita growth 5 year lag	-1.06***	-3.10	0.002	0.0353
Domestic credit provided to private sector	-0.02	-0.43	0.665	
GDP per capita growth 5 year lag	-1.05***	-3.16	0.002	0.0436
Agriculture value added	0.11	1.49	0.138	
GDP per capita growth 5 year lag	-1.13***	-3.33	0.001	0.0354

¹⁹ All variables were used with their best performing lag according to single regressions

Manufacturing value added	0.02	0.11	0.915	
GDP per capita growth 5 year lag	-1.15***	-3.47	0.001	0.0384
Services value added	-0.08	-0.90	0.367	
Institutional quality				
GDP per capita growth 5 year lag	-1.37**	-2.33	0.022	0.0591
Control of corruption 5 year lag	0.15*	1.72	0.089	
GDP per capita growth 5 year lag	-1.41***	-3.43	0.001	0.0547
Government effectiveness	0.05	0.79	0.428	
GDP per capita growth 5 year lag	-1.31***	-3.63	0.000	0.0673
Political stability and absence of violence	-0.07	-1.20	0.233	
GDP per capita growth 5 year lag	-1.39***	-3.41	0.001	0.0655
Regulatory quality	0.05	0.75	0.457	
GDP per capita growth 5 year lag	-1.31***	-3.69	0.000	0.0603
Rule of law	-0.01	-0.13	0.897	
Urbanization				
GDP per capita growth 5 year lag	-1.14***	-3.50	0.001	0.0415
Urban population 10 year lag	-0.07	-1.45	0.169	
Democracy				
GDP per capita growth 5 year lag	-1.36***	-3.74	0.000	0.0598
Voice and accountability index	0.00	0.05	0.960	
GDP per capita growth 5 year lag	-1.12***	-3.38	0.001	0.0347
Polity index	-0.01	-0.08	0.938	
Population growth				
GDP per capita growth 5 year lag	-0.95***	-2.78	0.006	0.0426
Population growth 10 year lag	1.51	1.48	0.139	

*** 1 percent significance level; ** 5 percent significance level; * 10 percent significance level

The most striking fact considering the results of multiple regressions is that the growth elasticity of poverty, the extent to which a one percent increase in growth reduces poverty, increases if variables for human capital, openness to the world economy, government expenditure, private sector composition, institutional quality, urbanization, democracy and population growth are included in the regression (see first line in each box of table 7). Particularly variables that did not show significant results in single regressions largely and significantly contribute to the growth elasticity of poverty such as government expenditure, investment rate, private sector composition, institutional quality, urbanization and democracy are among the variables with the highest (negative) coefficients. The adjusted R^2 increases when combinations of variables are regressed on poverty compared to single regressions of the growth elasticity of poverty²⁰. Even though many of the variables, when included in the multiple regressions do not have a significant impact on poverty, they show a significant and high impact on the growth elasticity of poverty; in combination with growth, these determinants are therefore an effective way to reduce poverty.

We ask first, whether human capital contributes to the growth elasticity of poverty, that is, whether an increase in the level of education contributes to the extent to which growth ‘translates’ into poverty reduction. The answer is that by adding any of the variables for human capital, the growth elasticity of poverty increases. Including the variable of average years of secondary schooling

²⁰ With the exception for ki and the polity index where the adjusted R^2 is slightly lower

attained for example, increases the growth elasticity of poverty from -0.95 to -1.14 ($t=-2.91$, $p=0.004$) (see table 7). Furthermore, the coefficient of average years of secondary schooling itself contributes to poverty reduction and for an additional year of secondary schooling poverty decreases by 3.23 percent ($t=-3.66$, $p=0.000$). Including average years of schooling attained in combination with growth increases the growth elasticity of poverty to -1.04 ($t=-2.62$, $p=0.009$) and an additional year of schooling decreases poverty on average by 1.56 percent ($t=-3.00$, $p=0.003$). The percentage of completed secondary education also shows an impact on the growth elasticity of poverty, however, this impact (-0.96) is only slightly higher than without adding this variable.

Even though the average years of tertiary schooling attained and the percentage of completed tertiary education do not show a significant reduction in poverty themselves; and their coefficients in combination with growth do not show significant results, they do increase the growth elasticity of poverty significantly to the highest values of all variables of human capital; -1.17 ($t=-2.91$, $p=0.004$) and -1.18 ($t=-2.94$, $p=0.004$) respectively (see figure 7). Human capital thus significantly and largely contributes to the growth elasticity of poverty.

Another concern is whether openness to the world economy is a contributing factor to the growth elasticity of poverty; that is, whether higher exports and trade contribute to the extent to which increased growth reduces poverty. As table 7 reveals, exports and trade do in fact contribute to the growth elasticity of poverty. In combination with each of these variables, an increase of one percent of growth, reduces poverty by 1.04 ($t=-3.23$, $p=0.001$) and 1.06 ($t=-3.26$, $p=0.001$) percent respectively (compared to the 0.95 reduction without exports and trade). Furthermore, both of these variables contribute to poverty reduction themselves to about the same extent as in single regression; an increase in exports and trade on one percent of GDP reduces poverty by 0.14 ($t=-2.62$, $p=0.009$) and 0.07 ($t=-2.46$, $p=0.015$) percent respectively. Thus, strong support is given to the hypothesis that education and openness to the world economy play a vital role in influencing the growth elasticity of poverty.

It is assumed that there is a relationship of FDI and the growth elasticity of poverty; the higher the investments that flow into developing countries from multinational corporations, the higher the extent to which growth contributes to poverty reduction. Results of empirical data show that even though growth significantly contributes to poverty reduction, it does so by a smaller extent than without adding FDIs. The growth elasticity of poverty reduces from a value of -0.95 to -0.84 ($t=-2.50$, $p=0.013$) by including the ten year lag of FDI net inflows. Furthermore FDI net inflows reduce poverty by 1.37 ($t=-2.87$, $p=0.004$) percent, compared to the 1.71 percent resulting in single regression. The conclusion drawn is that the growth elasticity of poverty in combination with FDI, the extent to which a one percent increase in growth reduces poverty, is lower than for growth alone and lower than any of the other impacting variables. However, FDIs are still one of the most important contributors to poverty reduction.

It will be recalled that government expenditure is expected to have positive effects on the growth elasticity of poverty because it contributes to the accumulation of infrastructure, human capital, health and other skills and crowds-in private investment. High government expenditure in developing countries is necessary for the improvement of infrastructure, health and education systems and the structure of government expenditure is crucial for the direct effect of the growth elasticity of poverty. Data show that, even though government final consumption expenditure, expenditure on health and expenditure on education do not contribute to poverty reductions, they do influence the

growth elasticity of poverty to a large and significant extent. A one percent increase in growth in combination with the three variables mentioned above reduce poverty by 1.33 ($t=-3.42$, $p=0.001$), 1.33 ($t=-3.79$, $p=0.000$) and 1.47 ($t=-3.71$, $p=0.000$) percent respectively (see table 7). Even though (just as in single regressions) the variables for government expenditure do not reduce poverty themselves, they constitute a vital determining factor of the growth elasticity of poverty.

The question of whether the investment rate has a positive effect on the growth elasticity of poverty is asked. In particular, a high investment rate, if focused towards the future rather than the present, enables the achievement of long-term goals and aligning an economy according to its competitive advantage. The answer is that even though a high investment rate does not directly contribute to poverty reduction, it does in fact influence the growth elasticity of poverty. However, the extent to which a relative change in poverty occurs for a one percent increase in growth is almost exactly the same as without adding the variable of investment; a coefficient of -0.95 ($t=-3.06$, $p=0.002$) is shown (see table 7). It is thus concluded that the investment rate does neither positively nor negatively influence the growth elasticity of poverty.

Just as the investment rate, none of the variables for the determinant of private sector composition show significant coefficients in reducing poverty by themselves or in combination with growth. However, it will be recalled that the growth elasticity of poverty is expected to increase if labor-intensive sectors of an economy in developing countries are expanded because the structure of the economy and the development of its sectors are largely determined by its factor endowments and market structure. This hypothesis is verified by data. The growth elasticity of poverty in combination with domestic credit provided to private sector, agriculture value added, manufacturing value added and services value added is significantly higher than without these variables. A one percent increase in growth in combination with each of these variables, decreases poverty by 1.06 ($t=-3.10$, $p=0.002$), 1.05 ($t=-3.16$, $p=0.002$), 1.13 ($t=-3.33$, $p=0.001$) and 1.15 ($t=-3.47$, $p=0.001$) percent respectively. Thus, the hypothesis that advancements in the financial, agricultural, manufacturing and service sector contribute to the growth elasticity of poverty receives strong support.

Institutional quality is expected to contribute to the growth elasticity of poverty because institutions are responsible for a wide variety of tasks that are absolutely necessary for an economy to prosper and for individuals, particularly the poor, to take part in the economic activity of a country. Empirical evidence shows that this is in fact the case and that the growth elasticity of poverty increases by about 50 percent when variables for institutional quality were added to the regression. The growth elasticity of poverty increased from its original value of -0.95 to -1.37 ($t=-2.33$, $p=0.022$) for the five year lag of control of corruption, to -1.41 ($t=-3.43$, $p=0.001$) for government effectiveness, to -1.31 ($t=-3.63$, $p=0.000$) for political stability and absence of violence, to -1.39 ($t=-3.41$, $p=0.001$) for regulatory quality and to -1.31 ($t=-3.69$, $p=0.000$) for the rule of law (see table 7). Even though only the five year lag of corruption shows a small (but positive) coefficient to reduce poverty by itself, institutional quality shows a significant and large effect on the extent to which poverty reduction is achieved through increases in growth.

It is assumed that urbanization positively influences the growth elasticity of poverty because urbanization is the result of growth that utilizes labor-intensive production processes and that this particular type of growth reduces poverty. This assumption is verified by data. Adding the ten year lag of the percentage of population living in urban areas indeed increases the growth elasticity of

poverty to -1.14 ($t=-3.50$, $p=0.001$). Thus a one percent increase in growth reduces poverty by 1.14 percent, rather than 0.95 percent by adding urbanization levels.

Even though democracy did show significant results in poverty reduction, it will be recalled that it is expected that democracy has a small effect on the growth elasticity of poverty because democracy, including political and economic freedom and rights, is viewed as an essential component for development. As table 7 reveals, data show that democracy does indeed increase the growth elasticity of poverty and democracy, with its voice and accountability and polity index, produces growth elasticities of poverty that are higher than without these variables. A one percent increase in growth reduces poverty by 1.36 ($t=-3.74$, $p=0.000$) and 1.12 ($t=-3.38$, $p=0.001$) percent if the voice and accountability and polity index are added respectively.

High levels of population growth are expected to reduce the extent to which growth translates to poverty reduction because the benefits of growth have to be divided between a larger number of people. This hypothesis is not verified by data. The growth elasticity of poverty stays the same at -0.95 ($t=-2.78$, $p=0.006$) but the increasing effect on poverty is quite large (1.51 percent), however, it fails to reach significance ($t=1.48$, $P=0.139$).

The results of multiple regressions show that by adding the determinants one by one to the regression of growth poverty, the growth elasticity of poverty can be positively influenced by certain determinants. Particularly those determinants that did not show significant results in single regressions, namely government expenditure, private sector composition, institutional quality and democracy, increase the estimated growth elasticity of poverty reduction from -0.95 to approximately -1.3 and thus show a large and significant positive impact on the extent to which growth reduces poverty. However, just as in single regressions, these determinants failed to depict a direct impact of the variables on poverty (revealed by the coefficient in the second line of each box in table 7). FDIs, the investment rate and population growth do not show a positive contribution to the growth elasticity of poverty. The investment rate and population growth do not influence the growth elasticity of poverty and their respective coefficients for poverty reduction failed to reveal significance. FDIs decrease the growth elasticity of poverty, however, the direct impact of FDI on poverty is very large and overall FDIs have a significant and large effect on poverty reduction. The determinants of human capital and openness to the world economy reveal a significant contribution to increases in the growth elasticity of poverty as well as a direct impact on poverty reductions for most of their variables. Particularly average years of secondary schooling attained and exports show a high growth elasticity of poverty as well as a high coefficient impacting poverty directly. The biggest contributors through direct poverty reduction and through an increased growth elasticity of poverty are thus human capital, openness to the world economy and FDIs.

4.5 Differences for regions and income classification

The next step in the analysis of empirical data includes the examination of regional differences and differences in income classifications of countries. The most influential variables to reduce poverty are secondary schooling attained, exports and the ten year lag of FDI. These variables were tested according to their regional affiliation and income classification.

Regional differences

This analysis has the goal of investigating whether regional affiliation plays a major role in explaining poverty changes. Results considering the growth elasticity of poverty by region show that there is not one region that stands out as having a higher influence on poverty per percentage of growth than any other (see table 8). The conclusion drawn is that regional affiliation in and of itself does not change the growth elasticity of poverty.

Table 8: Growth elasticity of poverty by regions

GDP per capita growth (5 year lag)	Coefficient	t-stat	p-value	Adjusted R²
Aggregate across all regions	-0.95***	-3.26	0.001	0.0348
East Asia and the Pacific	-1.13	-1.63	0.112	0.0387
Europe and Central Asia	-1.10 *	-1.71	0.098	0.0646
Latin America and the Caribbean	-0.76	-0.56	0.575	-0.0075
Middle East and North Africa	0.41	0.21	0.836	-0.0865
Sub-Saharan Africa	-0.71	-1.67	0.100	0.0251
South Asia	-0.47	-0.28	0.780	-0.0482

When testing the effect of the average years of secondary schooling attained on the growth elasticity of poverty, it is shown that even though none of the coefficients for secondary schooling themselves have a significant effect on poverty reduction, the effect on the growth elasticity of poverty is particularly large in Europe and Central Asia (see table 9). This region has a payoff from secondary schooling attained that is more than twice the size of the aggregate across all regions. Furthermore, Sub-Saharan Africa also shows significant results, however, the payoff is smaller than at the aggregate level. However, these results have to be taken with care as they are only significant at a level of ten percent.

Table 9: Effects of secondary schooling on growth elasticity of poverty by region

Human capital: Average years of secondary schooling attained		Coefficient	t-stat	p-value	Adjusted R²
Aggregate across all regions	Growth elasticity	-1.14 ***	-2.91	0.004	0.0893
	Secondary schooling	-3.23***	-3.66	0.000	
East Asia and the Pacific	Growth elasticity	-1.08	-1.39	0.173	-0.0017
	Secondary schooling	-0.92	-0.41	0.681	
Europe and Central Asia	Growth elasticity	-2.37 *	-1.82	0.096	0.1435
	Secondary schooling	-7.84	-0.52	0.610	
Latin America and the Caribbean	Growth elasticity	-0.46	-0.30	0.767	-0.0059
	Secondary schooling	-2.52	-1.08	0.285	
Middle East and North Africa	Growth elasticity	0.33	0.16	0.876	-0.1875
	Secondary schooling	1.41	0.25	0.805	
Sub-Saharan Africa	Growth elasticity	-0.90*	-2.01	0.051	0.0478
	Secondary schooling	-0.92	-0.65	0.516	
South Asia	Growth elasticity	-0.18	-0.12	0.906	0.0686
	Secondary schooling	-3.74	-1.51	0.150	

Openness to the world economy with its variable of exports as a percentage of GDP plays an important role particularly in East Asia and the Pacific as well as Europe and Central Asia (see table

10). In both regions the growth elasticity of poverty is higher in combination with exports than at the aggregate level and exports themselves contribute to poverty reduction to a larger extent than at the aggregate level.

Table 10: Effects of exports on growth elasticity of poverty by region

Openness to world economy: Exports		Coefficient	t-stat	p-value	Adjusted R²
Aggregate across all regions	Growth elasticity	-1.04 ***	-3.23	0.001	0.0638
	Exports	-0.14***	-2.62	0.009	
East Asia and the Pacific	Growth elasticity	-1.31*	-1.95	0.058	0.1169
	Exports	-0.18**	-2.13	0.039	
Europe and Central Asia	Growth elasticity	-1.32*	-1.73	0.096	0.2073
	Exports	-0.86**	-2.36	0.026	
Latin America and the Caribbean	Growth elasticity	-1.09	-0.79	0.433	-0.0105
	Exports	-0.06	-0.49	0.627	
Middle East and North Africa ²¹	Growth elasticity	1.03	0.46	0.654	-0.1495
	Exports	-0.19	-0.63	0.543	
Sub-Saharan Africa	Growth elasticity	-0.73*	-1.67	0.099	0.0116
	Exports	-0.02	-0.26	0.793	
South Asia	Growth elasticity	0.78	0.39	0.700	-0.0330
	Exports	-0.25	-1.13	0.273	

Even though FDIs play a major role in poverty reduction at the aggregate level, regional affiliation does not reveal an important role. Neither the growth elasticity of poverty nor the coefficient for FDI itself is highly significant in one, compared to other regions (see table 11).

Table 11: Effects of FDI on growth elasticity of poverty by region

FDI (10 year lag)		Coefficient	t-stat	p-value	Adjusted R²
Aggregate across all regions	Growth elasticity	-0.84**	-2.50	0.013	0.0638
	FDI	-1.37***	-2.87	0.004	
East Asia and the Pacific	Growth elasticity	-0.64	-0.89	0.379	0.0998
	FDI	-2.14*	-1.93	0.061	
Europe and Central Asia	Growth elasticity	-1.30	-1.51	0.144	0.0436
	FDI	-0.88	-0.59	0.563	
Latin America and the Caribbean	Growth elasticity	-0.13	-0.09	0.926	0.0062
	FDI	-2.20	-1.50	0.137	
Middle East and North Africa ²²	Growth elasticity	0.66	0.30	0.772	-0.1859
	FDI	-1.04	-0.28	0.785	
Sub-Saharan Africa	Growth elasticity	-0.76*	-1.69	0.096	0.0126
	FDI	0.22	0.37	0.713	
South Asia	Growth elasticity	0.80	0.50	0.622	0.1507
	FDI				

²¹ The number of observations for Middle East and North Africa is too small (n=13) to be taken into consideration.

²² The number of observations for Middle East and North Africa is too small (13) to be taken into consideration.

	FDI	-9.24**	-2.33	0.031	
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Even though, some regions may play a more important role for one or the other variable on the growth elasticity of poverty, the results above show that regional affiliation itself does not account for drastic differences in the effects of certain variables on the growth elasticity of poverty.

Differences in income classification

Data reveals that the growth elasticity of poverty is higher the lower the income of a country. Low income countries show a higher growth elasticity of poverty than lower middle income countries; upper middle income countries do not show significant results and thus the importance of growth in GDP per capita decreases with advancement of economies in their respective development stage (see table 12).

Table 12: Growth elasticity of poverty by income classification

GDP per capita growth (5 year lag)	Coefficient	t-stat	p-value	Adjusted R ²
Aggregate across all incomes	-0.95**	-3.26	0.001	0.0348
Low income countries	-1.13*	-1.85	0.069	0.0347
Lower middle income countries	-0.83***	-3.20	0.002	0.0727
Upper middle income countries	-1.22	-1.27	0.207	-0.0077

Secondary schooling attained plays a particularly important role in poverty reduction in low income countries. The growth elasticity of poverty as well as the coefficient for secondary schooling itself are larger than at the aggregate level (see table 13). The pay-off for an additional year of secondary schooling is also high in lower middle income countries whereas upper middle income countries show insignificant results. It is concluded that the lower the income of a country, the more important the role of secondary education.

Table 13: Effects of secondary schooling on growth elasticity of poverty by income classification

Human capital: Average years of secondary schooling attained		Coefficient	t-stat	p-value	Adjusted R ²
Aggregate across all incomes	Growth elasticity	-1.14 ***	-2.91	0.004	0.0839
	Secondary schooling	-3.23***	-3.66	0.000	
Low income countries	Growth elasticity	-1.37*	-1.82	0.075	0.1198
	Secondary schooling	-3.94**	-2.38	0.022	
Lower middle income countries	Growth elasticity	-1.11***	-3.59	0.001	0.1892
	Secondary schooling	-2.76	-3.50	0.001	
Upper middle income countries	Growth elasticity	-1.13	-0.86	0.392	0.0218
	Secondary schooling	-4.36	-1.40	0.166	

Openness to the world economy indicated by exports as a percentage of GDP, shows that the coefficient of exports is more than twice as high for low income countries than at the aggregate level but the growth elasticity of poverty shows insignificant results. However, the growth elasticity of poverty is slightly larger for lower middle income countries than at the aggregate level but the coefficient for exports is insignificant (see table 14). Upper middle income countries do not show significant results.

Table 14: Effects of exports on growth elasticity of poverty by income classification

Openness to world economy: Exports		Coefficient	t-stat	p-value	Adjusted R ²
Aggregate across all incomes	Growth elasticity	-1.04 ***	-3.23	0.001	0.0638
	Export	-0.14***	-2.62	0.009	
Low income countries	Growth elasticity	-0.89	-1.51	0.135	0.1214
	Export	-0.32***	-2.74	0.008	
Lower middle income countries	Growth elasticity	-1.12***	-3.56	0.001	0.0903
	Export	-0.08	-1.30	0.197	
Upper middle income countries	Growth elasticity	-0.80	-0.76	0.448	0.0267
	Export	-0.20	-1.39	0.168	

FDIs are particularly important for lower and upper middle income countries. The growth elasticity of poverty increases significantly for lower middle income countries and the coefficient for FDIs itself increases drastically compared to the aggregate level (see table 15). This result suggests that through investments of multinational corporations, knowledge and technology spillovers take place that are of particular importance for poverty reduction the higher the level of income in a country.

Table 15: Effects of FDI on growth elasticity of poverty by income classification

FDI (10 year lag)		Coefficient	t-stat	p-value	Adjusted R ²
Aggregate across all incomes	Growth elasticity	-0.84**	-2.50	0.013	0.0638
	FDI	-1.37***	-2.87	0.004	
Low income countries	Growth elasticity	-0.81	-1.25	0.217	0.0492
	FDI	-1.56	-1.42	0.162	
Lower middle income countries	Growth elasticity	-1.05***	-3.25	0.002	0.0780
	FDI	-0.20	-0.36	0.717	
Upper middle income countries	Growth elasticity	-0.52	-0.53	0.598	0.0598
	FDI	-2.43**	-2.32	0.023	

5. Illustrative examples

Sorting countries in the sample according to their growth performance of GDP per capita shows that the best growth performers (China, Azerbaijan, Vietnam, Armenia and Chile) also significantly reduced poverty. In addition they revealed a difference in human capital, openness to the world economy and FDIs. The best growth performers tremendously increased their average years of schooling, average years of secondary schooling, exports and trade as a percentage of GDP and FDI net inflows whereas the worst performers (Burundi, Cote d'Ivoire, Zambia and the Central African Republic) decreased these variables or only increased them slightly. Particularly the two variables chosen for human capital show that years of education are a lot lower for the worst performers. The average growth rate of the four best performers for which data are available (Armenia, Chile, China, Vietnam) is 5.85 percent per year whereas the four worst performers (Burundi, Cote d'Ivoire, Zambia and the Central African Republic) show an annual growth rate of negative 1.32 percent on average. Poverty reduction was approximately 15 percent per year for high growth countries, while poverty increased for three of the worst growth performing countries and only decreased slightly in the

others. The average years of schooling attained is almost nine years for the best and only four years for the worst performers. Secondary schooling attained is 3.4 years compared to one year, FDI new inflows 7.4 compared to 3.6 percent of GDP, exports 41.22 compared to 26.6 percent of GDP and trade 90.67 compared to 64.57 percent of GDP on average for the best and worst performers respectively. Table 16 shows the best and worst growth performers with their corresponding annualized rate of poverty reduction as well as their success in human capital, openness to the world economy and FDIs.

China for example had an average yearly growth rate of GDP per capita of approximately 8.63 percent from 1981 to 2005 while reducing poverty at an average yearly rate of 7.56 percent for the same time period. China also increased its average years of schooling from 4.75 to 7.62 years and its secondary schooling increased from 0.90 to 2.51 years. FDI net inflows are approximately 17 times larger in 2005 than in 1981, and exports and trade as percentage of GDP increased tremendously by about 3 and 2.5 times. On the contrary, Cote d'Ivoire had a negative average yearly growth in GDP per capita of -1.38 percent and poverty increased at an average yearly rate of 3.97 percent from 1985 to 2008. Even though its average years of schooling and average years of secondary schooling slightly increased from 2.44 to 3.70 and 0.85 and 1.18 years respectively, it is at a lower level than for any of the best performers. Additionally, exports and trade only show modest increases. There are also some exceptions such as Georgia and Kenya. Georgia has a tremendous average yearly growth rate in GDP per capita of 7.73 percent. Its poverty rate however increased at an average yearly rate of 9.92 percent. Kenya on the other hand has a negative yearly growth rate in GDP per capita of -0.27 but could achieve reductions in poverty at a rate of 5.13 percent.

Table 16: Best and worst growth performers

Country	time period	Growth ²³	Poverty ²⁴	average schooling		secondary schooling		FDI		exports		trade	
				from	to	from	to	from	to	from	to	from	to
Best Performers													
Armenia	1996-2008	4.68	-21.79	10.41	10.43	4.50	5.23	0.19	7.85	23.24	11.73	79.23	54.51
Azerbaijan	1995-2008	10.54	-20.81	no data available						27.90	69.47	69.41	94.25
Chile	1987-2009	3.97	-11.54	7.74	10.18	2.38	3.92	4.26	7.76	3013	38.14	57.35	68.50
China	1981-2005	8.63	-7.56	4.75	7.62	0.90	2.51	0.21	3.51	12.58	37.08	24.64	68.63
Vietnam	1993-2008	6.12	-10.56	4.57	7.62	0.81	1.99	7.03	10.61	28.72	77.92	66.21	171.05
Worst Performers													
Burundi	1992-2006	-2.29	-0.25	2.16	2.86	0.23	0.39	0.06	0.00	8.75	10.73	38.23	57.71
Central African Republic	1992-2008	-0.82	-1.75	2.66	3.62	0.73	1.03	-0.74	5.89	11.50	10.81	35.62	34.17
Cote d'Ivoire	1985-2008	-1.38	3.97	2.44	3.70	0.85	1.18	0.42	1.91	46.77	46.51	79.17	85.32
Guinea-Bissau	1991-2002	-1.24	1.52	no data available				0.81	1.75	9.98	29.82	47.77	81.04
Madagascar	1980-2005	-0.24	-0.94	no data available				-0.02	1.70	13.34	28.22	43.08	73.78
Zambia	1991-2004	-0.77	0.18	4.89	6.33	0.84	1.02	1.02	6.70	34.61	38.33	71.86	81.09
Exceptions													
Georgia	1996-2008	7.73	9.92	no data available				6.91	12.22	13.33	28.62	45.70	87.02

²³ Average growth rate per year of GDP per capita for time period under consideration

²⁴ Average change in poverty per year for time period under consideration

Kenya	1992-2006	-0.27	-5.13	5.60	7.10	0.79	1.16	0.08	0.11	26.26	28.51	52.93	64.48
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6. Robustness check, shortcomings

Growth variable

To test the robustness of growth of GDP per capita, the variable was exchanged with growth in real GDP. All lags of the growth elasticity of poverty show significant results with growth in real GDP with the five year lag showing the best results (see table 17). The growth elasticity of poverty is slightly higher for growth in real GDP than for per capita terms. Even though the results of GDP per capita might be conservative, it can be concluded that the growth variable is robust when regressed on changes in poverty.

Table 17: Growth elasticity of poverty with growth in real GDP

Growth	Coefficient	t-stat	p-value	Adjusted R ²
Real GDP growth	-0.92***	-2.86	0.005	0.0263
Real GDP growth 5 year lag	-1.15***	-2.92	0.004	0.0275
Real GDP growth 10 year lag	-0.82*	-1.89	0.061	0.0095

Testing the multiple regressions with growth in real GDP (rather than growth in GDP per capita) shows that results are very similar to those for growth in GDP per capita and thus, only the results are reported without making further specifications (see table 18).

Table 18: Summary of combinations of variables with growth in real GDP

Combination of variables: growth in real GDP	Coefficients	t-stat	p-value	Adjusted R ²
Human capital				
Growth in real GDP 5 year lag	-1.31***	-2.89	0.004	0.0771
Average years of schooling	-1.77***	-3.44	0.001	
Growth in real GDP 5 year lag	-1.43***	-3.17	0.002	0.0959
Average years of secondary schooling	-3.57***	-4.04	0.000	
Growth in real GDP 5 year lag	-1.18**	-2.59	0.010	0.0729
Percentage of completed secondary schooling	-0.31***	-3.30	0.001	
Growth in real GDP 5 year lag	-1.26***	-2.73	0.007	0.0359
Average years of tertiary schooling	-2.84	-1.60	0.110	
Growth in real GDP 5 year lag	-1.34***	-2.88	0.007	0.0403
Percentage of completed tertiary schooling	-0.54*	-1.88	0.62	
Openness to world economy				
Growth in real GDP 5 year lag	-1.14***	-2.95	0.004	0.0578
Export	-0.15***	-2.86	0.005	
Growth in real GDP 5 year lag	-1.13***	-2.94	0.004	0.0542
Trade	-0.07***	-2.68	0.008	
FDI				
Growth in real GDP 5 year lag	-0.83**	-2.07	0.039	0.0570
FDI 10 year lag	-1.45***	-3.05	0.003	
Government expenditure				

Growth in real GDP 5 year lag	-1.18***	-2.94	0.004	0.0248
Government final consumption expenditure	-0.11	-0.48	0.634	
Growth in real GDP 5 year lag	-1.31***	-3.10	0.008	0.0360
Health expenditure	-0.82**	-0.96	0.172	
Growth in real GDP 5 year lag	-1.35***	-2.68	0.008	0.0378
Expenditure in education	-1.01	-1.37	0.172	
Investment rate				
Growth in real GDP 5 year lag	-1.14***	-2.68	0.008	0.0238
Investment rate (ki)	-0.01	-0.05	0.962	
Private sector composition				
Growth in real GDP 5 year lag	-1.07***	-2.62	0.009	0.0256
Domestic credit provided to private sector	-0.03	-0.69	0.492	
Growth in real GDP 5 year lag	-1.16***	-2.94	0.004	0.0388
Agriculture value added	0.16**	2.06	0.040	
Growth in real GDP 5 year lag	-1.12***	-2.94	0.006	0.0233
Manufacturing value added	0.04	2.06	0.760	
Growth in real GDP 5 year lag	-1.25***	-3.06	0.002	0.0288
Services value added	-0.12	-1.24	0.215	
Institutional quality				
Growth in real GDP 5 year lag	-1.26**	-2.50	0.013	0.0275
Control of corruption	0.05*	0.88	0.380	
Growth in real GDP 5 year lag	-1.25**	-2.48	0.014	0.0240
Government effectiveness	0.03	0.41	0.686	
Growth in real GDP 5 year lag	-1.33***	-3.09	0.002	0.0502
Political stability and Absence of violence	-0.08	-1.42	0.158	
Growth in real GDP 5 year lag	-1.24**	-2.46	0.015	0.0239
Regulatory quality	0.02	0.39	0.698	
Growth in real GDP 5 year lag	-1.34***	-3.08	0.002	0.0409
Rule of law	-0.02	-0.34	0.737	
Urbanization				
Growth in real GDP 5 year lag	-1.31***	-3.26	0.001	0.0365
Urban population 10 year lag	-0.09*	-1.87	0.063	
Democracy				
Growth in real GDP 5 year lag	-1.38***	-3.13	0.002	0.0401
Voice and accountability index	-0.01	-0.21	0.837	
Growth in real GDP 5 year lag	-1.21***	-2.94	0.004	0.0247
Polity index	-0.08	-0.50	0.618	
Population growth				
Growth in real GDP 5 year lag	-1.11***	-2.84	0.005	0.0378
Population growth 5 year lag	1.81*	1.96	0.051	

*** 1 percent significance level; ** 5 percent significance level; * 10 percent significance level

Fixed Effects Estimation

To stay consistent with the methodology used for OLS estimation, variables used in the FE estimation were selected according to their performance in single FE regression. The ten year lag of growth in

GDP per capita performed best when regressed on poverty (see table 19) and will thus be used as growth variable in FE estimation²⁵.

Table 19: Growth elasticity of poverty using FE estimation

Growth	Coefficients	t-stat	p-value	Overall R ²
GDP per capita growth	-1.27***	-2.73	0.008	0.0359
GDP per capita growth 5 year lag	-1.52***	-2.89	0.005	0.0384
GDP per capita growth 10 year lag	-2.17***	-4.08	0.000	0.0222

The most important discovery is that in general, the growth elasticity of poverty, when adding each determinant to the regression, for FE estimation is higher than for OLS estimation. The propositions drawn from OLS estimation, however, do not change. The biggest contributors to the growth elasticity of poverty and poverty reduction are human capital (particularly the years of secondary and tertiary education play an important role), openness to the world economy and FDIs. The regression of the ten year lag of GDP per capita growth and the ten year lag of average years of tertiary schooling attained on changes in poverty for example shows that the growth elasticity of poverty is -3.53 (compared to the growth elasticity without the added variable of -2.17) and the coefficient for average years of tertiary schooling is -5.16 (see third box of human capital in table 20). The determinants of government expenditure and private sector composition with the exception of services value added also showed a significant increase in the growth elasticity of poverty. The only variables for which the growth elasticity shown in the last row in table 20 decrease considerably when adding other variables to growth, is FDI (as was shown for OLS estimation), the ten year lag of services value added, rule of law and the ten year lag of the voice and accountability index, even though the last two determinants mentioned do not show significance. The elasticity stays at about the same level for openness to the world economy and the ten year lag of population growth.

Table 20: Summary of multiple regressions using FE

Combination of variables using FE	Coefficients	t-stat	p-value	Overall R ²	Coefficients with OLS
Human capital					
GDP per capita growth 10 year lag	-2.57***	-2.72	0.009	0.0637	-0.84**
Average years of schooling 10 year lag	-3.78*	-1.78	0.080		-1.62***
GDP per capita growth 10 year lag	-2.35**	-2.49	0.016	0.0824	-1.07***
Average years of secondary schooling 10 year lag	-10.29*	-1.81	0.076		-3.46***
GDP per capita growth 10 year lag	-2.4**	-2.60	0.012	0.0614	-0.85**
Percentage of completed secondary schooling 10 year lag	-1.01**	-2.06	0.044		-0.29***
GDP per capita growth 10 year lag	-3.53***	-3.57	0.001	0.0306	-0.97**
Average years of tertiary schooling	-5.16***	-7.11	0.000		-2.81
GDP per capita growth 10 year lag	-3.38***	-3.27	0.002	0.0296	-0.99**
Percentage of completed tertiary schooling	-0.61	-0.33	0.746		-0.48*
Openness to world economy					
GDP per capita growth 10 year lag	-2.19***	-2.70	0.009	0.0531	-0.84**

²⁵ Results of single FE regressions are shown in table A.5 in the Appendix

Exports	-0.3**	-2.15	0.035		-0.16***
GDP per capita growth 10 year lag	-2.16**	-2.67	0.010	0.0523	-0.89**
Trade	-0.15	-2.10	0.039		-0.08***
FDI					
GDP per capita growth 10 year lag	-1.93**	-2.22	0.030	0.0597	-0.73**
FDI net inflows 10 year lag	-2.26	-1.29	0.201		-1.56***
Government expenditure					
GDP per capita growth 10 year lag	-2.58***	-3.63	0.001	0.0210	-0.96**
Government final consumption expenditure	0.26	0.65	0.518		-0.13
GDP per capita growth 10 year lag	-2.93***	-3.56	0.001	0.0334	-1.10***
Health expenditure	0.32	0.11	0.913		-0.65
GDP per capita growth 10 year lag	-3.67***	-3.14	0.003	0.0408	-1.36***
Expenditure on education	0.46	0.20	0.839		-0.96
Private sector composition					
GDP per capita growth 10 year lag	-2.58***	-3.52	0.001	0.0235	-0.85**
Domestic credit provided to private sector	0.00	0.05	0.963		-0.02
GDP per capita growth 10 year lag	-2.33***	-2.84	0.006	0.0289	-0.86**
Agriculture value added 10 year lag	0.24	0.98	0.329		-0.09
GDP per capita growth 10 year lag	-2.39***	-3.48	0.001	0.0111	-0.90**
Manufacturing value added 10 year lag	0.77	1.36	0.180		-0.01
GDP per capita growth 10 year lag	-1.71**	-2.21	0.030	0.0109	-0.93**
Services 10 year lag	-0.91**	-2.49	0.015		-0.08
Institutional quality²⁶					
GDP per capita growth 10 year lag	-3.41***	-3.49	0.001	0.0019	-1.12*
Political stability 5 year lag	1.39**	2.37	0.021		0.01
GDP per capita growth 10 year lag	-2.03	-0.85	0.402	0.0001	-1.11***
Rule of law 10 year lag	1.91	0.98	0.333		-0.02
Urbanization					
GDP per capita growth 10 year lag	-2.41***	-3.23	0.002	0.0256	-0.87**
Urban population 10 year lag	-0.43*	-1.84	0.071		2.24**
Democracy					
GDP per capita growth 10 year lag	-1.28	-0.51	0.615	0.0092	-1.13***
Voice and accountability index 10 year lag	-3.48	-1.15	0.257		0.01
GDP per capita growth 10 year lag	-2.53***	-3.48	0.001	0.0231	-0.93**
Polity index	-0.20	-0.69	0.492		-0.01
Population growth					
GDP per capita growth 10 year lag	-2.11***	-2.88	0.005	0.0426	-0.87**
Annual population growth 10 year lag	6.04*	1.70	0.094		2.24**

*** 1 percent significance level; ** 5 percent significance level; * 10 percent significance level

The results of all robustness tests show that the coefficients of the growth elasticity of poverty are increased using growth in real GDP rather than growth in GDP per capita and FE effects rather than OLS estimation. However, the interpretation of results itself does not change and it is thus confirmed that the single and multiple OLS regressions create conservative but stable results.

²⁶ Control of corruption, government effectiveness and regulatory quality show insufficient observations for FE estimation

Shortcomings

Even though this study was conducted with great care, there are some aspects that require special mention. Although recent literature on poverty reduction has placed a focus on the change in the distribution of incomes, the topic of inequality is not addressed because of the very specific focus set forth in this study. The effects of growth on poverty reduction, rather than the effects of inequality on poverty reduction was chosen because “most of the variation in changes in poverty is due to growth in average incomes” (Kraay, 2006, p. 199) and “that the incomes of the very poorest on average do not grow more slowly than average incomes” (p. 213). Thus, the concept of poverty used in this study does not account for inequality and the growth elasticity of poverty is estimated without considering changes in inequality. Following the main approach in recent literature on poverty reduction, an absolute measure of poverty, the poverty line of \$ 1.25 per day, was chosen. Even though it is believed that results would not change drastically if more bottom-sensitive poverty measures were used; which places a higher emphasis on the income or expenditure of the poorest of society; differing results could occur. Furthermore, data were not adjusted for population size. The results presented are conservative estimates as the coefficients of the growth elasticity of poverty tend to increase with growth in real GDP rather than growth in GDP per capita and with fixed effects estimation.

7. Conclusion

The study investigates the determinants of the growth elasticity of poverty by using the internationally designed poverty line of \$ 1.25 per day with single and multiple OLS and FE regressions. Data of 65 developing countries from 1983 to 2009 show two main results. The main result is that growth in GDP per capita is in fact one of the important and significant contributors to reductions in poverty particularly in the long run and for low income countries (otherwise the elasticity is independent of the region in which growth occurs). The second probably equal important result is that (i) some variables significantly increase the coefficient ‘growth elasticity of poverty reduction’, specifically human capital, openness to trade, government expenditure, institutional quality and democracy, and (ii) other variables impact significantly and directly poverty reduction namely human capital, openness to trade and FDI. Thus two sets of variables complement the effect of growth on poverty. The determinants cluster around institutions, human capital and openness and are not easy to disentangle, this can be seen from the fact that equations with more than two or three explanatory variable do not add to the explanatory power for poverty reduction and variables added often reduce the significance of existing variables due to multicollinearity.

Referring to human capital we find that secondary education plays a more important role in poverty reduction on average than average years of schooling and tertiary education in developing countries. This does not mean however, that policies improving tertiary education should not be advanced; it simply shows that with early development stages (developing compared to developed countries); policies that increase secondary education for large parts of the population play a major role because economies mainly operate in agriculture and low-skilled manufacturing, rather than high-skilled manufacturing. Results also show that the lower the income of a country, the more important the role of secondary education. The practical implications of the impact on the growth elasticity of poverty and poverty reduction have to be taken somewhat with care. Even though it is shown that they are conservative but stable in the robustness check, one has to keep in mind that one additional year of schooling might not be easily attained, particularly considering the low starting point in many

developing countries. The average years of secondary schooling attained for example was only 2.35 on average in 2009 across all countries included in the sample.

Openness plays an important role for poverty reduction, be it trade openness or inward foreign direct investment. Specifically exports as a percentage of GDP contribute to the growth elasticity of poverty and have a major contribution to direct poverty reduction. FDI net inflows have a significant impact on poverty reduction whereas the growth elasticity of poverty is lower when FDI is added than for any of the other impacting variables. Furthermore, FDIs require long time lags to absorb the technological advancement multinational corporations pass on to a country. However, to increase FDIs, certain prerequisites have to be met and government resources have to be allocated toward a stable financial system, stable macroeconomic environment and infrastructure.

The tentative policy implication of this paper is first that growth is an important driver of poverty reduction; second human capital, openness to trade, institutional quality and democracy increase the growth elasticity of poverty while human capital, openness to trade and FDIs impact poverty reduction directly. Growth as well as these additional variables are the keys to success in poverty reduction. Further research is needed to show whether these results are confirmed if the recent financial crisis is taken into account, and if other poverty measures are used.

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Appendix

Table A.1: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
v1	3250	2283.192	1218.065	151	4700
country	0				
country_code	0				
code	3250	33	18.76455	1	65
year	3250	1984.5	14.43309	1960	2009
poverty_level	414	25.86024	23.73247	.03	92.55
change_pov~y	268	-5.11694	15.73593	-81.35	101.83
yearly_gro~c	2730	1.673582	5.437417	-46.89	37.84
growthpc	270	2.357481	3.486021	-22.44	16.22
growthpc_5	270	1.708556	3.247809	-22.44	12.34
growthpc_10	270	1.256593	2.994584	-22.44	9.31
growthpc_5~g	267	1.112135	3.918933	-19.41	10.25
growthpc_1~g	266	.6873308	3.654218	-19.41	9.26
yearly_gro~h	2951	4.251261	6.47953	-50.4	92.04
growth	269	4.434349	2.96855	-6.63	16.79
growth_5	269	4.000186	2.424581	-6.63	13.06
growth_10	269	3.807212	2.223844	-6.63	10.17
growth_5_lag	264	3.555417	3.256702	-19.13	16.38
growth_10~g	264	3.424545	2.876664	-19.13	9.85
yearly_gdppc	1844	3432.439	3071.781	303.48	17567.59
second_com~e	614	11.24267	11.87797	.1	62.5
second_comp	211	16.02028	11.8053	.5	62.3
second_com~5	243	15.23617	11.89033	.4	62.05
second_co~10	243	14.21107	11.45904	.33	61.07
tertiary_c~e	614	2.597068	3.27404	0	22.9
tertiary_c~p	211	4.13109	3.948306	.2	21.7
tertiary_c~5	243	3.901111	3.728064	.1	21.1
tertiary_c~0	243	3.602922	3.480806	.1	19.67
yrs_school~e	614	4.644495	2.520845	.13	10.88
yrs_school	211	5.984739	2.143582	.9	10.42
yrs_school_5	243	5.810123	2.162206	.84	10.42
yrs_schoo~10	243	5.563333	2.136596	.76	10.42
secondary~e	614	1.376857	1.248219	.01	6.47
secondary	211	1.903365	1.24488	.11	6.47
secondary_5	243	1.825967	1.228239	.1	6.47
secondary_10	243	1.730494	1.206031	.09	6.47
tertiary_b~e	614	.1585342	.3083066	0	6.47
tertiary	211	.2883412	.6367137	.01	6.47
tertiary_5	243	.2557202	.4037221	.01	3.55
tertiary_10	243	.248107	.3972328	.01	3.55
yearly_exp~t	2738	25.36559	15.95659	2.09	121.31
export	267	30.20944	17.24957	4.73	111.4
export_5	269	28.91271	16.30775	5.22	101.61
export_10	269	27.78844	15.52117	5.07	93
yearly_trade	2738	57.40162	32.73243	5.31	220.41
trade	267	66.50004	34.9876	13.3	205.05
trade_5	269	64.06896	33.28495	13.16	192.52
trade_10	269	61.81788	31.71245	11.56	176.68
yearly_fdi	2120	2.111269	3.615418	-25.78	45.15
fdi	269	2.698996	2.650966	-1.47	19.89
fdi_5	269	2.344052	2.269068	-.37	14.81
fdi_10	269	2.061599	2.034695	-.16	14.52
yearly_hea~h	975	2.473918	1.217488	.27	7.12
health	208	2.506538	1.242684	.65	6.45
health_5	207	2.448696	1.223522	.65	6.2
health_10	207	2.436377	1.220053	.65	6.2
yearly_edu~n	679	3.889116	1.906381	0	15.31
education	162	3.730494	1.557048	.83	12.62
education_5	210	3.596238	1.557974	.83	12.62
education_10	242	3.605207	1.558264	.43	11.6
yearly_ki	2979	20.34137	10.50301	-10.85	111.35

ki	270	20.64489	7.578864	2.73	46.25
ki_5	270	20.38393	7.351357	3.3	48.03
ki_10	270	20.31807	7.262362	3.47	51.08
yearly_gov~m	2683	13.05673	5.864376	1.4	64.39
gov_consum	265	12.39079	4.38133	4.23	36.42
gov_consum_5	266	12.46429	4.224897	4.27	34.42
gov_consu~10	266	12.65305	4.287875	4.42	32.66
yearly_cre~t	2631	24.33794	21.90868	0	161.91
credit	269	29.67937	26.15706	1	141.48
credit_5	269	28.36554	23.40474	1.44	128.7
credit_10	269	27.27647	21.09595	2.15	116
yearly_agr~e	2417	27.04966	15.70484	2.67	94.85
agriculture	263	21.25331	12.6983	3.29	58.29
agricultur~5	264	22.45348	12.93733	3.53	58.44
agricultu~10	264	23.3317	13.04518	3.77	58.44
yearly_man~t	2259	15.40418	6.90496	.8	45.28
manufact	263	16.81414	6.706629	3.12	36.78
manufact_5	264	17.01348	6.710113	3.29	38.3
manufact_10	264	17.13989	6.718785	3.29	37.56
yearly_ser~e	2398	45.70874	11.08289	7.64	78.53
service	263	49.16084	10.4522	21.72	75.93
service_5	264	48.15106	10.30217	21.72	75.45
service_10	264	47.32212	10.07466	21.72	74.79
yearly_cor~n	650	35.03206	19.06339	1.456311	92.23301
corruption	170	35.21124	18.56439	3.16	90.13
corruption_5	102	35.42529	18.33457	3.48	90.27
corruptio~10	21	31.31619	15.90045	5.54	72.75
yearly_gov~t	650	38.26551	19.27741	1.456311	88.34952
gov_effect	170	39.07029	18.07095	3.4	88.35
gov_effect_5	101	39.53188	17.38063	4.04	87.26
gov_effec~10	20	37.8615	14.78616	17.89	66.12
yearly_sta~y	715	31.21202	18.85316	0	87.5
stability	191	32.45419	18.65571	2.88	87.5
stability_5	117	33.18368	17.88524	3.43	76.92
stability_10	50	31.8628	18.06173	5.65	75.69
yearly_qua~y	650	40.39288	18.64258	2.898551	94.68599
quality	170	42.30853	18.4274	5.85	92.58
quality_5	101	43.77574	17.53924	9.41	92.27
quality_10	20	42.531	15.05331	22.79	67.98
yearly_law	715	34.15592	18.12289	1.428571	89.52381
law	192	34.96323	17.07839	1.43	88.04
law_5	116	34.94198	16.21017	4.87	87.58
law_10	50	33.824	16.02864	8.81	87.58
yearly_urb~p	3250	37.15557	20.12725	2	93.66
urban_pop	269	46.49836	20.14821	7.23	92
urban_pop_5	269	45.40394	20.0233	6.75	90.7
urban_pop_10	269	44.27416	19.89793	6.24	89.32
yearly_rur~p	3250	62.84443	20.12725	6.34	98
rural_pop	269	53.50242	20.14832	8.01	92.77
rural_pop_5	269	54.59665	20.02313	9.3	93.25
rural_pop_10	269	55.7261	19.898	10.68	93.76
yearly_voice	715	37.05844	18.40771	2.884615	88.94231
voice	193	39.03052	18.50045	3.83	84.96
voice_5	116	40.55517	18.39709	7.21	83
voice_10	50	38.981	18.95185	7.76	81.4
yearly_pol~y	2947	-.3708856	6.684217	-10	10
polity	270	2.831963	5.931884	-9	10
polity_5	270	2.186074	5.901261	-9	10
polity_10	270	1.509926	5.840518	-9	10
yearly_pop~h	3250	2.175098	1.009101	-8.27	10.04
pop_growth	269	1.811747	1.006538	-1.81	4.06
pop_growth_5	269	1.89881	1.023375	-1.52	4.39
pop_growth~10	269	1.983717	.9742833	-1.38	4.43
income	3250	1.908	.7589604	1	3
region	3250	3.632	1.544644	1	6
country1	3250	33	18.76455	1	65

Table A.2: Summary of all variables used in the study

Determinant	Variables	Source	Comments
Poverty	Poverty headcount index [change_poverty] ²⁷	World Development Indicators	Headcount index that measures the percentage of population that lives below the international poverty line of \$ 1.25 per day in PPP
Growth	GDP per capita growth [growhpc]	World Development Indicators	Annual percentage growth rate of GDP per capita at market prices based on constant local currency
Human capital	Average years of schooling attained [yrs_school]	Barro Lee Educational Attainment Dataset	Average years of schooling attained by population aged 15 and over
	Average years of secondary schooling attained [secondary]	Barro Lee Educational Attainment Dataset	Average years of secondary education completed among people over age 15
	Completed secondary schooling attained (% of population) [second_comp]	Barro Lee Educational Attainment Dataset	Percentage of complete secondary schooling attained in population of the total population 15 years and older
	Average years of tertiary schooling attained [tertiary]	Barro Lee Educational Attainment Dataset	Average years of tertiary education completed among people over age 15
	Completed tertiary schooling attained (% of population) [tertiary_comp]	Barro Lee Educational Attainment Dataset	Percentage of complete tertiary schooling attained in population of the total population 15 years and older
	Openness to world economy	Trade (% of GDP) [trade]	World Development Indicators
Exports of goods and services (% of GDP) [export]		World Development Indicators	Value of all goods and other market services provided to the rest of the world
Foreign direct investment	FDI, net inflow (% of GDP) [fdi]	World Development Indicators	Net inflows of investments to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of

²⁷ The name in squared paranthesis indicates the variable name of the input command in the statistical software package used

			the investor
Government expenditure	general government final consumption expenditure (% of GDP) [gov_consum]	World Development Indicators	All government current expenditures for purchases of goods and services (including compensation of employees)
	Public spending on education, total (% of GDP) [education]	World Development Indicators	Government spending on educational institutions (both public and private), education administration as well as subsidies for private entities
	Health expenditure, public (% of GDP) [health]	World Development Indicators	Recurrent and capital spending from government, budgets, external borrowings and grants and social health insurance funds
Investment rate	Ki [ki]	Penn World Table	Investment share of real GDP per capita
Private sector composition	Domestic credit provided to private sector (% of GDP) [credit]	World Development Indicators	Financial resources provided to the private sector, such as through loans, purchases of non-equity securities, and trade credits and other accounts receivable, that establish a claim for repayment.
	Agriculture, value added (% of GDP) [agriculture]	World Development Indicators	Agriculture includes forestry, hunting, and fishing, as well as cultivation of crops and livestock production. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources.
	Manufacturing, value added (% of GDP) [manufact]	World Development Indicators	Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources.
	Services, value added (% of GDP) [service]	World Development Indicators	Services include value added in wholesale and retail trade (including hotels and restaurants), transport, and government, financial, professional, and personal services such as education, health care, and real estate services. Also included are imputed bank service charges, import duties, and any statistical discrepancies noted by national compilers as well as discrepancies arising

			from rescaling.
Institutional quality	Political Stability and Absence of Violence/Terrorism [stability]	Worldwide Governance Indicators	Perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism.
	Control of Corruption [corruption]	Worldwide Governance Indicators	Perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as 'capture' of the state by elites and private interests.
	Government Effectiveness [gov_effect]	Worldwide Governance Indicators	Perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.
	Regulatory Quality [quality]	Worldwide Governance Indicators	Perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote Private sector development.
	Rule of Law [law]	Worldwide Governance Indicators	Perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.
Urbanization	Urban population (% of total) [urban_pop]	World Development Indicators	People living in urban areas as defined by national statistical offices.
Democracy	Polity [polity]	Polity IV: Regime Authority Characteristics and Transitions Datasets	Combined Polity Score: The POLITY score is computed by subtracting the AUTOC score from the DEMOC score; the resulting unified polity scale ranges from +10 (strongly democratic) to -10 (strongly autocratic).
	Voice and Accountability Index [voice]	Worldwide Governance Indicators	Perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.
Population growth	Population growth (annual %) [pop_growth]	World Development Indicators	Annual population growth rate

Table A.3: Summary of all poverty spells in the sample

The table lists all years for the poverty spells used in the sample. The average length of poverty spells is 4.1 years with a median of three years. The longest spell includes 13 years whereas the shortest spell (by definition) is two years.

Country	Poverty spell	Country	Poverty spell	Country	Poverty spell	
Armenia	1996-1999	Ethiopia	1982-1995	Moldova	1988-1992	
	1999-2001		1995-2000		1992-1997	
	2001-2003		2000-2005		1997-2002	
	2003-2008		1996-1999		2002-2004	
Azerbaijan	1995-2001	Georgia	1999-2002	Mongolia	2004-2008	
	2001-2005		2002-2005		1995-1998	
	2005-2008		2005-2008		1998-2002	
Bangladesh	1984-1986	Ghana	1987-1989	Morocco	2002-2005	
	1986-1989		1989-1992		1985-1991	
	1989-1992		1992-1998		1991-1999	
	1992-1996		1998-2006		1999-2001	
	1996-2000		1987-1989		2001-2007	
Bolivia	2000-2005	Guatemala	1989-1998	Mozambique	1997-2003	
	1997-1999		1998-2000		2003-2008	
	1999-2002		2000-2002		Nepal	1985-1996
	2002-2005		1991-1994			1996-2004
Brazil	2005-2007	Guinea	1994-2003	Nicaragua	1996-1998	
	1981-1983		2003-2007		1998-2001	
	1983-1986		1991-1993		2001-2005	
	1986-1989	Guinea-Bissau	1993-2002	Niger	1992-1994	
	1989-1992		1989-1992		1994-2005	
	1992-1995		1992-1997		2005-2007	
	1995-1998	Honduras	1997-1999	Nigeria	1986-1993	
	1998-2001		1999-2003		1993-1996	
	2001-2004		2003-2007		1996-2004	
	2004-2008		1978-1983		1987-1991	
	Burkina Faso	1994-1998	India	1983-1988	Pakistan	1991-1997
		1998-2003		1988-1994		1997-1999
	Burundi	1992-1998	Indonesia	1994-2005	Panama	1999-2002
1998-2006		1984-1987		2002-2005		
1994-2004		1987-1990		1979-1991		
Cambodia	2004-2007	Iran, Islamic Rep.	1990-1993	Paraguay	1991-1995	
	1996-2001		1993-1996		1995-1997	
Cameroon	2001-2007	India	1996-1999	Peru	1997-2001	
	1992-2003		1999-2002		2001-2004	
Central African Republic	2003-2008	Indonesia	2002-2005	Paraguay	2004-2006	
	1987-1990		2005-2009		1990-1995	
Chile	1990-1994	Iran, Islamic Rep.	1986-1990	Paraguay	1995-1999	
	1994-1996		1990-1994		1999-2002	
	1996-1998		1994-1998		2002-2005	
	1998-2000		1998-2005		2005-2008	
	2000-2003		1990-1993		1994-1996	
	2003-2006		1993-1996		1996-2001	

	2006-2009		1996-1999		2001-2005
China	1981-1984		1999-2002		2005-2009
	1984-1987		2002-2004	Philippines	1985-1988
	1987-1990	Kazakhstan	1993-1996		1988-1991
	1990-1992		1996-2003		1991-1994
	1992-1995		2003-2007		1994-1997
	1995-1998	Kenya	1992-1994		1997-2000
	1998-2002		1994-1997		2000-2003
	2002-2005		1997-2005		2003-2006
Colombia	1980-1988	Kyrgyz Republic	1993-1998	Rwanda	1985-2000
	1988-1991		1998-2002		2000-2005
	1991-1995		2002-2004	Senegal	1991-1995
	1995-1998		2004-2007		1995-2001
	1998-2000	Lao PDR	1992-1997		2001-2005
	2000-2003		1997-2002	South Africa	1993-1995
	2003-2006		2002-2008		1995-2000
Costa Rica	1981-1986	Lesotho	1987-1993		2000-2006
	1986-1990		1993-2003	Sri Lanka	1985-1991
	1990-1993	Lithuania	1993-1998		1991-1996
	1993-1996		1998-2000		1996-2002
	1996-2000		2000-2002		2002-2007
	2000-2003		2002-2004	Tanzania	1992-2000
	2003-2005	Madagascar	1980-1993		2000-2007
	2005-2009		1993-1997	Tunisia	1985-1990
Cote d'Ivoire	1985-1988		1997-1999		1990-1995
	1988-1993		1999-2001		1995-2000
	1993-1995		2001-2005	Turkey	1987-1994
	1995-1998	Malaysia	1984-1987		1994-2002
	1998-2002		1987-1989		2002-2005
	2002-2008		1989-1992	Uganda	1989-1992
Dominican Rep.	1986-1989		1992-1995		1992-1996
	1989-1992		1995-1997		1996-1999
	1992-1996		1997-2004		1999-2002
	1996-2000	Mali	1989-1994		2002-2005
	2000-2003		1994-2001		2005-2009
	2003-2007		2001-2006	Venezuela, RB	1981-1987
Ecuador	1987-1994	Mauritania	1987-1993		1987-1995
	1994-1998		1993-1996		1995-1998
	1998-2003		1996-2000		1998-2003
	2003-2005	Mexico	1984-1989		2003-2006
	2005-2007		1989-1992	Vietnam	1993-1998
	2007-2009		1992-1995		1998-2002
Egypt, Arab Rep.	1991-1996		1995-1998		2002-2004
	1996-2000		1998-2002		2004-2006
	2000-2005		2002-2006		2006-2008
El Salvador	1989-1995		2006-2008	Zambia	1991-1993
	1995-1998				1993-1996
	1998-2002				1996-1998
	2002-2005				1998-2004
	2005-2008				

Table A.4: Countries per region included in the sample

The table below shows the countries included in each region in the sample according to the World Bank regional classification of developing countries.

East Asia and Pacific		
Cambodia	Lao PDR	Philippines
China	Malaysia	Vietnam
Indonesia	Mongolia	
Europe and Central Asia		
Armenia	Kazakhstan	Moldova
Azerbaijan	Kyrgyz Republic	Turkey
Georgia	Lithuania	
Latin America and the Caribbean		
Bolivia	Ecuador	Nicaragua
Brazil	El Salvador	Panama
Chile	Guatemala	Paraguay
Colombia	Honduras	Peru
Costa Rica	Jamaica	Venezuela, RB
Dominican Republic	Mexico	
Middle East and North Africa		
Egypt, Arab Rep.	Morocco	
Iran, Islamic Rep.	Tunisia	
South Asia		
Bangladesh	Nepal	Sri Lanka
India	Pakistan	
Sub-Saharan Africa		
Burkina Faso	Guinea-Bissau	Nigeria
Burundi	Kenya	Rwanda
Cameroon	Lesotho	Senegal
Central African Republic	Madagascar	South Africa
Côte d'Ivoire	Mali	Tanzania
Ethiopia	Mauritania	Uganda
Ghana	Mozambique	Zambia
Guinea	Niger	

Source: <http://data.worldbank.org/about/country-classifications/country-and-lending-groups>
[19.04.2011]

Table A.5: Summary of all variables in used in single regression with FE estimation

	significant	not significant	p-value	Overall R ²
Growth				
GDP per capita growth	-1.27***		0.008	0.0359
GDP per capita growth 5 year lag	-1.52***		0.005	0.0384
GDP per capita growth 10 year lag	-2.17***		0.000	0.0222
Real GDP growth	-1.22**		0.049	0.0300
Real GDP growth 5 year lag	-2.17***		0.006	0.0312
Real GDP growth 10 year lag	-2.80***		0.003	0.0132
Human capital				
Average years of schooling	-5.19***		0.052	0.0487
Average years of schooling 5 year lag	-5.55***		0.012	0.0466
Average years of schooling 10 year lag	-5.78***		0.009	0.0467
Average years of secondary schooling	-12.64***		0.006	0.0607
Average years of secondary schooling 5 year lag	-11.33**		0.056	0.0561
Average years of secondary schooling 10 year lag	-13.90**		0.021	0.0554
Average years of tertiary schooling	-5.01***		0.000	0.0104
Average years of tertiary schooling 5 year lag		-2.17	0.525	0.0032
Average years of tertiary schooling 10 year lag		-20.18	0.197	0.0039
Percentage of completed secondary schooling	-1.05***		0.005	0.0517
Percentage of completed secondary schooling 5 year lag	-1.17***		0.010	0.0423
Percentage of completed secondary schooling 10 year lag	-1.37***		0.010	0.0434
Percentage of completed tertiary schooling		-1.54	0.416	0.0110
Percentage of completed tertiary schooling 5 year lag		-1.50	0.328	0.0096
Percentage of completed tertiary schooling 10 year lag		-1.43	0.307	0.0101
Openness to world economy				
Exports	-0.49***		0.001	0.0340
Exports 5 year lag	-0.40***		0.009	0.0294
Exports 10 year lag	-0.48**		0.014	0.0281
Trade	-0.26***		0.002	0.0303
Trade 5 year lag	-0.19**		0.017	0.0249
Trade 10 year lag	-0.24**		0.026	0.0237
FDI				
FDI net inflows		-0.65	0.359	0.0163
FDI net inflows 5 year lag	-2.31*		0.061	0.0386
FDI net inflows 10 year lag	-3.68**		0.030	0.0489
Government expenditure				
Government final consumption expenditure		0.28	0.463	0.0001
Government final consumption expenditure 5 year lag		0.47	0.334	0.0005
Government final consumption expenditure 10 year lag		0.58	0.345	0.0011
Public health expenditure		-0.36	0.916	0.0003
Public health expenditure 5 year lag		2.99	0.635	0.0002
Public health expenditure 10 year lag		2.36	0.685	0.0008

Public spending on education		-1.18	0.680	0.0068
Public spending on education 5 year lag		0.16	0.926	0.0003
Public spending on education 10 year lag		1.29	0.485	0.0010
Investment rate				
Investment share		-0.03	0.930	0.0044
Investment share 5 year lag		0.13	0.751	0.0031
Investment share 10 year lag		0.14	0.751	0.0026
Private sector composition				
Domestic credit to private sector		-0.09	0.396	0.0078
Domestic credit to private sector 5 year lag		-0.07	0.478	0.0052
Domestic credit to private sector 10 year lag		-0.12	0.409	0.0047
Agriculture value added	0.68***		0.008	0.0143
Agriculture value added 5 year lag	0.78***		0.003	0.0118
Agriculture value added 10 year lag	0.82***		0.002	0.0086
Manufacturing value added		0.69	0.104	0.0017
Manufacturing value added 5 year lag		0.63	0.158	0.0017
Manufacturing value added 10 year lag	1.05*		0.088	0.0015
Services value added	-0.56*		0.066	0.0013
Services value added 5 year lag	-0.87***		0.010	0.0018
Services value added 10 year lag	-1.31***		0.002	0.0015
Institutional quality				
Control of Corruption		0.31	0.329	0.0029
Control of Corruption 5 year lag		0.47	0.326	0.0272
Control of Corruption 10 year lag	-480.3***		0.000	0.0031
Government Effectiveness		0.34	0.313	0.0001
Government Effectiveness 5 year lag		0.58	0.252	0.0106
Government Effectiveness 10 year lag	-15.31*		0.063	0.0481
Political Stability		0.31	0.248	0.0125
Political Stability 5 year lag	1.40**	1.40	0.051	0.0001
Political Stability 10 year lag		4.36	0.130	0.0529
Regulatory Quality		0.31	0.222	0.0005
Regulatory Quality 5 year lag		0.35	0.425	0.0125
Regulatory Quality 10 year lag	-12.93***		0.000	0.0102
Rule of Law		0.44	0.140	0.0033
Rule of Law 5 year lag		1.08	0.148	0.0060
Rule of Law 10 year lag		1.59	0.357	0.0003
Urbanization				
Urbanization levels	-0.55***		0.009	0.0045
Urbanization levels 5 year lag	-0.58***		0.007	0.0048
Urbanization levels 10 year lag	-0.62***		0.005	0.0053
Democracy				
Voice and Accountability		0.42	0.212	0.0010
Voice and Accountability 5 year lag		1.03	0.134	0.0226
Voice and Accountability 10 year lag		-3.43	0.266	0.0087
Polity score		-0.38	0.160	0.0004

Polity score 5 year lag		-0.32	0.218	0.0001
Polity score 10 year lag		-0.23	0.476	0.000
Population growth				
Annual population growth		0.27	0.954	0.0098
Annual population growth 5 year lag		4.90	0.137	0.0159
Annual population growth 10 year lag	10.80***		0.005	0.0220