"Changing the Narrative: The Need for a More Holistic Approach to Eradicate Poverty"

A Linear Regression Analysis of Alternative Policy Domains regarding the Reduction of Extreme

Poverty Levels Worldwide

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Abstract

If we want to eliminate extreme poverty by 2030, new strategies of poverty reduction need to be formulated. This requires a stronger focus on the planning and implementation process of policy making, eliminating the "anything goes" mindset. Furthermore, we need to shift from the common growth-centric, to a more holistic development strategy. Poverty should be tackled with a multi-dimensional perspective, including the impacts of social and political inequalities among society. Recognising these needs, this research applied a multiple-linear regression analysis to determine the statistical associations between different socio-economic policy domains and extreme poverty levels on a global scale. Next to an overall investigation, it concentrated the data analysis specifically on low- and middle-income countries to capture the circumstances of those most in need. The results present negative associations between Poverty and Life Expectancy, the Labour Force Gender Ratio, as well as overall Income Inequality. While this indicates that a focus on these variables might positively contribute to the reduction of poverty, more country-specific research is needed. Surprisingly, logGDP per capita showed a positive association with Poverty, suggesting that it is not a useful predictor of poverty and does not capture human-wellbeing. In light of these results, it must be profoundly discussed why the growth-centric approach still remains the default in the development discussion.

Keywords: Poverty; Inclusion; Growth; Policy Development; Statistical Analysis

Contents

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"Eradication of extreme poverty for all people everywhere by 2030" (United Nations, 2022) – has it become a dream of the past? The United Nations' Sustainable Development Goal number one seemed ambitious but achievable in 2015; however, seven years later it appears to be out of reach (Roser & Ortiz-Ospina, 2013; Lakner, Mahler, Negre, & Prydz, 2021). While we observed a downward trend in global poverty numbers over the last two decades, 100 million additional people were pushed into poverty following the COVID-19 pandemic (Yonzan, Lakner, Mahler, Aguilar & Wu, 2020). It is unfortunately the already destitute population groups who suffer from these negative developments the most (Mahler, Yonzan, Lakner, Aguilar, & Wu, 2021). Moreover, the pandemic demonstrated clearer than before that poverty is not only an issue of lacking financial means but is also influenced by many other socio-economic dimensions such as health and infrastructure (World Bank, 2020).

Growth is good, but not enough. Several growth promoting policies have been used in different, especially developing countries, aiming to lift the poor out of poverty. Despite these efforts, millions are still facing the challenges of extreme poverty and are excluded from the promised growth profits (Desai, 2016). The World Bank (2014a) recognized the issue early on, stating that, while growth is necessary to enable innovation and create new opportunities, it might not benefit those in need as they lack the necessary skills or access. Impacted health, stigma or social inequalities might make it impossible for individuals to escape their life in poverty (Thomas & Gaspart, 2015). Furthermore, the consequences of unequal income distribution show that the alluring concept of growth we have been following so far is increasing the poverty gap, also impacting countries that seem to be well-off on paper (Lakner, Mahler, Negre, & Prydz, 2021).

The slow progress in eliminating extreme poverty calls for new action plans and policies, which will not only reduce the high numbers of poverty globally, but also reduce the inequalities within countries (World Bank, 2017). It is necessary to take a step back and re-evaluate the problem of poverty, identifying its main components and thus targets of new policies. The United Nations already paved the way by pointing out the multidimensionality of poverty by proclaiming to "eliminate

poverty in all forms" (United Nations, 2022). By shifting from the commonly applied economic perspective to a more holistic approach of policy making, tackling poverty in health, education, and opportunity, there is hope that we can reduce global poverty levels and empower those most in need (Burchi, Rippin, & Montenegro, 2018).

Governments and social institutions must take on the responsibility of formulating new policies to reduce poverty levels of their country. It is evident that there has been no "one-fits-all" model, as the circumstances in each country – or even region – will influence the policies outcome; too often those outcomes show the adverse effect if implemented without caution (Burchi, Rippin, & Montenegro, 2018; Castro, 2016). Therefore, countries need to put much more emphasis on the policy development process, generating sets of policy priorities and evaluating the most effective poverty reducing reforms (Rodrik., Hausmann, & Velasco, 2005; World Bank, 2014b).

Nonetheless, this precise analysis of the country's resources, opportunities and already existing policies is a high time and financial investment, requiring additional resources and knowledge that are often not available (World Bank, 2021)Resulting in failing policies and further costs, the need for a comprehensive framework to simplify the policy making process becomes all the more clear (Ahmed & Dantata, 2016; Rodrick & Rosenzweig, 2009). Moreover, it needs to be established what policy domains are proven to have an impact on poverty numbers generally, before valuable resources are wasted on superfluous analyses of variables.

Therefore, this paper is undertaking the first necessary step of providing empirical results of a global poverty data analysis, looking at poverty determinants from a holistic set of policy domains that might be conducive in reducing poverty levels. Specifically, it will try to answer the questions, whether *global poverty levels can be determined by policy domains other than economic performance* and, should the former be confirmed, *which concrete indicators of these domains show significant associations with poverty*. With reference to the Inclusive Development Framework, this study will analyse different socio-economic domains and try to reformulate the common understanding of poverty, shifting the focus from a pure economic concept to a holistic perspective. While this will only

result in a broad overview of potential leads in the reduction of poverty, the pre-selection of determinants might ease the analysis process for individual countries.

The following chapter will provide an overview of current poverty numbers, elaborating on the developments and achievements of the past decades. It will then continue to explain the main challenges of poverty such as the poverty trap phenomenon, as it is necessary to understand the context of poverty before developing effective solution approaches. Afterwards, it will explain the need for a more holistic development strategy and introduce the Inclusive Development Framework. Reviewing a selection of projects who have implemented this framework, the study condenses the findings in seven specific policy domains that seem conducive in reducing poverty.

The main part of this study will then be the statistical analysis of the formerly defined domains and their association with poverty. Following a detailed explanation of the methods and data chosen for this study, multiple-linear regressions will be used to examine the associations between domain-representative variables and the share of people living in extreme poverty. Attention will particularly be paid to the analysis of low- and middle-income countries, as they are representing those populations most in need.

Finally, the results will be summarised and put in context of existing literature. Following the analysis of the significant variables in the result section, the discussion will answer the research question and elaborate on the underlying interactions of variables which might have led to the discrepancies between the expected results and the actual outcomes. Following this comprehensive assessment, the study will then continue to discuss the challenge of putting the theory of a more holistic approach to poverty reduction into practice, ending with a set of recommendations for future development and research. After elaborating on limitations of this study and future research areas, a summary of the paper will be given in the concluding section.

The Reality of Extreme Poverty

Poverty is a global problem. More specifically, over 700 million people are currently living in extreme financial poverty, meaning with less than $1.90 per day (Roser & Ortiz-Ospina, 2013). Despite this already dreadful number, this paper tries to draw attention to the fact that poverty is much more than the absence of financial means. As already established by the United Nations, we need to eliminate poverty in ALL forms (United Nations, 2022)

Literature has shown that there are more factors that should be considered when talking about poverty, such as health poverty, poverty in basic infrastructure, as well as poverty of opportunity (Burchi, Rippin, & Montenegro, 2018). Unfortunately, looking at numbers of multidimensional poverty, the number of people living in poverty increases to a total amount of 1.3 billion, representing 21.7% of the total population (UNDP, 2021).

This development nurtures the global risks for (internal) conflicts, disease spreading and environmental destruction (Roser & Ortiz-Ospina, 2013). Furthermore, rising inequalities within, but also between countries are hampering growth and opportunities of innovation, trapping the destitute populations in poverty (Lakner, Mahler, Negre & Prydz, 2020). It is simply not sustainable if only 10% of the population are holding 85% or the world's wealth, compared to 50% of the population only owning a wealth-total of 1% (Davies, Sandström, Shorrocks & Wolff, 2006).

For a better understanding of the context, the following will provide a concise summary of past and current developments of poverty. Further, it will elaborate the main challenges of reducing poverty, specifically considering the current growth paradigm. Afterwards, the paper turns to the Inclusive Development Framework as an alternative approach and identifies often unconsidered policy domains that might be conducive in the reduction of poverty.

Global Extreme Poverty - Development Over the Past Years

When exploring the developments of poverty, we can denote a change in its reputation. Two centuries back, it was seen as an inevitable, in a way necessary concept, to fill despised but essential working positions. Anti-poverty strategies did not seem sensible, unless they ensured that work could be done (Ravallion, 2016). Since 1990 however, with an emerging focus on human-wellbeing, poverty

has been considered a social disease that dramatically reduced society's potential; a human-made, unnatural process that needs to be interrupted to foster economic wellbeing (Gent, 2017; Ravallion, 2016). Strategies such as the Millennium Development Goals (MDG) or the subsequent Sustainable Development Goals (SDG) developed by the United Nations have ever since tried to reduce poverty further (United Nations, 2015; United Nations, 2022).

Still, until today most people are living in poverty-stricken conditions. Furthermore, every tenth person must survive on int.-$1.90 or less each day, which rightfully classifies them as living in extreme poverty (Roser & Ortiz-Ospina, 2013). The $1.90 threshold is one of the three common international poverty lines measuring absolute poverty (next to $3.20 and $5.50), which have been established as comparable international standards (World Bank, 2020). This does not mean that people living above these lines are better off; a look at national poverty lines provides a more accurate overview of relative poverty, accounting for national price levels (Roser & Ortiz-Ospina, 2013). There has been debate whether it is still useful to look at the $1.90 line, as it only captures the most extreme cases of poverty (World Bank, 2018; Roser & Ortiz-Ospina, 2013). Undoubtedly, however, this paper agrees that it is important to specifically address those in greatest need.

Looking at concrete numbers, we can see that the share of people living in poverty has continually decreased. In the last 200 years, extreme poverty has been reduced from 76%, to below 10% (Dilli, Carmichael & Rijpma, 2021). While the reduction has not been equal over the years, the 21st century particularly accelerated the process as economic growth reached more countries, improving income and living conditions (Ravallion, 2016). Absolute numbers show that 764 million people lived in extreme poor conditions in 2018. Looking at 1820 with 756 million people, but accounting for the increase in overall population, the share of people living in poverty decreased from four out of five to only one (Dilli, Carmichael & Rijpma, 2021; Ravallion, 2016).

Looking back at the economic achievements, it seemed like the world was finally solving one of its biggest problems. In 2015, the United Nations therefore confidentiality published their number one SDG to eliminate poverty by 2030; while ambitious, the forecast of the economic growth numbers looked promising (Ravallion, 2016). No one could have foreseen the COVID-19 pandemic that hit the

whole world in 2019, leading to an economic shutdown (Mahler, Yonzan., Lakner, Aguilar, & Wu, 2021).

For the first time, we experienced an increase in poverty numbers, with 100 million additional people being pushed below the $1.90-line. In addition, middle-income countries presumably looking good on paper with relatively high and stable levels of GDP increasingly denoted high levels of inequality, compelling large parts of the population to fall behind (Luebker, 2010). Suddenly, the goal to completely eradicate poverty, even to bring it below 3% as intended by the World Bank, appears out of reach (Roser & Ortiz-Ospina, 2013).

At best, we will reach the 7% mark (United Nations, 2022). New studies further predict that the rising inequalities make it sheer impossible to ever reach the original goal, as economic growth simply will not reach those in need, resulting in consistent 500 million people being stuck in poverty (World Bank, 2018). This shows that if we want to reduce poverty at best, novel government policies are needed to find a way out of this dead end (Lakner, Mahler, Negre & Prydz, 2020).

The Poverty Trap, and why Growth is Not Enough

What it means to live in poverty is far more complex than it first appears. Understanding the underlying causes, however, is necessary to develop suitable policies. One of the biggest issues many countries face in this context is the so-called "poverty trap", describing the endless cycle of poverty-reinforcing poverty(Allard, 2019). Christiaensen & Shorrocks (2012) point out that especially the duration of poverty causes long-lasting damage and is thus important to account for when trying to formulate strategies breaking the cycle.

The literature distinguishes two main, often simultaneously occurring drivers of the trap – individual heterogeneity, and state dependence – summarising intrinsic factors such as the level of education, the size of the social network or a person's health status, as well as factors of the living environment like overall poverty rates of a country, lack of opportunities or social exclusion respectively (Thomas & Gaspart, 2015; Sachs, 2006 ; Allard, 2019). Furthermore, it shows that past poverty experiences overall tend to cause a lack of motivation or increased risky behaviour. Especially

children that grew up in poverty are impacted due to different developments in early life

(Christiaensen & Shorrocks, 2012; Thomas & Gaspart, 2015).

The problem why people cannot escape these traps is that the financial burden is so high that

even financial aid simply cannot cover the impact of the surrounding or intrinsic issues, such as

lacking opportunity or health (Sachs, 2006; Chen, Li, Lue, Xiong, 2017). The common approach, to

focus on a country's economic development and boost growth in hope that it tickles down to the

surrounding socio-economic domains, has further reached its limits. Due to increasing inequality

within countries, the money does simply not reach those most in need (Lennox & Hollender, 2020).

While growth has been an important factor in reducing poverty, the situation shows that a sole

increase in Gross Domestic Product, does not equal increased wellbeing (Rauniyar & Kanbur, 2010,

World Bank, 2014). Instead, more academics such as Ravallion (2016) see the need for social policies,

improving health or access to education. As shown in the case of Bangladesh, it was improvements of

the food supply reducing levels of malnutrition, job training for a more skilled labour force and focus

on family planning to reduce fertility rates that together with outward migration helped the country to

escape the poverty trap (Traverso, 2016), suggesting a new focus on alternative poverty dimensions.

Need for a New Strategy: A More Holistic Approach

When looking at the definition of poverty, it is commonly described as not being able to have

the resources for a minimum standard of living, and thus being happy, healthy, or prosperous (World

Bank, 2014). Most often, poverty has thus been interpreted as the lack of income, motivating

development experts to focus on improving the economy. However, as formerly established, growth

does not automatically translate into reduced hunger or increased life expectancy, nor captures it

inequalities, resulting in big population groups falling behind (Rauniyar & Kanbur, 2010).

The problem stems from the general misuse of the terms development and growth. Often used

interchangeably, they are yet very distinct concepts, of which the first describes the process of

increasing wellbeing and thus reducing poverty, while the latter, a measure of only economic growth,

is a sole indicator of development (Gent, 2017). Too often, growth has become an end in itself, instead of a means (Rauniyar & Kanbur, 2010).

The Inclusive Development Framework put more emphasis on this distinction, aiming at reducing poverty by specifically addressing structural inequalities that hinder development (UNDO, 2021). The concept of growth is seen as only one part that contributes to this development, and only if a pro-poor approach is applied (Gent, 2017). Next to it, the framework sees the multidimensionality of poverty and includes other dimensions that go beyond economic wellbeing (Rauniyar & Kanbur, 2010; Gent, 2017).

Unfortunately, there is no clear definition of what these dimensions entail exactly. Thus, this paper reviewed different interpretations or similar approaches that implemented the framework of inclusive development. An overview can be found in *Table 1*. Based on this analysis of socio-economic dimension proposed by individual authors or international organisations, the study condensed the findings in seven distinct policy domains that seem promising in the reduction of poverty levels: *Health, Education, Living Conditions, Gender Equality, Income Inequality, Institutions and Economic Performance*.

The following will provide individual elaborations of the domain's potential impact on poverty. Subsequently, these dimensions are then used as a basis for the empirical analysis of potential poverty determinants, applying a holistic approach.

Table 1: Holistic Approaches of Poverty Reduction (Author's Elaborations)

Framework / Source	Dimensions
Swedish Level of Living Survey Johansson, S., Erikson, R., Jonsson, J.O., & Tåhlin, M. (1968)	1. **Health** and Access to Health Care 2. **Employment** and Working Conditions 3. **Economic Resources** 4. **Education** and Skills 5. Family and **Social Integration** 6. **Housing** 7. **Security** of Life and Poverty 8. Recreation and **Culture** 9. **Political Resources**
Human Development Index United Nations (1997)	1. **Life Expectancy Index** (Life Expectancy) 2. **Education Index** (Expected & Mean Years of Schooling) 3. **GNI Index** (GNI per capita (PPP $))
Multidimensional Poverty Index United Nations (2010)	1. **Health** (Nutrition; Child Mortality) 2. **Education** (School attendance; Years of Schooling) 3. **Standard of Living** (Cooking fuel; Sanitation; Drinking Water; Electricity; Housing; Assets)
Gupta, J., Pouw, N. R. M., & Ros-Tonen, M. A. F. (2015)	1. Developing relevant **epistemic communities**, communities of practice and social movements 2. Transforming governance into **interactive governance** to enable empowerment 3. Adopting **appropriate governance instruments**.
Sustainable Development Goals United Nations (2015)	1. **Sustainable Economy** (No Poverty; Zero Hunger; Good Health & Wellbeing; Decent Work & Economic Growth; Industry, Innovation & Infrastructure) 2. **Sustainable Society** (Quality Education; Gender Equality; Reduced Inequalities; Sustainable Cities & Communities; Peace, Justice & Strong Institutions; Partnerships for the Goals) 3. **Sustainable Planet** (Clean Water & Sanitation; Affordable & Clean Energy; Responsible Consumption & Production; Climate Action; Life below Water; Life on Land)
Framework for Inclusive Growth Asia Development Bank (2016)	1. **Poverty & Inequality** (Income Poverty; No income Poverty) 2. High Efficient **Sustained Growth** to create Productive Jobs and Economic Opportunity (Economic Growth & Employment; Key Infrastructure Endowments) 3. **Social Inclusion** to ensure equal access to Economic Opportunity (Access and Inputs to Education & Health; Access to Basic Infrastructure, Utilities & Service; Gender Equality & Opportunity) 4. **Social Safety Nets** 5. **Good Governance** and Institutions
Inclusive Development Index World Economic Forum (2018)	1. **Growth and Development** (GDP per capita; Employment; Labour Productivity; Health Life Expectancy) 2. **Inclusion** (Median Household Income; Poverty Rate; Income Gini; Wealth Gini) 3. **Intergenerational Equity and Sustainability** (Adjusted Net Savings; Public Dept; Dependency Ratio; Carbon Intensity of GDP)
Burchi, F., Rippin, N., & Montenegro, C. E. (2018)	1. Fulfilling **work, education, health** 2. Decent **housing**, access to **food**/nutrition, **social security**, access to **water**, **political participation**, access to **sanitation**, living in a good environment 3. **Economic security, safety,** participation in community life, **social relations** 4. Culture, emotional **well-being,** decision-making

Health

One of the most discussed social domains in the context of poverty is health, often highlighting the direct effect of poverty on people's physical and mental wellbeing (Zijdeman & Ribeiro de Silva, 2014). However, it can also be found that improvement of health has an inverse effect on poverty levels (Lawansin & Umar, 2021), as health is a mandatory foundation for everything we do (WHO, 2022).

Poor health, for example from undernourishment or chronic illness, can prevent people from working or studying (Lock, 2020). Illness in early ages impacts the future development of a child and can greatly reduce the chances of a life without poverty. A lack of information regarding women's health and family planning can further increase the chances of pregnancies, which might not only entail risks and serious long-term consequences, but also represent a financial burden (WHO, 2022; Bloom & Canning, 2010).

The health system itself must also be examined, barriers to health such as high costs can ruin whole families (WHO, 2022; Rahman et al, 2020). An example showing how improvements in health systems lead to less poverty can be seen in Uganda. The malaria eradication campaign increasing access to vaccinations improved people's access to schooling, translating into income gain of 5-20% and a 40% likeliness of wage work (Barofsky & Anekwe, 2015).

Education

One of the most empowering tools for the poor is education. It enables them access to knowledge and skills, which will improve their chances of a job and can increase their income (UIS, 2017). This might not only help them, but also their entire family (60milliongirls Foundation, 2017). Often referred to as human capital, government investment is crucial, as high education fees might limit access for many. Return rates are seemingly endless, as education paves the way for innovation (Odior, 2014; Montenegro & Patrinos, 2014). Furthermore, education is an important factor in reducing inequalities by improving the economic status of the poor. As found by Montenegro & Patrinos (2014), one extra year of education could increase wage earnings by 10%.

Living Conditions

The domain of Living Conditions summarises those factors that have shown to be important to reach a certain standard of living. This includes having access to drinking water and electricity, receiving housing, feeling safe and being able to express and engage in one's culture (Tunstall et al, 2013; OECD, 2020). Having a certain living standard ensures that people can live a prosperous life and motivates them to reach out to more poverty reducing opportunities (Tunstall et al, 2013). Limited access to electricity for example increases health risks and limits education (OECD, 2020). Improving access could however lead to new businesses, as shown in the example of implementing Solar Panels in Tanzania. By enabling new farming methods, earnings could be increased from "$1.20 a day to $7.25 a day in just two years" (Huie, 2017). Gupta, Pouw & Ros-Tonen (2015) further point out the importance of living areas. Living in urban areas enables access to important public resources, as well as well-paid jobs (OECD, 2020).

Gender Inequality

Gender equality is a growing concern in the development debate, touching upon the labour market, gender, politics, as well as society as a whole. Being intrinsically important, it also impacts the poverty levels of countries (Dilli, Carmichael & Rijpma, 2021). Women make up half of the workforce, if they cannot live to their full potential it will result in negative effects on the economy (Banerjee, 2019; OECD, 2015). Ferrant & Kolev (2016) calculated that gender inequality causes 7.5% loss in world GDP. Increasing the opportunities for women to work and educate themselves would thus be a big step in human development (Morrison, Raju & Sinha, 2007). Giving women more rights to make decisions in the household, in politics or simply in their own lives could potentially reduce poverty (Nieuwenhuis, Munzi, Neugschwender, Omar & Palmisano, 2018). As literature shows, women are more focussed on health and education matters, suggesting that they would indirectly benefit other socio-economic domains (Burchi, 2013).

Income Inequality

This domain focuses on the important concepts of inclusion and equity. Both are necessary for people to receive the means and resources they need according to their needs (Rauniyar & Kanbur, 2010). Most problems in the field of development are not necessarily caused by the lack of resources, but rather the distribution thereof (Gupta et al, 2014). As previously discussed, low inequality would distribute more of the growth benefits to the poor and could thus reduce poverty (Luebker, 2010). Decreasing the Gini Index by just 1% would be more impactful on global poverty rates than if all countries improve their expected growth rate by 1% (Mahler, Yonzan, Lakner, Aguilar, & Wu, 2021). This would be especially important for low-income countries with high shares of extreme poverty (Barro, 1999). Furthermore, not improving inequality will widen the differences in education levels and further decrease social cohesion, increasing the risk of crimes and riots, which might increase poverty even further (OECD, 2015).

Institutions

In the context of reducing poverty, institutions play a major role in developing strategies and allocating resources. Mostly implying democratic institutions, they are described as stable regulators, which seem to promise accountability and controls of corruption (Brady, Blome & Kleider, 2016). Good governance is one big part that is commonly discussed in that regard, referring to the establishment of rule of law, effective governance bodies and high-quality public services (Asian Development Bank, 2011). Having the power to define market structures, institutions can expand the private sector to increase job opportunities or develop social protection schemes, thus potentially reducing inequality in society (Rauniyar & Kanbur, 2010; Brady, Blome & Kleider, 2016). Furthermore, democratic government institutions represent the citizens and guarantee their rights, which would enable the impoverished to vocalise their needs (Keefer & Knacks, 1997).

Economy Performance

Putting the economy in the context of poverty seems superfluous at first, but it is important to get an understanding of the domain and its indicators. Growth has been the common indicator for economic activity. Measured in GDP, or GDP per capita growth has been the most effective tool in reducing poverty (DFID, 2008), presenting Mozambique as just one example of a country that reduced poverty form 69% to 52% in only 6 years by focussing on their growing economy (Moin, 2008). Growth creates jobs and thus enables individuals to increase their income (DFID, 2008; Asian Development Bank, 2011). Different macroeconomic factors such as inflation or trade regulation furthermore influence the job market's effectiveness. While high inflation is negatively associated with wage outcomes (Easterly & Fischer 2000), consumers and businesses are benefiting from liberalised trade regulations that allow access to a larger market and thus potentially increased chances of money inflow (Winters, McCulloch & McKay, 2004).

Methodology

The aim of this paper is to answer the research question whether (1) global poverty levels can be determined by policy domains other than economic wellbeing, and (2) should the former be confirmed, which specific determinants of poverty show significant correlations with poverty. In order to analyse these potential determinants of global poverty, this research conducted an extensive literature review, as well as an empirical analysis. Based on the variables identified in the literature, this research relied on quantitative data instead of qualitative interviews. Consequently, multiple-linear regressions were used to assess the correlations between the dependent variable "Poverty" and a set of explanatory variables.

Study Design and Methods

Linear regressions are a commonly used tool of predictive analyses, examining the relationships between one dependent, and one or more independent variables. Using this statistical technique, one can identify the effect of the independent variables, also referred to as explanatory variables, on the dependent outcome variable (Wooldridge, 2010). As the results provide information regarding the significance or strength of the variables' relationship, regression modelling has become a standard practice in the analysis of poverty determinants.

This study concentrated on unbalanced cross-sectional panel data with observations of 163 countries. For the period of 1995 till 2019, the measure of *Poverty* was regressed on a set of 13 explanatory variables. Latter were clustered by the seven overarching groups *Health, Education, Living Conditions*, *Gender Equality, Income Inequality, Institutions, Economic Performance* following the identified policy domains of the literature review.

Analysing the whole data set, as well as a subset of selected countries, seven individual regressions were run for each of the policy domains in isolation, as well as one additional regression including all domains. This resulted in eight regressions for each dataset. The domains themselves included one to three indicators, later referred to as poverty determinants, that were used as representatives for the domain.

The equation for one of the domains, in this example Health, can be stated as:

$$poverty_{i,t} = \alpha + \text{life expectancy}_{i,t-5} + \text{oop helath expenditure}_{i,t-5} + \mu_i + \nu_t + \varepsilon_{i,t}$$

Where:

- $poverty$ is the DV reflecting the share of population living in extreme poverty
- life expectancy and $\text{oop health expenditure}$ describe the IVs
- α is the constant/intercept
- i denotes the country
- t is the time/year, including a five-year time-lag as indicated by the t subscript for the DV and the $t-5$ subscript for the IVs
- μ_i and ν_t are country and time/year fixed effects respectively
- ε is the error term

The poverty determinants in this equation would simply need to be exchanged by the other domain-representative indicators to describe their relationship with Poverty. Consequently, the final regression equation, including all domains, moreover all poverty determinants, can be summarised as:

$$poverty_{i,t} = \alpha + \sum_{h=1}^{2} \beta_h health_{h,i,t-5} + \sum_{j=1}^{2} \gamma_j education_{j,i,t-5} + \sum_{p=1}^{1} \delta_p living\ standard_{p,i,t-5}$$

$$+ \sum_{q=1}^{1} \zeta_q gender\ equality_{q,i,t-5} + \sum_{r=1}^{2} \vartheta_r income\ inequality_{r,i,t-5}$$

$$+ \sum_{w=1}^{3} \varkappa_w institutions_{w,i,t-5} + \sum_{z=1}^{1} \lambda_z economic\ performance_{z,i,t-5} + \mu_i + \nu_t$$

$$+ \varepsilon_{i,t}$$

The regression model was calculated with a time lag. Assessments of policy impact evaluations have highlighted the importance of deciding on the right time to measure the policies effects. Distinctions have been made between context-specific short- and long-term effects of applied policies, dependent on the type of policy, the program duration, implementation time as well as delays due to external factors (Gertler, Martinez, Premand, Rawlings & Vermeersch, 2016). Hence, the regressions were calculated with a five-year lag. While a larger time-lag, for example ten years, might show different, potentially more significant results in some cases, it was not possible to collect sufficient data for the number of years required.

Furthermore, time and entity fixed effects were included in this regression to account for intrinsic characteristics of individual years and countries respectively. This two-way fixed effect model captures the impact of factors such as culture or financial shocks which might affect the sample data. By applying entity fixed effects, one accounts for unobserved individual heterogeneity; a method similar to including dummy variables (Wooldridge, 2010). During this process, one reference country will automatically be selected to calculate and remove the mean difference between countries. Thus, potential confounders that are shared within a cross-sectional group will be removed. Adding time

fixed effects follows the same principle, additionally removing potential trends that might impact the whole sample (Wooldridge, 2010; Allison, 2009).

To improve the robustness of the model further, clustered-robust standard errors were applied to additionally reduce the threat of heteroskedasticity and autocorrelation of the error terms. This way, the standard error is calculated by cluster; in the case of this study per country. The modification of the regression model avoids false positives in the statistical significance (Wooldridge, 2021).

Before conducting the actual regressions, the data was controlled for the assumptions. Consequently, independent variables that were highly correlated, meaning with a correlation coefficient above 0.7, were dropped until no multicollinearity could be reported (s. Appendix 1 for the original set of variables). This process reduced the set of poverty determinants from 23 to 13 variables. *Figure 1* visualises the remaining variables in a correlation matrix. It is crucial to note that *GDP per capita* was kept in the dataset for comparison reasons, even though it was correlating with other variables. The review of regressions with and without the GDP variable showed that the results were not severely affected. The only difference was a slight increase in significance of three already significant variables (Labour Force Gender Ratio, Gini Index and Polity Score) when including the measure. GDP per capita was furthermore log-transformed to address the issue of normality.

Figure 1: Correlation Matrix of used Explanatory Variables and Poverty
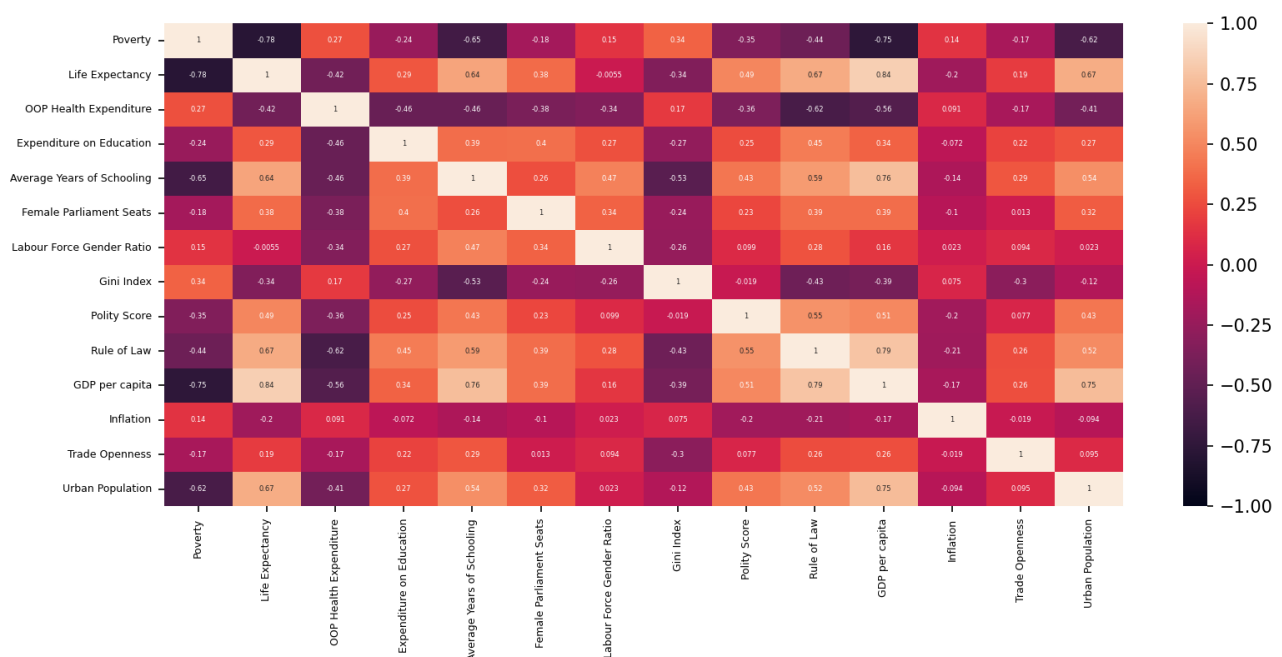
Data Collection

As stated before, poverty is a global problem. Following, this study included data from all countries available. While the original dataset included 163 it is important to mention that not all countries were included in the process of the regression analyses due to missing values for different variables. This resulted in samples ranging from 71 to 103 countries in the individual regression models.

For analysis and comparison purposes, the sample was additionally divided into smaller sub-groups. While it would have been desirable to generate sets for all economic groups as defined by the World Bank – classifying high, upper-middle, lower-middle, and low-income countries (Hamadeh, Rompaey & Metreau, 2021) – the number of observations only allowed for two subsets encapsulating high-, as well as low-and middle-income countries. Classified by a country's Gross National Income, the threshold was set at $US12,696 for high-income countries, resulting in 75 high-income and 125 low- and middle-income countries. Again, the regression model of the latter did not include all countries but used samples ranging from 36 to 59 countries. Overall, it needs to be mentioned that 37 countries changed their economic group over the years, from "high" to "low" and vice versa, which resulted in the additional country records.

The empirical analysis used unbalanced panel data, mostly obtained from the World Bank Databank. Additional data from the Human Development Data Center of the United Nations, as well as the Polity5Project was taken into this study, gaining access to variables that were not available through the World Bank. Due to the differences of data availability over the years, a linear interpolation was conducted to adjust the missing data. Both, the merging as well as the interpolation of the data were done using Python in the Visual Studio Code environment. Further analysis was conducted using Stata.

Poverty Measurement

This study used the poverty headcount ratio of people living at $US 1.90 a day, as the variable for a country's poverty level. It describes the percentage of the total population living under the international extreme poverty line and is a common standard in global poverty studies (Roser & Ortiz-

Ospina, 2013). Using this variable will allow comparisons with other studies using this variable

standard. As it is important to convert the consumption levels not only by market exchange rates, but

also by the differences in purchasing power to enable a cross-country comparison (Roser & Ortiz-

Ospina, 2013), the data was adjusted by the Purchasing Power Parity. While one should further

investigate other international poverty lines such as people living at $US 3,20 or $US 5,20 a day, this

study specifically concentrated on those populations most in need. Making this choice consequently

resulted in the focus on low- and middle-income countries, as data shows that extreme poverty is not a

prevalent issue in high-income countries (World Bank PovcalNet, 2021)

Explanatory Variables

The explanatory variables were selected as representative measures for the previously

identified policy domains Health, Education, Living Conditions, Gender Equality, Income Inequality,

Institutions and Economic Performance. Following an extensive review of existing literature on

multidimensional poverty and inclusive development using peer-reviewed papers available on

ScienceDirect, Google Scholar and Smart Cat, as well as publications of the United Nations and the

World Bank, 23 explanatory variables for poverty were identified, of which 12 were selected for this

research. While a detailed explanation of those variables and their relevance will be provided in the

following, a summarised overview can be found in *Table 2*.

Table 2: Determinants of Poverty sorted by Policy Domain (Author's Elaborations)

Policy Domain	Variable Name	Description	Measurement	Source
Health	Life Expectancy	Expected years of life for a newborn, assuming the mortality at the time of its birth was to stay constant in the future.	Years	World Bank
	Out-Of-Pocket Health Expenditure	Spending on health directly out-of-pocket by households	% of total health expenditure	World Bank
Education	Average Years of Schooling	Average years of education completed among people over age 25.	Years	World Bank
	Government Expenditure on Education	Total general (local, regional and central) government expenditure on education (current, capital, and transfers.	% of GDP	World Bank
Living Standard	Urban Population	Population living in areas classified as urban as defined by each country.	% of total population	World Bank
Gender Equality	Female Parliament Seats	Parliamentary seats in a single or lower chamber held by women.	% of total seats	World Bank
	Labour Force Gender Ratio	Female to male ratio for the proportion of the population ages 15 and older that is economically active.	% (Ratio)	World Bank
Income Inequality	Gini Index	Extent to which the distribution of income among households within an economy deviates from a perfectly equal distribution.	0-100 scale	World Bank
Institutions	Rule of Law	Citizens trust in and abide by the rules of society, specifically concerning quality of contract enforcement, property rights, the police, the courts, as well as the likelihood of crime and violence.	Estimated country score on a scale from -2.5 to +2.5	World Bank
	Polity Score	Regime authority spectrum from hereditary monarchy (-10) to consolidated democracy (+10).	21-point scale	Polity5Project
Economy	logGDP per capita	Gross Domestic Product per capita at purchasing power parity rates (PPP), measuring the sum of final goods and services produced in a country, divided by the average population of that year.	logarithm of $ international (2017)	World Bank
	Inflation	The consumer price index, reflecting the annual changes of prices for the average consumer to purchase representative basket of goods and services.	% of annual change	World Bank
	Trade Openness	Sum of exported and imported goods and services, indicating the openness to foreign trade and economic integration.	% of GDP	Human Development Data Centre

Regarding the domain of *Health*, the proxy variable **Life Expectancy** has shown positive correlations with countries' wellbeing, indicating that populations with higher life expectancy are prone to follow a healthier lifestyle and are more resilient to negative events compared to communities with lower life expectancy (Arora et al, 2016). It follows the assumption that those populations seek out more opportunities to improve their financial situation, or are simply more able to (Lock, 2020). This suggests that an increase of life expectancy leads to a reducing poverty.

Contrary, high **Out-Of-Pocket Health Expenditure** (OOP Health Expenditure) has been described as a serious risk regarding poverty. Measuring the share of health-related costs individuals must carry by themselves, Sirag & Mohamed (2021) concluded that this financial burden will not only lead to reduced health, but also to an increased chance of poverty. Furthermore, the impact of OOP health expenditure showed even more catastrophic effects in already impoverished communities, causing 16% of households in Bangladesh to face financial catastrophes (Garg & Karan, 2009; Rahman et al, 2022).

Two variables could also be identified for the domain of *Education*. The variable ***Average Years of Schooling*** has been a common variable in the literature, providing insights about the overall level of education within a country. Assuming that higher levels of education lead to better job opportunities and thus more income, the variable can be considered as a potential determinant for poverty, or better the reduction thereof. As stated in the UIS Policy Paper (2017), just two more years of schooling could "lift nearly 60 million people out of poverty" (UIS, 2017).

Furthermore, ***Government Expenditure on Education*** has been identified as one key element of providing more access to education (Odior, 2014). The direct costs of education often hinder particularly poorer populations to gain access to schooling and consequently the opportunities to acquire the knowledge and skills to escape the poverty trap (60milliongirls Foundation, 2017).

The former bridges the gap to the next domain, *Living Conditions*. A publication of the OECD (2020) states that public services such as health and education have been more accessible in cities compared to their rural counterparts, resulting in overall improvements in quality of life. Further examination presented disparities between urban and rural areas, exposing poor populations to far more risks of poverty (Asian Development Bank, 2011). Based on the positive association of urbanisation and standard of living, it follows that an increase in ***Urban Population*** might lead to a reduction in poverty as well (Chen, Li, Lue, Xiong, 2017).

An additional factor that is increasingly being discussed in that context is *Gender Equality*, especially with reference to empowerment and opportunity. Women's representation in the labour force is just one example in which gender inequality is present, with almost all countries showing lower rates of female participation (Morrison, Raju & Sinha, 2007). As it could be the case that countries show overall low participation rates, this research looked at the ratio of female-to-male participation in the workforce, in the following referred to as ***Labour Force Gender Ratio***. Women, making up half of the population, could have a strong impact on poverty levels, if given the chance to engage (Banerjee, 2019).

The same principle applies to female representation in politics. Literature shows that women are more efficient in making necessary resources available and generally prioritise policy domains like

health and education (Burch, 2013). An increase in ***Female Parliament Seats*** as a measure of women's representation and participation in legislative processes could thus have a positive effect on the reduction of poverty.

Following gender equality, this research investigated *Income Inequality*. As discussed earlier in this paper, poverty is often not a lack of resources, but of the distribution thereof. Using the popular measure of the ***Gini Index,*** it is possible to capture inequalities of income by one single summary statistic (De Maio, 2007; Campano, 2006; Champernowne, 1998).

Talking about distribution of resources, it strongly depends on the type of *Institution* that is involved in the decision-making process. Some scholars have argued that democracies "are more responsive and effective at channelling state resources" (Brady, Blome & Kleider, 2016), while authoritarian regimes might repress the impoverished and vulnerable (Lee, 2005). Using the variable **Polity Score** (revised version), a measure of regime authority, it can be investigated what type of institutional structure might be more effective in the reduction of poverty.

Another measure for the quality of institutions is found in the variable ***Rule of Law***. It captures the trust of the citizens in the institutional environment and the character of law enforcement (Keefer & Knack,1997). It follows that countries with higher rule of law rankings provide more participation rights for citizens and ensure access to justice systems. This gives especially vulnerable populations the power to voice their demands and helps them to seek out new opportunities (Rauniyar & Kanbur, 2010).

Continuing, even though this paper wants to move away from the common notion that the sole focus on economic processes is the solution to poverty, this paper looked at different factors representing *Economic Performance*. This includes the standard measure of the l**ogGDP per capita**, measuring the average economic output per person. Commonly used to evaluate the economy's wellbeing, it was established earlier that it does not include the distribution of output and therefore does not capture the real well-being of the population (Lennox & Hollender, 2020). Nonetheless, it remains an important factor for many countries in monitoring economic progress and the fight against poverty (Rauniyar & Kanbur, 2010).

In addition, a negative relation has been established between ***Inflation*** and *Economic Performance*, affecting both the level of growth as well as the efficiency of production. A policy paper by Eastlerly & Fischer (2000) provided new evidence that inflation is especially problematic for poor populations, leading to the assumption that a reduction of inflation could eliminate poverty levels.

Finally, scholars have established the connection between economic growth and ***Trade Openness***, referring to it as one of the most affordable and simple strategies to increase GDP per capita (Pradhan, Mahesh, 2014). Especially developing countries have been benefiting from trade liberalisation, resulting in reduced numbers of absolute poverty (Pradhan & Mahesh, 2014).

Results and Analysis

Multiple-linear regressions were used to investigate if, and further which, explanatory variables significantly predict the outcome variable Poverty. For that the analysis of the data was split in two steps. First, regressions were run for individual policy domains (e.g. Health), including the associated explanatory variables (e.g. Life Expectancy and OOP Health Expenditure). Afterwards, one final regression including the variables of all policy domains was calculated. Both steps were repeated for the complete dataset including all countries, as well as for the subset of low-and middle-income countries (LMIC). As described more elaborately in the following section, high income countries (HIC) did only report small numbers of extreme poverty. Thus, the study did not continue with an individual regression analysis for this subset. The results of the regression including all countries, and the one only capturing LMICs, can be found in *Table 6* and *Table 7*.

Beforehand, descriptive statistics were analysed to get an overview of the data and identify specific trends. Summaries of the results can be found in *Table 3* for all countries together, as well as in *Table 4* for LMIC. Even though excluded later, *Table 5* presents the descriptive statistics of HIC for comparative reasons.

Descriptive Statistics

The original dataset of all countries included 1525 observations of poverty. However, as some observations of the explanatory variables could not be interpolated due to lacking comparative values, the number of final data points decreased to varying degrees in the process of running the individual regressions. The descriptive statistics below only capture the samples of the final regressions, including all explanatory variables. Consequently, they depict the variables based on 671 observations for the dataset including all countries, and 231 and 440s observations for the LMICs and HICs subsets respectively. An explanation for the fewer observations of LMICs, regardless of the overall higher number of investigated countries could be a lack of resources and knowledge for, or unequal priorities in the data collection processes within these countries, resulting in many missing values for individual variables and years (Aiyub, Novitayani & Marthoenis, 2020).

Apart from these differences, the descriptive statistics are a useful tool to identify general trends within the individual datasets. While it would be interesting to touch upon all variables individually, it is out of the scope of this paper to analyse all the differences between the subsets, Therefore, the following will only elaborate on the most outstanding differences, to provide a first impression of the data.

The first important measure to inspect is the dependent variable, Poverty. As depicted in *Table 3*, the mean of the population share living below the poverty line based on all analysed countries lies at 3.35%, a measure far lower than reported in the literature (World Bank, 2014b; Roser & Ortiz-Ospina, 2013; Lakner, Mahler, Negre, & Prydz, 2021). While this score seems very promising at first glance, it must be remembered that these numbers are based on an incomplete dataset, only capturing 71 in the regression due to missing values. Could more data be included in the analysis, particularly from LMICs, the average share of the population living in poverty would potentially be much higher. Nonetheless, looking at the maximum value of poverty, it reveals that there are some countries within this dataset that are far above the average, like Rwanda with poverty numbers of almost 70%. Looking at the subsets, one can conclude that these countries belong to the LMICs, as the maximum value of the HIC subset is only at 6.5%. Furthermore, the mean of HICs is also only at 0.719%, pointing out that poverty is a comparatively small problem in HICs. This finding is in line with the literature,

showing that most people living in extreme poverty are found in low-income, and by now also middle-income countries (World Bank, 2018).

Turning to the explanatory variables, LMICs are overall worse off, looking at the averages of all variables and comparing them with those of the dataset including all countries. Beginning with life expectancy, LMICs have a four-year lower expectancy on life. The difference becomes even more extreme when comparing the minimum values of LMICs with the one of HICs. We can denote a difference of almost 13 years, which may indicate strong differences in health, access to electricity and an overall poor living standard (OECD, 20220).

A look at the determinants of the Education domain is likewise worrying. While the government expenditure on education only shows a slight difference in the values, one needs to look at it as a percentage of the country's GDP, resulting in far more extreme differences. Thus, it can either translate into $US 59.78billion in the case of Spain, or only $US 4.57billion for Ecuador (based on calculations of the author using country data from 2018 and 2019 respectively). It is no wonder that LMICs can denote three years less in the average years of schooling, when compared with HICs. Costs of schooling are automatically higher for the individual, if not subsidised by the government (Asian Development Bank, 2011). An even closer inspection of the HICs data shows that the minimum education is twice as high as the minimum years of education in LMICs. Following the UIS paper (2014), this could take away the opportunity of escaping poverty for many.

Moving on to the next domain, Gender Equality, we can see that the Labour Force Gender Ratio is only at 72% looking at all countries together, and even 8% lower for LMICs. This is a difference of 30 percentage points from an equal distribution of the female-to-male participation in the workforce. This shows that the world is far from an equal society, which might negatively impact the incomes of individuals. However, a very interesting detail stands out when looking at the maximum values for LMICs. The subgroup also includes countries where the gender ratio is almost equal. A more detailed analysis shows that Rwanda, the poorest in this study, is also the most gender equal. This needs to be kept in mind when interpreting the final regression results.

Talking about equality, the Gini Index of LMICs is almost 6 ranks lower than the average of all countries; 10 ranks, when compared to HICs. It follows that on average income distribution is much more unequal in LMICs. As pointed out by Rauniyar & Kanbur (2010), this only increases the risk of social and political unrest. Furthermore, as income inequality is slowing down the effects of growth, it further traps communities of LMICs in poverty (Luebker, 2010). It can however also be noted that the lowest, minimum ranking of LMICs is at the same level as HICs, confirming that income inequality is also a prominent issue in HICs (Dabla-Norris, Kochhar, Suphaphiphat, Ricka & Tsounta, 2015).

Finally, turning towards the Economic Performances of countries, clear differences can be seen between LMICs and HICs or all countries. Looking at the logGDP per capita is of course important, albeit predictable. We can see an average of 9.93 logGDP per capita for the data set of all countries, corresponding to a GDP per capita of $27,385.33. For LMICs the average lies at a logGDP per capita of 9.05; while it does not look too different, it corresponds to $9,561.12 GDP per capita, less than half of the former group. A closer look at LMICs maximum values further reveals, that with their logGDP per capita of 9.906 ($20,042.81 GDP per capita) does not even reach the average of all countries, indicating their comparative weakness in economic performance.

Significant differences can also be found in inflation. The average for all countries lies at 3.9%. In comparison, LMICs perform almost twice as badly. If you compare LMIC with HIC, the difference is almost threefold. These results are also reported in the literature, with a widening inflation gap between income groups (Easterly & Fischer, 2000). Especially during the pandemic and consequent increases in food prices have been an extra burden for LMIC (Kindberg-Hanlon, 2021).

The most striking trend from the descriptive analysis is the generally poorer position of LMIC. In all domain-representative variables does the subgroup present poorer results. However, it can also be stated that HICs are also concerned with the challenges of gender and income inequality. While it can be assumed that the currently stronger financial situation of HICs ensures that their poverty figures remain low, this should be analysed more closely in the future.

Table 3: Descriptive Statistics of Regression Observations for All Countries

Variable	Obs.	Mean	Std. Dev.	Min	Max
Poverty	671	3.352	7.17	0	69.1
Life Expectancy	671	76.019	4.824	53.447	83.754
OOP Health Expenditure	671	29.675	15.457	7.369	84.794
Gov. Expend. on Education	671	4.56	1.286	1.363	8.031
Average Years of Schooling	671	10.186	1.892	3.647	12.924
Urban Population	671	68.656	14.316	16.912	98.001
Female Parliament Seats	671	22.086	10.491	0	56.25
Labour Force Gender Ratio	671	72.411	13.054	19.259	99.657
Gini Index	671	37.477	8.863	24	64.8
Polity Score	671	7.657	3.888	-7	10
Rule of Law	671	.371	.997	-1.372	2.13
logGDP per Capita	671	9.936	.803	7.046	11.68
Inflation	671	3.901	4.378	-4.478	48.7
Trade Openness	671	92.494	53.663	22.611	408.4

Table 4: Descriptive Statistics of Regression Observations for Low- and Middle-Income Countries

Variable	Obs.	Mean	Std. Dev.	Min	Max
Poverty	231	8.366	10.426	0	69.1
Life Expectancy	231	71.812	4.1	53.447	78.769
OOP Health Expenditure	231	42.664	15.049	7.995	84.348
Gov. Expend. on Education	231	4.048	1.361	1.363	7.397
Average Years of Schooling	231	8.597	1.754	3.647	11.766
Urban Population	231	60.417	14.982	16.912	93.553
Female Parliament Seats	231	18.269	9.822	0	56.25
Labour Force Gender Ratio	231	64.04	13.635	19.589	99.657
Gini Index	231	43.061	9.507	24	64.8
Polity Score	231	6.325	3.808	-7	10
Rule of Law	231	-.563	.465	-1.372	1.29
logGDP per Capita	231	9.053	.516	7.046	9.906
Inflation	231	6.064	5.466	-1.404	48.7
Trade Openness	231	74.136	30.177	22.611	152.2

Table 5: Descriptive Statistics of Observations for High-Income Countries

Variable	Obs.	Mean	Std. Dev.	Min	Max
Poverty	440	.719	1.153	0	6.5
Life Expectancy	440	78.228	3.535	66.15	83.754
OOP Health Expenditure	440	22.856	10.516	7.369	84.794
Gov. Expend. on Education	440	4.829	1.159	2.256	8.031
Average Years of Schooling	440	11.02	1.351	7.089	12.924
Urban Population	440	72.982	11.863	44.698	98.001
Female Parliament Seats	440	24.09	10.283	3.103	46.991
Labour Force Gender Ratio	440	76.806	10.317	19.259	94.056
Gini Index	440	34.545	6.893	24.2	54
Polity Score	440	8.357	3.749	-7	10
Rule of Law	440	.861	.84	-1.056	2.13
logGDP per Capita	440	10.4	.469	9.42	11.68
Inflation	440	2.766	3.138	-4.478	18.014
Trade Openness	440	102.132	60.394	23.9	408.4

Multiple-Linear Regressions

To test if the explanatory variables significantly predict poverty, multiple-linear regressions were conducted. Presented in *Table 6* and *Table 7* one can find the corresponding regression results for the dataset containing all countries, as well as the one of only LMIC. An overview for HIC can be found in the appendix (s. Appendix 2). Eight different regression models were run for each country set to receive information regarding the effect of individual policy domains in isolation, as well as the effect of all variables together. The following will report the significant results and subsequently set them in the context of existing literature.

All Countries

Summarising the results of all countries, significant results were found within the domains Health (Life Expectancy), Gender Equality (Labour Force Gender Ratio), Institutions (Polity Score) and Living Conditions (Urban Population). However, only Gender Equality and Institutions remained stable determinants of poverty, no matter if looked at alone or in comparison with other domains. While Health seemed important in isolation, it was later replaced by Living Conditions. Taking a closer look at the independent variables will enable a better understanding of the interactions.

Looking at the regression results of the isolated domains, Life Expectancy (β = [-0.945***], p = [0.005]) and the Polity Score (β = [-0.258**], p = [0.038]) both demonstrate a negative association with Poverty, indicating that one more year lived on average, as well as a more democratic regime independently leads to a reduction of poverty. Both results are in line with the formerly mentioned assumptions, that increased life expectancy might lead to more opportunistic behaviour (Lock, 2020), and that democratic regimes foster an environment that benefits those in need (Brady, Blome & Kleider, 2016).

Surprisingly, the regression analysis further results in a positive association between the Labour Force Gender Ratio measure and the percentage of the population living in extreme poverty (β = [0,147**], p = [0.011]). Following, a one percentage point increase in the female-to-male ratio of the workforce, and thus a more equal participation rate, seems to increase poverty levels. These results are

contrary to the findings in the literature which predicted a decrease in poverty consequent to a higher female-to-male ratio (Banerjee, 2019)

While it would require a more detailed investigation, it could be the case that the type of work women are pursuing plays a role. Other research shows that women predominantly work in the informal market (Morrison, Raju, & Sinha, 2007), which makes them vulnerable to incomes and exploitation (OECD, 2015). Furthermore, many women are not paid the same as men, which has negative consequences especially for households of a female single parents (Nieuwenhuis, Munzi, Neugschwender, Omar & Palmisano, 2018; OECD, 2015).

Turning to the final model including all variables, the R²-value of the overall regression indicates a relatively good fit (R^2 = [0.522]), explaining a little over 50% of the data's variation. As mentioned, the Labour Force Gender Ratio and Polity Score remain significant in the prediction of Poverty, while the p-value of Life Expectancy increases to 0.176 and therefore loses significance.

Instead, Urban Population becomes slightly significant (β = [-0.283*], p = [0.062]), showing a negative association with the outcome variable. Thus, a one percentage point increase in urbanisation seems to reduce Poverty by 0,28 percentage points. The change of significance may be related to interactions between the different variables and the dependent variable, meaning that Urban Population might already account for improved life expectancy and is thus more significant in the prediction of poverty. This evaluation is supported by the notion that living in urban areas also improves access to healthcare, which plays one essential role in maintaining a good and long life (OECD, 2020).

Low- and Middle-Income Countries

The regressions of LMICs are showing different results in the analysis of individual policy domains. Significant predictors can once again be found in Health (Life Expectancy), with additional significance Income Inequality (Gini Index) and Economic Performance (logGDP per capita). Different than in the analysis of all countries, all domains with their respective indicators remain significant in the analysis including all variables. Furthermore, the domain Gender Equality (Labour Force Gender Ratio) becomes significant as well.

Analysing the domain-indicators more in detail shows that Life Expectancy, again, is negative associated with the outcome variable ((β = [-1.054***], p = [0.009]). Compared to the analysis of all countries, the β-coefficient is greater and thus Life Expectancy seems to have a stronger impact on Poverty in LMICs. This could be explained by the situation in which the relative change of one unit of years is more significant for LMICs, than compared to a change of one unit in the average Life Expectancy of all countries. Furthermore, the average life expectancy of all countries might simply be stagnating.

Furthermore, the Gini Index' association with Poverty also shows clear differences to the analysis of all countries. Not only is the variable a significant predictor for LMICs, but it is also negatively associated Poverty ((β = [-0.244*], p = [0.076]). The regression results of all countries, however, show a positive, though insignificant association. A first impression is that LMICs are more affected by the negative consequence of income inequality, resulting in the significant association with poverty. The finding that income distribution has a greater impact in countries with high rates of extreme poverty backs this argument (Desai, 2016).

Finally, logGDP per capita significantly predicts Poverty, presenting a positive association with the outcome variable (β = [6.234**], p = [0.036]). Thus, a one percentage point increase in GDP per capita results in 0,62 percentage point increase in Poverty. This is clearly in contrast to existing literature and the common notion that growth decreases poverty (DFID, 2008). however, this result can probably be traced back to interactions with other independent variables.

The analysis of the final model capturing all 12 explanatory variables shows a high R^2-value of 0.751, representing a very good fit by explaining around 75% of the data's variability. Interestingly, the variables Life Expectancy, Gini Index and logGDP per capita all remain significant in the final model. Thus, the individual policy domains represent the associations overall.

Moreover, the variable Labour Force Gender Ratio gains significance. In contrast to the analysis of all countries, the variable is negatively associated with Poverty (β = [-0.270**], p = [0.017]), which is more in line with other research noticing an increase in GDP after an increase in the female-to-male labour force ratio (Esteve-Volart, 2004). Referring back to the case of Rwanda we can

therefore regard it as an outlier. A more detailed analysis of the country further shows that their high female-to-male ratio is a direct consequence of the genocide in 1994, which drastically reduced the share of the male population and thus forced women to dominate the labour market (Thomson, 2017).

Concluding, the analysis of both country sets results in an overview of determinants for Poverty which can be used as alternatives to the standard economic determinants of poverty. While there are not too many trend patterns in the results, Poverty in LMICs can be significantly predicted by four variables, while only three variables significantly predict Poverty in the dataset including all countries. One could argue that due to their higher poverty rates LMICs have more potential of improvement in different areas, resulting in a higher variety of impactful poverty determinants.

Interestingly, all significant "holistic" variables for LMICs show negative associations with the poverty measure, while logGDP per capita is positively associated. An interpretation of that could be that GDP per capita does not predict poverty, and thus population well-being very accurately on its own. Instead, the poverty data is explained much better by other underlying factors – some of them measured by the significant variables in this analysis. The next section will elaborate on that further.

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Table 6: Fixed Effects Regression Table for All Countries predicting Poverty

VARIABLES	(1) Health	(2) Education	(3) Living Cond.	(4) Gender Equality	(5) Income Ineq.	(6) Institutions	(7) Economic Perf.	(8) All Domains
Life Expectancy	-0.945***							-0.564
	(0.333)							(0.412)
OOP Health Expenditure	0.0132							-0.0435
	(0.0571)							(0.0502)
Gov. Expenditure on Education		-0.224						-0.118
		(0.279)						(0.273)
Average Years of Schooling		-0.855						-0.576
		(1.156)						(0.883)
Urban Population			-0.239					**-0.284***
			(0.188)					(0.150)
Female Parliament Seats				-0.0542				-0.0369
				(0.0373)				(0.0472)
Labour Force Gender Ratio				0.147**				**0.135***
				(0.0568)				(0.0697)
Gini Index					0.0764			0.0315
					(0.153)			(0.116)
Polity Score						-0.285**		**-0.252****
						(0.135)		(0.105)
Rule of Law						1.138		-0.396
						(1.195)		(1.661)
logGDP per Capita							-1.615	-1.152
							(1.837)	(2.281)
Inflation							-0.0115	-0.00116
							(0.0107)	(0.0307)
Trade Openness							0.0128	0.0216
							(0.0252)	(0.0222)
Constant	72.74***	13.37	21.03*	-3.084	2.718	7.656***	19.92	72.91
	(24.26)	(10.28)	(12.05)	(3.747)	(5.875)	(1.342)	(17.44)	(44.34)
Observations	840	724	844	839	850	813	818	671
R-squared	0.468	0.457	0.454	0.455	0.441	0.458	0.429	0.522
Number of countries	101	76	102	100	103	97	96	71

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
Note 1: Country and time fixed effects are implemented but not reported.
Note 2: Coefficients are calculated with a five-year time lag.

Table 7: Fixed Effects Regression Table for Low- and Middle-Income Countries predicting Poverty

VARIABLES	(1) Health	(2) Education	(3) Living Cond.	(4) Gender Equality	(5) Income Ineq.	(6) Institutions	(7) Economic Perf.	(8) All Domains
Life Expectancy	-1.054***							**-1.509****
	(0.388)							(0.601)
OOP Health Expenditure	-0.0302							-0.0383
	(0.0653)							(0.0639)
Gov. Expenditure on Education		-0.0230						-0.591
		(0.385)						(0.567)
Average Years of Schooling		-1.346						-0.234
		(2.174)						(1.266)
Urban Population			-0.235					0.221
			(0.298)					(0.280)
Female Parliament Seats				0.0324				0.0974
				(0.0519)				(0.0613)
Labour Force Gender Ratio				-0.0801				**-0.270****
				(0.0746)				(0.107)
Gini Index					-0.244*			**-0.390*****
					(0.135)			(0.117)
Polity Score						-0.0210		-0.0172
						(0.153)		(0.147)
Rule of Law						2.127		2.823
						(1.438)		(2.479)
logGDP per Capita							6.234**	**8.505****
							(2.898)	(3.911)
Inflation							0.00699	0.00648
							(0.00981)	(0.0217)
Trade Openness							0.00336	-0.00289
							(0.0419)	(0.0330)
Constant	87.61***	23.80	27.69*	20.29***	26.22***	16.99***	-38.13	71.37
	(26.03)	(15.38)	(15.61)	(4.874)	(6.068)	(1.315)	(24.79)	(50.17)
Observations	311	239	315	311	321	316	303	231
R-squared	0.684	0.662	0.661	0.659	0.671	0.662	0.675	0.751
Number of countries	57	38	58	57	59	57	52	36

Robust standard errors in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$
Note 1: <u>Country and time fixed effects</u> are implemented but not reported.
Note 2: Coefficients are calculated with a <u>five-year time lag.</u>

Discussion

Unlike other studies that try to forecast poverty, this research focused on the analysis of a holistic set of potential poverty determinants. It specifically focused on examining *whether poverty can be determined by domains other than a country's economic performance*, since research increasingly shows that economic growth reaches its limits in relation to poverty reduction. Furthermore, it analysed *which concrete indicators of these domains show significant associations with poverty*. Using the outcomes of the literature, as well as the results of the regression analyses, the following will try to answer the research questions and further elaborate on what next steps are necessary to reduce global poverty.

Answering the Research Questions – What Policies Do We Need?

Examining the results, the first question can be answered with a simple "yes". Other policy domains than Economic Performance showed significance in predicting Poverty, both when calculated in isolation, as well as in comparison with other variables. However, deciding which domains and domain-indicators play a significant role in predicting Poverty demands a more detailed interpretation of the results. Not only is it necessary to evaluate the varying significance between specific regression models (domains individually or all together) and the country sets overall, but one also needs to discuss why certain other variables did not fulfil the assumption of having a significant effect. As an analysis of the results can be found in the section before, the following will focus on the interpretation of overarching trends.

Should Women Only Work in LMICs?

Following the differing outcomes for the regression of all countries, and the one of LMICs, it seems that an increase in gender equality is only beneficial for the latter. Results must however be interpreted with caution. While providing women in LMICs with the opportunity to work could be a mandatory step to escape poverty, the Labour Force Gender Ratio in general does not say enough about the fundamental structure of the workforce. Thus, individual countries might present equality in the workforce, but only have woman working in the less-well paid informal market; as found by Nieuwenhuis, Munzi, Neugschwender, Omar & Palmisano (2018), the contribution of women's

earnings to the household income was less than half, which might explain why more equal conditions in the workforce do not translate into reduced poverty. Overall, it is necessary to conduct country specific analysis to understand the underlying factors impacting the labour market. Cases like Rwanda are just one example that show that understanding the context is important for evaluating the need for policies.

Can Democracies Save Us All?

As described earlier, the results regarding the regime authority are in line with the literature. The character of a democratic regime will most likely contribute to the reduction of poverty (Brady, Blome & Kleider, 2016). However, it is not enough to say that a democratic institution is sufficient, it must be ensured that the institutions fulfil their responsibilities in exercising good governance. However, which exact criteria are most important, e.g., control of corruption, governance effectiveness or opportunities for participation, requires further investigation.

What Happened to Education?

One surprising outcome of the study was the insignificance of the Education domain; touted as one of the most important strategies to reduce poverty, it now presents chastening results. Nonetheless, this does not indicate that the domain itself is unnecessary. Even though insignificant, we see the negative association with Poverty. It is most likely, that the variables chosen simply do not measure the crucial factors that are important in the field of education. For example, an increase in average years of schooling might not say anything about the quality of education (OECD, 2012). This would mean, that individuals do not benefit enough from their training to have a significant effect on reducing poverty levels. Thus, new variables should be selected to test for the significance of this domain.

Proof to Disregard GDP per capita After All?

The positive associations identified in the regression of LMICs might seem like the final proof to stop all growth-centric strategies and start anew. However, this would be a false and potentially damaging decision. Even though the results indicate an increase in poverty following an increase in

logGDP per capita, it should be interpreted as a consequence of interactions between the independent variables. Hence, the "positive" impact of logGDP per capita on Poverty might simply be better explained by other variables such as the Labour Force Gender Ratio or the Gini Index, resulting in a reverse trend for the logGDP per capita variable. Thus, instead of ignoring the benefits of growth, it should remain an important variable to enable the improvement of other socio-economic domains (World Bank, 2014b).

Do only LMICs experience Income Inequality?

The sad answer is no. On the contrary, an increasing number of HICs countries are experiencing income gaps (Dabla-Norris, Kochhar, Suphaphiphat, Ricka & Tsounta, 2015). However, one explanation for the lacking significance for all countries could be that the relative impact is much more harmful for LMICs, pushing people below the poverty line more easily (Desai, 2016). However, to enable long-term growth that benefits everyone, income inequality should be fought in all countries, as inequalities between countries would only further increase the burden for countries with high shares of extreme poverty (Barro, 1999).

Following this interpretation of the results, the second research question needs to be with an unsatisfying "it depends". Overall, the results suggest that the Polity Score predicts poverty most stable. However, to be able to derive more precise policy recommendations, individual sub-points of this indicator must be examined, such as voice and accountability, rule of law and government effectiveness. Other domains such as Living Conditions or Education might also be important, though they require a more detailed analysis of individual countries to assess the need of specific determinants of each domain.

When specifically turning to those most in need however, meaning LMICs, the results present some more specific variables that should be added to the list of important poverty determinants. The study suggests that a reduction of income inequality is one of the most significant factors to reduce poverty levels. This goes in hand with creating a more gender-equal workforce. Both determinants most likely contribute to the reduction of poverty, by distributing resources more equally and

increasing opportunities. Furthermore, life expectancy should be improved, though this is more of a free interpretation of the results, keeping in mind the issue of reverse causality.

Finally, even though it presented a positive association, increases in logGDP per capita need to remain an important focus in an attempt to reduce poverty levels. However, it needs to be seen as a contributing variable enabling improvements in other socio-economic domains.

Changing the Narrative - What is still Missing?

The results show that a holistic approach to poverty reduction is not only possible, but also beneficial. Backed up by the literature, we see that including a comprehensive set of socio-economic factors in the development strategy enables governments to tackle the underlying problems of poverty (Ravallion, 2016). There are several new measures of poverty accounting for other factors than economic performance. How come then, that still the focus remains on economic growth?

There is of course the argument that tackling poverty is easier in a growing economy (World Bank, 2014b). Not only enables it the redistribution of wealth, but it also fosters innovation. Stagnant economies would not be able to create new opportunities for the increasing population (World Bank, 2014b). Many LMICs are very dependent on improving their economy and cannot afford not to exploit the full potential of growth. Nothing is inherently wrong with that, as the World Bank (World Bank, 2014b) stated, no one should because of missing opportunities.

However, as this paper argues, what does it help if growth does not reach the people in need, or does not translate into improvements in other areas of life? Thus, economic growth needs to be seen as what it really is, a means to an end, instead of an end to itself (Rauniyar & Kanbur, 2010). Some level of growth is necessary condition; however, it must be combined with other targets and a pro-poor approach that reduces inequalities (Desai, 2016). That would enable individuals to actually benefit from growth, while at the same time contributing to it by becoming valuable members of the society (Gent, 2017).

Next to the apparent growth-dependency are however two other factors that potentially slow the implementation of more holistic frameworks. Here, we have the vagueness of these framework. They are missing clear definitions and guidelines (Gupta et al, 2015). Looking at the Inclusive Development Framework, it is only a broadly elaborated idea, which leaves a lot of room for interpretation. The SDGs tried to propose 17 specific goals, all with individual targets, nonetheless, they are not providing information regarding exact measurements, strategies, nor do they assign responsibility (Loewe & Rippin, 2015). It is no wonder that some of the goals are often marginalised and replaced by a focus on growth (Gupta et al, 2015) – which in comparison offers specific measures that have been tested worldwide.

This builds the bridge to the second point, which is the missing number of evidence. Country-specific research in the field of holistic policy making is needed in the context of poverty. Actual numbers are necessary to convince government and institutions to take on a different approach and enable comparison between countries (Aiyub, Novitayani, & Marthoenis, 2020; World Bank, 2020). This paper provided empirical evidence that a holistic approach is possible; what follows next is the analysis of individual countries and putting the theoretical knowledge into practice.

Action Steps for an Inclusive Future

The previous section made clear that incentives are missing for governments or institutions to enhance their development strategies. While more research is needed in that regard, an outline of the most important recommendations for advertising and implementing a more holistic approach to poverty reduction can be found below.

- **To enhance growth, inequalities need to be reduced.** Therefore, development strategies need to be pro-poor and set in a relational context. This will ensure that those in need receive the necessary support, reducing inequality in the long run.

- **Growth must be understood as a means, instead of an end in and of itself**. While it needs to remain a part of the development strategy, focus must be put on a holistic set of additional socio-economic factors.

- **Countries need to invest in research and the collection of national data.** This will enable them to get a better understanding of underlying causes of poverty and enables the development of specific targets.

- **Responsibilities need to be clearly defined.** Governments and institutions need clear guidelines, to follow up on specific tasks. This will enable a better control of the overall progress.

- **New comparable measurements of socio-economic factors need to be developed.** The international community needs to come together and share their experiences in the reduction of poverty, to create an overview of measures that proved to be significant in the reduction of poverty.

Limitations

Albeit the efforts to be comprehensive and precise in the analysis of potential poverty determinants, this research is limited by a selection of factors. First, the statistical analysis does not provide information regarding the causal relationships of variables. Therefore, significant associations between individual explanatory variables, e.g., Life Expectancy, and the dependent variable Poverty can also exist due to reverse influences. Proof of causality can only be given when observations from field experiments confirm a causality.

Furthermore, the time-lag of the regressions might have been too small. Thus, potential impacts of specific independent variables could have not been determined, as that would have required an observation over a longer period. Additionally, the overall dataset might have been too small to grasp the full spectrum of interactions between variables.

Finally, next to general omitted variables bias, the research worked with a limited number of variables that might have not properly captured the true meaning of the identified dimensions. There are several alternative variable options that should be considered. This of course strongly depends on the data availability and coherence of international collection methods.

Future Research

Since this study has only made a superficial contribution to the global understanding of poverty and its determinants, several in-depth research questions are pending. Hence, it would be interesting to carry out a similar study with different poverty lines to determine whether an alternative measure of poverty leads to different variable significance regarding its prediction.

This proposal could also be extended to national analyses. When considering a specific country and examining the national circumstances in detail, the results of the regression analysis could be used to develop evidence-based policies.

In general, this paper has highlighted the issue of inclusion and equality. In relation to the first, further research on the effective formulation of development targets and action plans could be undertaken. It would be interesting to find out what information and instructions are needed to make national governments aware of their responsibility to improve the human-welfare of their country. Furthermore, it should be examined how international organisations can promote inclusive development that also looks at the relational context.

Finally, a final idea regarding equality is a more detailed examination of the connection between income inequality, economic growth and poverty. The focus should be on reducing inequality, while improving poverty levels, without losing sight on the effect this might have on growth.

Conclusion

The purpose of this paper was an overall analysis of a holistic set of potential new policy domains, suitable for the reduction of poverty levels. Although the results are not supposed to be used for the development of national policies, they can be seen as first indications of national research directions. The focus was to break away from the ubiquitous dogma that economic growth is the main strategy in combating poverty.

As the literature has shown, the growth model has reached its limits. Challenges such as country wide poverty traps, especially regarding rising income inequalities, cannot be tackled by economic growth alone, if it does not ensure that surrounding socio-economic conditions are improved in the process. Therefore, new strategies are necessary to achieve the United Nations first SDG – the elimination of extreme poverty by 2030 - despite the setback caused by the COVID-19 pandemic.

With reference to the Inclusive Development Framework, seven individual policy domains were singled-out from the literature that appear promising in the fight against poverty. After a selection of domain-specific variables, multiple-linear regressions were performed to obtain information regarding their predictability of poverty.

The results show that different determinants of poverty can be found in domains other than Economic Performance. More specifically, negative associations between Poverty and Life Expectancy, the Labour Force Gender Ratio, as well as overall Income Inequality were found, indicating that improvements in these directions might contribute to the reduction of poverty. However, more country-specific research is needed.

This highlights the multidimensionality of poverty and points out the need for new policies, replacing the growth-centric development strategy. An inclusive pro-poor approach must be applied that particularly focuses on those in need, and at the same time tries to reduce inequality gaps between the rich and the poor. Of course, economic growth should not be completely neglected in this process. However, it must be brought back to the fore that growth is a means to reach the goal of development, and not an end in and of itself.

What is important to focus on the future is the establishment of clear context-relevant targets and action plans. As discussed in this paper, current (inclusive) development strategies such as the SDGs are missing direct guidance on how to follow up on specific goals and who carries the responsibility of executing necessary interventions. By advancing these frameworks, it becomes possible to build a society of inclusion and equity, in which the achievements of the SDGs become promoters of economic growth, building a self-reinforcing cycle.

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Appendix

Appendix 2: Correlation Matrix including all Variables

Figure 2: Feature Correlation Matrix of Poverty and Poverty Determinants
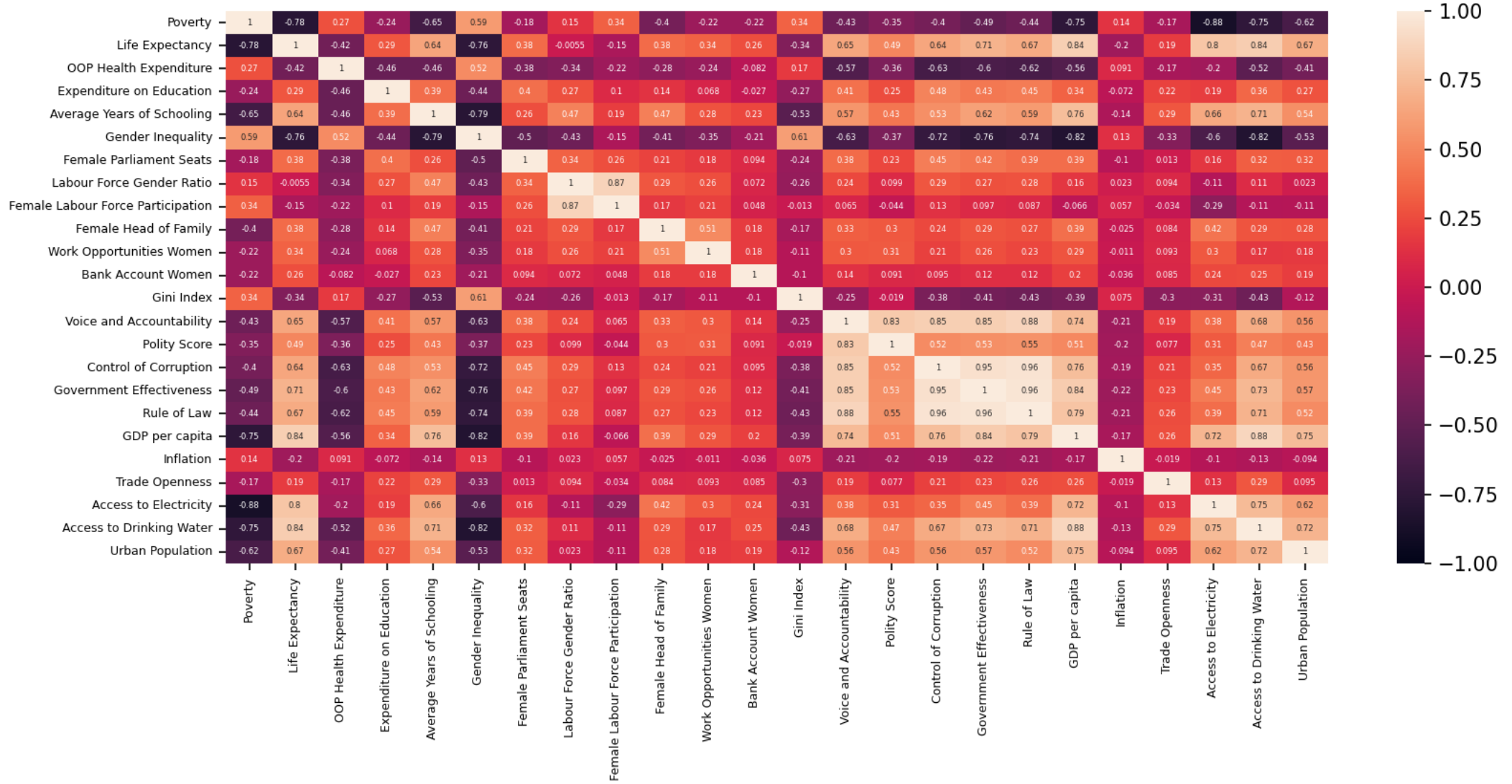
Appendix 2: Regression Table High-Income Countries

Table 8: Fixed Effects Regression Table for High-Income Countries predicting Poverty

VARIABLES	(1) Health	(2) Education	(3) Living Cond.	(4) Gender Equality	(5) Income Ineq.	(6) Institutions	(7) Economic Perf.	(8) All Domains
Life Expectancy	0.0329							0.0696
	(0.0812)							(0.0818)
OOP Health Expenditure	-0.00462							-0.0163
	(0.0112)							(0.0131)
Gov. Expenditure on Education		0.0373						0.112
		(0.103)						(0.106)
Average Years of Schooling		0.0488						-0.0470
		(0.0825)						(0.102)
Urban Population			-0.00900					-0.0168
			(0.0223)					(0.0217)
Female Parliament Seats				0.00618				0.00652
				(0.00857)				(0.00700)
Labour Force Gender Ratio				0.0226				-0.00157
				(0.0142)				(0.0111)
Gini Index					0.0478***			0.0211*
					(0.0178)			(0.0121)
Polity Score						-0.0250		-0.00173
						(0.0174)		(0.0142)
Rule of Law						-0.616**		-0.610
						(0.255)		(0.384)
logGDP per Capita							-1.143**	-0.947
							(0.548)	(0.851)
Inflation							0.0106**	0.0218**
							(0.00460)	(0.00864)
Trade Openness							-0.00225	0.00100
							(0.00278)	(0.00363)
Constant	-1.677	-0.0430	1.279	-0.974	-1.035	1.368***	12.23**	6.102
	(5.947)	(1.123)	(1.597)	(0.957)	(0.630)	(0.266)	(5.528)	(6.084)
Observations	529	485	529	528	529	497	515	440
R-squared	0.099	0.100	0.098	0.111	0.132	0.121	0.133	0.184
Number of countries	65	56	65	64	65	61	63	51

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
Note 1: Country and time fixed effects are implemented but not reported.
Note 2: Coefficients are calculated with a five-year time lag.

Appendix 3: Python Code – Creating the Dataset

```python
import pandas as pd
import numpy as np
from typing import AsyncIterable
from importlib.resources import path
import matplotlib.pyplot as plt
import seaborn as sns




###DATASETS
poverty = pd.read_csv("poverty.csv", skipfooter=176-171)
gdp = pd.read_csv("gdp.csv")
gni = pd.read_csv('gni.csv', skipfooter=223-218)
development = pd.read_csv("governance.csv")
politics = pd.read_csv('politics.csv')
women = pd.read_csv('women.csv')
av_schooling = pd.read_csv("av_schooling.csv")
gender_ineq = pd.read_csv("gender_ineq.csv")
trade = pd.read_csv("trade.csv")
pol_struc = pd.read_csv("pol_struc.csv", delimiter=';')
fem_labour = pd.read_csv("fem_labour.csv")


###TRANSFORMING DATASETS
#Poverty Data
poverty = poverty.drop(['Series Name', 'Series Code'], axis = 1)
poverty = poverty.melt(id_vars = ['Country Name', 'Country Code'], var_name =
          'Year', value_name = 'Poverty')
poverty = poverty.rename(columns={'Country Name': 'Country'})

print(poverty['Poverty'].eq('..').sum())
poverty = poverty[(poverty['Poverty'] != '..')]
poverty.to_csv(path_or_buf='new_poverty.csv')

#GDP Data
gdp = gdp.drop(['Time Code'], axis = 1)
gdp = gdp.rename(columns={'Country Name': 'C1', 'Time':'Year'})
gdp.to_csv(path_or_buf='new_gdp.csv')

#GNI Data
gni = gni.drop(['Series Name', 'Series Code'], axis = 1)
gni = gni.melt(id_vars = ['Country Name', 'Country Code'], var_name = 'Year',
      value_name = 'GNI')
gni = gni.rename(columns={'Country Name': 'C2'})
gni.to_csv(path_or_buf='new_gni.csv')

#Development Data
development = development[development['Series Name'] != 'Poverty headcount
```

```python
               ratio at $1.90 a day (2011 PPP) (% of population)']
development = development[development['Series Name'] != 'Literacy rate, adult
               total (% of people ages 15 and above)']
development = development.drop(['Series Code'], axis = 1)
development = development.melt(id_vars=['Country Name','Country Code','Series
               Name'], var_name='Year')
development = (development.pivot_table(index=['Country Name','Country
               Code','Year'], columns='Series Name', values='value', aggfunc=',
               '.join).reset_index().rename_axis(None, axis=1))
development = development.rename(columns={'Country Name':'C3',
                            development.columns[3]:'Access to Electricity',
                            development.columns[4]:'Gini Index',
                            development.columns[5]:'Expenditure on Education',
                            development.columns[6]:'Inflation',
                            development.columns[7]:'Life Expectancy',
                            development.columns[8]:'OOP Health Expenditure',
                            development.columns[9]:'Access to Drinking Water',
                            development.columns[10]:'Female Parliament Seats',
                            development.columns[11]:'Labour Force Gender Ratio',
                            development.columns[12]:'Urban Population' })
development.to_csv(path_or_buf='new_development.csv')

#Political Structure Data
politics = politics.drop(['Series Code'], axis = 1)
politics = politics.melt(id_vars=['Country Name','Country Code','Series
            Name'], var_name='Year')
politics = (politics.pivot_table(index=['Country Name','Country Code','Year'],
            columns='Series Name', values='value', aggfunc=',
            '.join).reset_index().rename_axis(None, axis=1))
politics = politics.rename(columns={'Country Name':'C4',
                        politics.columns[3]:'Control of Corruption',
                        politics.columns[4]:'Government Effectiveness',
                        politics.columns[5]:'Rule of Law',
                        politics.columns[6]:'Voice and Accountability'})
politics.to_csv(path_or_buf='new_politics.csv')

#Women Data
women = women.drop(['Series Code'], axis = 1)
women = women.melt(id_vars=['Country Name','Country Code','Series Name'],
        var_name='Year')
women = (women.pivot_table(index=['Country Name','Country Code','Year'],
columns='Series Name', values='value', aggfunc=',
        '.join).reset_index().rename_axis(None, axis=1))
women = women.rename(columns={'Country Name':'C5',
                        women.columns[3]:'Female Head of Family',
                        women.columns[4]:'Work Opportunities Women',
                        women.columns[5]:'Bank Account Women'})
women.to_csv(path_or_buf='new_women.csv')
```

```python
#Education Data
av_schooling = av_schooling[['country','year','WBcode','yr_sch']]
av_schooling = av_schooling.rename(columns={'country':'C6','WBcode':'Country
            Code','year':'Year','yr_sch':'Average Years of Schooling'})
av_schooling.to_csv(path_or_buf='new_av_schooling.csv')

#Gender Inequality Data
gender_ineq = gender_ineq.drop(['HDI Rank', 'a', 'b', 'c', 'd', 'e', 'f', 'g',
            'h', 'i', 'j', 'k', 'l', 'Unnamed: 28'], axis = 1)
gender_ineq = gender_ineq.melt(id_vars = ['Country', 'Country Code'],
            var_name = 'Year', value_name = 'Gender Inequality')
gender_ineq = gender_ineq.rename(columns={'Country': 'C7'})
gender_ineq.to_csv(path_or_buf='new_gender_ineq.csv')

#Trade Data
trade = trade.drop(['HDI Rank', 'a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i',
        'j', 'k', 'l','m','n','2010-2019',trade.columns[-1]], axis = 1)
trade = trade.melt(id_vars = ['Country', 'Country Code'], var_name = 'Year',
        value_name = 'Trade Openness')
trade = trade.rename(columns={'Country': 'C8'})
trade.to_csv(path_or_buf='new_trade.csv')

#Polity5Project Data
pol_struc= pol_struc[['country','scode','year','polity2']]
pol_struc = pol_struc[pol_struc.year >=1995]
pol_struc = pol_struc.rename(columns={'country':'C9', 'scode':'Country Code',
            'year':'Year', 'polity2':'Polity Score'})
pol_struc.to_csv(path_or_buf='new_pol_struc.csv')

#Labour Force Data
fem_labour = fem_labour.drop(['Time Code'], axis = 1)
fem_labour = fem_labour.rename(columns={'Country Name': 'C10', 'Labor force
            participation rate':'Female Labour Force Participation', 'Time':
            'Year'})
fem_labour.to_csv(path_or_buf='new_fem_labour.csv')


###MERGING DATASETS
print(poverty.dtypes)
print(gdp.dtypes)
print(gni.dtypes)
print(development.dtypes)
print(politics.dtypes)
print(women.dtypes)
print(av_schooling.dtypes)
print(gender_ineq.dtypes)
print(trade.dtypes)
print(pol_struc.dtypes)
print(fem_labour.dtypes)
```

```python
merge1 = pd.merge(poverty, development,how='left',on=['Country Code', 'Year'])
merge2 = pd.merge(merge1, gni, how = 'left', on=['Country Code', 'Year'])
merge3 = pd.merge(merge2, politics, how = 'left', on=['Country Code', 'Year'])
merge4 = pd.merge(merge3, women, how = 'left', on=['Country Code', 'Year'])
merge4.Year = merge4.Year.str[:4]
gender_ineq.C7 = gender_ineq.C7.str[1:]
trade.C8 = trade.C8.str[1:]
merge5 = pd.merge(merge4, gender_ineq, how ='left',on=['Country Code','Year'])
merge6 = pd.merge(merge5, trade, how = 'left', on=['Country Code', 'Year'])
merge6 = merge6.astype({'Year': 'int64'})
merge7 = pd.merge(merge6, fem_labour, how ='left',on=['Country Code', 'Year'])
merge8 = pd.merge(merge7, gdp, how = 'left', on=['Country Code', 'Year'])
merge9 = pd.merge(merge8, av_schooling,how ='left',on=['Country Code','Year'])
final = pd.merge(merge9, pol_struc, how = 'left', on=['Country Code', 'Year'])
print(final.columns)
final = final[['Country', 'Year', 'Poverty','Access to Electricity', 'Gini
        Index','Expenditure on Education','Inflation', 'Life Expectancy', 'OOP
        Health Expenditure','Access to Drinking Water', 'Female Parliament
        Seats','Labour Force Gender Ratio', 'Urban Population', 'GNI',
        'Control of Corruption', 'Government Effectiveness', 'Rule of Law',
        'Voice and Accountability', 'Female Head of Family','Work Opportunities
        Women', 'Bank Account Women', 'Female Labour Force Participation',
        'Gender Inequality', 'Trade Openness', 'GDP per capita','Average Years
        of Schooling', 'Polity Score']]


###CLEANING DATASET
print(final.eq('..').sum())
final = final.replace(['..'], np.nan)
print(final.eq('..').sum())

print(final.isnull().sum())

final.to_csv(path_or_buf='cleaned_data.csv')
final.to_excel('cleaned_data.xlsx')




###FORMATTING THE DATA
df = pd.read_csv("cleaned_data.csv")
df.iloc[:, 3:] = df.iloc[:, 3:].astype('float32')


#Log-transforming GDP
df['GDP per capita'] = np.where(df['GDP per capita'].isna(), np.nan,
np.log(df['GDP per capita'])


#Changing order of columns
```

```python
df = df[['Country', 'Year','Poverty', 'Life Expectancy', 'OOP Health
    Expenditure','Expenditure on Education', 'Average Years of Schooling',
    'Gender Inequality','Female Parliament Seats','Labour Force Gender
    Ratio','Female Labour Force Participation','Female Head of Family', 'Work
    Opportunities Women','Bank Account Women','Gini Index', 'Voice and
    Accountability', 'Polity Score', 'Control of Corruption', 'Government
    Effectiveness','Rule of Law', 'GDP per capita', 'Inflation', 'Trade
    Openness', 'GNI', 'Access to Electricity', 'Access to Drinking Water',
    'Urban Population']]

#Eliminating Missing Values
df = df.groupby('Country').apply(lambda group:
group.interpolate(method='linear', limit_direction='both'))

print(df.isnull().sum())




###SUBSETS (*more subset alternatives below)
#Economic Groups
def economic_group(value):
    if value >= 12695 :
      return "high"
    else:
      return "low"

df['Economic Group'] = df['GNI'].map(economic_group)




###CORRELATION MATRIX
df_corr = df[['Poverty', 'Life Expectancy', 'OOP Health Expenditure',
         'Expenditure on Education', 'Average Years of Schooling', 'Gender
         Inequality','Female Parliament Seats','Labour Force Gender
         Ratio','Female Labour Force Participation', 'Female Head of Family',
         'Work Opportunities Women','Bank Account Women','Gini Index',
         'Voice and Accountability', 'Polity Score', 'Control of Corruption',
         'Government Effectiveness','Rule of Law', 'GDP per capita',
         'Inflation', 'Trade Openness', 'GNI', 'Access to Electricity',
         'Access to Drinking Water', 'Urban Population']]

corr=sns.heatmap(df_corr.corr(), annot = True, annot_kws={'size': 4}, vmin = -
1, yticklabels = True, xticklabels=True)
corr.tick_params(labelsize=6)
#corr.set_title('Correlations between Inclusive Policy Domains and Poverty',
size = 12)
print(plt.show())



#Dropping Variables due to Multicollinearity
```

```python
df_corr = df[['Poverty','Life Expectancy', 'OOP Health Expenditure',
         'Expenditure on Education', 'Average Years of Schooling','Female
         Parliament Seats','Labour Force Gender Ratio','Gini Index','Polity
         Score', 'GDP per capita', 'Inflation', 'Trade Openness','Urban
         Population']]

corr=sns.heatmap(df_corr.corr(), annot = True, annot_kws={'size': 4}, vmin = -
1, yticklabels = True, xticklabels=True)
corr.tick_params(labelsize=6)
#corr.set_title('Correlations between Inclusive Policy Domains and Poverty',
size = 12)
print(plt.show())



###FINAL DATA FOR REGRESSION
df = df[['Country', 'Year','Poverty', 'Life Expectancy', 'OOP Health
     Expenditure','Expenditure on Education', 'Average Years of
     Schooling','Female Parliament Seats','Labour Force Gender Ratio','Gini
     Index','Polity Score', 'GDP per capita', 'Inflation', 'Trade Openness',
     'Urban Population', 'Economic Group']]

#All Countries
df.to_csv(path_or_buf='df_final_interpolated.csv')

#Subsets
df_high = df[df['Economic Group'] == 'high']
df_high.to_csv(path_or_buf='df_high_interpolated.csv')

df_low = df[df['Economic Group'] == 'low']
df_low.to_csv(path_or_buf='df_low_interpolated.csv')


#Checking what countries change groups
print(df_high['Country'].nunique())
print(df_low['Country'].nunique())
print(df['Country'].nunique())

print([c for c in df_low["Country"].unique() if c in
df_high["Country"].unique()])
```