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# Growth is Dead, Long Live Growth

## The Quality of Economic Growth and Why it Matters

Edited by

Lawrence Haddad
Hiroshi Kato
Nicolas Meisel

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Japan International Cooperation Agency (JICA)

The views and opinions expressed in the articles contained in this volume do not necessarily represent the official views or positions of the organizations the authors work for or are affiliated with.

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# Growth is Dead, Long Live Growth

## The Quality of Economic Growth and Why it Matters

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## Foreword

The three organisations behind this book—AFD, IDS, and JICA—have different roles and responsibilities when it comes to global development, but each has long advocated for a more nuanced debate on growth, emphasising, for example, its distributional consequences, its human development impacts, and its environmental effects. As we enter into the post 2015 development era, all of these features of growth are becoming ever more integrated, and gaining importance as decisive factors for realising sustainable development.

We are delighted that the authors of this book have come together, supported by our respective institutions, to make a significant contribution to inform our debate on this subject. In the 21st century our decisions and policies will perhaps be judged less on the quantity of growth they help to achieve, but on its quality—what it does for the things that we, as citizens of this planet, really care about. This book will offer some guidance on what we have come to know about the quality of growth, and it will help to identify the research gaps that most urgently need to be filled.

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## Preface

This book was written because the editors felt that insufficient attention is being given to the quality of growth.

As the signs of negative impact of global climate change are becoming evident, and especially in the aftermath of the global economic turndown, societies had a choice—either reframe their definition of growth, or try to pursue it— growth as we have known it for many decades—via business as usual routes, using metrics rooted in the 20th century. True, there are emerging signs of change. For example, the debate on the post-2015 development agenda is slowly moving towards a greater consensus on the need to focus on growth that generates jobs, reduces inequality, is consistent with a sustainable use of natural resources and generates manageable amounts of greenhouse gases. By and large, however, despite such debate in international arena, politicians both in developed and developing countries alike seem to be choosing the latter routes, pursuing growth as we have known it via business as usual approaches and metrics.

What does the academic world have to say on these issues? Among the various academic disciplines, economists in particular seem to have focused insufficiently on these issues: What are the dimensions of growth quality we should most care about? How to measure such qualities? And what are the tradeoffs between them in the context of different policy regimes and governance structures? And the list of such important research questions goes on.

This collection of papers represents an effort of the researchers of the three institutions—AFD, IDS, and JICA—to contribute to the deepening and widening of international debate on such issues. We hope it provokes policy-makers to think twice about the blind pursuit of "growth at all costs," and our development community to think seriously about how their day-to-day decisions and activities can contribute, both positively and negatively, to realizing a higher quality of growth.

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**Introduction**

# Growth is Dead, Long Live Growth

## The Quality of Economic Growth and Why It Matters

Lawrence Haddad, Hiroshi Kato and Nicolas Meisel

***"Speed is irrelevant if you are going in the wrong direction"***
**(M. Gandhi)**

### Why the quality of growth?

The way that economic growth is conceptualised and measured has been a topic of great debate for many years (Seers 1972). How can equity considerations be incorporated? How can environmental externalities be taken into account? And, ultimately, how can we improve the ability of economic growth to drive the development outcomes we most care about? Many now talk about degrowth (Demaria et al. 2013), the end of growth (Heinberg 2011), or the forthcoming secular stagnation (Teulings and Baldwin 2014) —about how growth is no longer desirable, useful, or even feasible. This collection of papers prefers to frame the debate not as the end of growth, but as the end of growth as we know it. The 20th century definition of growth must be left in the 20th century and 21st century formulations adopted for the times we live in.

We are not the first to discuss the quality of growth. The debate on the quality of growth is primarily a debate about the quality of life. It is well known since the early works of Easterlin (1974) that the progress of GDP per capita in Western countries does not mean a parallel progress in perceived happiness. Since 1990, the United Nations Development Programme (UNDP) through both its Human Development Reports and the Human Development Index has brought the idea of the quality of growth into the mainstream policy discourse. An important piece of work on this issue by Thomas, et al. (2000) was also published by the World Bank at the turn of the millennium. It argued that while economic growth remains important among the factors that contribute to development, the quality of that growth is equally important. The report contended that development is better served when quantity and quality of growth intertwine and explicitly focus on an agenda that addresses the human, social, environmental, and governance dimensions of development.[1]

In addition to the benefit of 15 more years of observation, conceptualization, data and studies, our work advances Thomas et al. (2000) in three important ways. First, the ramifications of the global financial crisis of 2007-8 flow through many of the papers in this collection, generating greater insight about what we should be measuring. Second, the evidence on climate change is more organized and compelling, generating a new literature on the potential tradeoffs between economic growth, poverty reduction and environmental costs. Finally, much more work has been done on the levels, drivers and consequences of inequality and we draw on and aim to contribute to this literature.

Indeed, the trends and events of the last decade have moved these debates from largely academic exercises to urgent matters of public policy. The dramatic increases forecast in greenhouse gas emissions, the persistence of chronic poverty despite the increasing wealth of nations, and an increasing recognition of the interplay between different types of growth and different types of fragilities have made the search for new ways of framing, measuring, analysing and assessing economic growth even more pressing. If not all forms of growth are equally valuable and some are destructive of development, what growth do we need and how do we get it?

Policy debates on the quality of growth have been very active around the world. In Asia, for example, the quality of growth has been hotly debated. This is understandable, for Asia is a region that has achieved remarkable economic development, but only with accompanying difficulties such as inequality within the region and within countries, insecurity in terms of the supply of food and energy, increased risk of infectious diseases, and the middle-income poverty trap problem (Sumner 2013). Thus the APEC's growth strategy adopted in 2010 (Xia 2011) highlighted five pillars, that included (1) balanced growth, (2) inclusive growth, (3) sustainable growth, (4) innovative growth, and (5) secured growth. Even China seems to have clearly put an end to its policy orientation of "growth at all costs." In 2011 Chinese Premier Wen Jiabao told a conference in Beijing[2] that he believes

1. World Bank Institute (2001).

2. Annual Meeting of the New Champions (what is generally called "Summer Davos" conference) in 2011.

that "China's economy can achieve longer term, better quality growth". The participants of the said conference came up with an understanding that the following five elements constitute "quality growth:" sustainability, inclusion, fairness, balance, and innovation.

In Africa we have heard the term "quality of growth" less frequently but the current heated debate on African development seems to be centred not simply on assuring the continent's continued growth but more importantly on economic transformation, i.e., away from the excessive dependency on extractive mineral and energy sectors and toward more broad based economic development. It centres on "inclusive growth" or how to share the fruit of growth among the populace, and this is at the core of the quality of growth debate. In Latin America, too, where inequality has long been a major constraint to development, this is an agenda attracting attention from policy makers (Thorbecke 2013).

In Europe the debates have been around sustainable growth (Jackson 2011), degrowth (Demaria et al. 2013), measurement issues (Stiglitz, Sen and Fitoussi 2013) and the connection between inequality and economic, social, and ecological challenges (Alvaredo et al. 2013, Haddad 2015). All of these refer to quality of growth issues.

In this volume we do not offer a precise definition of the quality of growth. More importantly we focus on expanding the knowledge base on three agreed key dimensions of quality: (1) growth that manages environmental tradeoffs, (2) growth that supports equity and inclusiveness, and (3) growth that is less susceptible to shocks. By bringing together these strands we aim to contribute to a unification of the field and to identify any common patterns and synergies.

**Environmental Sustainability and Climate Change**

A few years earlier than the work of Easterlin (1974), the Meadows report (1972) on *The Limits to growth* drew the world's attention to the contradiction between exponential growth trends in population and GDP and the finite resources and carrying capacities of our planet. The report was ignored or ridiculed by the bulk of the economic profession at the time of its publication. However, 35 years later Turner (2008) showed that the values predicted in 1972 by the 'standard run' (business as usual) scenario were disturbingly close to the observed data. In this scenario, exponential growth is followed by a collapse of our economic system at some point in the 21st century due to soaring global emissions of greenhouse gases (GHG, such as methane, nitrates and carbon dioxide from various sources related to human activity).

Likely climate change generated by greenhouse gas (GHG) emissions will have both short and long run effects. First, via temperature-induced changes in water stock availability climate change would progressively erode the natural capital base of our societies, hence adversely impacting agricultural output and food security. A recent study by MIT scholar John Reilly (2014), which was presented at the 11th AFD-Proparco-EUDN conference on Energy for Development, shows that policy efforts aiming to control climate change through (re)forestation for carbon sequestration, use of land for bioenergy production and increased energy costs, would ultimately affect prices of food, hence generating systemic pressure on the already fragile climate-agriculture link. Moreover, as a consequence of altered biophysical equilibria, life expectancy would shrink from current average, due to, among other factors, rising health costs, emerging pathologies and viruses, severe droughts, the destruction of infrastructure and conflicts. In the longer run, and more indirectly, geophysical evolutions such as changes in oceanic streams or releases of GHG trapped under the permafrost might entail a substantial and sudden rise in atmospheric temperature with dramatic ecological, economic and social consequences.

Whatever the exact nature and timing of such events, their likelihood is rapidly increasing according to the International Panel on Climate Change (IPCC, 2014) and the many research centres working on these issues. A famous paper by Anderson and Bows (2011) from the Tyndall Centre for Climate Change Research in the UK states: "*The analysis within this paper offers a stark and unremitting assessment of the climate change challenge facing the global community. There is now little to no chance of maintaining the rise in global mean surface temperature at below 2°C, despite repeated high-level statements to the contrary. Moreover, the impacts associated with 2°C have been revised upwards, sufficiently so that 2°C now more appropriately represents the threshold between dangerous and extremely dangerous climate change.*"

Western Europe and Japan have been experiencing near-stagnant growth for some years now and the prospects remain moderate to say the least while the centre of gravity of global growth has moved to Asia. Sharing the diagnosis of Jackson (2011) and many others, our societies face a dilemma to reconcile economic progress, social stability and the preservation of our ecosystems. The primary constraint pertains to the link between social stability and 'growth as we know it', and the dilemma has to do with the contradiction between the quest for 'growth as we know it' and the resulting GHG emissions within viable limits as suggested by the IPCC (2014). Let us shed some light on each of them in turn.

How to reconcile an indefinitely growing global economy fuelled by a growing population (set to reach nine billion by 2050), always producing and consuming more goods and services with the preservation of a viable environment for humankind needed to ensure the reproducibility of our societies? CO2 emissions and global GDP have moved hand in hand for the last two centuries, following not an arithmetical, nor a geometrical, but an exponential growth trajectory. In the last decade according to the IPCC (2014), population growth and economic growth outpaced emission reductions from improvements in energy intensity. Increased use of coal relative to other energy sources reversed the long-standing trend of gradual decarbonisation of the world's energy supply. The current share of fossil fuels in energy consumption will increase with about 1200 new coal-fired plants in the world according to the World Resources Institute (Yang and Cui, 2012), two thirds of which are in China and India. Given this rising share of fossil fuels in the energy mix, keeping the extraction of non-renewable materials (i.e. fuels and minerals), the production of waste and pollution, and the emission of GHG within 'reasonable' limits (i.e. avoid overshooting the 2°C target of global warming beyond which extreme events would become highly likely) would practically mean constraining the economic system to a global average 'growth as we know it' close to 0.

Growth as we know it thus faces a physical impossibility that policy-makers around the world do not seem to fully realize. In the words of Daly (2005), one of the first ecological economists at the World Bank: "the biosphere is finite, non-growing, closed (except for the constant input of solar energy), and constrained by the laws of thermodynamics. Any subsystem, such as the economy, must at some point cease growing and adapt itself to a dynamic equilibrium, something like a steady state."

Fully internalising the negative carbon externality over the short and long run is a challenge to the tools of economists because of the uncertainty over the magnitude of future shocks. Current market signals do not allow us to identify the magnitude of the future market failures. Market signals would likely remain too small until too late, i.e. when irreversibility thresholds would have been crossed. The only way out of this massive "market failure" is to think of government regulations changing market signals and incentives at the local, national and global levels. Examples would include carbon markets with a global quota system setting the volume of expected reductions in emissions, or a "carbon tax" setting a carbon price, with the risks that these mechanisms will be either insufficient or bypassed or, if effective, will have strong recessive consequences.

Moreover there is little analysis of the politics of collective action required to prevent catastrophic outcomes in the future, let alone confront them. This refers the political difficulty of mobilising populations on abstract and remote threats where the costs of political inaction are diffuse and in the future, the benefits of inaction are concentrated in the hands of powerful sectors of the economy and the consequences of inaction impact the majority of the population, usually the poorest disproportionately.

**Job Creation, Equality and Inclusiveness**

In the presence of productivity gains, which are both the core engine and outcome of economic growth, net job creation in our current economic system depends on permanently increasing the size of the economy (Jackson 2011). Indeed, as soon as GDP growth stands below productivity gains, jobs are destroyed, all other things being equal (size of working age population, number of worked hours, and duration of working time). In many parts of the world, the same mechanism and the concentration of growth in capital-intensive enclaves can help explain "jobless growth" and the ineffective calls for making it more "inclusive." Maintaining or improving the lot of the unemployed and of those who are not part of the labour force depends either on the ability to grow the economy and include them, or on the ability of states to tax a flow of incomes and redistribute them through social transfers, public goods and public services. Some put the emphasis on the first term ("Grow, dammit, grow!" urged The Economist in October 2010), some on the second (e.g. Paul Krugman pointing at Europe's secret success, its welfare states). Social stability and progress in both cases fundamentally rest on "growth as we know it," i.e. a growth in the production of goods and services. It is by sustaining impressive levels of output growth over three decades that the Chinese regime managed to pull 400 million people out of poverty. Should growth stagnate or diminish, the whole social edifice is shaken as is now the case in many European countries, triggering a vicious circle of growing structural unemployment, lower consumer spending, lower investment, rising social transfers, diminishing tax revenues, and widening budget deficits that turn into rising debt and sooner or later justify slashes in social spending. Our current economic system seems to be doomed to indefinitely growing in size if it is to maintain stability.

The concept of inclusive growth is an idea that encompasses the centrality of job creation at its core but also others such as the issues of inequality of access to social services and income inequality. One of the reasons that this notion came to be highlighted is that the MDG framework did not pay enough attention to the issue of inequality. World Bank President Zoellick adopted this concept as part of the organization's vision in 2007, and the Asian Development Bank also adopted this concept as one of its main agendas in its Strategy 2020.

Defined by the World Bank as a kind of growth that "allows people to contribute to and benefit from economic growth,"[3] this concept is broader than "pro-poor growth" in that it emphasizes not only the benefits for those living in poverty but also for other excluded groups of society, such as the disabled, minorities, and those living in disadvantaged areas. In the current debate on the upcoming post-2015 development agenda this issue of inclusiveness is one of the issues receiving strong attention. As will be demonstrated by one of the papers in this volume, investment in those who are generally regarded as vulnerable and unproductive could pay off not only from the humanitarian perspective but also from the perspective of economic welfare.

**Exposure to Shocks and the Promotion of the Resilience of Growth**

Another quality that the growth of the 21st century must embody is resilience: an ability to keep driving human development outcomes in the context of shocks and uncertainties (Spence 2011). Indeed progress toward the MDGs has been critically hindered by shocks and crises such as natural disasters, manmade disasters, economic and financial crises, and conflicts (Conceicao et al. 2011).

3. World Bank (2009).

The evidence base is thin in this area. There are several papers that link shocks to growth: for example, Dell et al. 2012 find evidence that temperature shocks are significantly associated with dips in economic growth rates, especially in poorer countries. There are fewer papers that identify the attributes of growth that make it more or less able to withstand shocks. One example is the work of Wen and Wu (2014), comparing China's post global financial crisis experience with other countries. Wen and Wu argue that it is not the rate of growth pre-shock that was important. They conclude that China's growth was the most resilient of all nations in the face of the 2008 global financial crisis due to some of its features (the role of state owned enterprises) and some of its policies (such as an aggressive fiscal stimulus).

However, the blind pursuit of resilience is not always going to be consistent with other goals of growth such as poverty reduction. While the benefits of adopting the concept of resilience as an analytical framework to understand how systems respond to shock/stress have been widely recognized in the social-ecological systems literature (see e.g. Carpenter et al. 2001; Chapin et al. 2009) the evidence of benefit in development is less clear. Indeed, Béné et al. (2012) argue that resilience is not necessarily a pro-poor concept—countries, institutions and people who are better off can invest in resilience—and that there is no automatic link between poverty reduction and resilience.

Nevertheless, many conclude that it is better to be safe than sorry, and Hoddinott (2014), in a wide ranging review, argues that the post 2015 development framework will need to give much more to identifying and promoting policies to nurture the capabilities of more vulnerable economies, people, and communities to deal with external shocks. Understanding the characteristics of growth that make it more resilient to shocks while maintaining or improving its pro-poor features is an important area for future research.

### The Contributions of the Papers in This Volume

This collection of papers contributes to this debate on the quality of growth in a number of ways. First, we show how different conceptualisations of growth, when measured, deliver very different assessments of country performance over time, and between countries. The paper by Aglietta shows that for many countries, what appears to be strong performance is revealed as a path towards depletion. The unsustainability of extractive resource based economies is clearly demonstrated, but so too the weak performance of economies that appear robust but which place the greatest emphasis on individual as opposed to social welfare. The easiest thing to do is to continue with the façade of measuring and reporting GDP per capita, but reporting real wealth or IWI reveals the truer benefits and costs of resource allocation decisions. Policymakers need to decide whether to choose between truth or simplicity. The negative shocks of the last decade—and the promises of ever more frequent and severe shocks in the future—suggest that simplicity has become merely simplistic and that truth cannot be dismissed for the sake of convenience.

Second, we show how 20$^{th}$ century conceptions of growth do not deliver on the issues we care about in the 21$^{st}$ century. Even the most reliable refuge of those who protect current definitions of economic growth—its ability to drive down extreme income poverty—will soon offer no protection. Bluhm, de Crombrugghe and Szirmai show that even under the most optimistic of scenarios there will be a slowdown in the ability of growth to reduce $1.25 a day poverty. A much overlooked dimension of the quality of growth is its spatial distribution—if poverty rates are to continue declining at historical rates, each of the countries of sub-Saharan Africa will have to grow at 4.5% per capita for the next 15 years. In the past 10 years, they have—on average—achieved 2.5%, an excellent performance, but not good enough for the next 15 years if we want to continue to drive down extreme poverty. The next three papers in the volume remind us that even this historically good performance of growth in driving down poverty has bypassed the most vulnerable members of society. Tsuruga shows that in Cambodia, despite excellent macroeconomic performance between 2004 and 2010 and extremely rapid declines in income poverty rates, households with certain attributes (primarily agrarian, who own little or no land) remain stuck in poverty.

Using global data, Haddad, Masset and Smith show that compared to income poverty rates, infant stunting rates are much less responsive to economic growth and that this has implications for their own poverty as adults and for the likely poverty of their children. Using a large dataset from Nepal, Lamichhane, for the first time, is able to compare the responsiveness of human development outcomes to income growth between individuals with and without disabilities. The paper makes it clear that income growth delivers less for individuals with disabilities.

Third, we show that different components of growth deliver different development outcomes. There are policy choices and they matter. What attributes of growth do we need to pay more attention to make it a driver not a destroyer of the kinds of development transformations we want to see? We focus on growth that helps control greenhouse gas emissions, that generates employment, that does not increase susceptibility to external shocks, and that capitalises on fundamental demographic transitions in Africa. Willenbockel's analysis makes it clear that without low carbon growth in the low income countries global emission targets will not be met, causing problems for all countries. He argues that it is in the interests of low income countries—and everyone else—for them to avoid the "grow now, go green later" strategy. This, he stresses, is the rationale for rich country investment in low carbon growth in the poorest countries. Jobs are a driver of development and decent work is a vital component of human wellbeing. Cirera analyses the links between income growth components and different components of employment. His analysis demonstrates the evidence gaps in our understanding of how to direct growth towards better employment outcomes.

Using local government panel data from Japan, Shimada refutes the notion that long run growth is spurred by the impact of natural crises. He estimates significant short run and long run impacts of disasters on growth. He also explores whether some growth patterns are better or worse at mitigating the impacts of a given disaster. The susceptibility of different types of growth to shocks is another key dimension of quality. Focusing on Africa, Losch highlights the major demographic trends that Africa will experience in the coming decades. In particular, over the next 40 years the ratio of adults of working to nonworking age will double—from one to two—presenting African countries with the potential for a demographic dividend. This transition will represent a dividend if employment opportunities can be created by investments now. How to realise this potential and avoid a demographic nightmare? For countries, where agriculture is an employer of a large percent of the population, investing in agriculture is one way of stimulating rural income, lowering the real price of food in urban settings, stimulating the demand for non-farm goods and bidding up rural wages. It is also a pro-poor way of growing. But is this an adequate strategic response to the potential demographic dividend? The paper also discusses the possibility of a time window where wage rates in some African countries will become much more competitive with those in Asia. The potential of these overlapping windows sharpens the focus on making the right strategic choices about growth.

Finally, as the papers by Hosono and Mejia Acosta make clear, there is no single path towards high quality growth. There are many policy choices and many common ingredients, but the heterogeneity of context is great and sequencing matters enormously. These papers also remind us, as does Willenbockel, that single policy instruments should not be relied upon to move forward multiple dimensions of growth quality. A range of instruments should be employed to advance a range of growth attributes. Trade-offs are inevitable and generate winners and losers, at least in terms of short run perceptions. This means that politics come into play—at the global, national and subnational levels. Mejia Acosta examines the policy choices that have been deployed to attempt to convert one key source of growth—natural resource extraction—from a historically low quality type of growth into a higher grade. He focuses on the oil and gas sectors in ten low and middle income countries and highlights the complexities and technical and political trade-offs involved in strategizing around stabilisation and savings funds, revenue sharing formulas (between regions and between different levels of government) and cash transfers. Hosono's paper brings us back to an expanded definition of the quality of growth, adding security to the standard component of innovation and the newer recognition of inclusiveness and sustainability. His paper examines four case studies that are widely recognised to exhibit some attribute of high quality growth. He analyses Chile's salmon industry, the Cerrado in Brazil, the automobile industry in Thailand, and the garment business in Bangladesh. The case studies vividly demonstrate the structural transformations that took place, the vital role of learning, knowledge and institutional innovation, but the analysis also highlights the vulnerabilities of even these success stories in terms of sustainability (Chile), security (Bangladesh).

**Implications for Policy**

Several implications for policy emerge from these papers, and from the work they build on.

First, policymakers need to become more discerning about growth. Not all types of growth are good. Some forms advance the human condition—now and in the future—and some do not. Growth is a contingent means to an end, not an end in itself. The numbers in the paper by Aglietta pull back the curtain on what growth has really been achieved and at what cost. This is a difficult position for low-income governments to take when increases in GDP per capita are (still) an effective way of reducing poverty (Chen and Ravallion 2013). Thus the middle and high-income countries must lead the way in changing their behaviour towards growth. They will not do this until their failure has some electoral consequences. The gradual strengthening of the green movement and the hollowness of jobless growth will eventually bring about this awakening. We can only hope it will be before some irreversible physical threshold has been crossed (Hughes et al 2013).

Second, we need to set out to design the kind of growth we want. If we want growth to reduce poverty, to not destroy the environment, and to not be fragile to shocks, we know what to do: at the very least prevent inequality from worsening, make sure social and environmental costs are incorporated into benefit-cost ratios, and view growth through a resilience lens, where diversification is a key principle. The resource curse literature has shown that governance is the difference between growth that is high quality and low quality (Moore 2011). The rules of the game can be influenced to make it more likely that higher quality growth will be generated. Innovations that promote lower resource footprints per unit of growth need to be incentivised and shared via R and D spending, well-designed public-private partnerships to shift incentives in the use of long-term investment resources, targeted tax breaks and international charters which reduce transactions costs on high quality growth-promoting intellectual property. As envisaged more or less explicitly in different papers of the volume, notably Aglietta, the most coherent and ambitious way forward should consist in a massive and coordinated global investment initiative to accelerate the transition from low cost non-renewable to low cost renewable energy sources. This would require strong global political support and a financial commitment of long-term resources backed by central banks in order to pool the risk on the path to this energy transition.

Finally, we need to measure the things we care about. How much employment is generated per unit of growth? How many resources are used per unit of growth? How much emissions are produced per unit of growth? There are many efforts to answer these questions (e.g. Schreyer and Jorgenson 2013) and they must be supported. Until we have reliable measures of these dimensions, growth for growth sake will prevail. The SDGs need to set the standard here for a new generation of indicators and targets that fuse economic, social and environmental outcomes, guiding domestic and external resources. Key here is that any development spending targets expressed as percentages of income need to have denominators that incorporate all dimensions of growth quality.

The papers in this collection do not underestimate the challenge of thinking and acting differently about growth. For 80 years since the creation of national accounts, massive investments have been made in consolidating and refining that system. The creaking nature of the national accounts infrastructure—and to some extent, how we measure income at the national level [4]—has only become widely apparent in the past 15 years. It will take more evidence, more persuasion and, perhaps, more shocks for this agenda to accelerate more rapidly. We hope that this collection contributes in some small way to that much needed acceleration.

4. Even going so far as using night light data as an income proxy (Henderson et al. 2011).

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# Part I

## *Growth: A Path towards Abundance or Depletion?*

Chapter 1

# What is the Quality of Growth? Sustainability and Inclusiveness

Michel Aglietta

## 1. Introduction

The world is in the grip of a three-dimensional crisis: financial, social and ecological. This lingering crisis provides a warning that the finance-led growth regime dominant since the early 1980s is now worn-out. It is plagued by ever-widening inequalities in income, the huge rent levied by finance on the economy, the dearth of productive investment, the crumbling social systems and the degradation of ecosystems. The magnitude and persistence of the problems mean that the in-built mode of regulation of financialised capitalism is unable to correct the distortions in the market economy.

Shareholder value, efficient market hypothesis and "fair value" accounting are the principles that have precipitated deep havoc in every part of the market economy. Shareholder value has given rise to extravagant concentrations of wealth, made the cost of capital prohibitive for many firms and has diverted profit from productive investment. The efficient market hypothesis, supposed to reveal objective fundamental values as a linchpin for market price adjustment, has been invalidated by the financial cycle, much studied by the BIS, which has led to the global financial crisis. Mark-to-market accounting has exacerbated ample and long financial cycles driven by momentum and interspersed by devastating financial crises, triggered by the reversal of debt-induced asset price bubbles. It follows that a longer-term view of the future of our economies is necessary to provide a basis for overhauling the basic principles that underlie failing modes of regulation.

It is now more and more accepted that the growth regime must be overhauled in the direction of inclusiveness and sustainability.

### *Defining inclusiveness*

On a theoretical level, any relevant and useful understanding of society cannot escape a definition of social welfare. If inclusiveness is a social end worthy of pursuit, a process of social choice must provide guidance in the selection of relevant policies. In democratic societies that rest on principles of market economies, welfare theorists might wish that social choice could be based on individual preferences. However this endeavour is a dead end, because it encounters Arrow's impossibility theorem[1]. There is no non-arbitrary social choice procedure regarding minimal conditions of consistency in choices. This sweeping and very powerful achievement stems from the impossibility of aggregating heterogeneous individual preferences in any meaningful social welfare function. It is why neo-standard models in macro economies are usually dynamic stochastic general equilibrium models based upon a single representative agent. They *ipso facto* ignore distribution problems. It follows that neither absolute poverty nor relative inequalities can be considered in such a framework.

To overcome this dead end, equity must be defined in a way that permits interpersonal comparisons. One cannot rely on a majority vote to enact a fair rule of income sharing. It excludes underrepresented minorities, as much as the market excludes people with no access to money. One cannot be content with abstract and empty formulas, like so-called "human rights" much praised by Western politicians. Individuals are embedded in civil society with multiple belongings. A collective expertise of social interdependencies, where economists shall have their say, is needed. However, to contribute valuably, economics must be thought of as part of the social sciences without any pretence to supremacy.

In order to address social welfare issues, it is impossible to bypass ethical principles, as they provide a linchpin for social justice. To this end, John Rawls has set up a cardinal principle regarding access to the basic resources of society: primary goods of which no one should be deprived. It follows that social development should be measured according to improvements in the accessibility of primary goods amongst the most disadvantaged people. In this respect China has succeeded in raising 400 million people over the UN absolute poverty

1. See Arrow (1963) for more on the theorem, its meaning and the substance of the demonstration.

threshold (less than 1.25$ a day) in 30 years. Should this not also be considered one of the highest achievements for human rights?

Rawls (2001) understands primary goods as a broad set of public resources: material, educational and institutional. They encompass the accessibility and quality of public health, primary education, basic civil rights and environmental goods, all of which are not market commodities. Therefore, in setting his principle of justice, Rawls asserts forcefully that equality between human beings worth to be pursued is far from being only formal.[2] It is a plain rejection of utilitarianism attached to *homo economicus*. Inequalities can be justified only if they help raise productivity in such way as to expand accessibility to primary goods. The market can contribute if it is embedded under development policies dedicated to that end.

Therefore the key concept of capability goes beyond Rawls's principle, as far as policies aiming at inclusiveness are concerned. He emphasizes the conversion factors of primary goods into life achievements. Indeed equality in the space of primary goods cannot prevent *per se* serious social inequalities, all of which can be magnified by runaway market expansion. A few of them are evils of contemporaneous societies. Ethnic discrimination, gender discrimination in social roles, structural unemployment, power relationships in corporations and institutions are all levers exploited in present-day capitalist societies. They help in shaping labour markets so that real freedoms of many people are subordinated to the paramount objective of shareholder value: extracting maximum rent for the benefit of an elite, with the main outcome the extravagant rise in income inequalities over the past 30 years.

***Defining sustainability***

Sustainability is an intergenerational concept. It is the conservation and possible improvement over time of social welfare as defined above. A society cannot be sustainable if it is not inclusive. As we will see in the next section, sustainability cannot be measured by GDP paths.

Because it involves time, sustainability is intrinsically intertwined with

2. In 2001, Rawls revisited his theory and clarified the link between social justice and equity (see Rawls 2001). Freedom of speech and of vote are formal liberties that pertain to primary goods. But freedom for people that are starving and illiterate does not mean much. This is the kind of problem that the "largest democracy in the world" encounters.

finance. When one is evoking finance, one is confronted with the sacred core of market fundamentalism in its most dogmatic belief: the efficient market hypothesis in its strongest form. It stipulates that financial markets reveal fundamental values of assets, i.e. the marginal contributions to social welfare of all types of capital. If it were true, the moving price system in financial markets over time would be the most relevant expression of what society values in pursuing its own perpetuation.

The problem raised with this assertion is profound indeed. Upheld by most powerful financial interests, fostered by the ever-lasting deregulation and globalization over more than 30 years, it has led to dramatic policy failure leading up to the devastating financial crisis and its costly aftermath. Indeed, finance has moved under a momentous dynamic for so long and generated a financial cycle so huge and long-lasting that the efficient market hypothesis cannot stand under Karl Popper's reality principle. What is at stake is a much more fundamental question than market imperfections, asymmetrical information and bounded rationality. It is the implicit assumption about what constitutes economic time and what value means.

As everyone should notice, only the strong form of market efficiency is relevant in sustainability, because that form is required to pretend that market finance achieves the optimal allocation of saving overtime. Only this assumption can amalgamate rational expectations and the fundamental value of assets. The basic question is the feedback of the future (expectations) on the present economic equilibrium. No mechanical or biological system can be said to be determined by the future. Their workings and law of motions proceed from more or less complex linkages that science has the mission to discover more or less accurately. Causal time is an arrow that is not reversible whatever the knowledge mustered on it. Social systems are different because human beings are capable of beliefs about the future. However the reflexivity of financial expectations on observed economic variables cannot be called causal in any meaning of the word causation. However market fundamentalism pretends that fundamental values have a predetermined objectivity (in logical sense of the word) external to financial markets that the market reveals. Such an assertion is the result of a confusion in regard to the notion of time. It is postulated that the causal time of objective processes is homogenous to the subjective time of expectations. How can it be so?

Let us look at the fundamental value of an asset when all rational market participants share all the available relevant information. The fundamental value stemming from market efficiency is:

$$VF_t = E_t\ R_{t+1} + VF_{t+1}\ )/(1+x),$$

where VF is the fundamental value, E(R) the future expected income from holding the asset and x the discount rate.

To assume that market participants make expectations in such way that the market is balanced at a price Pt =VFt, x must be known. However this equation is just an arbitrage saying that in an efficient market there cannot be excess returns. An arbitrage is just a condition equating the returns on two assets. It can be used to determine the price of an asset only if the return on the other is known. But the VF equation is a very peculiar arbitrage that equates the return of the asset… with itself. Indeed it can be rewritten:

$$\frac{E_t(R_{t+1} + VF_{t+1}) = (1+x)}{VF_t}$$

The left hand side term is the definition of the asset return. The right hand side is the required return x=r $+\rho$ with r the riskless interest rate and $\rho$ the risk premium of the asset. $\rho$ is as much unknown as VF itself. Therefore the efficiency hypothesis teaches us nothing as far as the determination of fundamental values is concerned, because it encapsulates two unknowns: fundamental value and risk premium. One has to specify a model able to determine x. But it has nothing to do with market efficiency. *There will be as many asset price dynamics as there are a priori beliefs on the future of the economy that embodies those assets*. The core reason is the reflexive nature of the feedback of expectations on market prices. It is so because the subjective time of expectations is *counterfactual*. It bears no logical homogeneity with objective time of past events. *The market creates values; it does not reflect pre-existing values*. Values depend irrevocably on beliefs. The relevant question is how beliefs are coordinated through strategic interrelationships, gurus, prophets or market manipulators, focal points, self-generated fixed points in converging mimetic processes. All kinds of processes can occur in financial markets. A particular convergence of expectations defines a value and, as a result, an economic equilibrium can ensue. A different belief that gives rise to another focal point might also produce equilibrium. Beliefs about the future are a priori unlimited. Subsequently, reflexivity generates multiple equilibria. This is the very nature of the coordination by the future.

Because financial markets have been allowed to get loose in the last 30 years or so, a powerful financial cycle encompassing real estate, equity, fixed income and the associated derivatives has dominated financial valuations. Momentum has been the mode of coordination of expectations fuelled by leverage. The piling up of risky exposures in the balance sheets of both asset owners and financial intermediaries has created an interlocking of fragilities that no supervisor can embrace even if it were willing. Indeed regulators were not willing to look inside the intricate web of counterparty risks, because they assumed that finance was self-regulating by nature. They were not upset by the extreme of the momentum in the real estate market, believing that the extravagant levels reached by property prices were fundamental prices. It follows that the turnaround of the momentum surprised them. Indeed the precise date of the turnaround was unknowable, even if the burst of the bubbles was certain!.

This phenomenon points to the theoretical distinction between risk and uncertainty[3]. The latter cannot be dissolved into the former. The future pertains to counterfactual time because finance is nothing but trading promises. It is driven by fluctuating beliefs, migrating from one equilibrium to another. How can a long-term horizon emerge in such a world without strong regulation imposed by a public authority? Therefore the mutation of the growth regime to one based on sustainability and inclusiveness is a daunting collective task that requires an intellectual revolution to re-embed economics into social sciences, a deep social reform to make the firm a locus of participative social contracts between stakeholders, a transformation of finance to allow investors with long-run view, a better say in social choices.

If sustainable growth is to be taken seriously, it will turn economics upside down. Society comes first. There is no longer an axiomatic micro-foundation of the macro-economy, but a social welfare theoretic

3. Hyman Minsky was the author that most forcefully elaborated on Keynes's conception of uncertainty. See H. P. Minsky (1992) for more on the theoretical formulation of his thinking.

approach that derives macro conditions to be implemented by individual agents through proper incentives. This paper can only pinpoint theoretical problems and browse the main results from serious attempts to measure sustainable development by international institutions.

## 2. Conceptual issues and measurement problems

A social welfare approach involves a revolution in macroeconomics. It is akin to the revolution in economic thought that was triggered by World War II. After Keynes' (1940) memorandum to the British Chancellor of the Exchequer on May 4, 1940, followed by another paper by Colin Clark (1940), the conceptual and measurement work to create national accounting began because the British government wanted to know what were the resources the country could muster for the war and how much they were worth. The research program achieved the first consistent system in the 1945 memorandum published by the UN in 1947 (Stone 1947). As a result, GDP was invented and measured for the first time. The impulse for this breakthrough was entirely political: the urgent need to muster and mobilize all the economic resources of the country for the war effort on the one hand, and the fear that the great depression would resume after the war on the other. To act efficiently the government needed to measure the aggregate supply and demand of the country, something a decentralized market economy does not provide.

Nowadays climate change is a worldwide peril, threatening the ecological foundation of economies, exacerbating precariousness and inequalities among countries and jeopardizing the welfare of future generations. Nonetheless, even if political elites talk of inclusiveness and sustainability, it is just lip service. The sense of urgency is nowhere apparent in the West. Public opinion is indifferent at best, and rather hostile in countries like France. Powerful vested interests in energy-producing and electricity-using industries pay armies of scientists to spread climate-scepticism. A related scepticism arises on the ability to measure linkages between environmental processes and social preferences. On that matter there is a strange de facto alliance between industrial and financial lobbies on the one hand, and "fundamentalist" ecologists on the other hand (Oreskes and Conway 2010). Both consider that persistent and strenuous efforts to internalize externalities are not worthwhile.

The first group, the industrial and financial lobbies, follows its own interests and disguises them under the claim that markets cannot fail. To enhance private profitability it is better to deny that more costs should be taken account of in pursuing its own activities. This is the usual divorce between private and social ways of assessing values while there are market failures. The second group, the "fundamentalist" ecologists, pretends that ecosystems are so radically alien that their impact on human beings, regardless of damage or benefits, cannot be intrinsically measured in value terms. This is pure nonsense because any factor that impinges upon wellbeing always has a social marginal value or cost. Yet what is true is that this social marginal value is not always revealed by a market price, often by a wide margin. Renouncing the quest to evaluate those social values amounts to denying that a global strategy for sustainable development is possible. This is not the way responsible governments and vivid civil societies should behave. Measuring social values is the best and most rational way to define and deliver common goods and therefore to detect the best capital assets in which to invest. In other words it is the indispensable input of social choices.

Starting from a very imperfect situation it is understandable that several methods have been advocated to handle the problem. They differ in scope: macro or micro, all-encompassing or digging into specific questions and using partial economic analysis. They also differ in their time span, dealing with urgent questions and setting specific objectives or elaborating the theoretical basis of a sustainable growth regime in the long run. Some possible ways forward have been explored in the Stiglitz report (Stiglitz, Sen and Fitoussi 2009). Enriching GDP from a public policy perspective would need to take account of inequalities, completing GDP with an array of physical indicators without measuring their social marginal values, broadening the scope of capital assets in an extended accounting registered in satellite accounts, and developing a new integrated social accounting system based upon a generalized version of capital

In the next section, I will follow the way forward explored in the UN project in improving the measurement of an extended definition of capital and its link with social welfare. I will also acknowledge the proximity and differences with the World Bank project. Both approaches are endeavours to link the theoretical framework of social welfare to sustainability conditions. They differ in their dealings with externalities to measure marginal social values. Then I will introduce a problem left aside in the Stiglitz report. On one side, a macro model of social capital growth is necessary to frame a long-run policy of sustainable development. On the other side, capitalism will still prevail in allocating resources for the foreseeable future. Therefore processes to achieve social incentives will still be shaped by the pursuit of private returns in decentralized firms. Therefore there is an inescapable problem of incentives. Although social values are not reflected in market prices, they should be. In one way or another, they impinge upon the prospective rates of return of the firms, which will invest in the types of capital that might produce those social values. It follows that firm accounting must also be reformed to become consistent with social accounting conditions. The literature on business accounting ignores the problem entirely. Corporate management is content with the rhetoric of social responsibility, an empty discourse without any meaningful impact on the business model of the firms. Setting the problem has only one virtue for the time being: displaying how far we are from the beginning of a transition to sustainable growth. Correlatively, I will sketch the conception of long-run financing investments driven by sustainability conditions, focusing on climate policy.

## 3. A social welfare-theoretic approach of sustainability

The present paper is not the place for a survey of the different approaches for dealing with sustainability. As explained above, it takes the view of those who base measurement upon monetary value, hence who are concerned with valuing environmental and intangible assets, as well as ecological services with no market values. International institutions lead the investigations. The World Bank (2012) explores a weak condition of sustainability with its genuine saving concept. The High Level Panel set up by the general secretary of the UN explores a strong condition summed up in the inclusive wealth indicator (IWI) (High Level Panel 2012). However both derive the sustainability condition from the concept of social welfare not decreasing over time.

Let us first understand the theoretical underpinning of the measurement methodology based upon an extended concept of social capital. Many forms of this all-encompassing concept of capital are public goods that boost the productivity of privately-owned capital. Those relationships imply interdependence, viewed as strong or weak depending on the way one defines social marginal productivity, between public choices and private property rights. Measurement is controversial because those social marginal productivities are shadow prices, i.e. expected marginal contributions to social wellbeing of the different forms of capital. Shadow prices are not observed; they are counterfactual by their very nature, because they depend on the future path of the economy.

Because society is a collective that pervades over time, well-being is trans-generational. Its productive base is economic development. Sustainability is defined as a pattern of development that along with intergenerational well-being does not decline. There must be an aggregate measure of the productive base of a national economy, called total national wealth. Social well-being is produced by its productive base. There exists a generalized production function relating them. Aggregate net investment is a measure of the rate at which the marginal intergenerational well-being changes over time, provided that the different types of capital comprising social wealth are measured at their social marginal values in terms of welfare (shadow prices) and that the shadow prices can be taken as constants to get a measure of the "volume" of the growth in wealth. Another way to look at it is by saying that aggregate wealth is the shadow value of the stocks of all assets available in the economy. Box 1 sketches the basic model used by the High-Level Panel.

Therefore the strong condition of sustainability is the following: *a long-run economic policy is sustainable if and only if aggregate net investment measured at shadow prices is positive over time.*

**Box 1. Definition of the sustainability condition**

V(t) = intergenerational well-being
Ki(t) =stock of i asset in t. K(t)={K1(t),…., Ki(t),…Kn(t)} vector of capital assets.

V(t)=V[K(t),t] function of intergenerational wellbeing
Shadow price of time: Q(t)=dV(t)/dt
Shadow prices of capital assets: Pi(t)=dV(t)/dKi(t) if the economy does not cross a tipping point. If not, dV(t) is a finite step that must be estimated directly
Because of externalities in the V function, shadow prices are not market prices. Estimating them implies ethical values, which in turn depend on the conception of equity, theories on environmental/ social interactions, info on asset size, their distribution and their substitutability.

One can define inclusive wealth: $W(t) = tQ(t) + \sum_i P_i(t)K_i(t)$

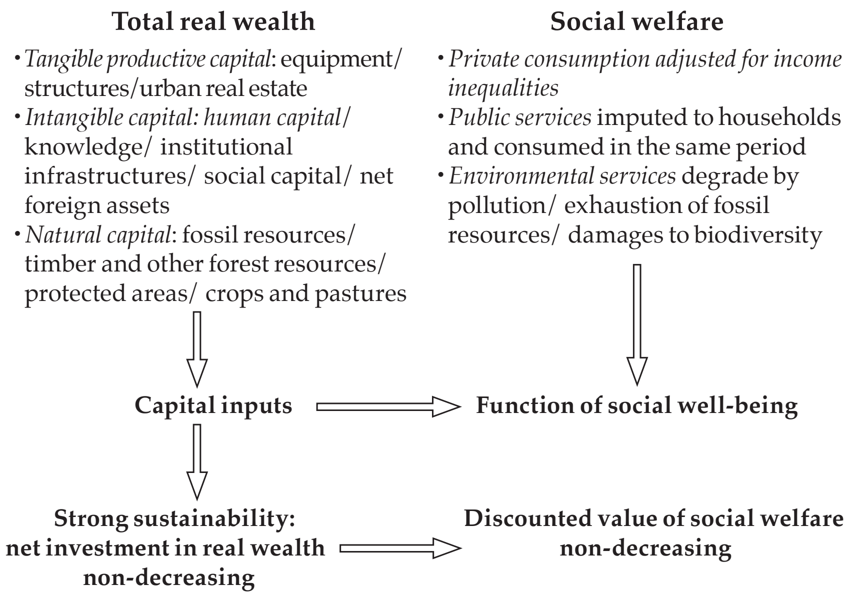
And the sustainability condition: if shadow prices are constant, the duality theorem gives the following condition:

$$\frac{dV(t)}{dt} = Q(t) + \sum_i P_i(t)\frac{dK_i(t)}{dt} = dW(t)$$

*On a time line short enough so that shadow prices can be held as constant, social welfare does not diminish if and only if inclusive wealth does not diminish.*

Figure 1 gives a stylized view of the approach.

**Figure 1. National wealth and social well-being: strong concept of sustainability**




To adjust private consumption for inequality of income for the purpose of tracking inclusive growth, the social welfare function must be increasing in average income growth and satisfy the transfer property: any transfer from a richer person to a poorer one increases the value of the function (Mishra and Peiris 2013). It can be measured this way:

*Inclusive income growth= average income growth + (average income) (Δ median/average income).*

The main problem is the measure of the services of ecosystems whose substitutability to private consumption is low. Estimating *shadow prices* is a tricky problem, while there is no market price equivalent because of externalities. *Shadow prices* must be approximated with notional prices. They are the outcomes of agreements among people with a social consciousness to internalize particular externalities. Getting agreements involves debates between partners concerned by the costs of negative and the advantages of positive externalities to be shared. Those debates will extend into a considerable time line while people better understand the challenge of ecological degradation for their life style. While social preferences are going to change through experience, better information and more political debates, improved valuation will be reflected in national accounts.

One challenge concerning the value of the services of ecosystems and of valuing natural capital more generally is their non-linear dynamic. Unknown thresholds can induce unknown discontinuous changes. There are different regimes when tipping points are crossed (e.g. destruction of fisheries and of the tropical rainforests). Some of the regimes may induce global systemic crises, massively destroying real wealth and decisively transforming human civilization as we know it (e.g.an increase in average world temperature over 5°C) (Oreskes and Conway 2014). The IPCC has argued convincingly about the non-negligible probability of this catastrophic scenario by the end of the century. Discontinuities in ecological processes should be reflected in shadow prices because the latter capture the substitutability between capital assets in the present and the future. Crossing a tipping point entails a discontinuous slump in substitutability between natural and other capital assets. It will provoke a violent surge in the shadow prices associated with these assets, making it uneconomical to draw further on them and forcing an immediate reinvestment in the worst possible economic environment, because societies will have suffered the losses of a systemic crisis. This is why the Stern Review (Stern 2007) has advocated the use of a quasi-zero discount rate and some authors have shown that there is a strong rationale to apply the precautionary principle (Weitzman 2009).

The High-Level Panel of the UN Secretariat has been following this path in the Inclusive Wealth Report that will be progressively reviewed every two years (High Level Panel 2012). However, there are other less demanding ways. The World Bank has settled for a criterion of *weak sustainability* drawn from a more restrictive view of total real wealth, called *comprehensive wealth*, that leads to a criterion of sustainability based upon an extended measure of national net saving, called genuine saving. Such a measure is a weak criterion because it avoids the estimate of shadow prices. It is essentially a revised measure of GDP.

The World Bank has drawn upon pioneering work by Pearce and Atkinson (1993). Development depends on total wealth defined in a restrictive way compared to UN methodology, e.g. produced, human, social and natural capital. Sustaining total wealth is the key for viable growth regimes. For the World Bank the different forms of capital are defined in the following way:

Produced (tangible) capital= equipment + structures + urban land

Intangible capital= human capital +institutional infrastructures + social capital + net foreign financial assets

Natural capital= subsoil assets + Timber resources + non-timber forest resources +protected areas + crop land + pasture land

The sum of the three components is the real wealth of the nation. The change in real wealth has been named the adjusted net saving (or *genuine saving*). If the different types of capital that make up the productive base of the economy in a general ecological and economic sense can be measured, the variation of total wealth per capita is the sum of the growth of total factor productivity and the increase in the aggregate growth in the volume of the different types of capital. Since the variation of total net real wealth or *genuine wealth* is the net investment of society, the condition of sustainability is that society does not destroy its wealth in mustering enough adjusted saving or genuine saving to match net investment. Therefore the sustainability condition becomes the following: *the development path of an economy is sustainable if, at every date, adjusted social saving (or genuine saving) is non-negative*. If it becomes negative, it means that society is destroying its wealth.

The definition of genuine saving is the following:

*Genuine saving = economic gross saving of the nation – fixed productive capital depreciation + change in value of human capital + change in value of social capital – depletion of mineral and energy fossil resources – net reduction of forests – damages due to pollution in ≈ $CO_2$*

How do inclusive wealth and comprehensive wealth compare methodologically? They have in common the intent to measure total wealth. Both introduce estimates of how well they can value intangibles and they both also try to measure the degradation in natural capital. However they have differences too. In inclusive wealth accounts, wealth is measured directly from its productive base while notional prices have been estimated. No pre-assumption is made on sustainability. Unsustainable trajectories are included. Inclusive wealth tries to disentangle ecosystem services (fisheries and water-related ecosystems). Furthermore population is a critical factor of sustainability. Population changes are directly estimated. In comprehensive wealth accounts population is supposedly stationary or increasing at a constant growth rate. Furthermore the social welfare function is only related to private consumption that is supposed to grow at a constant rate. Wealth is its present value. A given path of consumption is deemed unsustainable if adjusted net saving is negative for this path.

## 4. Comparing three measures of development: gross domestic product, comprehensive wealth, inclusive wealth.

Table 1 compares the evolution of the three indicators over long-run periods for some advanced and emerging market countries. In doing so they improve the picture given by GDP markedly. This is definitely an irrelevant indicator in framing long-run policies. For all but advanced countries the WB indicator is *grosso modo* between GDP and IWI. For the emerging market economies (EMEs) it is closer to GDP than to IWI. The reason is that natural capital weighs much more in total wealth in EMEs than in advanced countries where the weight of intangibles and their impact on development is much larger. However, the WB underestimates the losses in wealth due to the destruction of ecosystems that the UN panel tries to capture. This is why the former undervalues ecological losses.

**Table 1. Different measures of development**

| Countries | GDP/individual (% annual growth rate 1990-2008) | Real wealth/indiv (WB, % annual growth rate 1995-2005) | IWI/individual (UN, % annual growth rate 1990-2008) |
|---|---|---|---|
| *Advanced countries:* | | | |
| Germany | 1.5 | 1.3 | 1.8 |
| France | 1.3 | 1.7 | 1.4 |
| US | 1.8 | 2.3 | 0.7 |
| UK | 2.2 | 2.8 | 0.9 |
| Japan | 1.0 | 1.5 | 0.9 |
| *EMEs:* | | | |
| Brazil | 1.6 | 0.9 | 0.9 |
| China | 9.6 | 6.9 | 2.1 |
| India | 4.5 | 3.6 | 0.9 |
| South Africa | 1.3 | 1.3 | -0.1 |
| *Oil-exporting countries:* | | | |
| Nigeria | 2.5 | -1.5 | -1.9 |
| Russia | 1.2 | - | -0.3 |
| Saudi Arabia | 1.3 | -0.8 | -1.1 |
| Venezuela | 1.3 | -1.3 | -0.3 |

Based on these terms, the case of China is striking: massive expansion of fixed productive capital, fuelled by over-accumulation of capital in infrastructure and heavy industries, has produced outstanding growth in GDP. According to the gauge of comprehensive wealth the performance is reduced, but by not that much, because depreciation is taken into account (it is a net and not a gross concept like GDP) and because massive environmental damage is somewhat accounted for, but less than in inclusive wealth, which looks at the losses due to the deterioration of the regulatory properties of ecosystems. The IWI still attributes the best performance to China over the 30-year period or so, but it is no longer considered an outstanding performance. On the positive side the achievement is the eradication of absolute poverty – 400 million people have been taken out of absolute poverty in 30 years, the best performance worldwide of all time. Investment in human capital has also advanced substantially but it is still lagging in the rural sector. However, China is the country where the negative gap (IWI-GDP) per capita is the largest. It means that intensive growth in fixed capital has entered a stage of fast-decreasing marginal return and that the degradation in natural capital is destroying real wealth alarmingly. The new Chinese leadership has pledged to link the new urbanization drive with environmental policies and has issued detailed directives to guide the strategic planning for an overhaul of the growth regime. In India the situation might be worse since the political system seems to be unable to invest in infrastructure and in basic education for the larger masses of the population, while keeping enshrined crippling social discriminations, not least against women. However bottom-up frugal innovations are well under way, which save energy use and broaden the range of goods affordable by the nascent middle class.

In advanced countries, the comprehensive wealth indicator usually depicts better performance than GDP, essentially thanks to its measurement of intangible capital, something that has become the most important factor of growth since the ICT revolution. However what is striking is that the WB indicator veers toward GDP, rather than IWI in the comparison between advanced countries. In particular, the performance of Germany and France compared to the Anglo-Saxon countries is reversed. The latter fare much better in GDP and much worse in IWI. Remember that IWI is a measure of well-being. In the US, public health is appalling in terms of life expectancy, morbidity and obesity, while costs are prohibitive. This boosts GDP per capita since wages must be higher than in other countries just to pay for the rents drawn by the medical and the insurance sectors on the population. Therefore what is counted as a plus in GDP deteriorates IWI. Add to it that the US has not invested sufficiently in their public infrastructures, impairing the stock of public capital in the UN IWI. As for the UK, that share largely with the US the non-inclusive character of their growth model, especially the extreme inequality of income and the inefficiency of their health care, the exhaustion of oil fields has not been redeployed in real capital but in elusive foreign financial assets.

Furthermore, both the WB indicator and the IWI, as opposed to GDP, concur to show that non-advanced oil-producing countries are on an unsustainable path. This is the well-known curse of primary resource ownership for development. Be they increasing or decreasing in population, densely or sparsely populated, those countries have governments that impoverish their people. This is because the appropriation of the scarcity rent is squandered or redistributed according to the feudal (Saudi Arabia) or populist nature (Venezuela) of the political systems of the countries. In any case it is not invested enough in wealth-producing forms of capital to offset the exhaustion of fossil resources.

## 5. From macro to micro: how can firm accounting provide the right incentives to contribute to sustainable development?

As was acknowledged at the beginning of this paper, sustainability is a problem that stems from the dynamic of complex systems. The interactions between economy and ecology on the one hand, and the elaboration of policies for inclusiveness in societies impacted by multiple conflicting interests on the other, raise the questions of the incentives of economic agents that will make collective objectives come through. Because externalities are not exceptions but are dominant in environmental problems, because market prices are massively incomplete and finance has proved to be more than inefficient but systemic risk-prone, the macro–micro problem is both inescapable and daunting. The welfare theoretic approach and the generalized wealth accounting build tools for strategic planning to formulate societal long-run objectives. However in countries with vibrant civil societies, lifelong goals come from the bottom and economic implementation of those goals raises enterprises to the fore. Innovations in measurement in macro accounting must impact measurement in business accounting for policy goals to be conveyed into the right incentives. This is all the more challenging as the present business model of most firms is still based upon shareholder value, which is alien to the theoretical foundation of sustainable development.

### *Shareholder value, market finance and the social interest*

It has been commonly said, since the implicit contract view of the firm has become most influential in financial elites and popular among academics and politicians, that firms are agents of their shareholders[4]. Meanwhile the average holding time of business equities in OECD countries has dramatically declined from five years in the late 1960s to five months in 2010. The reason is the spread of the Anglo-Saxon model

4. In 2001, Hansmann and Kraakman (2001, p.89) wrote that the rules of corporate governance were being uniformed under shareholder value. The principle according to which firms must be exclusively run for the sake of their shareholders had already reached a very large normative consensus. They added that the dominant ideology of shareholder value would not be challenged in the future. According to their opinion, it amounted to the "end of history" in corporate governance. Hansmann H. and Kraakman R. (2001), "the End of History for Corporate law", Georgetown Law Journal, vol.89, pp.439-468.

of dispersed ownership in continental European countries where diverse forms of governance used to prevail: insider, family or block-ownership control. Obviously dispersed and tieless owners, obsessed with liquidity, have neither the interest nor the means to control firm strategies. Therefore the principal agent relationship is irrelevant as far as individual shareholders are concerned. Dispersed ownership and controlling power are contradictory.

The basic question remains: how should firms be managed and to achieve what? The goal looks fairly obvious: maximizing the total return of shareholders via share buybacks, dividend distributions and M&As. The entity capable of disciplining firm management to conform to those predicaments is the stock market. As long as the circulation of property rights is frictionless, the stock market is the principal of the firms since the liquidity of shares homogenize shareholders. Firm managers are under the threat of potential owners on the one hand and are induced to conform to shareholder value by the distribution of stock options on the other hand.

Therefore, if and only if equity markets are perfectly efficient, the anonymous control they exert achieves the social interest because all types of productive capital are represented and the equilibrium market returns are equal to their marginal social costs. If one buys these axioms, one must accept the conclusion: shareholder value is relevant in matching the macro–micro problem. Moreover the financial structures of the firms are meaningless because all financial assets are perfect substitutes in their risk-adjusted returns.

It is enough to spell out those conditions to understand how much they are irrelevant for the macro–micro problem. Contemporary societies must overcome the mutation from the failed growth regime of financialised capitalism to bring their economies onto a sustainable growth track. In Section 1, the basic reasons grounded in the very nature of finance were provided to reject the strong efficiency hypothesis. Correlatively, the assertion that the firm has no existence as an autonomous entity, being a knob of implicit contracts, does not hold.

***Stakeholdership, the social interest and responsible shareholders***

The failing of the implicit contract theory in equating shareholder value and societal responsibility has two flaws regarding the firm on top of its idealised view of finance. The first is its inability to recognize that the corporation is a legal entity of its own. In this respect the corporation is an entity in its capacity to make commitments on behalf of the enterprise. Excluding slavery, the enterprise is not an object that can be possessed by anyone. It is a human gathering dedicated to the production of social values. Its productivity depends crucially on the complementarity and cooperation of talents, as much as they are able to develop collective tacit knowledge. All bearers of intangible assets that contribute to the productive capacity of the firm and that have no directly marketable property rights are stakeholders in the social value produced by the enterprise. They should be as much entitled to have their say in the strategy of the corporation and to share the profit as the shareholders. They have even more stake since they do not enjoy the liquidity of the assets they own. As a consequence, they are more interested in long-run strategies that consider the corporation as a going concern.

Therefore, the quality of growth at the macro level depends on shareholder ship being replaced by a much larger stakeholders hip in corporate governance (Mayer 2013). Stakeholders are all the people bringing productive assets, be they tangible or intangible, to the collective productive strength of the enterprise. Since the productive capacity of the enterprise lies in the cooperation, individual marginal productivity cannot be measured in full. Correlatively individual marginal productivity cannot be measured entirely.

Stakeholders have multiple interests. With the stock market being unable to determine the business model that aligns the corporation governing the enterprise on the social interest, the business model must be the outcome of a strategy debated and decided by an organ of a political nature, the board of directors. The board is not only a controlling body working as the agent of a predetermined end, shareholder value. It must define the finality of the corporation and its associated strategy to make account of the multiple relationships of the enterprise both inside the organization and within its environment. In a stakeholder corporation, the board must gather the delegates of all stakeholders to elaborate the common interest. To establish the responsibility of management, checks and balances must be embedded in the structure of governance: separation between the chair of the board and the chief executive officer, equal participation of employee delegates in the board, pay and audit committees protected from the pressures of management, and objective criteria need to be linked to the strategic objectives defined by the board to assess the performance of management.

Such a structure might be able to link the participation of human capital to innovative investment projects, i.e. to make the achievements of individual "capabilities" fit with the larger finalities of the quality of growth. Stakeholder corporations are inclusive due to the participation of employees, not only by redistribution that was a principle of the post-war growth regime labelled "Fordism". They will be actors of sustainability if their strategies are shaped by investments that conform to environmental and societal criteria. Those investments aim at curbing the trends that are degrading the life of people: climate change, scarcity of resources, giant inequalities, discriminations, structural unemployment, and financial fragilities.

Those bad trends have noxious effects on long-run capital return because externalities develop over time and are loaded with irreversibility. They are intrinsically non-linear. Therefore they generate extra financial risks that must be converted into financial values. It is why business accounting and economic calculus of investment returns must be overhauled. The recognition of such needs requires long-term investors acting as responsible shareholders in stakeholder corporations.

***Governance matching corporate interests and social involvement needs an overhaul in business accounting***

Investment projects are selected according to their *internal rates of return* (IRR). The IRR of a project is the discount rate that cancels the net present value of future cash flows stemming from all revenues and expenditures up to the horizon of the project. This measure does not take account of the positive and negative externalities that impinge upon the social value linked to the project. The social value of an investment is the net present value of all costs and benefits entailed by the investment, whether this is comprised of money flows accruing to the investment or external impacts (positive or negative). This is, for instance, crucial for clean projects that abate a computable amount of greenhouse gases. They generate positive externalities in the amount of abated GHGs. These externalities can be valued if society recognizes that avoided GHG emissions are something of value and institutes a notional price: the social value of carbon, for a unit of avoided carbon-equivalent. Therefore externalities must be valued from notional prices that should be agreed upon in non-market social procedures. Rigorously the notional prices to guide investment choices of firms must be the shadow prices of the different types of capital on a sustainable trajectory, computed as the shadow prices associated to this trajectory. This is the macro–micro consistency. Practically such a consistency is out of reach at the present time: the development of numerical estimates of shadow prices that can be used in computing expected rates of return. However this normative consistency teaches a lot of what a price is all about.

Indeed, true market prices, i.e. prices whose determination follows a Walrasian adjustment, exist only in centralized asset markets. A price is much more general than a market price. This is an implicit, tacit agreement between two or more parties in sequential trade, when for instance consumers buy products at prices that are already posted in shops or stores. Or it is the product of negotiations between intermediaries (e.g. wages decided in collective bargaining), or it is notional like transfer prices between sub companies of a multinational corporation, or it is purely conventional – like accounting prices used in analytical accounting. Therefore the argument that it is impossible to value what has no market is empty of meaning. If pollution is not valued it is because public authorities have not instituted a carbon price and obliged firms to compute pollution costs in their operating accounts. The reason why they do not do it is because the political dominant influence in financialised capitalism makes it self-evident that a narrow view of property rights legitimates incentives of firm managers to maximize shareholder value.

While sustainable growth has gained momentum as a primary finality in the political debate, the need for consistency between the macro accounting of total real wealth and business accounting should become a requirement in order to fulfil incentives embodying environmental and societal objectives in corporate governance. Under those new incentives it will become necessary to correct the IRR and compute an integral internal rate of return (IIRR), valuing the externalities produced by firms' activities according to a generalized view of valuation. Such a view rests on the stakeholder view of the corporation where the board must answer the following questions: who are the stakeholders to whom must the firm be accountable? Which performance criteria must be accounted for? Under which procedures must they be accounted for? In stakeholder-corporate governance, corporations would have to report to their different stakeholders, so that it would be possible to identify and measure the global imprint of each firm on its natural, social and economic environment. In particular there should be a reporting towards socially responsible investors who need to assess the potential of investment projects according to IIRR.

In the first stage of implementing the new paradigm, one should not aim at a unified reporting where extra-financial valorisation are integrated in standard financial accounts. Extra-financial accounting would have to be experimental in any first stage. There should be satellite accounts whose ability to feed the extended calculus of the IIRR must be tested. *The enlarged accounting must be built as a new metric of societal responsibility*. But a metric it should be, which means prices defined in money as the universal unit of account. Business accounting must check whether particular firms contribute to sustainable development, e.g. create at least as much resources as they consume. To define prices that guide strategic investment decisions capable of attracting long-run investors, consultations between stakeholders interested by a particular domain of externalities must be organized (Schoum, de Saint-Front and Veillard 2012).

Considering social responsibility, since the capabilities of workers acting as a team comprise the main productive asset of the firm, expenditures to reproduce and expand them must not be treated as operating costs, but as investments in human capital. Discounted inflows and outflows of future wages due to the mobility of workers and revalorization of wages due to expenditures in vocational training would appear much more valuable in such accounting. Instead of dealing with a wage policy as a cost to compress as much as possible, wage policy would become investment policy to be anticipated as an integral part of investment projects.

## 6. Long-term finance and sustainable growth: How to finance climate policy?

Both the scope of possible human and material damages and their irreversible character if the average temperature increases above 2°C (compared with pre-industrial times) are arguments in favour of urgent and strong action by societies against climate change. The intervention should be much more energetic than what has been accomplished during the last 40 years to reduce the sources of emissions and increase the absorption wells. The last report of the Intergovernmental Panel on Climate Change (IPCC 2014") indicates that the emissions from human origins have increased during the years 1970-2010 at a rate higher than 2% per year, and that the last decade 2000-2010 has known the biggest increase in human history[5]. Past climate policies, which do not allow the increase in temperatures to be reversed, have thus been largely insufficient.

The uncertainties of the costs resulting from climate change cover several types of realities: uncertainty regarding the scope of climate damage with respect to the increase in temperatures; uncertainty about the scope of technical change, also mostly irreducible, allowing us to reduce the costs of abatement activities; uncertainty on the discount rate to be used today to evaluate damages that could occur in the very long run.[6] These different forms of uncertainties provide compelling reasons for societies to take early action against climate change, and eschew all forms of delay. The fifth evaluation report of the IPCC, published in 2013-2014, strongly called for increases in the level and the changes in structure of annual productive investment in the period 2010-2030 to help mitigate climate change. These included a reduction of the investments in fossil fuels, an increase of around $150 billion for investments in renewable and nuclear energy, as well as capture and storage of carbon emissions; and an increase of around $340 billion for investment in increasing energy efficiency in transport, housing and industry. According to the International Energy Agency (IEA), the annual investments in energy efficiency and low carbon technologies should reach $790 billion in 2020 and $2300 billion in 2035 in order to limit the temperature increase to 2°C.

5. According to a new analysis by the UN Wprld Meteorological organization, CO2 concentration rose 2.9 parts per million (ppm) between 2012 and 2013, the biggest annual increase sinc 1984. The IPCC 2014 report (part 1) states that the last three decades have been successively warner at the earth's surface than any preceding decade since 1850.In the Northern Hemisphere, 1983-2012was likely the warmest 30-yearperiod of the last 1400 years.

6. This uncertainty has polarized the debates on the costs of climate change after the Stern report (Stern 2007.) There has been criticism of the choice of a very low pure time preference that is not reflected in the discount values emerging from market prices (Nordhaus 2007).

### *From Kyoto to Cancùn: a paradigm shift*

Guiding the climate negotiations according to an ethical principle – leading the northern countries to finance the climate mitigation in the southern countries – does not amount to giving equal emission rights to everybody. The allocation of emission permits is just a form of allocation of financial assets. In a world where wealth inequality reaches extreme levels, the richest have soon bought their desired amount of permits on the market for emission rights, circumventing the equity principle. Emissions per head should be equalized in the very long run.[7]

Such an objective provides direction to the principle proposed by India at the Cancùn Conference, that of "equal access to sustainable development" (soon to be called the 'Cancùn paradigm shift'). Logically, this will require a massive increase in help from developed countries to developing ones. In this regard, the Cancùn Conference of Parties (COP-16) can be understood as a real shift, translating international negotiations from a top-down and insufficiently cooperative approach (a unique carbon price linked to a world market between states for emission reductions and burden sharing) based on the obligations of states towards an international climate regime based on the responsibility of states to voluntarily promote nationally appropriate mitigation actions[8].

Among the economic instruments allowing the correction of the distortions due to externalities, we usually distinguish between the price policies (taxes or subsidies) to control the prices paid by polluters and the quantity policies pretending to control the quantities of emitted GHGs. The markets for the emission permits (such as the "European Emission Trading Scheme", or EU ETS) are among those. If future damages due to GHG emissions were knowable with certainty, -, taxes and permits would be equivalent. In certain economic conditions it is always possible to determine the quantities of permits such that the market price is equal to a certain tax level. But the uncertainty of the real world makes the equivalence disappear. The market gives certainty on quantities; tax gives it on prices. The tax is more predictable only if the government has a well-defined climate policy in the medium run,

7. As Stern (2007) clearly states, if the world must emit less than 20 billion tons of CO2eq in 2050 and the planet will have around 9 billion inhabitants at that time, this means that emissions should be limited everywhere to 2 tons of CO2eq per head in 2050.

8. Nationally appropriate mitigation actions (NAMAs) for developing countries and Nationally Determined Contributions (NDCs) for all countries.

associated with a trajectory of carbon prices on which it is credibly engaged. On the other hand, the emission rights market is an asset market, and is thus accompanied by chaotic price trajectories, as the European market has well illustrated. A market that is affected by multiple externalities cannot be efficient. Price flexibility is a benefit only for the speculators, except if the market is regulated by a public entity able to insure a medium run trajectory in line with what would give a tax in a credible abatement scenario on 5 to 10 years. The tax is thus a priori better than the market, which was not the reasoning of the Kyoto Protocol. This advantage only exists however if the announced evolution of the value of the tax is considered credible by all the actors. And we know by experience that this is not the case. The political cost is so high that if a tax is put in place, its level can only be too weak to direct the new investments in a significant way.

The world of the perfect market is oblivious to weak environmental policies that are reached without any conviction, and prone to unpredictable changes of direction, amplifying the risks linked to the investments. They generally are not very popular when they take the form of a tax or a carbon market establishing a price from one day to the other. When they are put in place seriously, they impose immediate transition costs on entire sectors of the economy, early and indifferently depreciating parts of the installed capital of the economy to give value to a capital that is yet to come, and they have certain redistributive effects that are hard to quantify. The political economy arguments do not play in favour of these traditional tools, which do not seem to be preferred at a political level, compared with regulations, sector subsidies or other forms of industrial policies.

In developing countries, nationally appropriate mitigation actions, (NAMAs) could lead to an emphasis on national objectives of development: tightly linking low carbon technologies and the local environment, investing first in human capacities and R&D using the macroeconomic policies to lower the arbitrages between technical and social costs. There are several potential bottom-up initiatives here. The compatibility between many decentralized actions and the global goal of containing climate change becomes crucial (Guesnerie and Stern 2012). The NAMAs allow the governments of developing countries to integrate the governmental objectives into their national development policies. But the GHGs emissions are a global externality. As Roger

Guesnerie puts it, a global coordination for a global control of quantities must be created. For that matter countries must agree on a global emission level.

An international permits market would regulate the gaps between the permits allocated to countries and emissions, creating an international coordination at the margin (and not on each carbon unit emitted as in the Kyoto Protocol), while the States and the regional groupings of States would look for their internal objectives with the help of taxes and investment public policies. The compatibility between several decentralized actions and global climate change can thus be insured.

Of course the installed "dirty" capital must be depreciated in order to make room for "clean" technologies. But this must be done at the margin by new investments accumulating over time. Developing a new direction for the current investments and the investments to come is a priority that can be compared to the revaluation of the whole stock with a disruptive price. It can be done through a valuation of carbon through a notional price applied to investment categories that produce an abatement of GHGs, which independent agencies could validate.

We call such a level of abatement a carbon asset. Because it is not (or too partially) raised by a tax incorporated into the price of the produced goods, the return on these investments can be adjusted through the acquisition of carbon assets produced against monetary emissions. Money is indeed something that is universally acceptable and thus validates the product of all economic activities. It can answer the question of the financing of public investment policies in favour of the carbon externality.

### *Confronting the funding gap*

There is a huge funding gap in achieving a transition to a low-carbon economy. To assess the funding gap one should not confuse the flow of payments over the duration of the projects to cover capital and operation costs and the upfront costs, i.e. the cash necessary to cover the cost of the equipment before it enters into operation. The latter might be two or three times the former. Furthermore the financing need is not only what will finance net investment flows to accumulate capital in clean technology but must also cover the redirection from old production capacities in existing energy systems to new ones in low-carbon energy systems. If, for instance, a renewable energy plant produces electricity at a cost 30% higher than a coal plant, the real amount of investment to replace coal-fired electricity is 130%. Finally the total incremental costs of the changeover from one energy system to another must account for redirecting investment in building and transportation to achieve higher energy efficiency and lower energy demand permitted by changes in consumer behaviour. For around $500bn of incremental investment costs in 2020, a back-of-the-envelope calculation gives about $4100bn of redirected investment (Aglietta et al. 2014).

Confronting this huge need for finance, the cash flow generated by the clean development mechanism is utterly insufficient. Moreover it yields cash at the end of the project and thus is not designed to reduce the upfront investment cost. Public finance mechanisms do bring funds during the incubation phase of the investments, but they cover only the extra costs of low-carbon technology, not the bulk of the investment projects. Not considering the uncertainty in the time line of the new industrial revolution, they assume implicitly that without the extra incremental costs the projects will spontaneously yield positive internal returns.

Climate finance is fragmented for several reasons: the international market for polluting rights does not exist; the resources must be mobilized on a much larger scale and must be borrowed on highly diverse financing channels; climate change must be integrated into the development strategies of each country, so that financing is predictable and sustainable, contrary to the volatility of carbon finance. Only the appropriation of needs by the beneficiary countries will allow financing of overly narrow and divided projects to be avoided, because they are defined from the outside by international institutions or donating countries.

However market instruments are not available. The availability of savings can be found in public and private institutional investors, but they usually hold easily tradable assets - exactly what infrastructure and green bonds are not. These are alternative assets the institutional investors seldom possess, i.e. <1% of their portfolio for the pension funds in countries of the OECD (OECD 2013), because these instruments have the triple handicap of not being liquid, having high levels of risks, and dependant on tentative policies. So the energy policies in Europe are chaotic and contradictory. The subsidies for new sources of energy can be excessive and then suddenly disappear with devastating effects on the cash flows of the on-going projects. *From the point of view of the financing sources, a strong diversification of instruments and a change of scale are vital.*

Political uncertainty and the weakness of market structures to invest in environmental infrastructures are a double handicap. The obstacles to alternative investments are well-known: the competition of asset managers for the quarters' prize lists means that only the short term is valued, with most investors facing regulatory restrictions on long-term asset ownership. Competition policies that separate grid producers and service producers force the investors to choose the property rights they want to own without being able to incorporate the synergies in their investments. And while the activities are technically and economically integrated, there is no history of prices or benchmarks, forcing producers to internalise the management of assets completely (with supplementary costs). The green investments have supplementary handicaps. The most crippling argument is the inadequacy or even the non-existence of a carbon price determined by the market for polluting rights. This handicap is all the more striking given that innovations in "low carbon" investments bear both technological and ecological risks. Without a sufficiently credible valuation of carbon, guaranteed by the governments and increasing over time, and without the cessation of fossil fuel energies, these investments will continue to be dominated by the existing infrastructure.

As a conclusion, these binding constraints force the need to find a cutting-edge equilibrium. Engaging in industrial policies to mitigate climate change requires reorienting several billions from energy and soil without any existing cheap substitute for fossil fuels. To reorient savings in low carbon investments, risk profiles must be lowered without supplementary charges on the taxpayer. For that matter, the abatement of emissions has a monetary value that grows over time. But this monetary value cannot be obtained at present by a tax or a market that weakened economies after the crisis could bear (Hourcade, Shuklaet and Cassen 2014), One must thus think in a different way: the base of financing the transition towards a low carbon economy can only be monetary.

## 7. A carbon-based financial intermediation backed by money

### *Fundamental principles of the proposal*

The first principle is an international agreement instituting a social value of carbon. Better to do it at the COP21 in Paris 2015. The IPCC defines the social cost of carbon as the price that equalizes the marginal cost of reducing emissions and the marginal gain of avoided climate damage, along a sustainable growth trajectory. It is neither a price determined by a carbon market, nor a tax incorporated into the price of current goods. It is a notional price, defined as the value of the avoided ton of equivalent CO2, and applied to new investments, and not to the existing stock of capital. The estimations of the available models indicate that the social value of carbon is highly uncertain, because it relies on a large ensemble of parameters of which some are unknown (Dumas, Hourcade and Perrissin-Fabert 2010). This is the reason why it should be defined by a political agreement. We know that it should increase with time according to predefined agenda, which could be revised every five years.

This proposal introduces a temporal distinction in climate policy by distinguishing the valuation of new investments – that is the future capital to be produced and the valuation of already installed capital and the goods and services it produces. This distinction is made because the investments are urgent, uncertain and risky, while the introduction of a tax or a market price at a sufficient level to make these investments profitable is politically out of reach today in most countries. This distinction thus solves a political deadlock, which has affected climate negotiations until today, with the argument related to the high immediate employment impacts and welfare costs of a carbon price. *The social cost of carbon, defined in monetary units, establishes a new space of commensurability, which is the space of carbon assets*. These assets are the values applied to the volumes of avoided CO2-eq emissions thanks to "low carbon" investments in all economic activities. Carbon assets are produced when the quantity of avoided GHGs is checked and certified by competent and independent agencies.

The second principle is government guarantee. The government of each participating country guarantees for a period of five years a certain quantity of carbon assets as a contribution to the international climate policy. Effective emission reductions will be validated in kind by independent experts and give rise to a monetary value. Thus this financial organization aims at eliminating the divorce between private and social returns of investments, a drawback that plagues investments involving high degrees of externality. The firms bearing the projects will find advantage in the certainty of the rise in the social value of carbon, since it increases the relative value of low-carbon investments. Their lenders find the opportunity of a new source of credit for which the risks due to the production of carbon assets are shared at a level linked to the validated carbon assets. The governments should be interested in giving a guarantee on a certain level of carbon assets for their development policies. However, the process can only be started through an international agreement on the social value of carbon, and the identification of carbon assets must be accompanied by the expertise of independent agencies. Therefore an international supervision body should be instituted, to monitor the protocol followed by the independent agencies in their investigation. In order to foster a first wave of projects, it would be good that this international supervision body define the framework in which national states would be persuaded to promote investments: the technologies, sectors, temporal horizons. It could also propose the allocation rules of carbon assets, and thus the acceptability of the certificates by project type depending on the anticipation of avoided GHGs. There would be a common guide for the participation of each State.

The third principle allows central banks to register the value of the guaranteed carbon assets on the asset side of their balance sheets. On the liability side, the central bank can register *carbon certificates*. These carbon certificates are reserves or collateral for the financial institutions (development banks, investment funds, private equity funds) that have financed the validated investment projects. The risk for the investor who finances the projects is in a way socialized. It is diminished by the amount of carbon certificates on the guaranteed carbon assets.

The fourth principle has to do with time consistency. Monetary financing can be understood as a temporary device to launch a wave of innovative investments as much as quantitative easing (QE) has been to alleviate the impact of the financial crisis. As long as those investments are implemented, the production structure will change towards clean technology. The consumption structure will change with the use of capital while former "dirty" capital has been replaced. Therefore the resistance against a carbon tax or cap-and-trade market will wane. It should be possible to come back to a form of standard taxation, in the framework of a new international agreement. The exit condition would be the convergence in the long run of the valuation of the carbon externality through the monetary tool, and the one from a future carbon tax (or a carbon market such as the ETS). Without this convergence condition, there would be a time inconsistency in the expected return of investments during the transition from one tool to the other. In the long run, the proposed financial policy can be institutionalized in a new monetary system or can be thought of as temporary before the introduction of more traditional tools.

***Carbon assets in the monetary and financial systems***

The monetary financing proposal for low carbon projects is not akin to QE, which involves the purchase of already existing assets on secondary markets. Our proposal involves the direct financing of new real investments, creating carbon assets by monetization of credit. The monetization only occurs for validated projects by independent and official agencies. There is no endogenous inflation, since the price is predefined on the expected abatement trajectory and the counterpart of the monetary creation by the central bank is a real asset for which the state has defined a total maximum amount for a determined period and guarantees its value. *The only risk lies in possible errors from the certification agencies, which may accept projects that do not produce the anticipated carbon assets. There would thus be carbon asset destruction, cancellation of the money created and loss for the bank who gave the loan and/or loss for the entrepreneur who took the risk.*

The balance sheet of this monetary intermediation appears on table 2.

**Table 2. Bank balance sheets of a financial intermediation resting on carbon assets**

| Central Bank | | Commercial and development banks | |
|---|---|---|---|
| Assets | Liabilities | Assets | Liabilities |
| -Foreign exchange<br>-Bills and bonds<br>-Carbon assets | -Currency<br>-Bank deposits<br>-Carbon certificates<br>-Non-monetary items | -Reserves<br>-Commercial loans and securities<br>-Loans on low-carbon investments | -Deposits and ordinary bond issued<br>-Bonds issued on low-carbon investments<br>-Capital |

A complementary mechanism can be designed to tap the large pools of savings collected by institutional investors. Indeed, not only banks but also specialized non-bank financial investors can use the carbon-based monetary facility to back climate-friendly financial products. The idea is to create a financial intermediation to match the preference for low risk of the bulk of institutional investors worldwide and the involvement of specialized risk-taking funds. A green fund, backed by governments that would provide the core of its capital base, could issue climate bonds on carbon assets transferred by the specialized funds that had contributed to finance the investments. Those bonds would be dedicated to institutional investors. The accounting side of this intermediation scheme is depicted in Table 3.

On the asset side of its balance sheet, the green fund would finance a large array of financial specialists, which themselves finance diversified projects. It could acquire liabilities of private equity funds, buy project bonds, and lend to development banks.

**Table 3. Financial intermediation via Green Funds**

<table>
<tr><th colspan="2">Specialized financial investors</th><th colspan="2">Green Fund</th><th colspan="2">Institutional investors</th></tr>
<tr><th>Assets</th><th>Liabilities</th><th>Assets</th><th>Liabilities</th><th>Assets</th><th>Liabilities</th></tr>
<tr><td rowspan="2">Carbon assets from validated projects</td><td>Loans from EGF</td><td>Loans to finance specialists</td><td rowspan="2">Bonds on carbon assets</td><td>Climate Bonds on carbon assets</td><td rowspan="2">Collective saving (retirement contracts, life insurance, state funding of SWFs)</td></tr>
<tr><td>Other loans</td><td>Project bonds</td><td>Other bonds</td></tr>
<tr><td>Other assets</td><td>Capital</td><td>Equities</td><td>Capital</td><td>Equities</td><td>Capital</td></tr>
</table>

Therefore green funds could be established in every country participating in the international agreements on the notional carbon price and related state backing of carbon assets. The funds can mediate the financing of well-diversified investment projects, thereby creating carbon assets. Thanks to the diversification of risk in its interventions and the strong backing of its capital, the European green Fund is presumed to get the highest rating and be able to issue high-rated bonds with a high multiple of about 10 ($1000bn equivalent with a capital of $100bn). Institutional investors worldwide would be able to diversify their asset allocation with a new class of assets weakly correlated with existing assets. Because the specialists financing individual projects can be dispersed throughout the territories, the scheme can be decentralized. It can finance industrial policy linked to urban development, recycling processes and bio-agriculture that can re-territorialize industry, reducing heterogeneity and dependence on imported carbon intensity via foreign energy dependencies.

## 8. Conclusion

The paper has emphasized the linkages between a conceptual framework of social welfare improvement that can be called sustainable development, and shown the need for deep reform in national accounting to make operational the concept of total national wealth upon which long-run development policies can be implemented. It has also indicated that deep changes in corporate governance and business accounting are required to provide incentives for private firms to correspond with strategic national planning goals. Finally, the paper has taken the view that climate policy could be the decisive driver of sustainable development objectives. It is the domain where investment projects must be upgraded urgently. An international agreement on a notional price of carbon as well as the commitment of governments to achieve a definite amount of carbon abatement in a finite period of time is a precondition to define and run a new financial intermediation. This will provide the monetary backup necessary to overcome the inability of financial markets to provide the huge amounts of credit needed to reorient the production system.

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# Part II

## *The 20th Century Concept of Growth and Its Deliverables*

## Chapter 2

# Poor Trends: The Pace of Poverty Reduction after the Millennium Development Agenda[1]

Richard Bluhm, Denis de Crombrugghe and Adam Szirmai

## 1. Introduction

*"We are at an auspicious moment in history, when the successes of past decades and an increasingly favorable economic outlook combine to give developing countries a chance, for the first time ever, to end extreme poverty within a generation" (Jim Yong Kim, World Bank President, speaking at Georgetown University, April 3, 2013)*

Only 13 years after the Millennium Summit in September 2000 at which world leaders agreed on halving the 1990 global poverty rate at $1.25 a day by 2015, the end of extreme poverty seems to be in sight. Recent estimates suggest that the first Millennium Development Goal (MDG) was already reached in 2010 and about 700 million people were lifted out of poverty. In 2013, the World Bank declared a new organizational goal of ending extreme poverty by 2030; that is, reducing the $1.25 a day poverty rate to 3% by 2030. The last two decades clearly ushered in unprecedented success, but is 2030 really likely to mark the end of extreme poverty? Our main contribution is to demonstrate that this is unlikely.

In this paper, we review the origins of the 'dollar-a-day' poverty line, discuss progress over the last three decades, and forecast $1.25 and $2 a day poverty rates until 2030. It is well known that regional trends in poverty alleviation are very heterogeneous. In spite of rising inequality, rapid growth in China was the driving force behind global progress

1. We have greatly benefited from discussions with several participants of the AFD/IDS/JICA workshop on the "Quality of Growth". In particular, we would like to thank Lawrence Haddad, Nicolas Meisel, Charles Kenny and Laurence Chandy for useful comments and suggestions. We gratefully acknowledge financial support from the Agence Française de Développement (AFD). The findings, interpretations and conclusions expressed in this paper are solely the responsibility of the authors and do not necessarily represent policies or views of Maastricht University, UNU-MERIT, AFD and/or other affiliated institutions. All remaining errors are those of the authors.

over the last two decades and accounts for more than three quarters of the reduction in the number of people living below $1.25 a day. However, most of the poverty reduction potential coming from China is now exhausted. Poverty reduction in the developing world outside China has been considerably slower, although economic growth has accelerated significantly since 2000. In 2010, three-fourths of the extremely poor lived in sub-Saharan Africa and South Asia, as opposed to approximately 40% in 1981. This changing regional composition of world poverty has important ramifications for future trends in poverty reduction. Historically fast growing countries make up less and less of the global poor.

Building on a new method for estimating poverty elasticities and predicting poverty headcount ratios developed in Bluhm, de Crombrugghe, and Szirmai (2013), we show that the pace of poverty reduction at $1.25 a day is likely to slow down significantly after 2015. Extreme poverty barely falls below 8% in the most optimistic scenario. Ravallion (2013) first suggested the 3% target relying on the assumption that consumption in developing countries would continue to grow at the average post-2000 trend, or 4.5% per year. We find this 'equal-growth' assumption too optimistic. Poverty tends to be higher in countries with rapid population growth and lower than average consumption growth. None of our scenarios predict a poverty rate near 3% once country-specific trends from 2000 to 2010 are used. However, the $2 a day poverty rate may fall below 20% in 2030, while a slowdown happens only late during the forecast period or not at all. A distinct advantage of our approach is that it is computationally inexpensive. Hence, it can easily be used for benchmarking progress as new data become available.

The paper is structured as follows. Section 2 discusses some of the controversies surrounding the setting and updating of international poverty lines. Section 3 is a data-driven review of global poverty and inequality trends with a particular focus on China, India, Brazil and Nigeria. Section 4 presents projections of global and regional poverty rates until 2030 at the $1.25 and $2 a day poverty lines using different growth and inequality scenarios. Section 5 concludes and offers some policy recommendations.

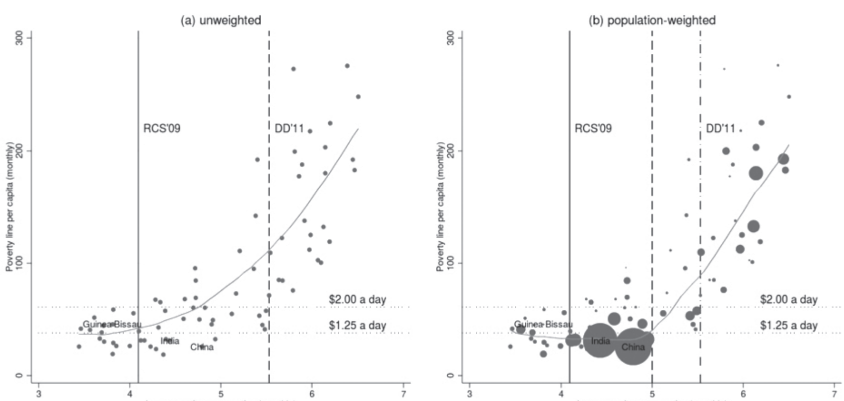
## 2. Drawing the line: international poverty lines

The dollar-a-day poverty line was first defined in a background paper to the 1990 World Development Report (in 1985 PPPs), then updated to \$1.08 (in 1993 PPPs) in 2000, and again updated to \$1.25 (in 2005 PPPs) in 2008. While the first update went by almost unnoticed, the most recent change has sparked a controversy. Redefining extreme poverty as living below \$1.25 a day raised the global poverty headcount by about 10 percentage points and reclassified approximately 450 million people as extremely poor (Chen and Ravallion 2010). In this section, we briefly review the origins of the \$1 a day measure and discuss shortcomings of the current updating procedure.

The problem of setting a global poverty line is far from trivial. Even if we could use a 'basic needs' or calorie-intake approach to devise a minimum consumption bundle for the entire world, it is inherently difficult to apply any such bundle in international comparisons. Subsistence needs, relative prices, and purchasing power vary across countries and over time. Faced with these problems, Ravallion, Datt, and van de Walle (1991, henceforth RDV) suggested an original solution. Since many national poverty lines are set using a basic needs or calorie-intake method, there should be a universal lower bound among the absolute poverty lines, which may be recovered from the data. Converting 33 national poverty lines and the corresponding consumption levels from the 1970s and 1980s into international dollars, RDV showed that a poverty line of about \$31 per month (\$1.02 a day, in 1985 prices) was shared by the six poorest countries in their sample, while those of two other countries came close. They argued that a rounded-off poverty line of \$1 a day was a sensible threshold for measuring global poverty, since any one poverty line is likely to be estimated with error and the non-food allowance included in the subsistence basket varies across countries. RDV also estimated a lower line of \$23 per month (about 76 cents a day) for the poorest country in their sample. This lower line was close to India's poverty line at the time and became widely used as the international poverty line during the 1970s and 1980s (e.g. Ahluwalia, Carter, and Chenery 1979).

Setting the poverty line in international prices has the advantage that domestic inflation is typically taken into account when average incomes or expenditures from surveys are converted into (base year) international dollars, so that the line itself does not have to be explicitly updated annually. However, purchasing power parities (PPPs) change over time as countries grow richer (due to the Balassa-Samuelson effect). In addition, the quality of PPP estimates has been improving substantially with each round of the International Comparison Program (ICP), so that updates are needed approximately every decade. When the 1993 ICP data became available, Chen and Ravallion (2001) revised the \$1 a day line to \$1.08 in 1993 prices. Using the same data as in the original study, they found that \$1.08 a day was the median poverty line of the ten poorest countries. However, when the 2005 ICP was completed, instead of converting the old poverty line to 2005 prices, new data were collected and the poverty line was redrawn. Ravallion, Chen, and Sangraula (2009, henceforth RCS) compiled a dataset of 74 national poverty lines to update the original analysis. They found that national poverty lines do not rise with per capita consumption until a certain turning point (about \$60 per month) but increase strongly thereafter (left panel, Figure 1). RCS set the global line as the average poverty line of the 15 countries below this threshold, or \$1.25 a day in 2005 prices.

**Figure 1. Poverty lines and consumption levels around 2000**




*Notes*: Author's calculations using the data reported in Ravallion et al. (2009) and following the illustration of Deaton (2010). The non-linear trends are estimated using a (weighted) local linear smoother with bandwidth 0.8.

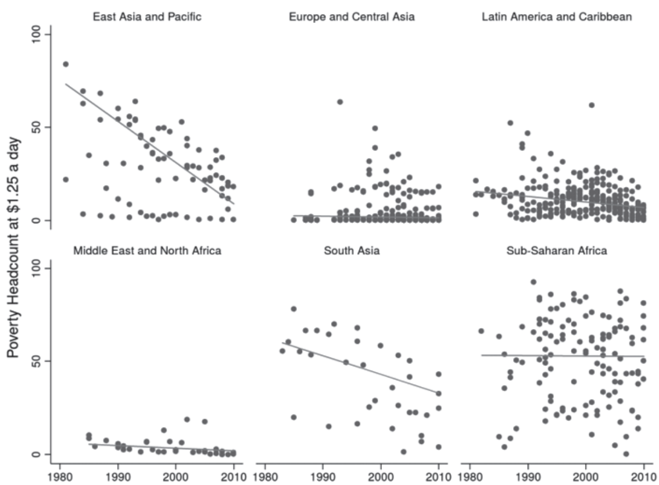
Deaton (2010), as well as Deaton and Dupriez (2011), take issue with this approach. They argue that updating the international poverty line based on new data leads to "graduation effects" when countries move out of the reference group. They illustrate their case using India and Guinea

Bissau as examples. India was part of the initial reference group in RDV, and both countries appear in RCS's more recent reference group. India has a relatively low poverty line ($0.90 a day in 2005 prices) and a population of more than a billion people, whereas Guinea Bissau has a higher poverty line ($1.51 a day in 2005 prices) and is home to less than 1.5 million people. As average consumption in India grew considerably until 2000, it crossed the $60 threshold and is no longer part of the reference group. Even though the average Indian has become richer, both the international poverty line and the global poverty headcount increased as a result of India dropping out of the average. With Guinea Bissau the case is reversed. Its poverty line is currently part of the average. A move out of the reference group would entail a fall in the global poverty line and a reduction in global poverty that is many times greater than the population of Guinea Bissau. The left panel of Figure 1 illustrates this relationship. The bold horizontal line marks the $60 per month threshold (labeled RCS'09). A related issue is that the ICP data are primarily designed for comparing living standards of entire populations, not just poor people. The typical consumption basket of the poor, and the associated price level, may be very different than the reference basket used for computing PPPs.

To address both the graduation issue and the PPP issue, Deaton and Dupriez (2011) propose using an alternative procedure. Linking consumption surveys to ICP data for the 50 poorest countries, they simultaneously estimate the poverty line and PPPs of those near the poverty line (PPPs for the poor, or P4s). This procedure yields lower poverty lines in between $0.92 and $1.19 a day. However, the effect of the P4s on the global poverty counts – at similar poverty lines – is relatively small. The resulting estimates of global poverty are lower primarily due to the lower poverty lines and not due to differences in relative prices.

To an extent, the Deaton-Dupriez criticism can be addressed within the RCS approach by (1) weighting the national poverty lines by population sizes, and (2) extending the reference group of "poorest" countries. The Deaton-Dupriez proposal, labeled DD'11 below, is to select the 50 poorest countries to constitute a fixed reference group. Clearly, the threshold of 50 countries is arbitrary. A possible alternative is to replicate the RCS approach but estimate the consumption gradient using population weights instead of equal weights (right panel, Figure 1). This is the approach proposed here. Examining the plot to find the point where the slope of consumption begins to be positive, we visually identify a threshold of about 5 log dollars or $148.41 per month ( (cluster t = -2.40) percentage points, respectively. Using an alternative $2 a day poverty line, the magnitudes and differences in speeds across regions remain broadly similar.[2]

**Figure 2. Population-weighted poverty trends by region, 1981 to 2010, $1.25 a day**




*Notes*: Authors' calculations based on surveys from PovcalNet.

An important question is whether consumption growth or redistribution is driving the decline in poverty. Estimating the historical contributions of growth and changes in distribution during the 1980s and 1990s, Kraay (2006) found that most poverty reduction was due to income or consumption growth. Our analysis broadly corroborates this finding (although we do not explicitly estimate contributions). The population-weighted growth rate of the survey means from 1981 to 2010 across all countries is a very robust 4% per year (cluster t = 3.03). Over the same period, within-country inequality, as measure by the Gini coefficient, actually increased slightly by about 0.7% per year (cluster t = 1.64). This implies that, on average, changes in distribution may have in fact moderately slowed the pace of poverty reduction. Poverty reduction over the last three decades has mostly been due to income and consumption growth. However, both the high average growth rate in

2. East Asia and Pacific (slope = -2.31, cluster t= -7.33), Europe and Central Asia (slope=-0.26, cluster t=-2.33), Latin America and Caribbean (slope=-.55, cluster t = -5.74), South Asia (slope = -0.72, cluster t= -4.92), and sub-Saharan Africa (slope = -0.02, cluster t= -0.07).

the survey means and the apparent rise in within-country inequality are driven by China. Excluding China, the survey means grew about 1.8% per year (cluster t = 2.45) and inequality barely moved (increased 0.047% per year, cluster t = 0.13). In other words, poverty reduction in the developing world outside China has been steady but slow and has (on average) not been helped by improvements in distribution. [3]

These findings are also in line with estimates of poverty at the $1.25 a day poverty line reported by the World Bank (see Appendix Table A-1). Chen and Ravallion's (2010) estimates indicate rapid progress in China, little improvement in sub-Saharan Africa, and moderate poverty reduction elsewhere. The poverty headcount ratio in sub-Saharan Africa only fell by about three percentage points over the entire period from 1981 to 2010, and actually exceeded its 1981 value for most of the period. Combining these trends with population growth rates reveals the dire absence of a robust positive trend in terms of the number of global poor outside of East Asia. While China has lifted an astonishing 680 million people out of poverty between 1981 and 2010, the rest of the world has only about 50 million fewer extremely poor people in 2010 than in 1981. This trend is owed to persistently high poverty rates coupled with strong population growth in sub-Saharan Africa and India. This is most evident in sub-Saharan Africa where the number of extremely poor has roughly doubled over three decades (in spite of the slight decrease in the headcount ratio). The rise of China from a poor to a middle-income country also implies that the relative composition of world poverty is changing rapidly. In 1981 about 40% of the world's extremely poor lived in sub-Saharan Africa and South Asia, by 2010 their share has risen to 75%.

A very intuitive approach to illustrating past progress (or lack thereof) is to approximate the shape of the income or expenditure distribution at various points in time and examine how the features of the distribution (esp. quantiles) shift over time. Figures 3 and 4 plot the lower tail (up to $400) of the monthly income or expenditure distribution for the most populous country of the four poorest regions – East Asia, South Asia, Latin America, and sub-Saharan Africa – in 1985, 1990, 2000 and 2010. The vertical lines are the $1.25 and $2 a day poverty lines in terms of monthly consumption. After lining up the survey data in time, we estimate the different density functions using a log-normal

3. Excluding India in addition to China from the sample does not qualitatively alter this result.

approximation.[4] While the assumption of log-normality has its weaknesses[5], it usually provides a useful first estimate of the shape of the income distribution. A key advantage is that it only requires knowledge of the mean and Gini coefficient.

We can illustrate a few essential concepts with these graphs. The area under the curve to the left of the poverty line gives the fraction of the population that is poor (the poverty headcount ratio), while the spread of the distribution reflects inequality. The raw difference between two such areas under the curve is the absolute change in the poverty headcount ratio in percentage points and the relative difference gives the percent change in the poverty headcount ratio. The sensitivity of poverty reduction to changes in income or inequality is often measured in the form of elasticities or semi-elasticities. The income elasticity of poverty is the percent change in poverty for a one percent increase in incomes, and the income semi-elasticity of poverty is the percentage point difference in poverty for a one percent increase in incomes. The inequality elasticity and semi-elasticity are defined analogously. An attractive feature of the semi-elasticity is that it first increases and then decreases again during the development process. It measures the pace of poverty reduction in terms of the percentage of the population lifted out of poverty. Hence, it is usually more informative for policy-makers and more useful than reporting relative changes.[6]

Figure 3 visualizes the tremendous progress in reducing poverty rates in China over the last three decades.[7] As noted before, poverty in China

4. We interpolate and extrapolate the data as follows. First, we project mean consumption forward and backward using the corresponding growth rates of personal consumption expenditures from the national accounts. Second, we linearly interpolate between the available Gini coefficients and extrapolate beyond the first or last available measure by keeping inequality constant. The same data set (with all countries from PovcalNet) is later used for computing the inequality indices in the developing world.

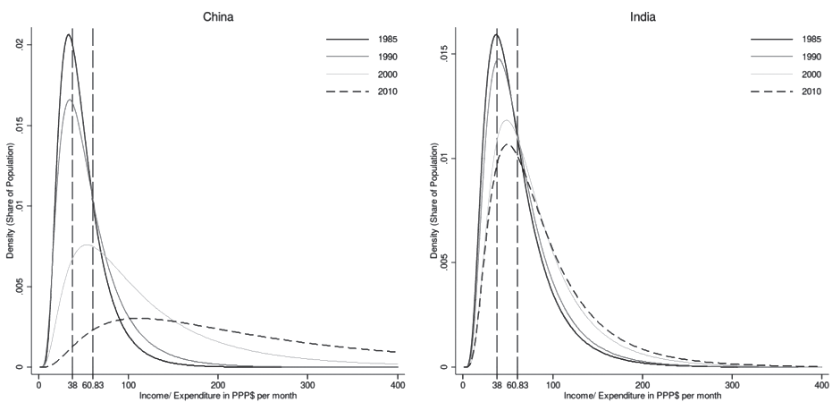
5. Log-normality typically works better with consumption surveys than with income surveys (Lopez and Serven 2006), tends to underestimate the level of poverty (Dhongde and Minoiu 2013), and overstates the pace of poverty reduction (Bresson 2009).

6. In relatively rich countries with low percentages of people below the poverty line, elasticities can be very misleading. Small reductions in the poverty headcount rate can manifest themselves as very high elasticities. For a more detailed discussion of the properties of elasticities and semi-elasticities of poverty see Bourguignon (2003), Klasen and Misselhorn (2008), and Bluhm et al. (2013).

7. The implied poverty rates for China correspond well with the official World Bank estimates. At the $1.25 a day poverty line, our estimates imply a poverty rate of 60.56% in 1985, 56.92% in 1990, 31.97% in 2000 and 9.75% in 2010.

at $1.25 a day fell rapidly over the entire period. The biggest gains occurred early on, between 1985 and 2000, when the peak of the distribution was close to the $1.25 and $2 poverty lines. By 2010, the peak of the distribution has moved considerably to the right of both poverty lines and the overall spread has widened. A great many Chinese are now considered part of a developing country 'middle class' (if defined between $2 and $13 per day).[8] However, this also implies that the poverty reduction potential from China is largely exhausted. The income semi-elasticity of the poverty headcount is far beyond its peak and steadily approaching zero. In addition, inequality has increased remarkably over the same period. In 1985, the Gini coefficient was 0.28 and by 2010 it has risen to 0.44.

**Figure 3. Estimates of the expenditure distribution: China and India, 1985–2010**




*Notes*: Authors' calculations. China's expenditure distribution is estimated based on a weighted mean and a rural-urban ln-mixture for the Gini coefficient. China's surveys in *PovcalNet* are consumption-based after 1987 and income-based before.

In India, on the contrary, there remains much greater potential for poverty reduction in the medium-term future. While the mode of the income distribution was near the $1.25 line around 1985 and 1990, the peak of the distribution in 2000 and 2010 is located between the two poverty lines. The process of "bunching up" in front of $2 a day observed by Chen and Ravallion (2010) implies that, in the medium-term

8. Ravallion (2010) defines the size of the 'middle class' by developing country standards as the proportion of the population living on at least $2 per day but less than $13 per day, where the upper bound is the poverty line in the United States. Naturally, this is one of many possible definitions.

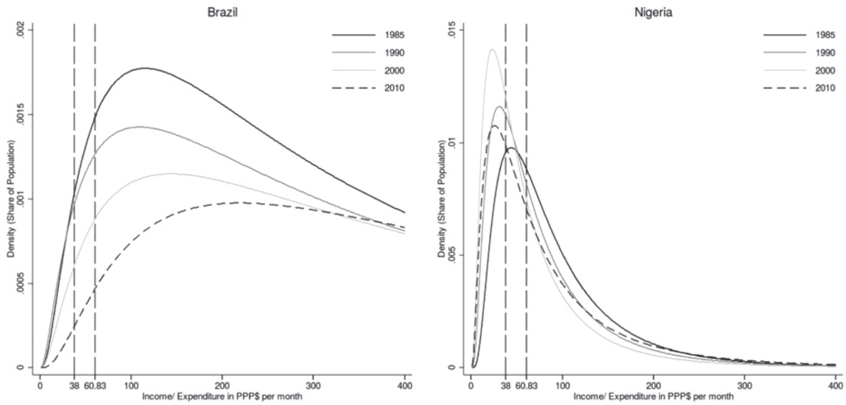
future, the pace of poverty reduction in India (defined as the absolute change in the headcount) will be particularly fast at the $2 a day line and continue at a fast but decelerating pace at the $1.25 line. Put differently, India's income semi-elasticity around 2010 is very high and a moderate rate of growth will immediately have a large (but decreasing) effect on the poverty headcount ratio at both thresholds.

Figure 4 illustrates two very different cases. The left panel shows that from 1985 to 1990 poverty reduction in Brazil was very slow, with some progress at the $2 a day line but a nearly unchanged poverty rate at the $1.25 line. Yet, on average, Brazilians were already considerably better off in the 1990s than their Chinese or Indian counterparts in 2010. After 1990, the pace of poverty reduction accelerates and by 2010 only 4.92% of the population was below the $1.25 a day poverty line.[9] Lifting the remaining people out of poverty will require sustained economic growth, as both the income and distribution semi-elasticities of poverty in Latin America as a whole are rather low (Bluhm et al. 2013). With a Gini of 0.56 in 1985 income inequality was initially very high in Brazil, peaked at 0.61 in 2000 and then fell again to 0.55 by 2010, thus positively contributing to poverty reduction after 2000. The right panel illustrates that poverty in Nigeria was considerably higher in 2000 or 2010 than in 1985. Nigeria's plight is characteristic for most of sub-Saharan Africa in the 1980s and 1990s, as real consumption on the subcontinent was declining at a pace of about 0.82% per year. Only after 2000 did expenditures recover and the poverty headcount ratio began to decline. Yet even by 2010, the peak of the expenditure distribution is still noticeably to the left of the poverty line and the implied poverty rate at $1.25 a day is 65.96%.[10] In addition, inequality in Nigeria increases over the observed period, starting from a Gini of 0.39 in 1985 to 0.49 in 2010.

9. The World Bank estimates a poverty rate of 5.38% at $1.25 a day for Brazil in 2010.

10. The World Bank estimated a poverty rate of 67.98% at $1.25 a day for Nigeria in 2010.

**Figure 4. Estimates of the expenditure distribution: Brazil and Nigeria, 1985– 2010**




*Notes*: Authors' calculations. Brazil's distribution is based on incomes instead of expenditures. The 2010 data for Nigeria was revised in late 2014 (not incorporated here).

Taken together, these four distributions exemplify the changing composition of global poverty and broadly represent the trends in their respective regions. Over the last three decades, most poverty reduction occurred in East Asia where consumption growth was fastest, some poverty reduction occurred in India where real consumption growth was steady, and little poverty reduction occurred in sub-Saharan Africa where real consumption growth was slow and volatile. This suggests that without significantly faster growth in sub-Saharan Africa than in the past, possibly coupled with improvements in the income or expenditure distribution, the global pace of poverty reduction will inevitably slow down in the near future.

Another essential aspect of poverty analysis is studying the evolution of inequality. In this part, we focus only on inequality among citizens of developing countries, as our interest is the changing relative position of people in the developing world rather than their position vis-à-vis rich countries. Interestingly, many of the global trends are also evident even when we restrict our attention to this truncated distribution. We compute three measures of inequality by applying Young's (2011) mixture of log-normal distributions approach to the PovcalNet data. 'Overall inequality' is the Gini coefficient for citizens of developing countries regardless of their country of residency. 'Within inequality' is a population-weighted summary measure of inequality within each country. Last, 'between inequality' is the population-weighted Gini coefficient of average incomes among all developing countries. In other words, the first measure encompasses both the within-country and between-country components that make up overall inequality in the developing world. Naturally, global inequality – including the citizens of developed countries – is typically estimated to be considerably higher. Recent estimates of the global Gini suggest that it is around 0.65-0.70, and may be even higher if underreporting of top-incomes is taken into account (e.g. see Pinkovskiy and Sala-i-Martin 2009; Milanovic 2012; Chotikapanich, Griffiths, Rao, and Valencia 2012; Lakner and Milanovic 2013).

**Table 2. Inequality in the developing world, 1980–2010**

| | *Gini coefficient* | | | | | |
|---|---|---|---|---|---|---|
| Year | Overall | Within | Between | Mean Consumption | Population | |
| 1980 | 0.596 | 0.356 | 0.486 | 73.29 | 2907.8 | 83 |
| 1985 | 0.555 | 0.353 | 0.421 | 79.05 | 3223.2 | 86 |
| 1990 | 0.578 | 0.367 | 0.449 | 95.98 | 4049.3 | 104 |
| 1995 | 0.559 | 0.385 | 0.411 | 98.41 | 4555.2 | 114 |
| 2000 | 0.537 | 0.395 | 0.374 | 102.45 | 4931.4 | 121 |
| 2005 | 0.535 | 0.399 | 0.372 | 120.34 | 5285.6 | 123 |
| 2010 | 0.554 | 0.404 | 0.399 | 150.72 | 5625.1 | 123 |
| Δ 1980-2010 (in %) | -7.186 | 13.632 | -17.82 | – | – | – |
| Δ 1990-2010 (in %) | -4.17 | 10.095 | -11.081 | – | – | – |
| Δ 2000-2010 (in %) | 3.066 | 2.2 | 6.642 | – | – | – |

*Notes*: Authors' calculations. The sample size varies over the years. A total of 124 countries are recorded in PovcalNet but we lack PCE data for West Bank and Gaza. The results are very similar if we constrain the developing world to consist of the 104 countries from which we have (interpolated) data from 1990 onwards. Due to the lower coverage, the results for the 1980s should be interpreted with caution. For details on the ln-mixture calculations refer to Young (2011).

Table 2 reveals some interesting trends. Overall inequality in the developing world has been falling between 1990 and 2005, but it exhibits an increase in 2010. At the same time, within-country inequality has been rising steadily since the mid-1980s. Between-country inequality fell over most of the period but also shows a slight increase between 2005 and 2010. If we exclude China from the computations given that its weight is very high, then these trends are considerably muted or even non-existent.[11] Hence, two developments drive the overall change. First, inequality of incomes within China has been increasing significantly and second, its relative position among developing countries has been changing rapidly. Rising mean incomes in China from the 1980s onwards initially implied a reduction of between-country inequality as the average citizen in China was moving from the bottom towards the middle of the developing country ranks, but they now put upward pressure on overall inequality as incomes in China continue to grow and the distance from incomes in sub-Saharan Africa increases.[12]

## 3 Going forward: poverty projections until 2030

As the expiration date of the MDGs is approaching quickly, new goals will have to be selected. Picking from a wide range of possible benchmarks invariably involves formulating expectations towards a fundamentally uncertain future. Thus, it becomes important to ask: what can the current data and methods tell us about the prospects for poverty alleviation over the next two decades? The list of policy-relevant questions is long. What level of poverty do we expect to prevail in 2030? Will it be feasible to truly eradicate extreme poverty by 2030? Or, how quickly do we expect poverty rates under the $2 a day poverty line to decrease? Here, we provide both a glimpse into several likely futures and some potential answers to these questions.

This section draws heavily on Bluhm et al. (2013), where we develop a 'fractional response approach' for estimating income and inequality (semi-) elasticities of poverty. Among other things, the paper shows that this new method can be used to easily forecast global poverty rates using only two variables (the survey mean and the Gini coefficient). A key advantage of this approach over, say, linear trend extrapolations, is that it builds in the non-linearity of the poverty-income-inequality relationship. Neither the income or inequality elasticity nor the income or inequality semi-elasticity is assumed to be constant. The method

11. Overall inequality is estimated as 0.583 in 1990 and 0.584 in 2010, within-country inequality is estimated as 0.384 in 1990 and 0.391 in 2010, and between-country inequality is estimated as 0.450 in 1990 and 0.454 in 2010. Removing India in addition to China has little effect on the trends in the inequality measures.

12. This trend is corroborated by the literature on global inequality. According to Lakner and Milanovic (2013), average incomes in sub-Saharan Africa were $742 in 1988 and just $762 in 2008 (in 2005 PPPs), while Chinese incomes increased by 228.9% and no longer make up a large part of the lower tail of the global income distribution. They also show that inequality within China has risen between 1988 and 2008.

accounts for the fact that income growth will have an increasing effect in very poor countries, where the mass of the distribution is to the left of the poverty line, and less and less of an effect in rich countries, where the mass of the distribution is far to the right of the poverty line.[13] Similarly, the effect of changes in distribution will indirectly depend on the prevailing levels of both income and inequality.

We are of course not the first to present poverty projections over the next two decades. Ravallion (2013), for example, outlines an aspirational scenario where an additional billion people are lifted out of extreme poverty by 2025-2030. Karver, Kenny, and Sumner (2012) discuss the future of the MDGs more generally and simulate poverty rates at the $1.25 and $2 a day poverty lines for 2030.[14] Yet there are some important conceptual and methodological differences between our approach and these studies. First, the assumption that the developing world will continue growing at the accelerated 2000 to 2010 pace for another twenty years (our optimistic scenario) is questionable. There is a well-known instability of growth rates across decades that should not be ignored (Easterly et al. 1993), especially since the high average growth rates in the developing world were driven by rapid growth in China. A more conservative assumption is that countries will grow at rates much closer to their individual long-run growth path. Second, the changing composition of the countries contributing to global poverty matters a lot for the expected speed of global poverty reduction. Unless there is a persistent acceleration of consumption growth in sub-Saharan Africa on top of the post-2000 growth rates and sustained consumption growth in India, we can show that the pace of poverty reduction at the $1.25 line is likely to experience a pronounced slowdown in all of our forecast scenarios (defined below). Third, pro-poor growth can potentially make a sizable difference in the expected poverty rates, while a rise in within-country inequality will hasten the arrival of the slowdown. Fourth, our method approximates the 'official' *PovcalNet* results at a fraction of the

13. The inability to account for countries that have relatively high incomes and zero poverty at some point in time (typically the beginning or end of a spell) is a key weakness of studies investigating poverty elasticities.

14. Karver et al. (2012) allow for country-specific growth rates but use older data (their *PovcalNet* reference year is 2008) and disregard the difference between GDP per capita growth and growth of the survey mean. This leads them to overestimate the speed of poverty reduction relative to our forecasts. A recent study by Chandy, Ledlie, and Penciakova (2013) echoes some of our results. They use GDP per capita rather than consumption expenditure data for most of the period, but apply a conversion factor, and report lower poverty estimates.

computational cost, so that a variety of scenarios can be easily estimated (and frequently updated with the arrival of new data).

We define three different constant growth scenarios on the basis of the historical personal consumption expenditure (PCE) growth rates from the national accounts.[15] An 'optimistic' scenario uses the average PCE growth rate of each country from 2000-2010, during which period growth rates were significantly higher than before 2000. A 'moderate' growth scenario uses the average PCE growth rate of each country from 1980 to 2010 – the long run average over the entire dataset. Finally, a 'pessimistic' growth scenario uses the 1980 to 2000 average PCE growth rates. The latter scenario assumes that mean consumption in sub-Saharan Africa is shrinking at a rate of about 0.82% per year.[16] Table A-2 in the Appendix reports the population-weighted average regional growth rates over several different periods to illustrate the implied regional income dynamics.

For each growth scenario, we also simulate three different inequality patterns. 'Pro-poor growth' implies an annual decline in the Gini coefficient of approximately -0.5%, 'distribution-neutral growth' keeps inequality constant at the level prevailing in 2010, and 'pro-rich growth' implies an increase in the Gini coefficient of approximately 0.5% per year.[17] As an illustration, if a country's Gini coefficient is 0.40 in 2010 and we apply the pro-poor pattern, then by 2030 we project a Gini coefficient of about 0.36. If we apply the pro-rich pattern, then the Gini coefficient is about 0.44 in 2030. Changes of this magnitude are in line with the population-weighted regional trends obtained from the surveys.

We forecast the poverty rates until 2030 as follows. First, we estimate the model outlined in Bluhm et al. (2013) for the $1.25 a day poverty line using all nationally representative surveys recorded in *PovcalNet* over the period from 1981 to 2010. Next, after lining up all surveys in 2010, we apply each of the nine growth and distribution scenarios to project the

15. The term 'national accounts' refers to data from the World Development Indicators or the Penn World Table 7.1, whichever has more data over the 30 year horizon.

16. Owing to the post-communist transition, consumption and incomes in Europe and Central Asia were shrinking over the same period. However, given the small number of poor in 2010, the influence of that region on the global poverty headcount in 2030 is minimal.

17. All reported growth rates (in percent) are computed as log differences if not otherwise noted.

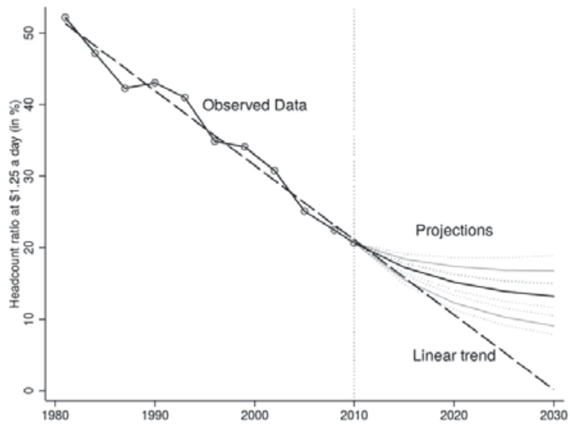
income and inequality data forward to 2030, country by country.[18] Then, we predict the poverty headcount ratios in five-year intervals over the period 2015 to 2030, country by country. Finally, we calculate population-weighted regional poverty rates and apply these to the projected total population in each region. For consistency with *PovcalNet*, the population projections are also taken from the World Bank and the 'developing world' is defined as in 1990 – the countries targeted by the MDGs – no matter how high we forecast the average level of consumption to be in 2030. Contrary to the World Bank's recent redefinition of the denominator, we still focus on the percent of poor population in the developing world and *not* the entire world.

Figure 5 plots the historical evolution of the poverty headcount from 1981 to 2010, a linear trend fitted through the observed data and then extrapolated until 2030, and our different scenarios. The linear trend serves as a reference for the non-linear projections. Several points are noteworthy. First, only the linear extrapolation predicts a poverty rate in the vicinity of zero by 2030. Regressing the global poverty rate at $1.25 a day on time one obtains a slope of about one percentage point per year (see also Ravallion 2013). [19] As the global poverty rate was about 20.6% in 2010, the linear trend predicts that extreme poverty will have vanished by 2030. Second, all our projections show a decelerating rate of poverty reduction. Even in the most optimistic scenario, the pace of poverty reduction slows down. Most forecasts show a decelerating trend early on. In the optimistic scenario the slowdown only becomes noticeable by about 2020. Third, all scenarios but the optimistic pro-poor growth or optimistic distribution-neutral growth scenarios imply a poverty rate higher than 10% in 2030 at the $1.25 a day line. The optimistic pro-poor growth and distribution-neutral scenarios suggest a poverty rate in 2030 of 7.9% and 9.1%, respectively. In a nutshell, 2030 is not likely to mark the end of extreme poverty, even under very optimistic assumptions. Our projections suggest that the World Bank's goal of 3% extreme poverty in 2030 is not likely to be reached.

18. To line up all surveys in 2010, we use the actually observed PCE growth rates from the national accounts to extrapolate the survey means from the latest available survey. In doing so, we keep inequality constant at the last observed Gini coefficient. In 2010, the average year when the last survey was conducted is 2006.7, so about 3 years prior to 2010. More than 40% of the last surveys were conducted in 2009 or 2010.

19. This differs from the 1.5 percentage points estimated in the previous section as the global poverty rate is measured by lining up and weighting all surveys at reference years (three year intervals from 1981 onwards), whereas in the previous section we were using an unbalanced panel of unequally-spaced, population-weighted survey data with a wide yet somewhat selective coverage.

**Figure 5. Actual and projected poverty headcount ratios at $1.25 a day, 1981–2030**




*Notes*: Authors' calculations based on Bluhm et al. (2013) and survey data from PovcalNet. The solid black line beyond 2010 refers to the moderate (distribution-neutral) growth scenario in Table 3, while the solid grey lines represent the distribution-neutral variants of the optimistic and pessimistic scenarios. The pro-poor and pro-rich variants are shown as grey dotted lines and are located above or below a solid line.

Table 3 provides the corresponding regional and total poverty rates in 2030 including the expected number of poor in the various scenarios. Our moderate growth estimate suggests a global poverty rate of 13.2% in 2030, implying about 950 million poor versus 1.2 billion poor people in 2010. The pace of poverty reduction will have slowed significantly both in terms of relative changes and in terms of numbers of poor people. In this scenario, about 70% of the world's poor live in sub-Saharan Africa and about 23% in South Asia by 2030. In contrast, the (distribution-neutral) optimistic result suggests a poverty rate of 9.11%, with about 655 million people remaining extremely poor. About 76% percent live in sub-Saharan Africa and about 17% in South Asia. The pessimistic case suggests next to no progress at all. Given an unchanged distribution, the poverty headcount ratio is estimated at 16.82% and the world is still home to 1.2 billion extremely poor people. Even if growth rates in sub-Saharan Africa were to *double* relative to the post-2000 trend, the global poverty rate in 2030 is still projected to be 6.50% with pro-poor growth, 7.67% with distribution-neutral growth, and 8.81% with pro-rich growth.

All of these estimates imply that it will take considerably longer than 2030 to lift the remaining 1.2 billion people out of poverty. The good news is that by 2030 extreme poverty in Europe and Central Asia, East Asia, Latin

**Table 3. Projected poverty headcount ratios and poor population at $1.25 a day in 2030, by region**

| | *Average PCE Growth* | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Optimistic (2000-2010) | | | Central (1980-2010) | | | Pessimistic (1980-2000) | | |
| | *Change in Inequality (Gini)* | | | | | | | | |
| | pro-poor | neutral | pro-rich | pro-poor | neutral | pro-rich | pro-poor | neutral | pro-rich |
| | *Panel (a) – Headcount at $1.25 a day in 2030 (in percent)* | | | | | | | | |
| East Asia and Pacific | 0.65 | 0.93 | 1.31 | 0.76 | 1.07 | 1.48 | 0.94 | 1.29 | 1.74 |
| Europe and Central Asia | 0.12 | 0.16 | 0.21 | 1.21 | 1.45 | 1.71 | 5.17 | 5.74 | 6.44 |
| Latin America and Caribbean | 2.27 | 2.74 | 3.28 | 3.46 | 4.12 | 4.91 | 4.59 | 5.46 | 6.48 |
| Middle East and North Africa | 0.48 | 0.66 | 0.91 | 1.54 | 2.07 | 2.75 | 3.72 | 4.77 | 6.05 |
| South Asia | 4.19 | 5.54 | 7.24 | 8.48 | 10.89 | 13.79 | 12.76 | 15.99 | 19.77 |
| Sub-Saharan Africa | 32.09 | 35.69 | 39.37 | 43.62 | 47.17 | 50.70 | 51.75 | 55.12 | 58.47 |
| Total | 7.88 | 9.11 | 10.49 | 11.63 | 13.2 | 14.96 | 14.96 | 16.82 | 18.89 |
| | *Panel (b) – Poor population at $1.25 a day in 2030 (in millions)* | | | | | | | | |
| East Asia and Pacific | 14.05 | 20.23 | 28.56 | 16.59 | 23.29 | 32.22 | 20.44 | 28.00 | 37.87 |
| Europe and Central Asia | 0.59 | 0.76 | 0.97 | 5.72 | 6.86 | 8.11 | 24.47 | 27.16 | 30.45 |
| Latin America and Caribbean | 16.15 | 19.44 | 23.32 | 24.61 | 29.3 | 34.86 | 32.61 | 38.77 | 46.05 |
| Middle East and North Africa | 2.12 | 2.94 | 4.04 | 6.84 | 9.18 | 12.18 | 16.47 | 21.15 | 26.83 |
| South Asia | 83.47 | 110.38 | 144.35 | 169.13 | 217.08 | 275 | 254.4 | 318.89 | 394.16 |
| Sub-Saharan Africa | 449.54 | 499.97 | 551.61 | 611.15 | 660.85 | 710.32 | 725.03 | 772.26 | 819.22 |
| Total | 567.2 | 655.36 | 754.95 | 836.34 | 949.49 | 1076.37 | 1076.35 | 1209.95 | 1359.23 |

*Notes*: Authors' calculations. Population projections are from the World Bank's Health, Nutrition and Population Statistics database. The different scenarios are estimated using the fractional response approach outlined in Bluhm et al. (2013) and the survey data reported in the World Bank's *PovcalNet* database.

America, and Middle East and North Africa may virtually disappear (projected to be less than 5% in most forecasts). However, we predict a strong increase in the (relative) share of global poverty located in sub-Saharan Africa, which suggests that a non-trivial fraction of extreme poverty may be concentrated in 'fragile states'. Whether these countries will overcome civil strife, political instability and corruption will ultimately decide whether there is a lower bound at which extreme poverty will continue to exist.

Gradual changes in inequality raise or lower the overall headcount in between 1.2 and 2.1 percentage points and account for about 100 million poor people more or less. Contrary to suggesting that inequality does not matter (we only assume slow changes), this finding hints at two crucial points. First, if the developing world as a whole is to truly maintain the impressive record in poverty reduction of the last decades, then this requires both sustained high growth at the level experienced since 2000 and improvements in distribution. Second, any systematic worsening of within-country inequality, particularly in large and largely poor countries like India or Nigeria, will reinforce the slowdown and thus more strongly decelerate the global rate of poverty reduction.

Readers may wonder why these results are so different from the projections reported in Ravallion (2013). Our results differ mainly because Ravallion (2013) uses the average growth rate of the developing world to project poverty in countries with very different track records, while we use country-specific average growth rates. Otherwise there are only minor differences in the data used and our method closely approximates results obtained using *PovcalNet*. Ravallion (2013) calculates that a PCE growth rate of 4.5% per year may bring the global poverty rate down to 3% by 2027. However, he makes the (in our view implausible) assumption that all developing countries will continue to grow equally fast at this common rate of 4.5%. Likewise, the linear projection of the global poverty rate on time ignores all issues of aggregation and provides an overly optimistic picture of the medium-term future.[20] Yet composition matters, even if we incorporate the optimistic assumption that the post-2000 trend will continue. The average hides that rapid growth is less likely in some countries than in others. As we have shown, this has direct consequences

20. We do not mean to imply that Ravallion (2013) is not aware of the aggregation issues. In fact, he uses PovcalNet precisely to confirm that his 'optimistic scenario' is possible once the intrinsic non-linearity of the poverty-income-inequality relationship is accounted for. Our point is rather that he envisions "the best possible world" to be used as a benchmark for future progress while we also focus on other, more likely, scenarios.

for when a slowdown will be observed and how strong the deceleration will be. However, even if we assume a uniform growth rate for all developing countries, a deceleration appears sooner or later within the next two decades (although it may actually be preceded by a brief acceleration if we assume growth rates in excess of 5% p.a.). It is comforting that, in line with Ravallion (2013), our method implies that if consumption in the entire developing world grew at a distributional-neutral pace of 7.6% per year, then extreme poverty would indeed virtually disappear by 2030 (fall to 1.1%). The 3% target can be reached with a uniform distribution-neutral growth rate of approximately 5.5% per year.[21]

We repeat this exercise at the $2 a day poverty line. The results are reported in Table 4 and Figure A-1 in the Appendix. Interestingly, the linear projection is a much better approximation of progress at the $2 poverty line than at the $1.25 poverty line. This is not due to a slower historical poverty reduction record: a regression of the global poverty rate at $2 a day on time also yields a slope of approximately one percentage point per year. However, the composition of countries (or people) near the $2 a day poverty line in 2010 is more reminiscent of its $1.25 counterpart in the early 2000s. At the start of the decade in 2010, the total $2 poverty rate is 40.67% – roughly double the $1.25 poverty rate. Fast growing East Asia and moderately fast growing South Asia still make up more than half of global poverty, implying that progress in these two regions will have a large effect on the overall poverty headcount.

Our moderate growth scenario predicts that about 1.87 billion people (26%) live on less than $2 a day in 2030 versus about 2.4 billion people in 2010. Considerably greater gains are possible. Global poverty at the $2 line falls below 20% in the optimistic distribution-neutral and pro-poor scenarios. If this occurs in 2030, then more than one billion people will have left poverty at the $2 a day line – undeniably a remarkable achievement. In most scenarios we also observe a slowdown at the $2 a day line but this slowdown tends to occur later and is less pronounced than at the lower threshold. In the most optimistic scenario, the rate of poverty reduction actually accelerates somewhat to about 1.16 percentage points per year, while the moderate growth scenario gives a trend of 0.73 percentage points per year over the projection period.
Examining the regional distribution, we find that poverty in East Asia is

21. Interestingly, a recent working paper by Yoshida et al. (2014), independently and using different methods, comes to very similar conclusions.

likely to fall to around 5% by 2030, down from 29.7% in 2010. Nearly everyone in East Asia will have entered the middle class (by developing country standards), but this forecast partially hinges on fast growth in China. In fact, some observers suggest that there is reason to believe that China runs a non-negligible risk of falling into a 'middle-income trap' (Eichengreen, Park, and Shin 2013) which might make it harder to achieve less than 10% poverty at $2 a day by 2030.[22] Progress in South Asia is also likely to be rapid. According to our moderate growth estimate the expected poverty rate is 35.9% in 2030, implying about 716 million poor, down from 66.7% and about 1.1 billion poor in 2010. In the optimistic pro-poor growth case, the headcount ratio falls by about one third to less than 20% and the number of poor decreases to less than 400 million. As a stark contrast, the $2 a day poverty rate in sub-Saharan Africa is expected to remain very high. Our moderate growth scenario predicts a poverty rate of about 66%, down from 69.9% in 2010, which at current population projections implies almost one billion poor in sub-Saharan Africa alone. Even in the optimistic distribution-neutral growth scenario, we project a poverty rate of about 55% and more than 750 million poor. This is underlined by the analysis in the preceding section where we suggest that the mass of the consumption distribution is far to the left of the $2 a day poverty line in 2010 for most of the subcontinent. Poverty alleviation in sub-Saharan Africa remains the primary development challenge of the first half of the 21st century.

## 4 Conclusion and policy recommendations

The main contribution of this paper is to forecast global poverty rates until 2030. To set the stage, we first highlighted that there is a fundamental uncertainty about the precise levels of extreme poverty. For the sake of comparison, we selected the standard poverty lines of $1.25 and $2 a day (in 2005 PPPs). We then discussed a robust set of global poverty and inequality trends. The global MDG of halving the 1990 extreme poverty level was reached in 2010 but this apparent progress hides substantial regional heterogeneity. Most of the global success was driven by rapid growth in China. Inequality among the citizens of developing countries and between developing countries was declining until 2005, while average within-country inequality was rising steadily until 2010.

22. However, our estimates suggest that this would require an exceptionally large slowdown. For poverty in East Asia to remain above 10% at $2 a day, growth needs to be less than half of the 2000-2010 trend.

**Table 4. Projected poverty headcount ratios and poor population at $2 a day in 2030, by region**

| | *Average PCE Growth* | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Optimistic (2000-2010) | | | Central (1980-2010) | | | Pessimistic (1980-2000) | | |
| | *Change in Inequality (Gini)* | | | | | | | | |
| | pro-poor | neutral | pro-rich | pro-poor | neutral | pro-rich | pro-poor | neutral | pro-rich |
| *Panel (a) – Headcount at $2 a day in 2030 (in percent)* | | | | | | | | | |
| East Asia and Pacific | 3.79 | 4.61 | 5.55 | 4.03 | 4.90 | 5.90 | 4.39 | 5.31 | 6.36 |
| Europe and Central Asia | 0.45 | 0.56 | 0.69 | 2.80 | 3.13 | 3.49 | 9.35 | 10.28 | 11.31 |
| Latin America and Caribbean | 4.00 | 4.73 | 5.59 | 6.29 | 7.39 | 8.66 | 8.57 | 9.99 | 11.60 |
| Middle East and North Africa | 2.85 | 3.55 | 4.39 | 7.20 | 8.62 | 10.25 | 12.86 | 14.88 | 17.12 |
| South Asia | 19.83 | 23.12 | 26.74 | 31.60 | 35.88 | 40.39 | 40.35 | 45.00 | 49.73 |
| Sub-Saharan Africa | 51.62 | 54.56 | 57.46 | 63.67 | 66.36 | 68.98 | 70.93 | 73.32 | 75.63 |
| Total | 17.36 | 19.23 | 21.24 | 23.73 | 25.94 | 28.26 | 28.71 | 31.07 | 33.53 |
| *Panel (b) – Poor population at $2 a day in 2030 (in millions)* | | | | | | | | | |
| East Asia and Pacific | 82.42 | 100.2 | 120.61 | 87.49 | 106.39 | 128.23 | 95.44 | 115.26 | 138.11 |
| Europe and Central Asia | 2.12 | 2.63 | 3.26 | 13.24 | 14.79 | 16.49 | 44.25 | 48.63 | 53.50 |
| Latin America and Caribbean | 28.39 | 33.63 | 39.73 | 44.71 | 52.52 | 61.50 | 60.90 | 70.99 | 82.42 |
| Middle East and North Africa | 12.64 | 15.74 | 19.47 | 31.94 | 38.22 | 45.46 | 57.02 | 65.95 | 75.91 |
| South Asia | 395.33 | 461.03 | 533.21 | 629.97 | 715.46 | 805.25 | 804.56 | 897.12 | 991.46 |
| Sub-Saharan Africa | 723.19 | 764.47 | 805.00 | 892.01 | 929.76 | 966.48 | 993.71 | 1027.19 | 1059.59 |
| Total | 1249.19 | 1383.61 | 1528.08 | 1707.2 | 1866.01 | 2033.35 | 2065.12 | 2235.43 | 2412.3 |

*Notes*: Authors' calculations. Population projections are from the World Bank's Health, Nutrition and Population Statistics database. The different scenarios are estimated using the fractional response approach outlined in Bluhm et al. (2013) and the survey data reported in the World Bank's *PovcalNet* database.

The changing composition of global poverty has profound implications for the medium-term future. After 2010, fast growing East Asia will contribute less and less to global poverty reduction, while the share of the global poor residing in sub-Saharan Africa and South Asia will continue to rise. All of our projections show that the global rate of poverty reduction at $1.25 a day will slow down markedly between 2020 and 2025. None of our nine scenarios predicts a poverty rate near zero by 2030. This stands in stark contrast to earlier studies and the '3% by 2030' target recently announced by the World Bank. The Bank's target can only be reached if we make the unrealistic assumption of equally rapid growth in all developing countries. Once country-specific growth rates are used, even our most optimistic scenarios suggest a poverty rate of between 7.9% and 10.5%, depending on the evolution of inequality. At $2 a day, the slowdown will occur much later and remarkable gains are possible if the post-2000 growth trends continue. An optimistic estimate suggests that the $2 a day poverty rate may fall below 20% by 2030, implying one billion fewer poor people than in 2010.

We propose two new 'twin targets' on the basis of these findings. An aspirational but realistic benchmark for progress would be to *"reduce the proportion of the population living below $1.25 to 8% by 2030 and reduce the proportion of the population living below $2 a day to 18% by 2030."* Both of these targets are firmly anchored in our optimistic pro-poor growth scenarios. The $2 a day poverty line should receive more attention in the future to better track continued progress in East Asia and, later on, South Asia. Partly for the same reason, China has recently raised its own national poverty line to about $1.80 a day.

These targets can be reached in a variety of ways but not only through a continuation of the current path. They will require either an additional acceleration of growth in poorer countries, or improvements in distribution. Reversing the trend of rising within-country inequalities would speed up the pace of poverty reduction and still ensure progress at more moderate growth rates. The returns to redistribution are increasingly high in East and South Asia, and remain relatively large in Latin America. However, in some regions growth takes precedent. Rapid poverty alleviation in sub-Saharan Africa still requires a significant and sustained acceleration in consumption growth.

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## Appendix A

**Table A-1. World Bank poverty estimates by region, 1981 to 2010 (selected years)**

| | *Year* | | | | |
|---|---|---|---|---|---|
| | 1981 | 1990 | 1999 | 2005 | 2010 |
| *Panel (a) – Headcount ratio at $1.25 a day (in percent)* | | | | | |
| East Asia and Pacific | 77.18 | 56.24 | 35.58 | 17.11 | 12.48 |
| China | 84.02 | 60.18 | 35.63 | 16.25 | 11.62 |
| Europe and Central Asia | 1.91 | 1.91 | 3.79 | 1.33 | 0.66 |
| Latin America and Caribbean | 11.89 | 12.24 | 11.86 | 8.66 | 5.53 |
| Middle East and North Africa | 9.56 | 5.75 | 5.01 | 3.45 | 2.41 |
| South Asia | 61.14 | 53.81 | 45.11 | 39.43 | 31.03 |
| India | 59.83 | 51.31 | 45.62 | 40.82 | 32.67 |
| Sub-Saharan Africa | 51.45 | 56.53 | 57.89 | 52.31 | 48.47 |
| Total | 52.16 | 43.05 | 34.07 | 25.09 | 20.63 |
| *Panel (b) – Poor population at $1.25 a day (in millions)* | | | | | |
| East Asia and Pacific | 1096.5 | 926.42 | 655.59 | 332.08 | 250.9 |
| China | 835.07 | 683.15 | 446.35 | 211.85 | 155.51 |
| Europe and Central Asia | 8.21 | 8.87 | 17.83 | 6.26 | 3.15 |
| Latin America and Caribbean | 43.33 | 53.43 | 60.1 | 47.6 | 32.29 |
| Middle East and North Africa | 16.48 | 12.96 | 13.64 | 10.47 | 7.98 |
| South Asia | 568.38 | 617.26 | 619.46 | 598.26 | 506.77 |
| India | 428.68 | 448.34 | 472.74 | 466.3 | 400.08 |
| Sub-Saharan Africa | 204.93 | 289.68 | 375.97 | 394.78 | 413.73 |
| Total | 1937.83 | 1908.45 | 1742.53 | 1389.2 | 1214.98 |
| Total excl. China | 1102.76 | 1225.3 | 1296.18 | 1177.35 | 1059.31 |

*Notes*: Based on PovcalNet and Chen and Ravallion (2010, 2013).

**Table A-2. Population-weighted regional PCE growth rates over various periods**

| | *Period* | | | | |
|---|---|---|---|---|---|
| | 2000–2010 | 1990–2010 | 1980–2010 | 1980–2000 | 1990–2000 |
| East Asia and Pacific | 5.906 | 5.772 | 5.598 | 5.377 | 5.608 |
| | (0.813) | (0.653) | (0.725) | (0.677) | (0.508) |
| Europe and Central Asia | 6.085 | 2.755 | 2.558 | -0.769 | -1.225 |
| | (0.989) | (0.412) | (0.411) | (0.916) | (1.027) |
| Latin America and Caribbean | 2.444 | 2.219 | 1.445 | 0.677 | 1.931 |
| | (0.239) | (0.140) | (0.098) | (0.171) | (0.337) |
| Middle East and North Africa | 3.495 | 2.532 | 1.851 | 0.495 | 1.253 |
| | (0.443) | (0.440) | (0.293) | (0.545) | (0.648) |
| South Asia | 4.448 | 3.612 | 3.179 | 2.173 | 2.511 |
| | (0.489) | (0.388) | (0.351) | (0.284) | (0.294) |
| Sub-Saharan Africa | 2.382 | 1.419 | 0.698 | -0.818 | 0.016 |
| | (0.689) | (0.470) | (0.472) | (0.540) | (0.688) |
| Overall average | 4.544 | 3.809 | 0.132 | 2.565 | 2.862 |
| | (0.152) | (0.132) | (0.114) | (0.161) | (0.225) |
| | 123 | 123 | 123 | 122 | 122 |

Chapter 3

# Chronic Poverty in Rural Cambodia: Quality of Growth for Whom?

Ippei Tsuruga

## 1. Introduction

For the past decade, policy makers and researchers have paid great attention to pro-poor growth, focusing in particular on what types of growth would decrease poverty. With the post-2015 era approaching and with smaller poverty headcounts compared to the past, debates surrounding poverty have started seriously considering the quality of growth to eliminate extreme poverty in the coming decades, rather than just its decrease. Zero poverty cannot be realised without tackling structured poverty. The Chronic Poverty Report (Shepherd et al. 2014) calls for the implementation of a comprehensive set of protective and preventative measures for those living in chronic poverty, or those moving in and out of poverty over time due to limited capacities. The paradigm shift from reduction to elimination requires future growth to be aware of whose poverty counts, or quality of growth for whom. High growth and consumption increases are likely to benefit many of the poor, but what of the chronic poor who structurally remain in long-term poverty. One of the critical questions concerns the effects of past growth, particularly in terms of structured poverty, and implications for the quality of growth in the new era.

Taking the case of Cambodia, this paper aims to assess the effects of past growth on the chronic poor by estimating the remaining population in chronic poverty, and analysing the structural characteristics that keep them in poverty indefinitely. Cambodia still faces significant challenges in its poverty reduction policy. After the devastating destruction of physical, social and human capital throughout the Pol Pot regime and the following period of unstable recovery, the country is finally enjoying steady development. With a favourable macroeconomic environment, the country achieved a dramatic improvement in consumption by the poor between 2004 and 2010. With more people emerging from poverty, there are more people concentrated near or just above the poverty line. The latest poverty assessment has emphasised the need to prevent these people from falling back into poverty (World Bank 2013a). Despite experiencing an excellent pro-poor growth period, households with certain attributes still live in poverty. What is missing in the poverty discussion in Cambodia, mainly due to lack of data and analysis, is the critically important focus on chronic poverty as well as the transient poor.

This paper attempts to make two major contributions: one is to fill the research gap on chronic poverty. Recent works by the Cambodia Development Resource Institute (CDRI) are the only widely published studies that have assessed persistent poverty (Tong 2012a, 2012b, 2012c). The second is to provide an estimated chronic poverty headcount with locally meaningful multidimensional criteria. The research by Tong provides a better understanding of chronic poverty through econometric analysis using panel data but has limited data coverage. In the absence of nationwide panel data, I estimate a nationally representative figure. The findings of this study could potentially be of benefit in identifying and targeting programmes for the chronic poor.

## 2. Growth and poverty in Cambodia

### (1) Pro-Poor Growth and Distribution

This section assesses the extent to which pro-poor growth has been achieved from the following perspectives. The definition of pro-poor growth in this study is simply "growth with poverty reduction," as widely adopted in the development community (DFID 2004). Pro-poor growth can be achieved in several ways, such as income growth (Dollar and Kraay 2001, Kraay 2006), distribution change (White and Anderson 2001; Ravallion 2004) and the favourable sectoral pattern of growth (Eastwood and Lipton 2000).

Quantitative data for poverty analysis has been derived from a series of Cambodia Socio-Economic Surveys (CSES). Following the Socio-Economic Surveys of Cambodia (SESC) conducted in 1993 and 1996, CSES was initiated in 1997, and data is available from 1997, 1999, 2004, and every year from 2007 onwards. Since 2004, the questionnaire has been improved to provide more information. The sample size was 12,000 households in 2004 and 2009, and 3,600 households in the other years. National poverty indicators have been calculated using CSES. In April 2013, the Cambodian government modified the official calculation method of consumption aggregation and redefined national poverty lines based on CSES 2009 (Cambodia. Ministry of Planning 2013). The food poverty line is now calculated based on an equivalent food consumption of 2,200 K-calories per person per day. The total poverty line is calculated by adding an allowance for non-food items to the food poverty line. Taking price differences into consideration, separate poverty lines are defined in three geographic areas: Phnom Penh (KHR 6,347), other urban (KHR 4,352), and rural (KHR 3,503) areas.

Applying the new method and adjusting poverty lines for inflation, Table 1 shows estimated poverty indicators. All the poverty indicators present a very positive improvement between 2004 and 2010. The poverty headcount ratio dropped significantly from 62.82 percent to 20.02 percent at the poverty line and 31.67 percent to 3.38 percent at the food poverty line. In terms of depth and severity of poverty, poverty indicators show a large improvement across the nation as well. The poverty gap dropped from 22.38 points to 4.17 points, whilst the squared poverty gap followed the same trend from 10.34 points to 1.32 points.

**Table 1. Poverty Estimation**

| Indicator | Region | Food Poverty Line | | Poverty Line | | Obs. | |
|---|---|---|---|---|---|---|---|
| | | 2004 | 2010 | 2004 | 2010 | 2004 | 2010 |
| p0 | Other Urban | 22.89 | 2.70 | 53.50 | 15.90 | 8,685 | 2,938 |
| | Rural | 35.50 | 3.83 | 66.61 | 21.54 | 45,258 | 10,011 |
| | Phnom Penh | 6.88 | 0.38 | 39.09 | 11.93 | 5,909 | 3,561 |
| | Cambodia | 31.67 | 3.38 | 62.82 | 20.02 | 59,852 | 16,510 |
| p1 | Other Urban | 5.96 | 0.45 | 19.02 | 3.36 | 8,685 | 2,938 |
| | Rural | 8.98 | 0.62 | 23.94 | 4.47 | 45,258 | 10,011 |
| | Phnom Penh | 1.79 | 0.05 | 12.05 | 2.63 | 5,909 | 3,561 |
| | Cambodia | 8.03 | 0.55 | 22.38 | 4.17 | 59,852 | 16,510 |
| p2 | Other Urban | 2.30 | 0.10 | 9.03 | 1.12 | 8,685 | 2,938 |
| | Rural | 3.27 | 0.14 | 11.05 | 1.40 | 45,258 | 10,011 |
| | Phnom Penh | 0.75 | 0.01 | 5.34 | 0.82 | 5,909 | 3,561 |
| | Cambodia | 2.95 | 0.12 | 10.34 | 1.32 | 59,852 | 16,510 |
| Updated | Other Urban | 1,774 | 2,694 | 2,962 | 4,498 | – | – |
| poverty | Rural | 1,565 | 2,377 | 2,384 | 3,620 | – | – |
| lines (riels) | Phnom Penh | 2,124 | 3,226 | 4,319 | 6,559 | – | – |

| Region (Rural Only) | Headcount ratio (%) | | Regional Share (%) | | Obs. | |
|---|---|---|---|---|---|---|
| | 2004 | 2010 | 2004 | 2010 | 2004 | 2010 |
| Mekong Plain | 63.92 | 18.02 | 54.95 | 43.57 | 26,548 | 5,485 |
| Tonle Sap | 69.29 | 16.66 | 26.8 | 21 | 11,384 | 2,659 |
| Coastal | 58.22 | 17.99 | 5.64 | 5.58 | 2,840 | 665 |
| North and Northeast Mountain | 79.83 | 45.63 | 12.61 | 29.85 | 4,486 | 1,202 |
| Cambodia | 66.61 | 21.54 | 100 | 100 | 45,258 | 10,011 |

Source: Author's calculations based on CSES

Note: Poverty lines have been adjusted by consumer price index (CPI) in Phnom Penh equally across the regional poverty lines because the regional CPI breakdown is not available. Fixing the averaged CPI October/December 2009 as 100 points, CPI for the other reference years was 0.68 for 2004 and 1.03 for 2010 (Carpenter 2012, National Institute of Statistics). All presented indicators have been assigned population weights provided by each survey, calculated based on General Population Census 1998 and 2008 respectively for CSES 2004 and 2010. Poverty indicators are calculated based on the Foster-Greer-Thorbecke method (1984).

This trend is likely a result of the favourable macroeconomic environment and growth pattern. Between 2004 and 2010, even during the global financial crisis, the country enjoyed 6.17 percent annual growth in GDP per capita. Sectoral growth took place almost evenly in agriculture, which most poor people rely on, at 6.81 percent, as well as manufacturing and services, at about 8 percent (Appendix 1). The consumption growth of the poor was higher than that of growth rate in mean and at median in all regions, increasing annually by 9.11 percent in Phnom Penh, 11.66 percent in other urban and 10.34 percent in rural areas (Appendix 2). The growth incidence curve clearly indicates that growth and distribution patterns were pro-poor in the rural settings. Moreover, human development has improved substantially. The net enrolment ratio presents an upward trend at all levels, primary, lower secondary and upper secondary whilst school attendance and adult literacy follow similar trends. Child mortality has also improved in terms of neonatal, infant and under-5 age groups. Overall, the quantitative data both on macro and micro confirm that the country has achieved pro-poor growth.

Looking closely into the socioeconomic data in 2010, geographic distribution and economic activities illustrate poverty characteristics further. All poverty indicators are noticeably higher in rural regions than urban settings. Rural poverty was 21.54 percent whilst urban poverty was even lower, 11.93 percent in Phnom Penh and 15.9 percent in other urban areas. Although the difference in poverty rates between rural and urban areas might be seen as small, it is significantly different in absolute terms. In spite of increasing urbanisation, rural areas are still home to 80 percent of the population and over 86 percent or 2.3 million of the poor. This geographic distribution correlates with the trends in economic activities: 72 percent of poor people depend on agriculture[1] for their livelihoods in Cambodia, and the rate increases to 78 percent in rural settings. Of the poor agrarians, crop farmers account for 80 percent. Although agricultural labourers, livestock farmers, forestry workers, fishery workers and hunters constitute a minority (12 percent), these groups contribute a higher share to poverty (18 percent) than their population share. Poverty rates are relatively higher among them too. In rural areas, 33 percent of fishery workers and 40 percent of agricultural labourers live below the poverty line. On the other hand, urban poverty

1 Main economic activities of households are defined by time that household members spend on particular sectors. A detailed definition is discussed later.

shows quite different patterns in economic activities, with 95 percent of the poor in Phnom Penh and 52 percent in other urban areas working in secondary or tertiary sectors.

To sum up, Cambodia seems to have achieved pro-poor growth between 2004 and 2010. Both macroeconomic environment and human development progress were steadily positive, consumption growth of the poor increased more than that of other socio-economic groups, and poverty indicators dramatically improved.

**(2) Existing Literature on Chronic Poverty**

Quantitative regional studies provide fruitful insights on chronic poverty. Tong (2012a) conducted a dynamic poverty study using CDRI panel data of 793 households, collected in 2001, 2004/05, 2008 and 2011, from nine villages in seven provinces in four geographic regions, including Tonle Sap, Mekong Plain, Plateau and Coastal areas. The data include information on household demographics, consumption, asset ownership and economic activities. The study applies principal component analysis to construct a wealth index from mixed asset ownership for ranking households (Filmer and Pritchett 2001). Households always below the set poverty line (40th percentile or 60th percentile) are regarded as the chronic poor. The study finds that most poverty was transient during the period. It also finds the following characteristics of the chronic poor households. Compared to non-poor households, the chronic poor households are likely smaller and have more children under-six years, fewer adults aged 15-64, and the household heads tend to be younger, less educated, female and single. They likely lack agricultural land, non-land assets, livestock, and connection with their community than other households.

Using the same dataset, Tong (2012b, 2012c) reassesses chronic poverty with consumption measurements to compare results. It confirms all the major findings above except for household size and age of household heads. While the asset approach finds that the chronic poor tend to be in smaller households and their heads are likely young, the consumption approach finds larger households and no significant trends in head's age among them. There is no further analysis of these particular contradictions.

These findings provide a valuable foundation for understanding chronic poverty in Cambodia. In relation to the previous studies by Tong, this paper potentially makes an important contribution by confirming some of his major findings from a different approach and at the national level. There are certain differences in methodologies and scopes. For example, while Tong's studies cover households with all the occupations in the selected areas, this paper limits its scope of analysis to agrarians in rural areas across the nation. While Tong's study uses consumption poverty and a wealth index, this study defines chronic poverty by local perspectives through PPA as discussed later.

## 3. Methodology for identifying chronic poverty

The methods for measuring the persistence of poverty have been disputed. In contradistinction to transient poverty, chronic poverty is commonly defined by poverty over long durations and regarded as intergenerational transmission of poverty through transferred capital or assets (Hulme and Shepherd 2003). For the identification of chronic poverty in practice, one of the most common approaches is quantitative assessment using a set of panel data (McKay and Lawson 2002; Haddad and Ahmed 2003; Wadugodapitiya and Baulch 2011). Comparing income or consumption of the same households over time, it provides informative analysis with figures. On the other hand, Hulme, Moore and Shepherd . (2001, 34) argued that monetary measurements cannot fully reflect the complexity of chronic poverty; therefore such analyses need to take into account the multidimensional characteristics of chronic poverty and can benefit from qualitative or subjective assessment by poor people themselves. White (2002) also argued that productive synergy can be established between them in poverty analyses.

Building upon these ideas, Howe and McKay (2007) developed an innovative framework for identifying chronic poverty by combining both quantitative and qualitative approaches. They pointed out that panel data analysis provides a narrow understanding of chronic poverty within the capacity of data availability or questionnaires, although it provides the numeric results that policy makers prefer to have for decision making. It can also assess relatively short spans and is usually sensitive to measurement errors. They also acknowledge the pros and cons of a qualitative approach. It provides narrative information based on rich local knowledge and experience that is usually missed by purely numerical methods. Data can be ambiguous and therefore difficult for policy makers to use the results, as there are fewer objective figures and macro perspectives. To overcome the limitations and maximise the advantages, they innovated by combining the methodologies. The major value of the resulting methodology is that it does not require panel data – instead, it uses cross-sectional socioeconomic data at a single point in time and qualitative information collected through participatory poverty assessments (PPA). They proposed undertaking several steps of analysis: firstly, selecting criteria of chronic poverty defined by the poor people themselves in the PPA, translating those qualitative criteria onto nationally representative household data, and finally checking the robustness and sensitivity of the estimation.

As Howe and McKay (2007) acknowledge, the sustainable livelihood approach (SLA) is a useful framework to understand qualitative information in a vicious poverty cycle at the stage of criteria selection (Ellis 2000, 2006). In SLA, livelihood is conceived as a cycle of three main components: assets, activities and outcomes. Assets consist of five or more types such as human capital (skills, education, health), physical capital (goods), financial capital (savings, access to loans), natural capital (land, water, forest), and social capital (kinship, friendship). Households are considered to mobilise those assets to produce outcomes through different types of economic activities, and invest the outcomes to accumulate assets again. In terms of vulnerability in SLA, households are considered to utilise assets to practise risk management and coping strategies. If they manage the sequence successfully, they are able to build up assets. If unsuccessful, they deplete assets. Institutions and policies are involved in the framework to reduce vulnerability. In relation to chronic poverty, destitute households may live in a vicious cycle of asset-activity-outcome.

In this study, I adopt the approach of Howe and McKay (2007) to identify chronic poverty. The approach is relevant for this study in two reasons. The first reason is data availability. Cambodia does not have nationwide panel data but socioeconomic survey data and the results of PPA are available. Secondly, the methodology allows estimating the chronic poverty headcount at two points in time, enabling analysis of the extent to which pro-poor growth benefits the chronic poor over the period. As Howe and McKay admit, this is not the most rigorous way to estimate chronic poverty and it has a tendency to underestimate the population but it is still considerably useful in assessing chronic poverty given the absence of panel data.

## 4. Qualitative insights into chronic poverty in Cambodia

This section reviews qualitative information to identify the characteristics of chronic poverty. The qualitative information is derived from the PPA conducted across the nation by the Asian Development Bank between October and December 2000 (ADB 2001). The PPA compiled local voices through focus group discussions (FGDs), formulated in geographically targeted poor regions based on quantitative surveys (National Population Census and CSES) and selection by local authorities, community or village members and nongovernmental organisations. Locally selected poor people participated in 169 FGDs in 154 villages in 70 communes in all 24 provinces and in additional 15 urban areas. The regional share of FGDs was 47 percent in the Mekong Plain, 29 percent in Tonle Sap, 12 percent in the North and Northeast Mountain regions, and 12 percent in coastal areas. The participants included a variety of vulnerable groups: women, children, rural farmers, fisher folk, ethnic minority groups, female-headed households, demobilised soldiers, orphans, street children, sex workers, plantation workers, garment workers, garbage collectors and cyclo-drivers. Females and ethnic minorities accounted for over 50 percent and 13 percent respectively. The PPA paid particular attention to the process to have real voices from those socially weaker groups. For instance, the team members conducted separate discussions with women in situations where they could not openly explore gender issues in the FGD where men were present.

As designed, the PPA provides deep insights about the livelihoods and demographic characteristics of poor households. It found that food insecurity is a primary concern for all poor households regardless of region and ethnic group. Poverty means they spend a large amount of time looking for food, potentially causing loss of other opportunities such as participation in village activities. It also found that food foraging activities are often undertaken by women and children; therefore children, particularly girls, in poor families potentially have a higher risk of missing educational opportunities. Most PPA participants generate their livelihoods through agriculture. Rice farming was listed as the most important economic activity by 83 percent, with market gardening second at 16 percent, and raising livestock third at one percent. Some households certainly mixed those activities but very few households had other supplemental activities for livelihood. Moreover, the PPA found a vicious poverty cycle in relation to asset deprivation. In rural Cambodia, the poorest families tend to sell assets to cope with major shocks like natural disasters, sickness or death of household members, resulting in low levels of asset ownership. As ownership of productive land was listed as very important for their lives, the coping strategy of selling land is certainly not an easy choice for the poor.

**Table 2. Household Characteristics Identified in Participatory Poverty Assessment**

| Category | Household Characteristics |
|---|---|
| Poorest<br><br>*Kror bamphot*: Extremely poor<br>*Toal:* People who have no way out of their present situation | 1. Little or no land (0.8-1.2 ha)<br>2. Perhaps one draft animal but no farming implements<br>3. Housing made of thatch in very poor condition<br>4. Few household utensils<br>5. Live on hand-to-mouth basis (food shortages for up to eight months)<br>6. Much reliance on natural resources to meet subsistence needs<br>7. Accumulated debts and inability to repay or borrow additional amounts<br>8. No kinship support<br>9. Large young families with 5-12 children |
| Poor<br><br>*Kror:* Literally poor<br>*Kror thomada*: Typical poverty | 1. Less than 2 ha of land in unfavorable locations<br>2. Usually have at least a pair of draft animals and some farm implements<br>3. Houses made of thatch sometimes with tile roof and bamboo walls<br>4. Limited number of household utensils<br>5. Food shortages for 3-6 months<br>6. Able to borrow money for rice farming |
| Lower medium income<br><br>*Kror imom*: Reasonably poor<br>*Kandal:* Medium | 1. Less than 3 ha of land<br>2. Draft animals and farm implements<br>3. Houses made of wood or bamboo, thatched roof and walls and tile roof<br>4. Limited number of household utensils<br>5. Food shortages for 3-4 months<br>6. Able to borrow money for rice farming |
| Middle income<br><br>*Mathyum*: Average<br>*Kandal*: Medium | 1. Land holdings of up to 6 ha<br>2. 2-4 draft animals, some livestock and all farm implements<br>3. Houses made of wood with either bamboo or wooden floors and tile roof<br>4. Reasonable number of household utensils<br>5. No food shortages except when major crisis or ritual occurs<br>6. Limited cash savings<br>7. Small-scale business<br>8. Old motorbike or boat |
| Least poor (Non-Poor)<br><br>*Throuthear:* Fully self-sufficient without any debts;<br>*Neak leu*: Living above poverty | 1. More than one hectare of very productive agricultural land<br>2. At least two draft animals and many other livestock and farm implements<br>3. Houses made of permanent building materials, including corrugated iron and tiles<br>4. Full food security with limited surplus for lending, sale or labor exchange<br>5. Well-furnished households, often with television<br>6. Able and willing to lend money to other villagers |

Source: Summarised by the author based on the PPA (ADB 2001)

The PPA identified five broad livelihood ranks and those characteristics (Table 2), enabling a chronic poverty threshold to be defined. The first category clearly implies chronic poverty. The literal description in local language is *Toal*, people who have no way out of their present situation, and *Kror Bamphot*, extremely poor. The identified characteristics also confirm a significant deprivation – namely, lack of food security most of the time (eight or more months per year), relying on subsistent livelihoods (living on a hand-to-mouth basis), no productive assets or kinship support. Spending most months hungry and unable to escape the situation, those households in this category can be clearly identified as being in chronic poverty. The second and third categories are too ambiguous to be regarded as chronic poverty. Households in these two categories have land at unfavourable locations and limited farming implements with relatively long term food shortages. The PPA describes their marginalised situation but does not provide a clear definition or characteristics of poverty persistence. In order to avoid ambiguity and subjectivity for selection criteria, this study regards only the first category as chronic poverty.

Reflecting the limitations in coverage of the PPA, the above criteria potentially underestimate chronic poverty in particular groups. Firstly, the PPA provides little information about urban chronic poverty. Although there are some related descriptions such as lack of in-house toilet, mobile phone, car or motorcycle, or child's education, it does not link to those characteristics to poverty persistence. Due to this lack of clear definition, this study is unable to estimate chronic urban poverty and therefore the following analysis focuses on rural areas. Secondly, the PPA does not provide sufficient information about characteristics of chronic poverty in secondary and tertiary sectors; therefore, the study's scope is limited to chronic poverty in agriculture in terms of livelihood. Given the lack of information, it also potentially underestimates the chronic poor who rely on non-farming agricultural subsectors. For instance, as resource-based livelihoods are reported to have very different characteristics from farming (Ballard et al. 2007), households relying on fishery and forestry would not be rigorously identified in chronic poverty by the single set of criteria. Similarly, chronic poverty among ethnic minorities cannot be easily identified by the single selection criteria because each tribe has a variety of perceptions of poverty. For example, whilst the Stieng and the Tumpoun recognise loss of cultural identity as a characteristic of poverty, the dominant lowland

Khmer, the Cham or the Vietnamese do not have such perceptions. Stieng participants stated that they do not even have a term to describe poverty and would not compare life with others in their culture. A tribal elder of the Tumpoun in Ratanakiri defines poverty based on situations in which they would be unable to protect and hand over their land to the next generation, and they would not be rich even if they had enough money. Such differences in values cannot be taken into account in this study.

Lastly, on a possible critique for using the PPA conducted over a decade ago, I would argue that the validity can be reasonably confirmed, because Tong's work (Tong 2012a, 2012b, 2012c), conducted throughout the decade after the PPA, also found similar demographic characteristics of chronically poor households, including lack of agricultural land, non-land assets, livestock, and networks with their community.

In summary, this study defines chronic poverty by the first category of Table 2 and focuses solely on rural areas. With limited information, this study potentially underestimates chronic poverty among households who make their livelihood through non-farming activities, the urban poor and ethnic minorities. Further studies could explore such categories. Nevertheless, this study is still of value because the proportion of the population in urban settings, forestry, fishery or ethnic minority groups is relatively small and the vast majority of rural populations are covered in the following estimation.

## 5. Chronic poverty estimation

I will now combine the quantitative information and the qualitative data to estimate chronic poverty. In order to identify the chronic poor, the general principle of criteria selection here is to translate as many local definitions as possible to household survey data. One critique of this combining method is that selected criteria are loosely associated with PPA results (Shaffer 2013, 49). Therefore, it is crucial for this study to test the robustness and sensitivity of the estimation result. This section reviews the descriptive statistics of each dimension that the PPA identifies, followed by an estimated chronic poverty headcount and finally, a robustness and sensitivity analysis.

### Descriptive Statistics and Discussion on Selection Criteria

Concerning economic activities, 77.34 percent of rural people relied on agriculture in 2004 and 72.87 percent in 2010 (Table 3). The data allows further breakdown into agricultural subsectors, but the categorisation is not fully comparable over the two datasets at the subsector level. Among agrarians in 2010, most of them lived on crop farming (87.53 percent), while others relied on agricultural labour (7.5 percent), livestock raising (2.37 percent), fishery (1.35 percent) and forestry (0.26 percent).

In terms of asset ownership among agrarians in each survey year respectively, 58.81 percent and 57.34 percent owned one hectare or less of land for any agricultural activities such as vegetable gardening, crop cultivation, livestock raising or private forestry; 42.19 percent and 46.48 percent owned one or no draft animals, which included cattle, buffaloes, horses and ponies but excluded other types of livestock like pigs, sheep, goats, chickens, ducks or quails; 82.35 percent and 75.44 percent owned no high value farming implements, such as tractors, bulldozers, threshing machines, hand tractors, rice mills, or water pumps; 58.49 percent and 57.06 percent lived in houses where the walls or roof are made from bamboo or thatch.

Some particular dimensions need further discussion in order to determine selection criteria. Firstly, the PPA found that the chronic poor tend to have 0.8 hectare to 1.2 hectares of agricultural land, as shown in Table 4, while also indicating that owning productive cropland is one criterion for non-poverty. The major difference between these two descriptions is quality of land. Unfortunately, there is no translatable quantitative data available to distinguish the quality of land. Therefore, defining chronic poverty by taking land ownership of between one hectare and 1.2 hectares potentially includes households with productive land who are not poor according to the PPA. To avoid the inclusion error, this study takes one hectare as a threshold.

Secondly, the farming implement criterion is disputable. Selecting households who have 'no farming implements', as the PPA indicates, identifies only 4.61 percent and 0.51 percent in respective years. It may cause significant underestimation of chronic poverty. On the other hand, selecting households with 'a few farming implements' potentially identifies those with productive agricultural machines. As the PPA implies that the poor rely on low productive activities, they are unlikely to own such modern farming tools. In order to minimise both inclusion and exclusion errors, this study adopts ownership of low productive farming implements including an animal cart, plough, harrow, rake, hoe, spade, axe or none as a criterion. In other words, households with high productive farming implements are excluded from this category. The number of owned implements is not considered here because the PPA does not specify the extent of ownership.

Thirdly, the PPA identifies that housing in chronically poor households is likely made of thatch in very poor condition. Although it does not specify what types of housing materials are indicated, roofs and walls are repeatedly mentioned in the other categories. As the household survey data do not allow division of bamboo and thatch and those qualities, those two materials, in any conditions, are treated as a criterion in this study. Finally, the other listed characteristics in the first category are not precisely translatable due to either limitation of the survey data or the PPA description. They mostly provide rich understanding of chronic poverty but are insufficient as identification criteria. A wide range of utensil variables is actually available in the survey data but the PPA provides little indication of what types of durables the participants meant. Although utensil ranking and assigned weights can probably be inferred through statistical techniques like principal component analysis (Filmer and Pritchett 2001), the result would not reflect the self-rated characteristics of the poor people in this study.

Similarly, the narrative description of "live on hand-to-mouth basis" or "food shortages" is not directly translatable into the survey data, but alternatively, consumption data are available. Variables for debt accumulation and kinship support are not available in the household survey data. Lastly, the dimension of "large young families with 5-12 children" is too ambiguous to be taken as a criterion and partially conflicts with the survey data. The survey data show no families with more than nine children and very few of them, 1.44 percent in 2010, have five children or more. This contradiction is probably because children in the PPA period have grown up and the household size norms have changed. However, this assumption cannot be verified with the available information. Some of these indicators will be used to test estimation robustness later.

**Table 3. Main Economic Activities and Asset Ownership in Rural Cambodia**

<table>
<tr><th></th><th>2004</th><th>2010</th></tr>
<tr><td colspan="3">Main Household Economic Activities (%)</td></tr>
<tr><td>Crop farmers</td><td rowspan="6">77.34</td><td>63.50</td></tr>
<tr><td>Livestock farmers</td><td>1.73</td></tr>
<tr><td>Forestry workers</td><td>0.19</td></tr>
<tr><td>Fishery workers or hunters</td><td>0.99</td></tr>
<tr><td>Agricultural labourer</td><td>5.47</td></tr>
<tr><td>Mixed agriculture</td><td>0.99</td></tr>
<tr><td>Non-agricultural activities</td><td>22.05</td><td>26.73</td></tr>
<tr><td>None</td><td>0.60</td><td>0.40</td></tr>
<tr><td>Obs.</td><td>45,258</td><td>10,011</td></tr>
<tr><td colspan="3">Land (among agrarian) (%)</td></tr>
<tr><td>0.8 ha or less</td><td>44.91</td><td>45.09</td></tr>
<tr><td>0.8< & <=1 ha</td><td>13.90</td><td>12.25</td></tr>
<tr><td>1 ha <</td><td>41.19</td><td>42.66</td></tr>
<tr><td>Obs.</td><td>34,786</td><td>7,317</td></tr>
<tr><td colspan="3">Draft Animal (among agrarian) (%)</td></tr>
<tr><td>None</td><td>32.56</td><td>37.2</td></tr>
<tr><td>One</td><td>9.63</td><td>9.28</td></tr>
<tr><td>Two or above</td><td>57.81</td><td>53.52</td></tr>
<tr><td>Obs.</td><td>34,786</td><td>7,317</td></tr>
<tr><td colspan="3">Farming Implement (among agrarian) (%)</td></tr>
<tr><td>High farm implements only</td><td>1.55</td><td>0.78</td></tr>
<tr><td>Both high and low value farm implements</td><td>16.10</td><td>23.77</td></tr>
<tr><td>Low value farm implements only</td><td>77.74</td><td>74.93</td></tr>
<tr><td>None</td><td>4.61</td><td>0.51</td></tr>
<tr><td>Obs.</td><td>34,786</td><td>7,317</td></tr>
<tr><td colspan="3">Housing Material (among agrarian) (%)</td></tr>
<tr><td>Wall and Roof made of Bamboo or Thatch</td><td>16.50</td><td>13.84</td></tr>
<tr><td>Wall or Roof made of Bamboo or Thatch</td><td>41.99</td><td>43.22</td></tr>
<tr><td>Others (Tiles, Fibrous cement, Concrete etc.)</td><td>41.50</td><td>42.94</td></tr>
<tr><td>Obs.</td><td>34,772</td><td>7,317</td></tr>
</table>

Source: Author's calculations based on CSES
Note: Main economic activity is defined by share of time that household members spend on each activity. The sum of months that household members spend in agriculture is divided by the total sum of months in all occupations to obtain the share of agricultural activity for each household. Then, main economic activity is identified in agriculture if the share is 50 percent or above. All the presented data are population-weighted.

**(2) Selection Criteria and Estimation Result**

As discussed above, this study adopts the following criteria for identifying chronic poverty, and regards households that meet all of these criteria as clearly chronically poor according to the local definition. The identified households would not have sizable-enough land to harvest sufficient food for household subsistence needs. They have very limited farming assets to increase the productivity and efficiency of farming activities, although they invest most time and labour in agriculture throughout the year. The vicious poverty cycle can be observed in the SLA framework as well. The criteria take into consideration physical capital (draft animals and farming implements), natural capital (agricultural land) and human capital (labourers). This provides a convincing enough picture of the negative spiral of poverty in the household:

- Main household economic activity is agriculture,
- Household owns agricultural land of one hectare or less,
- Household owns one draft animal or none,
- Household owns no high value farming implement, and
- Household walls or roof is bamboo or thatch.

Of the total rural population, these criteria identify chronic poverty rates of 11.53 percent and 11.34 percent in the reference years (Table 4). Although there are a few variations across different regions, it is notable that the chronic poverty headcount almost levelled off over the favourable period for economic growth and reduction in consumption poverty.

**Table 4. Estimated Chronic Poverty Headcount in Rural Cambodia**

| Region (Rural Only) | Headcount ratio (%) | | Regional Share (%) | | Obs. | |
|---|---|---|---|---|---|---|
| | 2004 | 2010 | 2004 | 2010 | 2004 | 2010 |
| Mekong Plain | 11.04 | 12.24 | 54.8 | 56.19 | 26,548 | 5,485 |
| Tonle Sap | 13.63 | 10.25 | 30.45 | 24.53 | 11,384 | 2,659 |
| Coastal | 7.39 | 9.56 | 4.13 | 5.63 | 2,840 | 665 |
| North and Northeast Mountain | 11.64 | 10.98 | 10.62 | 13.64 | 4,486 | 1,202 |
| Cambodia | 11.53 | 11.34 | 100 | 100 | 45,258 | 10,011 |

Source: Author's calculation based on CSES

**(3) Robustness Analysis**

In order to see the robustness of estimation, I compared the other indicators of poverty and human development, specified by PPA participants, between two groups: the chronic poor and non-chronic poor in the same economic activity at the 95 percent confidence level. The PPA claims that ill health and education access are major determinants of poverty and food shortages are important factors in defining chronic poverty. In relation to these descriptions, there are rich quantitative data available to create indicators of human development and consumption.

In general, the result shows that the estimation is robust across different indicators (Table 5). The education indicators of the chronic poor, including school enrolment, attendance and adult literacy, are significantly lower than those of the others in the same economic activity, except for primary net enrolment ratio in 2010 (for which the difference is statistically not significant). Looking over time, although the primary net enrolment ratio has improved equally and is even slightly higher among the chronic poor, the gap becomes much more evident in secondary education. Whilst both lower and upper secondary net enrolment ratio improved remarkably among the non-chronic poor, the results were different for the chronic poor. Only 8.93 percent of chronic poor children in the relevant ages go to lower secondary school, compared to 27.19 percent in non-chronic poverty in the same activity, and 35.53 percent for the non-agrarians. Moreover, the share of household members who ever attended school and the proportion of adult members who are able to read and write show considerable deprivation among the chronic poor.

Similarly, prevalence of illness or injury tends to be slightly higher among the chronic poor. The share of people who seek advice or care from health practitioners is not very different between the groups. That is probably because access to health care services improved equally and most people now seek health care services when they become ill. In terms of consumption, the estimation is also robust. The result presents a large proportion of chronic poor identified in the bottom consumption quintile, 34.32 percent and 32.83 percent, and few in the highest quintile, 5.99 percent and 3.16 percent, respectively; and most of the other chronic poor are concentrated in second and third lowest quintiles. The comparison of food consumption also follows the same distribution pattern. Overall, almost all indicators demonstrate a significant difference between the chronic poor and the others both in 2004 and 2010. It may provide an indication of the robustness for the estimation.

**Table 5. Comparison of Socio-Economic Indicators**

| 2004<br>Indicators (%) | (1)<br>Chronic Poor (CP) | (2)<br>Non-CP in same activity | All other | Total | (2) - (1)<br>Diff. | t-value |
|---|---|---|---|---|---|---|
| Net enrolment ratio (ages 6-11) | 65.60 | 74.84 | 79.72 | 74.70 | 9.24 | 5.34 |
| Net enrolment ratio (ages 12-14) | 4.84 | 10.26 | 21.34 | 12.17 | 5.42 | 4.54 |
| Net enrolment ratio (ages 15-17) | 2.55 | 3.64 | 8.75 | 4.67 | 1.10 | 1.12 |
| Ever attended school (ages 5+) | 61.52 | 72.59 | 81.39 | 73.39 | 11.08 | 13.92 |
| Adult literacy (ages 15+) | 50.55 | 64.50 | 77.39 | 66.07 | 13.95 | 13.91 |
| Prevalence of illness or injury | 20.51 | 18.20 | 16.99 | 18.19 | -2.31 | -3.75 |
| Seek care during the survey period | 13.64 | 11.70 | 10.97 | 11.76 | -1.94 | -3.68 |
| Seek care when ill or injured | 66.87 | 64.36 | 64.70 | 64.76 | -2.51 | -1.56 |
| 1st quintile, Food consumption | 27.37 | 24.63 | 14.85 | 22.73 | -2.74 | -3.98 |
| 5th quintile, Food consumption | 8.86 | 11.21 | 24.07 | 13.86 | 2.35 | 5.38 |
| 1st quintile, Total consumption | 34.32 | 24.58 | 13.61 | 23.22 | -9.74 | -13.43 |
| 5th quintile, Total consumption | 5.99 | 9.41 | 25.40 | 12.64 | 3.42 | 9.22 |
| Food consumption | 1,351 | 1,459 | 1,903 | 1,547 | 108 | 9.88 |
| Total consumption | 1,920 | 2,270 | 3,761 | 2,568 | 350 | 12.84 |

| 2010<br>Indicators (%) | (1)<br>Chronic Poor (CP) | (2)<br>Non-CP in same activity | All other | Total | (2) - (1)<br>Diff. | t-value |
|---|---|---|---|---|---|---|
| Net enrolment ratio (ages 6-11) | 87.51 | 81.95 | 90.48 | 84.77 | -5.57 | -1.95 |
| Net enrolment ratio (ages 12-14) | 8.93 | 27.19 | 35.53 | 27.43 | 18.26 | 4.67 |
| Net enrolment ratio (ages 15-17) | 2.74 | 11.72 | 23.20 | 13.94 | 8.98 | 3.69 |
| Ever attended school (ages 5+) | 68.30 | 78.05 | 85.94 | 79.14 | 9.75 | 6.06 |
| Adult literacy (ages 15+) | 56.50 | 71.43 | 81.31 | 72.65 | 14.93 | 7.37 |
| Prevalence of illness or injury | 23.36 | 18.60 | 21.46 | 19.91 | -4.76 | -3.47 |
| Seek care during the survey period | 19.97 | 16.21 | 18.96 | 17.38 | -3.76 | -2.92 |
| Seek care when ill or injured | 85.51 | 87.18 | 88.36 | 87.30 | 1.68 | 0.65 |
| 1st quintile, Food consumption | 32.83 | 23.51 | 21.19 | 23.94 | -9.31 | -6.17 |
| 5th quintile, Food consumption | 5.54 | 9.12 | 16.64 | 10.75 | 3.58 | 4.63 |
| 1st quintile, Total consumption | 38.46 | 23.20 | 19.44 | 23.91 | -15.26 | -9.77 |
| 5th quintile, Total consumption | 3.16 | 8.78 | 18.81 | 10.86 | 5.62 | 9.04 |
| Food consumption (constant 2004) | 1,937 | 2,132 | 2,398 | 2,182 | 195 | 7.39 |
| Total consumption (constant 2004) | 2,978 | 3,780 | 4,570 | 3,904 | 802 | 13.15 |

Source: Author's calculation based on CSES

### (4) Characteristics of Chronic Poverty, Regional Distribution and Key Factors

The previous sections have shown some key characteristics of the chronic poor – they have limited assets and relatively lower human development. Table 6 shows additional demographic characteristics. Chronically poor households are more likely to be headed by females with 31.96 percent, compared to 17.72 percent for the non-chronic poor in the same economic activities. The proportion of either elderly- or ethnic-minority-headed households is not statistically significant. Notably, households in chronic poverty tend to have higher dependency, in particular child dependency, mainly due to fewer working aged members, and household size is significantly smaller compared to other groups. The chronic poor also tend to be younger. The average age of household heads and members is about two years younger than the national average.

These results support some of the key findings of the previous studies. As Howe and McKay (2007) in Rwanda and Tong (2012a, 2012b, 2012c) in Cambodia found, chronically poor households are likely female-headed and smaller in rural Cambodia. As Tong also found, the chronic poor are liable to have fewer adults, younger members and less educated household heads. From a different approach, this paper confirms that chronically poor households seem to have structural challenges to accumulate human capital and make a living with fewer economically active members and high child dependency.

**Table 6. Demographic Characteristics of Chronic Poor in 2010**

| Indicators | (1) Chronic Poor (CP) | (2) Non-CP in same activity | All other | Total | (2) - (1) Diff. | t-value |
|---|---|---|---|---|---|---|
| HH head: female (%) | 32.01 | 17.53 | 24.79 | 21.35 | -14.48 | -4.82 |
| HH head: elderly 65+ (%) | 10.27 | 11.13 | 11.29 | 11.06 | 0.86 | 0.43 |
| HH head: ethnic minority (%) | 4.19 | 4.95 | 2.65 | 4.24 | 0.76 | 0.59 |
| HH head: age | 43.66 | 45.81 | 46.67 | 45.76 | 2.15 | 2.28 |
| HH member: age | 24.55 | 26.82 | 26.98 | 26.60 | 2.26 | 3.60 |
| HH head: school attainment (year) | 3.03 | 3.99 | 5.29 | 4.22 | 0.96 | 4.79 |
| Average HH size | 3.98 | 4.65 | 4.62 | 4.55 | 0.67 | 5.65 |
| Average number of working age | 2.27 | 2.92 | 2.99 | 2.85 | 0.64 | 8.15 |
| Average number of children 0-14 | 1.54 | 1.51 | 1.41 | 1.49 | -0.03 | -0.31 |
| Average number of elderly 65+ | 0.17 | 0.22 | 0.22 | 0.21 | 0.05 | 1.86 |
| Dependency ratio (%) | 85.13 | 73.45 | 67.18 | 73.30 | -11.68 | -2.24 |
| Child dependency ratio 0-14 (%) | 75.91 | 62.21 | 59.02 | 63.12 | -13.70 | -2.83 |
| Aged dependency ratio 65+ (%) | 9.22 | 11.24 | 8.16 | 10.17 | 2.02 | 1.02 |

Source: Own calculations based on CSES

Looking at regional distribution, the criteria seem to capture the chronic poor better in some regions than in others. Most notably, the criteria possibly underestimate chronic poverty in the North and Northeast Mountain region. The consumption poverty headcount ratio was 45.63 percent in the region in 2010, compared to 16.66 percent to 18.02 percent in the other regions. This regional disparity does not appear on the estimated distribution of chronic poverty, which is almost at the same level across the four regions. This estimation gap between the two measurements was also observed in 2004. One possible reason for the underestimation is diversity within the region. As discussed later, estimation in the region is relatively more sensitive to housing and land ownership criteria than the other regions. It possibly reflects the diversity of ethnicity, livelihood and concept of value, which standardised criteria cannot capture. To overcome this potential underestimation, more information both from quantitative and qualitative sides is necessary.

Regarding key factors, ownership of high value farming implements is the most influential variable among the four criteria (Appendix 5). With the highest contribution rate, lack of a high value farming implement explains chronic poverty most, followed by non-ownership of land, lack of draft animals and type of housing materials. In other words, owning high value farming implements has the largest impact on decreasing chronic poverty among the four variables; and worsening housing materials to thatch, and loss of draft animals to zero potentially increase chronic poverty most. Moreover, in the North and Northeast Mountain region, the ranking is clearly different from the others: farming implements, housing, land and draft animals in order. This implies again that particular attention needs to be paid to the unique and diverse characteristics of the Mountainous region in identifying chronic poverty.

**(5) Chronic Poverty and Consumption Poverty**

In practice, poverty targeting commonly focuses on consumption poverty; it is useful to know whether consumption poverty can provide a good proxy for chronic poverty. Comparison between consumption poverty and chronic poverty shows that measurement based on the national poverty line cannot capture a large proportion of the chronic poor identified in this study (Table 7). The total poverty line identifies only 36.32 percent of the chronically poor. Nevertheless, in terms of human development, the rest of the chronic poor (chronic poor but not consumption poor) are also greatly deprived. Their education indicators are as low as the consumption poor in lower and upper secondary enrolment, school attendance and adult literacy, except for the primary enrolment ratio. Health indicators show that the chronically poor become ill slightly more frequently than the consumption poor but access health care services almost equally. One interesting question for further studies at this point is how much the chronic poor spend on health services. They might be trapped in a vicious cycle of long-term poverty because of high prevalence of illness and health expenditure. In addition, some counterintuitive differences in demographic characteristics are worth noting. Unlike in other low-income countries, female-headed households are not a particular phenomena among the consumption poor in Cambodia but more evident amongst the chronic poor. The chronic poor tend to have smaller families while the consumption poor have larger ones, although both groups face higher dependency in common compared to the average.

Inconsistencies between the two measurements likely become greater when the population below the poverty line is smaller. In fact, the

**Table 7. Comparison between Consumption Poverty and Chronic Poverty among Rural Agrarians in 2010**

| Indicators (%) | (A) Consumption Poverty and CP | (B) Consumption Poverty but Non-CP | (C) Non- Consumption Poverty but CP | (D) Non-Consumption Poverty and Non-CP | (A) + (B) Consumption Poverty | (A) + (C) Chronic Poverty | Total |
|---|---|---|---|---|---|---|---|
| Net enrolment ratio (ages 6-11) | 86.28 | 71.32 | 88.64 | 86.45 | 75.04 | 87.51 | 82.90 |
| Net enrolment ratio (ages 12-14) | 2.33 | 14.75 | 14.90 | 30.65 | 11.47 | 8.93 | 24.62 |
| Net enrolment ratio (ages 15-17) | 2.99 | 3.95 | 2.57 | 13.62 | 3.74 | 2.74 | 10.63 |
| Ever attended school (ages 5+) | 69.31 | 68.87 | 67.73 | 80.33 | 68.97 | 68.30 | 76.59 |
| Adult literacy (ages 15+) | 54.63 | 60.29 | 57.37 | 73.77 | 58.96 | 56.50 | 69.28 |
| Prevalence of illness or injury | 21.09 | 13.59 | 24.65 | 19.91 | 15.42 | 23.36 | 19.34 |
| Seek care when ill or injured | 88.17 | 80.81 | 84.21 | 88.32 | 83.26 | 85.51 | 86.87 |
| HH head: female (%) | 20.67 | 16.76 | 36.18 | 17.68 | 17.78 | 32.01 | 20.10 |
| HH head: elderly 65+ (%) | 2.30 | 8.79 | 13.20 | 11.59 | 7.10 | 10.27 | 10.98 |
| HH head: ethnic minority (%) | 2.19 | 8.77 | 4.93 | 4.21 | 7.05 | 4.19 | 4.82 |
| HH head: age | 40.50 | 43.51 | 44.82 | 46.25 | 42.72 | 43.66 | 45.42 |
| HH member: age | 21.33 | 22.47 | 26.40 | 27.95 | 22.19 | 24.55 | 26.46 |
| HH head: school attainment (year) | 3.06 | 3.00 | 3.02 | 4.19 | 3.02 | 3.03 | 3.82 |
| Average HH size | 5.37 | 5.89 | 3.46 | 4.40 | 5.76 | 3.98 | 4.53 |
| Average number of working age | 2.77 | 3.13 | 2.09 | 2.88 | 3.03 | 2.27 | 2.80 |
| Average number of children 0-14 | 2.49 | 2.56 | 1.19 | 1.31 | 2.54 | 1.54 | 1.52 |
| Average number of elderly 65+ | 0.12 | 0.21 | 0.19 | 0.22 | 0.18 | 0.17 | 0.21 |
| Dependency ratio (%) | 122.75 | 109.10 | 70.64 | 66.42 | 112.68 | 85.13 | 75.48 |
| Child dependency ratio 0-14 (%) | 115.22 | 99.96 | 60.77 | 54.76 | 103.96 | 75.91 | 64.59 |
| Aged dependency ratio 65+ (%) | 7.53 | 9.14 | 9.88 | 11.66 | 8.72 | 9.22 | 10.89 |
| Food consumption (constant 2004) | 1,308 | 1,297 | 2,295 | 2,351 | 1,299 | 1,937 | 2,102 |
| Total consumption (constant 2004) | 1,858 | 1,879 | 3,617 | 4,278 | 1,874 | 2,978 | 3,655 |
| Obs. (individual) | 412 | 1,230 | 740 | 4,935 | 1,642 | 1,152 | 7,317 |

Source: Author's calculation based on CSES
Note: (C) is a group categorised as not being in consumption poverty at the national poverty line but identified as being in chronic poverty by the definition of this study.

consumption poor overlapped 79.44 percent of the chronic poor in 2004, compared to only 36.32 percent in 2010. It works even better to look at consumption poverty in relative terms – by adjusting consumption quintiles, chronic poverty can be identified more successfully. Looking cumulatively from the bottom, there are 38.46 percent in the lowest quintile, 65.41 percent in the second and 87.41 percent in the third bottom quintile in 2010. The result was almost identical in 2004, with 80.35 percent in the third bottom quintile. The national poverty line fails to identify the majority of the chronic poor but most of them are identified in the third cumulative consumption quintile.

The challenge of consumption poverty measurement is that it potentially underestimates the chronic poverty identified in this study, and that the applied criteria here overestimate it by including better-off people in consumption term. There is no doubt that consumption poverty measurement is useful for chronic poverty identification because households with the most vulnerable demographic characteristics appear in a group identified both in consumption poverty and chronic poverty. This study therefore suggests that consumption based targeting programmes should apply the criteria to identify chronic poverty in a mutually complementary manner. For example, this method can be used to identify potentially chronically poor households above the consumption poverty line, and to divide the consumption poor into the persistent poor and the others.

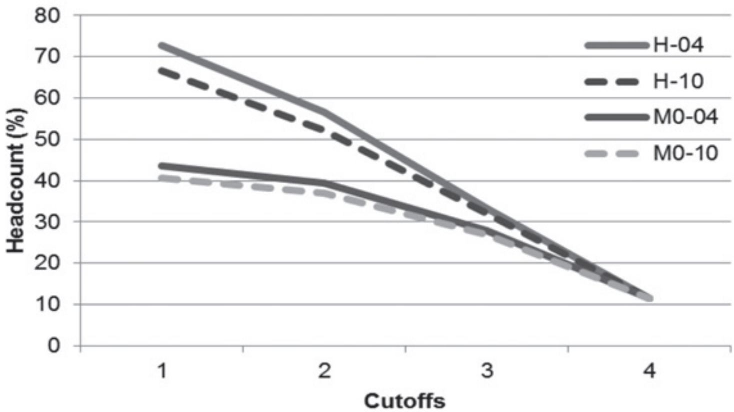
**(6) Sensitivity Analysis**

There are three types of sensitivity analysis to be considered, including sensitivity to selection of different criteria, level of identified criteria, and combination of identified criteria. Testing sensitivity to criteria selection is irrelevant here because chronic poverty is defined by satisfying all the criteria that the PPA specifies, so there are no unused criteria left. The other two sensitivity analyses are tested below.

Firstly, sensitivity to level of identified criteria can be tested through the comparison of the chronic poverty headcount ratio when changing the level of dimensions. There are 16 possible combinations generated by the abovementioned four variables, which have two alternative levels for each (Appendix 4). The alternative levels are associated with ambiguity that the PPA leaves as it defines the dimensions with ranges. The result shows that the hovering trend changes little at the national level no matter which levels of dimensions are adopted: the chronic poverty headcount almost stagnates between 2004 and 2010. It also indicates that the estimation is most sensitive to the ownership of farming implements followed by housing materials. Applying a criterion of no farming implements, the estimation comes up closer to zero for any combinations. Although the PPA recognises that the chronic poor tend not to have any farming implements, the household survey result shows that there are very few farmers who meet this criterion. Adopting farming implement ownership as a criterion, future research or targeting policy would need to be careful about the level, which may have strong effects on project outcomes. Excluding the farming implement variable, which hides the effects of other criteria, looking by regions reveals interesting tendencies. In the Mekong Plain, the estimation is sensitive to housing criteria. The Coastal and the Tonle Sap are not sensitive to the level of any of these selection criteria. In the North and Northeast Mountain region, the estimation is sensitive to both housing materials and land size.

Secondly, sensitivity to combining method can be tested using the counting method to examine whether the combination of identified criteria affect the trend (Appendix 5). In this method, cutoffs are defined for each dimension, and one point is assigned for each person below the cutoff. The process is repeated for other variables. It is then aggregated to obtain the total value of deprivation points (A). Then, the headcount ratio (H), which is the share of people below a set cutoff (k), is calculated. The adjusted headcount ratio (M0) is then calculated by the formula H times A divided by the number of deprivation criteria. In general, choice of different methods has little effect on the trend over the period. At almost all cutoff levels from 1 to 4 in every region, particularly at the higher or stricter cutoffs, little improvement in headcount ratio is observed (Figure 1).

**Figure 1. Adjusted Headcount Ratio with Different Cutoffs in Rural Cambodia**




Source: Author's calculation based on CSES

Furthermore, over the different combining methods, the relevance of the intersection selection may be justified for two reasons: the comparison with consumption poverty and conceptual framework. Firstly, only cutoff 4 shows a lower chronic poverty headcount ratio than consumption poverty. The headcount rates between cutoff 1 and 3 are even higher than the consumption poverty headcount both in 2004 and 2010. The estimation at cutoff 4 is also close to the estimation of Tong (2012a), 6 to 10 percent. From this point, the intersection method is likely to be a more suitable option among four alternative cutoffs. Secondly, in relation to the SLA framework of a vicious poverty cycle, the intersection method may be more appropriate than applying other cutoff levels. The main question mark for applying the other cutoff levels is on the determination of selected criteria and assigned weight. In this study, I attempt to draw locally meaningful definitions and criteria as strictly as possible, so chosen dimensions must be drawn from the PPA and be able to delineate a vicious cycle of poverty with the chosen criteria. From this point, with the PPA information, there are no reasons to justify the application of other cutoffs and weightings. Hence, the intersection method may be the most relevant combining method with given information availability.

## 6. Conclusions and Policy Implications

Despite the achievement of pro-poor consumption growth, this study concludes that chronic poverty in rural Cambodia, based on criteria defined by the poor, barely improved between 2004 and 2010. The result implies that rapid economic growth has certainly raised the consumption of chronically poor households by 43 percent in food and 55 percent in total, but done little to help them accumulate productive assets and human capital to break structural constraints of persistent poverty.

Regarding policy implications, one of the major findings is that consumption measurement based on the national poverty line cannot identify a majority of the chronic poor. In other words, targeting programmes or poverty analysis based on the poverty line would potentially ignore the chronic poor, which may result in them being left behind in the country's development process. More concretely, when the government attempts to implement social assistance, social insurance and public works to reduce poverty and vulnerability under the umbrella of the National Social Protection Strategy (Cambodia. Royal Government of Cambodia. 2011), its targeting mechanisms largely rely on consumption measurement. The application of defined criteria in this study may help the programmes related to the strategy to identify the chronic poor. Furthermore, the findings show that the consumption poor and the chronic poor have a lot of similar characteristics but some differences, such as household size and the sex of the household head. As the social protection strategy is expected to play a key role in ending poverty in Cambodia, these features of chronic poverty should be understood in order to implement programmes more effectively.

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**Appendix 1. Macroeconomic and human development indicators**

| Macroeconomic Indicators | 2004-2010 |
|---|---|
| Agriculture, ave. annual growth (%) | 6.81 |
| Manufacturing, ave. annual growth (%) | 7.96 |
| Industry, ave. annual growth (%) | 7.52 |
| Services, ave. annual growth (%) | 7.93 |
| GDP, ave. annual growth (%) | 7.74 |
| GDP per capita, ave. annual growth (%) | 6.17 |
| Inflation, ave. annual change (%) | 7.80 |

| Human Development Indicators | 2004 | 2010 |
|---|---|---|
| Net enrollment ratio (ages 6-11) (%)* | 75.98 | 85.60 |
| Net enrollment ratio (ages 12-14) (%)* | 16.37 | 30.80 |
| Net enrollment ratio (ages 15-17) (%)* | 8.53 | 17.50 |
| Ever attended school (ages 5+) (%)* | 75.92 | 81.70 |
| Adult literacy (ages 15+) (%)* | 69.78 | 76.28 |
| Mortality rate, neonatal (per 1,000 live births) | 27.2 | 19.7 |
| Mortality rate, infant (per 1,000 live births) | 56.6 | 37.3 |
| Mortality rate, under-5 (per 1,000 live births) | 70.3 | 43.8 |

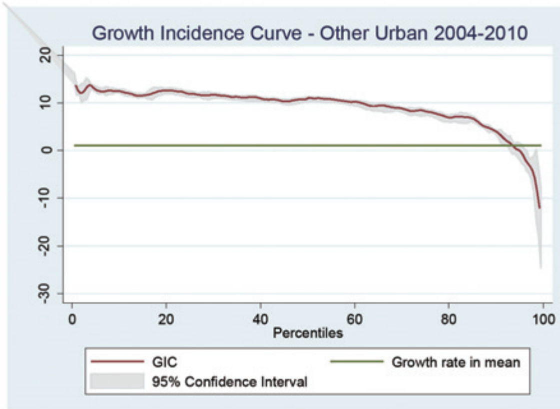
Source: Author's calculation based on WDI (World Bank 2013b) and CSES
Note: Education indicators (*) are calculated based on CSES.

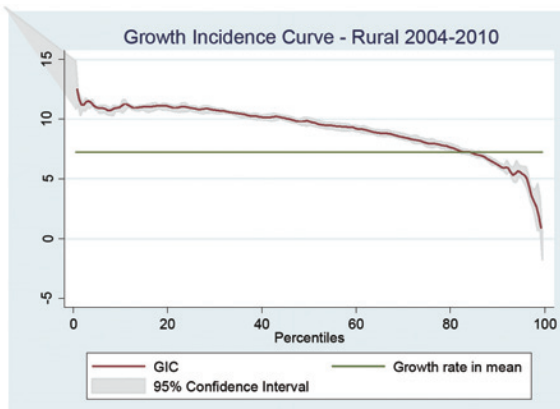
**Appendix 2: Consumption growth between 2004 and 2010**

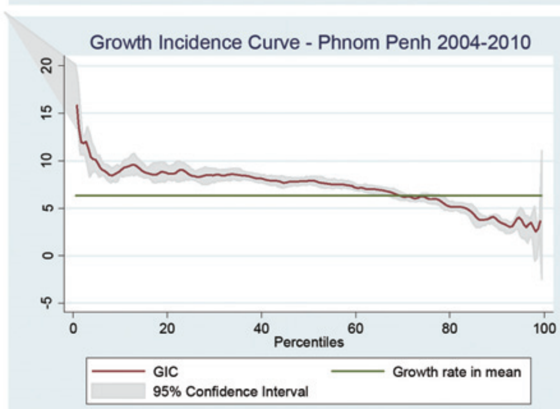
| Indicators | Other Urban | Rural | Phnom Penh |
|---|---|---|---|
| Growth rate in mean (%) | 1.05 | 7.23 | 6.31 |
| Growth rate at median (%) | 11.05 | 9.81 | 7.86 |
| Mean percentile growth rate (%) | 9.52 | 9.27 | 7.37 |
| Consumption growth of the poor (%) | 11.66 | 10.34 | 9.11 |
| Corresponding poverty rate (%) | 53.50 | 66.61 | 39.09 |

Source: Author's calculation based on CSES
Note: The calculation is based on the method of Ravallion and Chen (2003). The growth rate is calculated in real terms. Aggregate consumption has been adjusted by Phnom Penh consumer price index. Growth incidence curves elaborate how much the actual consumption by the poor grew over time (Appendix 3).

**Appendix 3. Growth incidence curve in Cambodia**




Source: Author's calculation based on CSES

**Appendix 4. Sensitivity to level of selected criteria**

| Possible combination | | | | Region (Rural Only) | CP Headcount | | Regional Share | |
|---|---|---|---|---|---|---|---|---|
| Land | Draft Animal | Farm Tool | House | | 2004 | 2010 | 2004 | 2010 |
| 1 ha | One | Low | OR | Cambodia | 11.53 | 11.34 | 100.00 | 100.00 |
| | | | | Mekong Plain | 11.04 | 12.24 | 54.80 | 56.19 |
| | | | | Tonle Sap | 13.63 | 10.25 | 30.45 | 24.53 |
| | | | | Coastal | 7.39 | 9.56 | 4.13 | 5.63 |
| | | | | N. & NE. Mountain | 11.64 | 10.98 | 10.62 | 13.64 |
| 1 ha | One | Low | AND | Cambodia | 5.66 | 4.38 | 100.00 | 100.00 |
| | | | | Mekong Plain | 5.15 | 4.36 | 52.09 | 51.85 |
| | | | | Tonle Sap | 6.74 | 4.53 | 30.65 | 28.07 |
| | | | | Coastal | 2.71 | 6.05 | 3.09 | 9.23 |
| | | | | N. & NE. Mountain | 7.63 | 3.37 | 14.18 | 10.85 |
| 1 ha | One | None | OR | Cambodia | 1.31 | 0.15 | 100.00 | 100.00 |
| | | | | Mekong Plain | 1.39 | 0.12 | 60.45 | 43.00 |
| | | | | Tonle Sap | 1.19 | 0.32 | 23.28 | 57.00 |
| | | | | Coastal | 1.04 | 0 | 5.12 | 0.00 |
| | | | | N. & NE. Mountain | 1.39 | 0 | 11.16 | 0.00 |
| 1 ha | One | None | AND | Cambodia | 0.76 | 0.08 | 100.00 | 100.00 |
| | | | | Mekong Plain | 0.76 | 0.02 | 56.99 | 14.09 |
| | | | | Tonle Sap | 0.75 | 0.24 | 25.40 | 85.91 |
| | | | | Coastal | 0.41 | 0 | 3.49 | 0.00 |
| | | | | N. & NE. Mountain | 1.02 | 0 | 14.12 | 0.00 |
| 1 ha | None | Low | OR | Cambodia | 9.32 | 8.95 | 100.00 | 100.00 |
| | | | | Mekong Plain | 8.57 | 9.29 | 52.65 | 54.06 |
| | | | | Tonle Sap | 11.7 | 8.74 | 32.34 | 26.49 |
| | | | | Coastal | 5.37 | 7.65 | 3.72 | 5.71 |
| | | | | N. & NE. Mountain | 10 | 8.73 | 11.30 | 13.74 |
| 1 ha | None | Low | AND | Cambodia | 4.67 | 3.61 | 100.00 | 100.00 |
| | | | | Mekong Plain | 4.1 | 3.55 | 50.27 | 51.24 |
| | | | | Tonle Sap | 5.83 | 4.01 | 32.11 | 30.17 |
| | | | | Coastal | 1.88 | 4.5 | 2.59 | 8.34 |
| | | | | N. & NE. Mountain | 6.67 | 2.62 | 15.03 | 10.24 |
| 1 ha | None | None | OR | Cambodia | 1.13 | 0.15 | 100.00 | 100.00 |
| | | | | Mekong Plain | 1.2 | 0.12 | 60.69 | 43.00 |
| | | | | Tonle Sap | 1.02 | 0.32 | 23.16 | 57.00 |
| | | | | Coastal | 0.75 | 0 | 4.28 | 0.00 |
| | | | | N. & NE. Mountain | 1.28 | 0 | 11.88 | 0.00 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 ha | None | None | AND | Cambodia | 0.66 | 0.08 | 100.00 | 100.00 |
| | | | | Mekong Plain | 0.68 | 0.02 | 58.86 | 14.09 |
| | | | | Tonle Sap | 0.63 | 0.24 | 24.39 | 85.91 |
| | | | | Coastal | 0.24 | 0 | 2.33 | 0.00 |
| | | | | N. & NE. Mountain | 0.91 | 0 | 14.42 | 0.00 |
| 0.8 ha | One | Low | OR | Cambodia | 9.53 | 10.39 | 100.00 | 100.00 |
| | | | | Mekong Plain | 9.81 | 11.23 | 58.93 | 56.29 |
| | | | | Tonle Sap | 10.51 | 9.43 | 28.40 | 24.64 |
| | | | | Coastal | 6.17 | 8.65 | 4.18 | 5.56 |
| | | | | N. & NE. Mountain | 7.69 | 9.96 | 8.49 | 13.51 |
| 0.8 ha | One | Low | AND | Cambodia | 4.61 | 4.01 | 100.00 | 100.00 |
| | | | | Mekong Plain | 4.56 | 4.1 | 56.63 | 53.26 |
| | | | | Tonle Sap | 5.17 | 4.11 | 28.93 | 27.80 |
| | | | | Coastal | 2.06 | 5.14 | 2.88 | 8.56 |
| | | | | N. & NE. Mountain | 5.06 | 2.95 | 11.55 | 10.38 |
| 0.8 ha | One | None | OR | Cambodia | 1.11 | 0.15 | 100.00 | 100.00 |
| | | | | Mekong Plain | 1.24 | 0.12 | 63.89 | 43.00 |
| | | | | Tonle Sap | 0.81 | 0.32 | 18.74 | 57.00 |
| | | | | Coastal | 1.04 | 0 | 6.05 | 0.00 |
| | | | | N. & NE. Mountain | 1.2 | 0 | 11.32 | 0.00 |
| 0.8 ha | One | None | AND | Cambodia | 0.61 | 0.08 | 100.00 | 100.00 |
| | | | | Mekong Plain | 0.64 | 0.02 | 60.10 | 14.09 |
| | | | | Tonle Sap | 0.47 | 0.24 | 19.96 | 85.91 |
| | | | | Coastal | 0.41 | 0 | 4.34 | 0.00 |
| | | | | N. & NE. Mountain | 0.91 | 0 | 15.61 | 0.00 |
| 0.8 ha | None | Low | OR | Cambodia | 7.75 | 8.4 | 100.00 | 100.00 |
| | | | | Mekong Plain | 7.74 | 8.66 | 57.14 | 53.69 |
| | | | | Tonle Sap | 8.98 | 8.13 | 29.83 | 26.28 |
| | | | | Coastal | 4.82 | 7.65 | 4.02 | 6.08 |
| | | | | N. & NE. Mountain | 6.64 | 8.31 | 9.01 | 13.95 |
| 0.8 ha | None | Low | AND | Cambodia | 3.84 | 3.39 | 100.00 | 100.00 |
| | | | | Mekong Plain | 3.72 | 3.35 | 55.42 | 51.48 |
| | | | | Tonle Sap | 4.45 | 3.8 | 29.84 | 30.46 |
| | | | | Coastal | 1.59 | 4.5 | 2.67 | 8.89 |
| | | | | N. & NE. Mountain | 4.4 | 2.2 | 12.07 | 9.17 |
| 0.8 ha | None | None | OR | Cambodia | 1 | 0.15 | 100.00 | 100.00 |
| | | | | Mekong Plain | 1.1 | 0.12 | 63.36 | 43.00 |
| | | | | Tonle Sap | 0.74 | 0.32 | 19.14 | 57.00 |
| | | | | Coastal | 0.75 | 0 | 4.87 | 0.00 |
| | | | | N. & NE. Mountain | 1.2 | 0 | 12.63 | 0.00 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 0.8 ha | None | None | AND | Cambodia | 0.57 | 0.08 | 100.00 | 100.00 |
| | | | | Mekong Plain | 0.6 | 0.02 | 60.30 | 14.09 |
| | | | | Tonle Sap | 0.45 | 0.24 | 20.30 | 85.91 |
| | | | | Coastal | 0.24 | 0 | 2.70 | 0.00 |
| | | | | N. & NE. Mountain | 0.91 | 0 | 16.70 | 0.00 |

Source: Author's calculation based on CSES
Note: The land ownership criterion varies between 0.8 hectares and one hectare; the draft animal criterion is one or none; the farming implements criterion is low productive implements or none; and the housing material criterion is walls or roof, or walls and roof.

**Appendix 5: Sensitivity to selection method**

| 2004 cutoff (k) | Headcount (H) | Adjusted Headcount (M0) | Deprivation (A) | Contribution (%) | | | |
|---|---|---|---|---|---|---|---|
| | | | | Land | Draft Animal | Housing | Farm Tool |
| Cambodia (Rural Only) | | | | | | | |
| 1 | 72.85 | 43.57 | 2.39 | 26.10 | 18.72 | 18.63 | 36.55 |
| 2 | 56.62 | 39.51 | 2.79 | 27.14 | 19.73 | 19.71 | 33.42 |
| 3 | 33.26 | 27.83 | 3.35 | 27.09 | 23.46 | 20.29 | 29.16 |
| 4 | 11.53 | 11.53 | 4.00 | 25.00 | 25.00 | 25.00 | 25.00 |
| Mekong Plain | | | | | | | |
| 1 | 71.18 | 43.02 | 2.42 | 29.07 | 18.94 | 17.39 | 34.59 |
| 2 | 56.79 | 39.42 | 2.78 | 29.36 | 19.80 | 17.94 | 32.90 |
| 3 | 33.08 | 27.57 | 3.33 | 28.09 | 23.77 | 19.06 | 29.09 |
| 4 | 11.04 | 11.04 | 4.00 | 25.00 | 25.00 | 25.00 | 25.00 |
| Tonle Sap | | | | | | | |
| 1 | 71.73 | 43.14 | 2.41 | 21.57 | 20.85 | 20.03 | 37.55 |
| 2 | 53.15 | 38.50 | 2.90 | 23.53 | 21.84 | 21.69 | 32.95 |
| 3 | 34.06 | 28.95 | 3.40 | 25.37 | 24.32 | 21.43 | 28.88 |
| 4 | 13.63 | 13.63 | 4.00 | 25.00 | 25.00 | 25.00 | 25.00 |
| Coastal | | | | | | | |
| 1 | 80.07 | 44.43 | 2.22 | 28.37 | 17.68 | 11.36 | 42.59 |
| 2 | 58.95 | 39.15 | 2.66 | 30.99 | 19.80 | 12.89 | 36.31 |
| 3 | 31.30 | 25.32 | 3.24 | 27.18 | 25.36 | 16.87 | 30.60 |
| 4 | 7.39 | 7.39 | 4.00 | 25.00 | 25.00 | 25.00 | 25.00 |
| North and Northeast Mountain | | | | | | | |
| 1 | 80.20 | 47.04 | 2.35 | 20.16 | 13.47 | 25.84 | 40.53 |
| 2 | 62.80 | 42.68 | 2.72 | 21.76 | 14.66 | 28.13 | 35.46 |
| 3 | 33.50 | 28.04 | 3.35 | 26.03 | 18.61 | 25.90 | 29.47 |
| 4 | 11.64 | 11.64 | 4.00 | 25.00 | 25.00 | 25.00 | 25.00 |

| 2010 cutoff (k) | Headcount (H) | Adjusted Headcount (M0) | Deprivation (A) | Contribution (%) | | | |
|---|---|---|---|---|---|---|---|
| | | | | Land | Draft Animal | Housing | Farm Tool |
| Cambodia (Rural Only) | | | | | | | |
| 1 | 66.68 | 40.53 | 2.43 | 25.77 | 20.89 | 19.43 | 33.91 |
| 2 | 52.06 | 36.87 | 2.83 | 26.38 | 21.43 | 20.38 | 31.81 |
| 3 | 32.02 | 26.85 | 3.35 | 26.72 | 22.71 | 21.88 | 28.70 |
| 4 | 11.34 | 11.34 | 4.00 | 25.00 | 25.00 | 25.00 | 25.00 |
| Mekong Plain | | | | | | | |
| 1 | 65.22 | 40.05 | 2.46 | 28.40 | 19.72 | 19.80 | 33.11 |
| 2 | 50.69 | 36.42 | 2.87 | 28.87 | 20.80 | 20.55 | 31.22 |
| 3 | 32.05 | 27.10 | 3.38 | 28.43 | 22.00 | 21.82 | 28.57 |
| 4 | 12.24 | 12.24 | 4.00 | 25.00 | 25.00 | 25.00 | 25.00 |
| Tonle Sap | | | | | | | |
| 1 | 66.20 | 39.02 | 2.36 | 22.89 | 24.27 | 16.94 | 32.89 |
| 2 | 50.22 | 35.03 | 2.79 | 24.59 | 23.93 | 18.52 | 31.45 |
| 3 | 29.43 | 24.63 | 3.35 | 26.38 | 23.85 | 21.33 | 28.27 |
| 4 | 10.25 | 10.25 | 4.00 | 25.00 | 25.00 | 25.00 | 25.00 |
| Coastal | | | | | | | |
| 1 | 70.24 | 42.10 | 2.40 | 27.53 | 19.40 | 13.76 | 37.93 |
| 2 | 56.86 | 38.76 | 2.73 | 27.53 | 19.80 | 14.59 | 34.32 |
| 3 | 31.75 | 26.20 | 3.30 | 25.00 | 24.12 | 19.83 | 29.47 |
| 4 | 9.56 | 9.56 | 4.00 | 25.00 | 25.00 | 25.00 | 25.00 |
| North and Northeast Mountain | | | | | | | |
| 1 | 71.32 | 44.43 | 2.49 | 21.21 | 19.50 | 25.26 | 36.56 |
| 2 | 58.37 | 41.20 | 2.82 | 20.84 | 20.09 | 25.63 | 33.10 |
| 3 | 37.07 | 30.55 | 3.30 | 22.47 | 22.63 | 23.72 | 29.45 |
| 4 | 10.98 | 10.98 | 4.00 | 25.00 | 25.00 | 25.00 | 25.00 |

Source: Author's calculation based on CSES

## Chapter 4

# Does The Quality of Income Growth Affect Child Nutrition Status?

Lawrence Haddad, Edoardo Masset and Lisa Smith*

## 1. Introduction

The goal of this paper is to explore the relationship between the quality of income growth and child nutrition status. Understanding more about the relationship between income growth and nutrition status is important for a number of reasons. There are currently 162 million stunted children under 5 (Black et al. 2013). These children have standardized heath-for-age scores (HAZ) that fall below a threshold (i.e. they are stunted) for which there are serious consequences for them and their societies. In addition to the moral case for protecting and respecting children's rights to food, care and a safe health environment, there are severe functional consequences of stunting. Black et al. (2013) estimate that 45 percent of child deaths under the age of 5 are due to child undernutrition. The economic consequences are also severe. Children who are stunted are more likely to learn less in school and to live in poverty as adults (Adair et al. 2013; Hoddinott et al. 2013).

Knowing the features of income growth that make it more likely to improve child nutrition status helps to invest strategically in nutrition programmes to reduce undernutrition. The smaller the magnitude of the income effect, the more strategic and proactive the scale-up of direct (nutrition specific, such as breastfeeding promotion, Bhutta et al. 2013) and indirect (such as social protection, Ruel and Alderman 2013) nutrition interventions needs to be for a given nutrition reduction target.

Estimating the relationship between income growth and nutrition status has a long history (Behrman, Deolalikar and Wolfe 1988, Strauss and Thomas 1998, Haddad et al. 2003, Headey 2012, Smith and Haddad 2014). However, there is no literature assessing the *quality* of income

* We would like to thank two anonymous reviewers for their comments. Any remaining errors are ours.

growth on nutrition outcomes (Gillespie et. al. 2013). This paper aims to make an early contribution. The main challenge the paper faces is how to define the quality of growth in an empirically practical way. To generate sufficient variation in the quality of growth, however defined, we opt for a cross-country descriptive approach.

We explore the quality of growth in three ways. The first two ways assess the relationship between economic growth and nutrition under different contexts. First, we survey the literature for comparable country-level estimates of the relationship between income growth and nutrition outcomes. We then describe the magnitude of the estimates by the level of income inequality in each country at the time. The relationship between income growth and poverty reduction is moderated by income inequality – the higher the inequality the lower the poverty reduction for a given rate of economic growth (see Ferreira and Ravallion 2008 for a review) – and this provides a useful clue for our paper. Second, we build on Smith and Haddad (2014) and employ cross-country econometrics to estimate the relationship between national income growth and stunting rates under different governance regimes. The third way of exploring the quality of growth uses measures of economic growth that fully embody some dimensions of quality. Unfortunately these data do not yet exist for many countries and so we are only able to undertake some preliminary descriptive analysis.

The paper is organized into the following sections. First, the paper presents the results of a systematic search of the literature estimating the relationship between income growth and z-score of height for age (HAZ) of children under 5. We identify several estimates and explore the association with income inequality as measured by the Gini coefficient. Second, we explore the role of governance in shaping the relationship between income and nutrition status using cross country regressions. Is the effect of income on nutrition larger (and therefore of higher quality) or smaller in different governance regimes? Third, for a small set of countries for which data are available, we compare the relationship between nutrition status and GDP per capita with the relationship between nutrition and the Inclusive Wealth Index (IWI). The IWI emerged from the post 2008 interest in measuring what matters, and represents an attempt to measure the quality of growth in terms of human development, equity and sustainable resource use (Smit and Steendjik 2014). The final section concludes with a discussion of the results and suggestions for further research in this area.

## 2. Income and nutrition elasticity estimates: do they vary by income inequality?

This section summarizes the findings of selected papers on the estimated magnitude of the relationship between height for age z-scores and traditional measures of income from household surveys. We searched the literature on income and nutrition, adopting the Rapid Evidence Assessment (REA) method[1]. This method applies simple exclusion criteria and circumscribes the limits of the reviewed literature in such a way that the process is conducted much more quickly than in a standard systematic review. The selection of the reviewed papers went through three stages.

In stage one, we searched the published literature on income and nutrition using the Citation Indexes at the Web of Science database (ISI) through Endnote software. This limited the search to papers that were published in peer-reviewed journals. We searched for all publications in English from 2000 to beginning of July 2012 using the following search strings: income OR expenditure AND nutrition OR undernutrition. This search delivered 1,836 papers. We then read all paper titles and removed all papers that were not from low and middle income countries by the World Bank classification, and that were not looking at the relationship between income and nutrition in an obvious way. This process reduced the number of publications to 307.

In stage two, we read all 307 abstracts and removed all publications that did not estimate the relationship between income (measured by either household income or expenditure) and nutrition (measured by height for age Z-scores). At this point we increased the number of selected studies in two ways: (1) by back-referencing we included studies referenced by the latest publications that escaped our search, and (2) by consulting experts. In stage 3 we downloaded all studies and removed those whose methodology did not address fundamental issues for the correct "identification" of income elasticities (i.e. they did not allow for unbiased independent effects of the association between income and nutrition status). This left us with the 6 papers in the Appendix Table,

1. UK Civil Service 2012. http://www.civilservice.gov.uk/networks/gsr/resources-and-guidance

yielding 14 elasticity estimates which are presented in Table 1.

The explanatory variable employed by the 6 studies reviewed is almost invariably the log of per capita expenditure. This specification allows for the calculation of a semilogarithmic elasticity that varies with the value of the dependent variable (various indicators of undernutrition). The outcome nutrition indicator used varied greatly by study. We chose standardized height-for-age Z-scores (HAZ) among under-5s (6 papers, 14 estimates) as the preferred indicator. We choose HAZ because we have the most estimates for this indicator and it has become the preferred nutrition status indicator, largely because it more accurately predicts long short and long term consequences of undernutrition (Adair et. al. 2013).

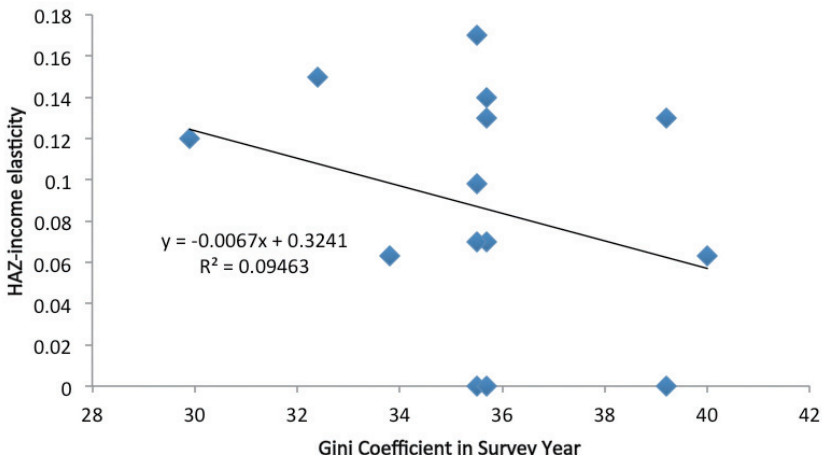
From Table 1 the miroeconometric HAZ-pc income (or expenditure) elasticities range from 0 (not significantly different from zero) to 0.17. A doubling of income will, at most, raise height for age z-scores by 17%. For more detail on the studies and the calculations of the elasticities, see the Annex Table.

**Table 1. Summary of elasticities from the microeconometric and cross-country studies, by nutrition outcome indicator**

| Nutrition indicator | Microeconometric studies |
|---|---|
| Z-score Height for age (HAZ level) | 0 (n.s.) (China 1991-1993/Osberg et. al. 2009)<br>0 (n.s.) (China 1997-2000/Osberg et. al. 2009)<br>0 (n.s.) (China 1997/Chen et. al. 2007)<br>0.063 (Ethiopia 1995-98/Christiansen et. al. 2004)<br>0.063 (Tanzania 1991-94/Alderman et. al. 2006)<br>0.07 (Vietnam 1993/O'Donnell et. al. 2009)<br>0.07 (China 1993/Chen et. al. 2007)<br>0.098 (Vietnam 1998/O'Donnell et. al. 2009)<br>0.12 (China 1989/Chen et. al. 2007)<br>0.13 (China 2000/Chen et. al. 2007)<br>0.13 (Vietnam 1993/Wagstaff et. al. 2003)<br>0.14 (China 1993-97/Osberg et. al. 2009)<br>0.15 (China 1991/Chen et. al. 2007)<br>0.17 (Vietnam 1998/Wagstaff et. al. 2003) |

Figure 1 plots the elasticities by Gini coefficient in the survey year and we can see a downward slope: as inequality increases elasticities decline. Note that the R-squared is low at approximately 0.095 and that we cannot reject the hypothesis that the estimated slope coefficient is zero.

**Figure 1. Elasticities (absolute values, vertical axis) for HAZ levels and PC expenditure by Gini coefficient in survey year (horizontal axis)**




Data source: http://data.worldbank.org/indicator/SI.POV.GINI?page=2

## 3. Does governance affect the nutrition-income relationship?

Having too few elasticity estimates to explore conclusively the relationship between elasticities and the Gini coefficients, we turn to more plentiful sources of data, national level GDP per capita and stunting rates. The twist in our analysis is that we intend to explore the cross-country relationships between these two variables in different governance contexts.

In the past decade, governance more broadly has risen up the agenda in terms of both health (Halleröd et. al. 2013; Farag et. al. 2013) and nutrition (Nishida 2009; Pelletier et. al. 2012; Mejia-Acosta and Fanzo 2012; Haddad 2012; Gillespie et. al. 2013). This reflects an increased recognition that the ability of governments to be responsive and responsible has a profound influence on a number of factors that determine nutrition status. Smith and Haddad 2014 found that nearly all the governance variables were associated with reductions in stunting, even when GDP per capita was included in the regressions.

To measure the quality of governance for the countries in our sample we employ International Country Risk Guide (ICRG) indicators published by the Political Risk Services Group (PRS 2013). The indicators are indexes corresponding to five dimensions of governance: (1) bureaucratic quality; (2) law and order; (3) political stability; (4) restraint of corruption; and (5) democratic accountability.[2] The data are available from 1982 onwards and, to render them comparable across countries and over time, are compiled based on PRS experts' subjective analyses of political information organized on the basis of pre-specified "risk components".

How might these five dimensions be relevant to facilitate or impede efforts to accelerate reductions in child undernutrition? [3] Smith and Haddad (2014) briefly surveyed the literature and concluded the following:

- *Bureaucratic quality* concerns the quality of public services and the civil service, including policy formulation and implementation, and regulation of the private sector. It is important for effectively providing public services and programs that support child nutrition status such as safe water, sanitation, education and public food safety net programs. Effective functioning of countries' bureaucracies is particularly important to child undernutrition because addressing it requires a multisectoral effort and vertical integration of different levels of government. It thus puts strong demands on public agencies. Similarly, a strong regulatory environment is necessary as the private sector produces a number of products that if marketed irresponsibly can harm the nutrient consumption of children under two years of age—effective regulation and enforcement of that regulation is vital for the nutrition status of the most vulnerable.

- A strong system of *law and order* is founded on a solid and impartial legal system in conjunction with popular observance of the law.

- *Political stability* rests on a government's ability to carry out its declared programs when in office and to gain office and stay in office through constitutional and non-violent means. Both are

2. The actual names of the ICRG indicators are: bureaucracy quality, law and order, government stability, corruption, and democratic accountability.

3. The definitions and descriptions of each dimension given here are from PRS (2013).

essential for providing reliable public services, creating an environment conducive to the economic stability of households, and the functioning of markets for essential nutrition inputs such as food. Much like natural disasters, violence due to conflict is estimated to have large and permanent effects on nutrition status. Both law and order and political stability allow governments to fulfill their role of protecting citizens from such violence.

- *Restraint of corruption*, that is, restraint of the exercise of public power for private gain, is important as many nutrition interventions involve the transfer of valuable commodities, such as food and drugs, at subsidized rates, which creates multiple opportunities for leakage.

- Finally, *democratic accountability*, including respecting and protecting the rights and civil liberties of all citizens, represents how responsive a government is to its people. The irreversibility of early childhood undernutrition means that public responsiveness in supporting families to meet the needs of young children is vital. Democratic accountability and its herald, transparency, are particularly important for nutrition as most forms of undernutrition are invisible, both because the clinical signs are not obvious unless at their most extreme and because of infrequent collection of nutrition data. Hence public awareness of the magnitude and consequences of the problem is low, and voice is essential to stimulate timely action. In addition, nutrition resource flows, being fragmented across multiple authorities, are also notoriously nontransparent, undermining accountability mechanisms.

To test whether the relationship between income and stunting rates differs by governance indicator level, we estimate panel regression coefficients (using instrumental variables when necessary) for variants of the form:

*Stunting = f (lnGDP per capita, governance indicator,*
*lnGDP per capita*governance indicator, demographic variables)*

While Smith and Haddad (2014) found that governance and income have separate effects on stunting, interactions were not explored. The five governance indicators are too correlated with each other to simultaneously include all of them and their interactions within the regression framework. So first we include an aggregated governance indicator (of the five components) and its interaction with income. Then we include each of the five-component governance indicators and their interactions, one by one.

We find that none of the interaction terms are significantly different from zero (regressions not reported). In other words, the governance variables we include do not seem to modify the relationship between stunting and income. This may be because the relationship does not exist, or the variables are too crude, or the model is incorrectly specified. To address the last possibility we conduct a range of specification tests, we use spline methods to detect any nonlinearities and we run the regressions for separate sets of observations described by different combinations of governance variables. Our specification tests do not signal misspecification and our spline and subset analyses yielded no significant estimates on the interaction terms. These results suggest no governance modification to the stunting-income relationship. Whether this signals an absence of a relationship or insufficiently refined indicators remains to be determined by future studies.

## 4. Comparing stunting with GDP per capita and the Inclusive Wealth Index

The Inclusive Wealth Index has been developed by UNEP and the UNU and comprises human capital, produced capital, natural capital and health capital. Prices are assumed to be constant so changes in wealth reflect real changes not short term price bubbles (UNU-IHDP and UNEP 2012, Smits and Steendjik 2014). This stock of wealth is then adjusted by taking into account (a) carbon damages (estimated emissions multiplied by social costs), (b) oil capital gains (i.e. gains stemming from oil price increases into account and (c) total factor productivity—the gains in output that cannot be accounted for by increases in inputs. Comparisons of the growth of IWI per capita over the past 2 decades with GDP per capita growth show that IWI per capita does not grow as fast as GDP per capita and that the correlation between the two is low (UNU-IHDP and UNEP 2012).

The IWI has only been calculated for 20 or so countries. Of these, only a few have significant undernutrition issues. Table 3 identifies these countries, and for the last two years in which they have had nutrition surveys it matches stunting data with GDP per capita and IWI per capita. It is clear that the percentage change in IWI per capita is smaller than the percentage change in GDP per capita. It is also clear that in Nigeria, Colombia and Venezuela, all mineral extracting countries, IWI per capita actually declines despite increases in per capita GDP, indicating non sustainable growth.

**Table 2. Stunting, GDP per capita and IWI per capita for countries with significant undernutrition**

| Country | Year | Stunting, (Countdown country profiles or WHO Global Database) | GDP/cap, PPP (World Bank, in 000s) | Inclusive Wealth Index/cap (IWI report in 0,000s) | % change in stunting | % change in GDP/cap | % change in IWI/cap |
|---|---|---|---|---|---|---|---|
| Brazil | 1996 | 14 | 5.11 | 3.449 | | | |
| Brazil | 2006 | 7 | 5.79 | 3.806 | -50.00 | 13.31 | 10.35 |
| China | 2000 | 18 | 0.95 | 1.203 | | | |
| China | 2008 | 10 | 3.41 | 1.503 | -44.44 | 258.95 | 24.94 |
| Colombia | 1995 | 20 | 2.53 | 2.707 | | | |
| Colombia | 2005 | 16 | 3.39 | 2.6 | -20.00 | 33.99 | -3.95 |
| India | 1999 | 54 | 0.46 | 0.45 | | | |
| India | 2005 | 48 | 0.74 | 0.483 | -11.11 | 60.87 | 7.33 |
| Kenya | 1998 | 36 | 0.48 | 0.305 | | | |
| Kenya | 2008 | 35 | 0.79 | 0.319 | -2.78 | 64.58 | 4.59 |
| Nigeria | 2003 | 43 | 0.51 | 0.644 | | | |
| Nigeria | 2008 | 41 | 1.38 | 0.592 | -4.65 | 170.59 | -8.07 |
| South Africa | 1999 | 30 | 3.1 | 3.64 | | | |
| South Africa | 2008 | 24 | 5.6 | 3.743 | -20.00 | 80.65 | 2.83 |
| Venezuela | 1996 | 19 | 3.03 | 10.99 | | | |
| Venezuela | 2006 | 16 | 6.75 | 10.91 | -15.79 | 122.77 | -0.73 |

Table 2 calculates the arc elasticities for stunting with respect to GDP per capita and IWI per capita. The population weighted mean arc elasticities show that the stunting-IWI per capita elasticity is more negative than the stunting-GDP per capita elasticity. This suggests that when we measure economic growth more fully we are measuring something that is more strongly associated with undernutrition (specifically, stunting).

**Table 3. Arc elasticities, stunting, GDP per capita and IWI per capita**

| Country, time period | arc elasticity, stunting/GDP pc | arc elasticity, stunting/IWI pc |
|---|---|---|
| Brazil 1996-2006 | -3.76 | -4.83 |
| China 2000-2008 | -0.17 | -1.78 |
| Colombia 1995-2005 | -0.59 | 5.06 |
| India 1999-2005 | -0.18 | -1.52 |
| Kenya 1998-2008 | -0.04 | -0.61 |
| Nigeria 2003-2008 | -0.03 | 0.58 |
| South Africa 1999-2008 | -0.25 | -7.07 |
| Venezuela 1996-2006 | -0.13 | 21.69 |
| Arc elasticity, population weighted mean | -0.38 | -1.16 |

However, these arc elasticities are problematic for at least two reasons. First, while there is no nutrition component within IWI, there are health related components, so the stronger correlation might be driven by this. Second, the IWI per capita elasticities are higher because IWI per capita does not grow as fast as GDP per capita, but the effort of increasing GDP per capita and IWI per capita by the same percentage is not equivalent. So while intriguing, the IWI per capita arc elasticities need to be interpreted with extreme caution. Until we have IWI per capita for more countries, single country observations will continue to exert a large influence and we need to continue to rely on more convention measures to explore the relationship between growth and nutrition status.

## 5. Conclusions

We have undertaken an exploratory analysis of the association between economic growth and its quality on nutrition outcomes. First, we conducted a systematic search for estimates of the elasticity between height for age of under 5s and income. We found several estimates and tried to identify pattern for their magnitude with reference to income inequality. Second, we explored the role of governance dimensions in shaping the relationship between income and nutrition status using cross country regressions to examine whether the effect of income on nutrition was larger or smaller under different governance regimes. Finally, for the same set of countries, we compared the patterns of changes in nutrition status and GDP per capita with those of nutrition status and the Inclusive Wealth Index per capita.

Our conclusions are as follows:

First, there are very few studies published in peer-reviewed journals, with good methodologies, estimating the relationship between nutrition status and income. This is a pity, because the lack of studies prevents some potentially interesting meta analyses, exploring an area that would be useful for policy making. Given only 14 elasticity estimates (from only 6 studies and 4 countries) we were restricted to undertaking scatter plots with Gini coefficients. Elasticities do reduce in magnitude as inequality increases but the relationship is not statistically significant.

Second, we find that different governance levels do not modify the relationship between GDP per capita and stunting rates. Income growth seems to be important in reducing stunting rates over a wide range of governance dimensions and levels.

Third, the arc elasticities between stunting and GDP per capita look very different when we substitute IWI per capita for the latter. The IWI estimates are much larger, but with so few country-level observations we are reluctant to draw any conclusion other than this is an avenue of analysis worth pursuing as more IWI per capita estimates become available.

From these three different types of analysis, the relationship between the quality of income growth and child growth, at least in the ways we have defined quality, is weak. From the cross-country regressions, there is no indication that the relationship between economic growth and stunting is modified by governance. There may be some sets of observations where governance does modify the stunting-income relationship, but we have not been able to identify them in this paper. The other two avenues of analysis will become more revealing when the IWI is calculated for more countries and when more HAZ-income elasticities are generated. More research is needed along all three lines.

One thing is clear from the wider literature, however, namely that economic growth as currently measured, on average, is not sufficient for rapid stunting reductions. Just as "zero poverty" targets will prove to be increasingly difficult to attain as poverty rates decline (Bluhm et. al. 2014, this volume), so too will "zero stunting" targets, because stunting has an even weaker relationship with GDP per capita than does $1.25 a day poverty rates (Ruel and Alderman 2013). Identifying which components of growth are most important for stunting reduction, and the conditions under which they are most powerful, will be vital if the world is to meet and exceed the World Health Assembly target of reducing the number of stunted under 5s from 165 million today to 100 million in 2025.

**Annex Table. Microeconometric estimates of the relationship between HAZ and income**

| Study | Country and year | Dependent and explanatory variable | Elasticity or other effect size | Other effects |
|---|---|---|---|---|
| HAZ levels | | | | |
| Alderman et al. (2006) | 4 wave panel Tanzania 1991-92-93-94 | Under 5 height-for-age Z-scores<br><br>Household per capita expenditure | The coefficient of log of per capita expenditure ranges from 0.1-0.2 depending on the specification. A doubling of household income would produce increase in Z-score of 0.1-0.2 SD<br><br>Elasticity (OLS) =0.206/ mean HAZ (-1.64)=0.125<br><br>Elasticity of HAZ (preferred estimate)=0.103/ mean HAZ (-1.64)=0.063 | In comparison the presence of a nutrition intervention in the communities increases the Z-scores by 0.3 SD |
| Christainsen et al. (2004) | 3 survey rounds Ethiopia 1996-97-98 | Under 5 Height-for-age Z-scores<br><br>Log of per adult equivalent household expenditure | The coefficients of log of household income range from 0.16-0.19 depending on the survey round.<br><br>Elasticity = 0.16/mean HAZ of 2.54 = 0.063 | In comparison an additional year of education of the most educated female household member increases the Z-score by 0.03 SD.<br><br>The community-level ability to detect stunting increases the Z-score by .24 SD |

| | | | | |
|---|---|---|---|---|
| O'Donnell et al. (2009) | 2 cross sections Vietnam 1993-98 | Under 5 Height-for-age Z-scores<br><br>Log of per capita household expenditure | The coefficients of the log of per capita expenditure increase the HA Z-scores by 0.14 (1993) and 0.16 1998).<br><br>Elasticity1993=0.14/mean HAZ (-2.03) =-0.07<br><br>Elasticity1998=0.16/mean HAZ (-1.64)=-0.098 | Decomposition analysis shows that 39% of the change in stunting occurring between the two rounds was the result of an increase in household consumption. Changes in water and sanitation and household structure had a smaller impact. |
| Osberg et al. (2009) | Three wave panel China 1991-93-97 | Under 5 Height-for-age Z-scores<br><br>Log of per adult equiv hh expenditure | The coefficient of log of per capita expenditure ranges from 0.0 to 0.17 depending on the survey period.<br>Elasticity 1993-97=-0.17/ mean HAZ (-1.25) =0.135<br>Elasticities in 1991-93 and 1997-2000 = 0 as a zero estimated coefficient cannot be rejected | Additional years of education of mothers and fathers do not have a statistically significant impact |
| Chen et al. (2007) | 5 survey rounds China 1989 19991-93-97 2000 | Height for age Z-score.<br><br>Log of household income | The coefficients of log of household income range from 0.09-0.19 depending on the survey round.<br>Elasticity 1989 = 0.157/1.315=0.12<br>Elasticity 1991 = 0.192/1.315=0.15<br>Elasticity 1993 = 0.085/1.218=0.07<br>Elasticity 1997 = 0<br>Elasticity 2000 = 0.122/0.971=0.13 | In comparison the coefficient of years of education of the head of household is only 0.01-0.02. |
| Wagstaff (2003) | 2 wave panel Vietnam 1993-98 | Under 5 Height-for-age Z score<br><br>Log of per capita household expenditure | The coefficient of log of per capita expenditure is 0.26 and 0.27 depending on the survey period.<br>Elasticity in 93= -0.26/mean HAZ (-2.036)=0.13<br>Elasticity in 98=0.27/mean HAZ(-1.608)=0.17 | In comparison years of schooling of mothers and fathers & access to safe water do not have an impact. |

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Chapter 5

# Disability and Growth Elasticity of Poverty in a Developing Country

Kamal Lamichhane and Damaru Ballabha Paudel

## 1. Introduction

Growth as one of the central components for inclusive and sustainable development. However, developing countries are struggling to accomplish the goal of sustainable growth. Ensuring good quality growth covering all strata of the society is important for the reduction of poverty and the achievement of social inclusion. When marginalized people are not brought into mainstream development, it is unlikely that growth can be achieved and then made sustainable. For example, despite the significant progress on the Millennium Development Goals (MDGs), the systematic exclusion of disability issues is likely to be one of the causes of the failure to achieve MDGs by 2015. This is a particularly important omission, as individuals with disabilities represent nearly 15 percent of the world's population (WHO & WB 2011) and comprise not only one of the most marginalized but also one of the largest minority groups. As a result, people with disabilities are frequently left behind and remain the poorest among the poor. However, as we are heading for the post-2015 development goals, it is high time that we attempt to bring marginalized groups, including people with disabilities, into the mainstream of development in order to achieve quality growth, reduce poverty, and make development sustainable and inclusive. It has been said that if growth is distributed in an equitable manner, it helps reduce poverty. However, if the opposite is done, this simply increases inequality and may result in a need for redistribution (Besley and Burgess 2003).

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Furthermore, recognizing poverty as a global threat, governments and international development agencies have been making efforts to reduce it. The MDGs have also focused on this as a priority issue by positioning "eradicate extreme poverty and hunger" as the primary goal. Despite governments and international development agencies investing their budgets in different sectors aimed at lifting people out of poverty, key questions still remain: why is progress so slow and how can we make growth more 'pro-poor'?

Most projects by international agencies have been aimed at the population nearest to the poverty line. It is likely that these agencies have an incentive to direct their focus toward this part of the population, as it is comparatively easier to show progress in poverty reduction if the transitory poor are able to rise out of poverty, even with a small push (Barder 2009). However, if the same trend continues, what will happen to the majority of the more marginalized population, including those with disabilities? In the absence of inclusive policies and strategies, the likelihood is that these people will remain below the poverty line and chronically poor. Therefore, if these groups are to be targeted, widening the efforts, increasing investment, and making such efforts more inclusive, is necessary. To do so, inclusive policies, institutions and growth are required.

In this paper, based on findings on the growth elasticity of poverty between people with and without disabilities in Nepal, we will explain why people with disabilities should be an important component in considering the quality of growth and inclusive development. In other words, this paper is a preliminary attempt at examining the impact of economic growth upon poverty between people with and without disabilities, using the nationally representative Nepal Living Standard Survey (NLSS) conducted in 2010.

### *Literature review*

Studies on disability and poverty are rare. Some have focused on the role of education through findings on high returns to education for persons with disabilities (Lamichhane and Sawada 2013), while others have studied the employment gap and wage differential between individuals with and without disabilities (Mitra and Sambamoorthi 2008), as well as the economic profile of persons with disabilities in the less-developed countries (Mitra et al. 2013). Lamichhane et al. (2014) studied the factors associated with poverty between people with and without disabilities in Nepal. Another study on Africa examined the living conditions of persons with disabilities (Loeb et al. 2008). However, none have focused on the growth elasticity of poverty for persons with disabilities.

Among the 15% of people with disabilities in the world, nearly 80% live in developing countries (WHO & WB 2011). Additionally, it is also estimated that people with disabilities make up 15 to 20% of the poor in developing countries (Elwan 1999). This means that the worldwide population of people living with disabilities constitutes one of the poorest and most marginalized segments of society (ILO 2007; DFID 2000). While there are multiple factors contributing to poverty among people with disabilities, unequal and poor access to education and employment, as well as the unequal distribution of other resources, are likely to be among the major causes of their poverty (Lamichhane et al. 2014). While inequality, exclusion, and discrimination are widespread, the needs of people with disabilities are not yet considered to be an important component in poverty reduction strategies.

In the literature that reflects on growth alone, the terms “inclusive growth”, “shared growth”, “broad-based growth” or “pro-poor growth”, are used to convey similar concepts. The World Development Report 1990 (World Bank 1990) coined the concept of “broad-based growth” as growth that could reduce poverty in a rapid manner through the inclusion of all strata of the society. On the other hand, there is a relatively rich literature related to the growth elasticity of poverty, an important economic term that is strongly related to the above-mentioned concept of pro-poor (inclusive) growth. For instance, Ravallion and Chen (1997) estimated the growth elasticity of poverty for developing and transitional economies. Additionally, when looking at pro-poor growth, Ravallion and Datt (1996, 1999 and 2002) studied the growth elasticity of poverty in different states of India. Moreover, among the most recent studies on the growth elasticity of poverty, differing estimates of the elasticity of poverty have been presented for a great variety of developing countries when considered as a whole

(Adams 2004; Bourguignon 2003; Ram 2006), as well as for individual country-level studies, such as India (Lenagala and Ram 2010; Ram 2011), and different regions of the world (Besley and Burgess 2003; Kalwiji and Verschoor 2007), by analyzing the growth-poverty relationship for different poverty lines and growth spells.

Despite the large amount of research during the last decades on the growth-poverty issue, to our knowledge, none of the studies has touched upon the issue of disability and growth so far. The reason for this important gap in the literature may be attributed primarily to the lack of data on disability, as well as to the lower level of priority given to this issue by governments and development agencies.

## 2. Dataset from Nepal

The nationally representative data set (NLSS III) published by the Central Bureau of Statistics of the Government of Nepal, has been used (CBS 2011a). This household survey was conducted by CBS with technical assistance from the World Bank. The survey contains a wide range of information from sample households such as: demographic characteristics of the head and other members of the household; housing; access to facilities; education; health services; agriculture; consumption; income; and employment status.

Altogether, information from 5,988 households was collected in this survey. In this paper, we use an adjusted sample of 4,840 households, with the household head having an economically active age of 15-59 years. For the first time, NLSS has included questions that capture information on disability. First author of this paper met CBS officials twice when the survey was in the design phase. At this time the author requested that disability specific questions be included in the questionnaires. Nepal's disability-related organizations also made an effort to include disability in the survey. Due to these collective efforts, the following two questions were included in the final version of survey: 1) whether participants have a disability or not, and 2) if yes, what type of disability. The types of impairments included in this survey were: physical impairments, visual impairments, hearing impairments, deaf blindness, speech problems, intellectual disability, and multiple disabilities. Based on this information on disability, it is possible to analyze growth elasticity of poverty between those with and without disabilities.

In this study, the consumption-based national poverty line calculated by the CBS is used. According to CBS (2011b), the national poverty line for Nepal is Nepalese Rupees (NRs) 19,261.18 – a figure based on the Cost of Basic Needs (CBN) approach. In this approach, the poverty line can be defined as the expenditure value (in local currency) required by an individual to fulfill his/her basic needs in terms of both food and non-food items. While the poverty line in the previous round of the survey (NLSS II), undertaken in 2003-04, was an update of prices for the same BNB previously estimated in 1995-96 (NLSS I), the poverty line for 2010-11 is based on a new BNB for the poor that reflects changes in well-being over time.

## 3. Empirical strategy

For the analysis of poverty, we use the Foster-Greer-Thorbecke (FGT) poverty measures (Foster et al. 1984), which are referred to as the head count index (P0), the poverty gap index (P1), and the severity of poverty index (P2). The generalized FGT poverty measures are defined as:

$$(1) \quad P_\alpha = \int_0^z \left( \frac{z-y}{z} \right)^\alpha f(y)dy \qquad \text{where } \alpha \geq 0$$

where *y* is the household per capita consumption expenditure, *f(y)* is its density (roughly the proportion of the population with a consumption level *y*), *z* denotes the poverty line, and $\alpha$ is a nonnegative parameter. For Nepal, the national poverty line, based on per-capita household consumption, is 19,261.18 NRs. Higher values of the parameter $\alpha$ indicate a greater sensitivity of the poverty measure to inequality among the poor or a greater emphasis to the poorest of the poor (Foster et al. 1984). We estimate poverty measures $P\alpha$ for $\alpha$ = 0, 1, and 2, which define P0, P1 and P2, respectively.

The growth elasticity of poverty is the total percentage change in poverty with respect to the total percentage change in per-capita income. In this paper, the analysis relies on per-capita consumption, instead of income, as preferred welfare indicator. According to the World Bank (2013), the growth elasticity of poverty is defined as:

$$(2) \qquad \varepsilon = \frac{\partial P}{\partial y}\frac{y}{P}$$

Since we do not have time series or panel data on poverty and growth focusing on disability, the methodology developed by Araar and Duclos (2013) to compute growth elasticity of poverty for household cross sectional data is used here. Based on this methodology, the elasticity of each FGT measure is estimated using DASP: Distributive Analysis Stata Package version 2.2. According to Araar and Duclos (2013), the overall growth elasticity (GREL) of poverty, when growth comes exclusively from growth within a group *k* (namely, within that group, inequality neutral), is given by:

$$(3) \qquad \begin{aligned} GREL &= \begin{cases} -\dfrac{zf(k,z)}{F(z)} \end{cases} \\ GREL &= \begin{cases} \alpha\dfrac{\overline{P}(k,z;\alpha)-\overline{P}(k,z;\alpha-1)}{\overline{P}(z,\alpha)} \end{cases} \end{aligned}$$

whereas, similar to above, *z* is the poverty line, *k* is the population subgroup in which growth takes place, *f (k, z)* is the density function at level of income *z* of group *k*, and *F(z)* is the headcount index. The upper case of equation (3) is for the condition $\alpha = 0$ and the lower is for the condition $\alpha > 0$ (the values of $\alpha$ are 1 and 2). Moreover, this kind of growth elasticity of poverty is group-specific and can be applied to comparisons among categorical groups. This type of analysis is therefore useful in understanding the differing rates at which poverty is reduced among different, well-identified groups due to the particular growth of their incomes or consumption expenditures. Additionally, a study like this will allow us to identify how these specific groups could be better targeted for the purpose of improving their living or welfare condition.

***Definition and Mean of Variables***

Household per-capita consumption expenditure is used as the welfare indicator. The consumption aggregates are constructed by adding together the various goods and services consumed by each household over a period of 12 months. Various components of consumption are grouped into three main categories: consumption of food items; consumption of housing; and consumption of other non-food items. Household level consumption in monetary terms is divided by the size of the household to find the household per capita consumption expenditure.

Other variables are grouped into different categories such as sex of household head, age of household head (different age groups ranging from 15 years to 59 years) grouped into five categories, education of household head (illiterate with 0 years to highest 17 years of schooling, split into three groups), region (rural or urban), land assets (landless to large household land size), a household's access to facilities (roads, schools, the market center, hospitals, electricity, and piped water) and ethnicity. A detailed definition of variables is presented in Table 1. Although the definition presented in Table 1 is self-illustrative for most of the variables, I have further elaborated on the variable of ethnicity based on Nepal's ethnic demographics, as the country has multiple and diverse ethnic groups.

According to the National Population and Housing Census Report 2012 (GON 2012b), the majority of Nepalese (81.3% of the population) are followers of the Hindu religion. Hindu societies are divided into a hierarchy based on the caste system. The same report further states that there are 125 caste/ethnic groups in Nepal. I have categorized these 125 castes into five major ethnic groups for the purpose of this study. The first group is the so-called 'high castes,' including the *Brahmin and Chhetri* castes of both Hills and Terai areas. High caste people are scattered all over the country and they are considered to be the historically privileged caste. The second group is Mongoloids, which includes *Magar, Tamang, Rai, Gurung, Limbu, Sherpa, Thakali, Jirel, Dura, Lepcha and Sunuwar* castes. People from this group reside mainly in the Hills and Mountains area. The third group is Newar. *Newar* is the caste of people who are settled in most of the cities, including Kathmandu valley, and are engaged in trade and commerce. The fourth group is Madheshi, which includes the *Yadav, Rajbanshi, Kalawar, Kanu, Tajpuria, Dhimal, Sudhi, Santhal/Satar,* and *Gangai* castes but excludes the *Brahmin* and *Chhetri* from Terai. The last group is the low castes, which includes the so-called low castes of the Hills such as *Kami, Damai,* and *Sarki*, and the low castes of Terai such as *Chamar, Dusad, Paswan, Musahar, Lohar*, and *Tatma*. The so-called low caste people are historically the most discriminated against and deprived group in Nepal. People in this caste suffer from a lack of access to the benefits of development. Previous studies such as (Lamichhane et al. 2014) have also analyzed poverty in Nepal through a similar caste-based classification of the population.

The last two columns of Table 1 show the mean values of the variables used for the growth elasticity of poverty estimates for persons with and without disabilities. Out of a total of 4,840 observations, 167 had disabilities. The lower percentage of disability prevalence can be connected to factors such as failure to address disability-related components adequately in the survey questionnaires, problems with defining disability, and enumerators (interviewers) not having proper training on how to ask disability-related questions. Additionally, the possibility of poor understanding by enumerators of the disability issue may have caused them to cover only those people whose impairments are severe. Factors like these may exclude other people whose impairments may be moderate or mild. Although inclusion of disability in the survey is a very positive step, further improvement of the survey design is required so that many people with disabilities that are currently excluded can be covered in the future. A similar explanation may account for the 1.94% disability prevalence rate given by the Government of Nepal National Population Census in 2012.

The average household per capita consumption is NRs 44,184.52 for persons with disabilities, whereas that is slightly higher (46,290.79 NRs) for their counterparts without disabilities. According to the census, the average household size is 4.21 and 4.39 respectively for persons with and without disabilities. In both cases, the vast majority of the households (84% and 90% respectively) are headed by a male, and the remaining 14 and 10% are headed by women with and without disabilities. The majority of the household heads have a lower level of schooling of below 5 years, with 84% and 81% of those with and without disabilities respectively falling into this category. Moreover, 10% of household heads have schooling of medium level (6-10) years and only 9% have schooling of higher level (11 years and above). Additionally, regardless of disability status, nearly two thirds (68%) are from rural areas.

In relation to land assets, 10% of those with disabilities and 12% of those without are landless; another 12% and 14% have only marginal land (less than 0.15 hectares (ha); 10% of both groups have medium land ownership (1.00ha-4.00ha), which is not different from the percentage owned by marginal-land or the landless groups. When looking at households with larger amounts of land (above 4.00 ha), the percentage decreases by more than 20 points when compared to households having small land assets. With regard to having access to facilities, except for electricity, both groups of people still have low-level of access to vehicle roads, hospitals, primary schools, piped water and market centers within a thirty-minute walking proximity.

## 4. Estimation Results

Table 2 shows estimations for poverty and inequality. It can be seen in the table that all poverty measures (P0, P1 and P2) are relatively higher for persons with disabilities than for their nondisabled counterparts. The figures, respectively, for those with and without disabilities are P0 = 0.28 and 0.24; P1= 0.08 and 0.05; P2= 0.03 and 0.02. Furthermore, the Gini coefficient indicates that both consumption and land-asset inequalities are also higher for persons with disabilities than for persons without disabilities. However, the data shows that the distribution of land assets is particularly more unequal for persons with disabilities (0.77) than for their nondisabled counterparts (0.65).

Table 3 shows calculations of the growth elasticity of poverty by different categories of people. For these groups, elasticity coefficients are presented based on all three measures of poverty: P0, P1 and P2. Row 1 of Table 3 shows the results by sex. Growth elasticity based on P0 is -1.68 and -1.08 for males and females with disabilities respectively. This means that a one percent increase in household per capita consumption will reduce poverty by 1.68 and 1.08% for males and females with disabilities respectively. The coefficients are -2.31 and -1.55 for males and females without disabilities. Similarly, the growth elasticities based on P1 are -2.92 and -1.21, respectively for males and females with disabilities, and -3.47 and -2.67 for males and females without disabilities. In the same vein, the growth elasticities based on P2 are -3.71 and -1.63 respectively for males and females with disabilities, and -3.95 and -2.81 for males and females without disabilities.

These results show clearly that the growth elasticities of poverty are lower for persons with disabilities regardless of the poverty measures used. Similarly, we can see in the same table, that the elasticities are also considerably lower for females in each of the two analyzed groups. Given that the growth elasticity of poverty is a decreasing function of the development level of a country and of the degree of inequality in the distribution of income/consumption (Borguignon 2003), the results indicate that the level of inequality facing individuals with disabilities and females is higher than the one that is present among people without disabilities and that of males. This means that regardless of the rate of growth in the country, the reduction of poverty will always be smaller for the more disadvantaged groups, including those with disabilities.

Consequently, in order to attain a higher level of poverty reduction for the whole Nepal, as well as for the more disadvantaged population, in this case for people with disabilities, and make development more sustainable and inclusive, public policies should strategically focus on improving the distribution of consumption further for these groups through specific targeted programs.

Row 2 of Table 3 shows the results according to the age of the participants. For both of the analyzed groups, the growth elasticities differ considerably between them. For example, with regard to persons with disabilities, P0 is highest in the 24-32 year old age group and lowest in the 15-23 year old group. For persons without disabilities, it is highest in the age group of 51-59 year olds and lowest in the 42-50 year old group. The case is however, different for P1 and P2 indices. For persons with disabilities, the poverty condition of groups covering ages 15-23 to 33-41 years old shows they are more sensitive to growth than the poverty experienced by other age groups, as their growth elasticities exhibit an absolute value equal or above 3.5 in all cases. However, for persons without disabilities, the growth elasticity of poverty does not show a clear pattern and is only higher than 3.5 in the case of the age groups 24-33 and 33-41 years old for P1 and P2, as well as the 51-59 years old group when the squared poverty gap is analyzed.

The previous results suggest that the impact of growth on poverty is the highest among relatively young and middle-age people with disabilities, and therefore that the economic well-being of those individuals is improved the most as the economy expands. The reason for this to be the case is that, as shown in Lamichhane et al. (2014), the same age groups (15-23, 24-32 and 33-41) are those with the highest levels of poverty in Nepal – they are generally in school or have just completed their university education and are searching for jobs. Consequently, this implies that even a small growth of the Nepalese economy or small investments in the human capital of these people with disabilities, who are considered one of the disadvantaged groups, will bring about a greater economic benefit to them. Lamichhane and Sawada (2013), who analyzed the returns on investment in education for people with disabilities in Nepal, likewise estimated a two or three times higher return on education for these people.

Comparing the growth elasticity of poverty between urban and rural regions, we can see in Table 3 that the urban population without disabilities has a lower elasticity. Persons with disabilities in the urban population exhibit an elasticity of -0.81 and those in the rural areas have a -1.73 elasticity based on P0. The other two indicators also show a similar trend albeit with higher elasticities in absolute value.

The results by region indicate that, regardless of disability status, reducing urban poverty through growth in Nepal is more difficult than improving the condition of the rural population by the same means. In other words, even a small amount of growth can help to reduce poverty in rural areas to a much greater extent than seems possible to achieve in the urban centers with a similar amount of growth. The main explanation for this growth-elasticity pattern may be the fact that poverty is much more prevalent and severe in rural than in urban areas as shown in Lamichhane et al. (2014). Consequently, it is likely that the poverty-reducing impact of growth will be stronger in the rural areas, where the majority of the total population resides, and a greater proportion is considered extremely poor and more disadvantaged than their urban counterparts.

Row 4 of Table 3 shows the elasticity of poverty estimates based on the level of education. Years of schooling are grouped into three categories: lower level education (0-5 years); middle level education (6-10 years); and higher level education (11 years and above). According to the results, in the case of persons with disabilities, the growth elasticity of poverty (P0) for persons with 0-5, 6-10 and 11 and above years of education is -1.83, -0.69 and -0.13 respectively. On the other hand, when analyzing P1 and P2 for persons with disabilities, it is possible to corroborate that the growth elasticity for people with more than 5 years of education is zero, while the one of individuals with an elementary level of schooling is -3.08 and -3.94 respectively. The zero elasticity that was found for the more educated groups reflects the non-poor economic condition of the people with disabilities that was also mentioned by Lamichhane et al. (2014). Contrastingly, given the fact that the less educated groups are those with higher levels of poverty in Nepal (Lamichhane et al. 2014), the contribution of growth to achieve a permanent reduction in the poverty level is indeed crucial as implied by the high elasticities that were obtained.

The results obtained for persons without disabilities with respect to P0 resemble our elasticity estimates for persons with disabilities, according to their educational status. Consequently, the growth elasticities of poverty are found to be higher the lower the level of education. These results are in line with the idea, supported by our previous results as well, that growth tends to have a stronger, positive impact on the economic well-being of people or groups whose levels of poverty are higher than the rest of the population.

Moreover, row 5 of Table 3 shows the results according to different land asset categories. For persons with disabilities, the highest elasticity based on P0 is found for landless households (-1.9), followed by households with small land assets (-1.82), households with marginal land assets (-1.42), households with medium land assets (-1.02), and lastly households with large land assets (-0.74). In the case of persons without disabilities, households with marginal land holdings, followed by households with small land and the landless exhibit higher elasticities (-2.92, -2.57 & -2.56) than those in the other groups. We can observe a similar trend for the cases of P1 and P2, corroborating again our previous findings about the positive relationship that exists between higher levels of poverty and higher growth elasticities (in absolute value). The results imply that, irrespective of disability status, persons that possess no or few assets are the ones who benefit the most as the economy expands, given that their poverty condition is reduced faster with a given level of growth. Moreover, based on the particularly high elasticities obtained, the results suggest that landless persons with disabilities are more vulnerable to fall into poverty than any other group in Nepal and, therefore, that specific policies or programs directed to them should be implemented to improve their economic well-being.

In row 6 of Table 3, results are presented based on individual access to various facilities that are within a 30-minute walking distance from their households. When analyzing P0, persons not having access to a vehicle road near their households have a higher elasticity (-1.63) than those who do have access (-1.2). In comparison, for those without disabilities, the figures are -2.26 and -1.87 respectively. A similar trend is observed for P0, P1 and P2 for most of the facilities in this analysis, except for the cases of vehicle road (P1 & P2) and school (P0, P1 & P2) in the case of persons with disabilities. These results are mainly related to the levels of poverty that were estimated for each particular group but, in general, they are in line with our general conclusion that when higher levels of poverty are observed, the absolute value of the growth elasticity of poverty is higher too, indicating the potentially strong impact that growth has upon poverty and the more disadvantaged groups in Nepal. For instance, based on the growth elasticity of P2 for people with disabilities who do not have electricity at home, a one percent increase in mean consumption reduces the severity of poverty by around six percent (see Table 3, row 6, column 3), while, in contrast, the reduction of poverty is only 2% for all persons who do have access to electricity (see also Table 3, row 6, column 6).

Finally, the last row of Table 3 shows the results by ethnic category. Regardless of disability status, all types of poverty (P0, P1 and P2) have the highest growth elasticity for households within the low caste. After the low caste households, Madheshi families have more elasticity, followed by Mongoloids, high caste, and Newar groups. Since households within the Newar ethnicity are generally less poor than households within the high caste, their corresponding growth elasticities are considerably lower. According to these results, households that belong to any of the ethnicity groups of low caste, Madheshi and Mongoloids should to be targeted in order to alleviate their poor condition faster through growth-redistributive programs.

## 5. Concluding remarks

Using a nationally representative dataset of Nepal (NLSS), growth elasticities of poverty were estimated for people with and without disabilities. Based on the results by disability status, it is not possible to identify a clear growth-elasticity pattern between the different analyzed categories. However, in some particular cases such as gender, education and land assets, growth elasticities for people with disabilities tend to be lower than those observed for their non-disabled counterparts. Given that poverty is determined by both growth and inequality (Datt and Ravallion 1992: Bourguignon 2003) and that, the higher the level of inequality that is prevalent in the economy, the lower will be the impact of growth upon poverty (Ravallion 1997), our results suggest that people with disabilities generally face higher levels of inequality in specific, relevant areas of development than the one experienced by people without disabilities. Consequently, it is advised that growth-redistributive programs, targeted to people with disabilities and other marginalized groups in Nepal, are implemented with the main purpose of reducing the persistent inequalities that are present between people with and without disabilities (see Table 2), so that the former of these groups can be equally benefited by the gains of growth, ultimately resulting in an increase in their economic well-being.

Moreover, regardless of disability status, our findings indicate that the poverty-reducing impact of growth accruing to the poorest and most disadvantaged people in Nepal (like the less educated, the landless and the low caste groups) is considerably higher than that observed for the rest of the population. As explained in the previous section, higher elasticities are related to higher levels of poverty. Therefore, it may be possible to affirm that the benefits of growth are greater for the groups whose levels of poverty are higher in the economy, implying that the growth of the Nepalese economy is pro-poor generally speaking.

Unfortunately, as explained above, pro-poor growth has not been reaching people with disabilities at the same pace. This seems to be essentially an equity matter, which, if properly addressed, will bring about important benefits not only to people with disabilities but to the economy as a whole. It should be fully acknowledged that every section of the society is equally important if the economy is to succeed in its path to development. Therefore, neglecting any population group is not only unfair but is also a threat to sustainable and inclusive development. Hence, it is of extreme importance that disability-inclusive poverty reduction strategies are implemented with the aim of achieving equity-based growth in the foreseeable future. Finally, as the inequality aspects of growth have not been analyzed in this paper, further research is needed to shed light on this issue.

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**Table 1. Definition and mean of variables**

| Variable | Definition | Persons with disabilities | Persons without disabilities |
|---|---|---|---|
| Per capita Consumption | Household per capita consumption in Nepalese Rupees (NPR) | 44184.52 | 46290.79 |
| Household Size | Size of household. | 4.21 | 4.39 |
| Married | 1 if married, 0 otherwise | 0.89 | 0.92 |
| **Sex of HH** | | | |
| Male | 1 if male, 0 otherwise | 0.86 | 0.90 |
| Female | 1 if female, 0 otherwise | 0.14 | 0.10 |
| **Age of HH** | | | |
| (15-23) years | 1 if having age group (15-23) years, 0 otherwise | 0.04 | 0.04 |
| (24-32) years | 1 if having age group (24-32) years, 0 otherwise | 0.13 | 0.20 |
| (33-41) years | 1 if having age group (33-41) years, 0 otherwise | 0.24 | 0.29 |
| (42-50) years | 1 if having age group (42-50) years, 0 otherwise | 0.29 | 0.26 |
| (51-59) years | 1 if having age group (51-59) years, 0 otherwise | 0.30 | 0.21 |
| **Education of HH** | | | |
| (0-5) Years | 1 if HH having education of (0-5) years, 0 otherwise | 0.84 | 0.81 |
| (6-10) Years | 1 if HH having education of (6-10) years, 0 otherwise | 0.10 | 0.10 |
| 11 Years and above | 1 if HH having education of 11 years or more, 0 otherwise | 0.07 | 0.09 |
| **Region** | | | |
| Urban | 1 if from urban region, 0 otherwise | 0.31 | 0.31 |
| Rural | 1 if from rural region, 0 otherwise | 0.69 | 0.69 |
| **Land Assets Group** | | | |
| Landless(0.00 ha) | 1 if having 0.00 hectare of land, 0 otherwise | 0.10 | 0.12 |
| Marginal (0.00 ha-0.15 ha) | 1 if having 0.00-0.15 hectares of land, 0 otherwise | 0.12 | 0.14 |
| Small (0.15 ha-1.00 ha) | 1 if having 0.15-1.00 hectares of land, 0 otherwise | 0.49 | 0.44 |
| Medium (1.00 ha-4.00 ha) | 1 if having 1.00-4.00 hectares of land, 0 otherwise | 0.10 | 0.10 |
| Large (4.00 ha & above) | 1 if having 4.00 & above hectares of land, 0 otherwise | 0.20 | 0.20 |
| **Access to facility** | | | |
| Vehicle Road | 1 if household has access to vehicle road, 0 otherwise | 0.07 | 0.09 |
| School | 1 if household has access to school, 0 otherwise | 0.05 | 0.07 |
| Market Centre | 1 if household has access to market center, 0 otherwise | 0.02 | 0.06 |
| Hospital | 1 if household has access to hospital, 0 otherwise | 0.04 | 0.04 |
| Electricity | 1 if household has access to electricity, 0 otherwise | 0.66 | 0.75 |
| Piped water | 1 if household has access to piped water, 0 otherwise | 0.23 | 0.29 |
| **Ethnicity** | | | |
| High Caste | 1 if caste is Brahmin & Chhetri, 0 otherwise | 0.33 | 0.35 |
| Mongoloids | 1 if from Mongoloids caste, 0 otherwise | 0.32 | 0.29 |
| Newar | 1 if caste is Newar, 0 otherwise | 0.07 | 0.09 |
| Madheshi | 1 if from Madheshi caste, 0 otherwise | 0.17 | 0.15 |
| Low Caste | 1 if from Low Caste, 0 otherwise | 0.11 | 0.12 |
| **Total Observations** | **Persons with Disabilities + Persons without Disabilities** | **167** | **4673** |

Source: Authors' Calculations
Note: HH = household head

**Table 2. Poverty and inequality measures**

| Variable (Mean Values) | Persons with disabilities | Confidence interval (95%level) | | Persons without disabilities | Confidence interval (95%level) | |
|---|---|---|---|---|---|---|
| Per capita Consumption | 44,184.52 | | | 46,290.79 | | |
| Headcount index($P_0$) | 0.28 (0.0383) | 0.21 | 0.36 | 0.24 (0.0105) | 0.22 | 0.26 |
| Poverty-gap index($P_1$) | 0.08 (0.0128) | 0.05 | 0.10 | 0.05 (0.0034) | 0.05 | 0.06 |
| Squared poverty-gap index($P_2$) | 0.03 (0.0061) | 0.02 | 0.04 | 0.02 (0.0016) | 0.02 | 0.02 |
| Gini coefficient of per capita consumption | 0.41 (0.0286) | 0.35 | 0.46 | 0.38 (0.0060) | 0.37 | 0.40 |
| Gini coefficient of land-asset ownership | 0.77 (0.0521) | 0.67 | 0.87 | 0.65 (0.0085) | 0.63 | 0.66 |
| **Total Observations** | **167** | | | **4673** | | |

Note: Standerd errors are shown in parenthesis.
Source: Authors' Calculations.

**Table 3. Growth elasticity of poverty**

| | | Persons with disabilities | | | Persons without disabilities | | |
|---|---|---|---|---|---|---|---|
| | | H index (P0) | PG index (P1) | SPG index (P2) | H index (P0) | PG index (P1) | SPG index (P2) |
| **1. Sex** | | | | | | | |
| Male | | -1.68 | -2.92 | -3.71 | -2.31 | -3.47 | -3.95 |
| Female | | -1.08 | -1.21 | -1.63 | -1.55 | -2.67 | -2.81 |
| **2. Age** | | | | | | | |
| 15-23 years | | -0.60 | -4.24 | -6.40 | -2.08 | -2.64 | -2.83 |
| 24-32 years | | -2.36 | -3.85 | -4.12 | -2.25 | -3.70 | -4.28 |
| 33-41 years | | -1.75 | -3.46 | -4.66 | -2.43 | -3.69 | -4.25 |
| 42-50 years | | -1.58 | -2.38 | -3.07 | -1.99 | -2.99 | -3.37 |
| 51-59 years | | -1.23 | -1.75 | -2.26 | -2.26 | -3.36 | -3.64 |
| **3. Region** | | | | | | | |
| Urban | | -0.81 | -1.74 | -1.25 | -0.84 | -1.13 | -1.03 |
| Rural | | -1.73 | -2.91 | -3.94 | -2.70 | -4.03 | -4.62 |
| **4. Education** | | | | | | | |
| 0-5 years | | -1.83 | -3.08 | -3.94 | -2.51 | -3.82 | -4.36 |
| 6-10 years | | -0.69 | 0.00 | 0.00 | -1.46 | -1.57 | -1.55 |
| 11 years and above | | -0.13 | 0.00 | 0.00 | -0.56 | -0.70 | -0.61 |
| **5. Land assets** | | | | | | | |
| Landless | 0.00 ha | -1.90 | -5.24 | -7.36 | -2.56 | -4.05 | -4.44 |
| Marginal | 0.00-0.15 ha | -1.42 | -2.33 | -3.29 | -2.92 | -4.30 | -4.84 |
| Small | 0.15-1.00 ha | -1.82 | -2.66 | -3.38 | -2.57 | -3.91 | -4.60 |
| Medium | 1.00-4.00 ha | -1.02 | -2.64 | -2.65 | -1.87 | -2.28 | -2.15 |
| Large | 4.00 & more | -0.74 | -1.17 | -1.34 | -0.65 | -0.77 | -0.72 |
| **6. Access to facilities** | | | | | | | |
| Vehicle road | Yes | -1.20 | -3.16 | -4.36 | -1.87 | -3.00 | -3.20 |
| | No | -1.63 | -2.66 | -3.37 | -2.26 | -3.43 | -3.90 |
| School | Yes | -2.34 | -4.12 | -4.82 | -1.61 | -2.33 | -3.00 |
| | No | -1.57 | -2.62 | -3.37 | -2.28 | -3.47 | -3.90 |
| Market | Yes | 0.00 | 0.00 | 0.00 | -1.49 | -2.26 | -3.11 |
| | No | -1.61 | -2.75 | -3.50 | -2.27 | -3.46 | -3.88 |
| Hospital | Yes | -0.18 | 0.00 | 0.00 | -1.63 | -2.48 | -2.83 |
| | No | -1.66 | -2.79 | -3.56 | -2.25 | -3.43 | -3.88 |
| Electricity | Yes | -1.22 | -4.67 | -1.95 | -1.66 | -2.21 | -2.15 |
| | No | -2.38 | -1.53 | -5.97 | -3.80 | -6.30 | -7.99 |
| Piped water | Yes | -0.94 | -1.39 | -1.35 | -0.78 | -1.27 | -1.24 |
| | No | -1.77 | -3.00 | -3.92 | -2.74 | -4.00 | -4.58 |
| **7. Ethnicity** | | | | | | | |
| High caste | | -1.29 | -2.04 | -1.69 | -1.49 | -2.22 | -2.63 |
| Mongoloids | | -1.80 | -2.52 | -3.59 | -2.57 | -3.62 | -4.01 |
| Newar | | -1.06 | -2.08 | -2.58 | -0.72 | -0.72 | -0.70 |
| Madheshi | | -1.81 | -3.62 | -4.76 | -3.16 | -4.27 | -4.62 |
| Low caste | | -1.89 | -3.69 | -5.88 | -3.43 | -6.03 | -7.02 |

Source: Authors' Calculations

# Part III

## *Different Growth, Different Outcomes in Sustainability, Inclusiveness, and Resilience*

## Chapter 6

# Reflections on the Prospects for Pro-Poor Low-Carbon Growth

Dirk Willenbockel

## 1. Introduction

Eradicating extreme poverty from the face of the earth once and for all is set to be a central goal of the emerging post-2015 development agenda. Without a rapid transition of the world economy to a low-carbon growth path over the next few decades, this ambitious goal will remain elusive.

Under current greenhouse gas (GHG) emission reduction pledges, the world is not on track to limit the average global temperature rise to +2°C above pre-industrial levels. Failure to meet this agreed target threatens to impede future progress and roll back past achievements in poverty alleviation. Prospective impact assessments indicate that for poor populations in tropical and sub-tropical hotspot regions in particular, the combination of high direct exposure, dominance of climate-sensitive sectors in economic activity and low autonomous adaptive capacity entail a high vulnerability to the predominantly harmful effects of climate change on agricultural productivity, food security, water resources, health, physical infrastructure and ecosystems.

Irrespective of the responsibility of the "Global North" for the bulk of atmospheric GHG concentration levels accumulated in the past, most of the growth in energy demand and global GHG emissions over coming decades will arise from today's developing countries. To avoid catastrophic climate change, a transition to a low-carbon growth path in today's large fast-growing middle-income countries is imperative and mitigation efforts in other developing countries are also required.

Yet developing countries are unlikely to adopt a low-carbon development strategy if such a strategy is perceived to be in conflict with domestic near-term poverty reduction aspirations. Thus, a better understanding of the potential distributional implications of different conceivable pathways to low carbon development is required to ensure the social acceptability and political viability of low carbon policy reforms. The growing recognition that the aims of equitable or pro-poor growth and low-carbon growth need to be addressed together[1] has led to efforts in the literature to identify potential synergies and trade-offs between pro-poor and low-carbon growth. This chapter provides a selective review of this literature along with some critical reflections.

To underpin the stated premises of this chapter concerning the need for climate change mitigation action in developing countries, the following section provides some quantitative background information about global GHG emission projections and targets, and about the geographical and sectoral composition of current emissions. A simple back-of-the envelope calculation is used to challenge the prevailing view that the emissions of today's least developed countries are irrelevant from a climate stabilization perspective. Section 3 contrasts arguments in favor of an early adoption of low-carbon growth strategies in low-income countries put forward in the recent literature with the dominant notion that these countries should focus on achieving growth and poverty reduction along conventional lines first and start efforts at cutting carbon emissions at a later stage. Section 4 looks at the potential direct poverty implications of adopting low-carbon development strategies in energy, agriculture and forestry, and Section 5 draws conclusions.

## 2. Some Unpleasant Greenhouse Gas Arithmetic

### *GHG Emission Projections and Targets*

To maintain a reasonable chance of limiting the average global surface temperature rise to +2°C above pre-industrial levels while keeping mitigation costs at manageable levels, annual global GHG emissions would have to peak before 2020 and then drop to around 44 gigatons of $CO_2$ equivalent ($GtCO_2e$) in 2020, 35 $GtCO_2e$ in 2030 and 20 $GtCO_2e$ in 2050 (UNEP 2013; OECD 2012; Rogelj and Meinshausen 2010; Stern 2009). These figures are based on recent estimates of the least-cost emission trajectories consistent with the +2°C goal, and are necessarily sensitive to assumptions about technical progress and learning effects in low-carbon technologies. They are also contingent on the current state of knowledge about climate sensitivity to atmospheric GHG concentrations.

1. E.g. Stern (2009), Urban (2010a, 2010b).

Current global emissions are around 50 $GtCO_2e$ / year. A full implementation of present voluntary pledges for mitigation action submitted by developed and developing countries under the 2009 Copenhagen Accord is projected to lead to 2020 emissions of 52-56 $GtCO_2e$ in 2020, suggesting an emission gap of 8-12 $GtCO_2e$ in relation to the least-cost trajectory (UNEP 2013). In this case far higher rates of mitigation effort than implied by this least-cost scenario would be required beyond 2020, which – if technically feasible at all – will raise total mitigation costs substantially. As a case in point, about 80 percent of the power stations likely to be in use in 2020 are either already built or under construction (IEA 2010). A large fraction of these plants is fossil fuel powered and will continue to pour out carbon for decades. Prematurely closing or retrofitting such plants is a very costly option. Thus, a large fraction of the global energy-related emissions still permissible under a +2°C scenario is already locked in by the existing infrastructure (IEA 2013b). Every year of delaying decisive mitigation action exacerbates this lock-in problem. Moreover, delayed action entails a higher reliance on the large-scale deployment of potentially risky negative emission technologies in the second half of the 21$^{st}$ century. In short, the door to achieving the required emission cuts at a manageable cost is rapidly closing. As a result, mitigation action needs to be stepped up without further delay in the run-up to 2020, the earliest date at which a comprehensive post-Kyoto climate agreement covering the major emitters might optimistically take effect, or we run the risk that the +2ºC goal is missed by a wide margin.

A recent study by the Potsdam Institute for Climate Impact Research for the World Bank suggests that under the current mitigation commitments and pledges, there is roughly a 20 percent likelihood of exceeding 4°C by 2100, and if these pledges are not met, a warming of 4°C could occur as early as the 2060s (PIK 2012). Similarly, the latest OECD Environmental Outlook baseline scenario, which likewise assumes no mitigation efforts beyond current pledges, projects increases in the global mean temperature of +2.0ºC to +2.8ºC by 2050 and of +3.7ºC to +5.6ºC by 2100 above pre-industrial (OECD 2012). The International Energy Agency's new World Economic Outlook 2013 central scenario, which likewise takes account of mitigation measures already announced by governments, sees the world on a trajectory towards a long-term average temperature increase of +3.6 °C (IEA 2013a).

These projections are broadly in line with the synthesis of results across the whole range of state-of-the-art global circulation models reported in the new 5th Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC 2013). For those two of the four representative concentration pathways (RCPs) that are consistent with low or moderate effective mitigation efforts considered in IPCC (2013), namely RCP6.0 and RCP8.5, the report states: "global temperatures averaged in the period 2081–2100 are …*likely* to exceed 2°C above preindustrial for RCP6.0 and RCP8.5 (*high confidence*). Warming above 4°C by 2081–2100 is *unlikely* in all RCPs (*high confidence*) except for RCP8.5 where it is *as likely as not* (*medium confidence*)".[2] The 5-95 percent range of across model projections towards the last decades of the century is +2.0 to +3.7°C under RCP6.0 and +3.2 to +5.4 °C under RCP8.5.

It is worth noting that projected temperature increases are not uniformly distributed across the globe. Projected increases for some regions are far higher than the global average. In view of these recent climate projections, scientists are starting to get serious about contemplating human development prospects in a +4°C world.[3]

### *The Decomposition of Present GHG Emissions by Region of Origin and Sector*

Table 1 displays global GHG emissions in 2010 by country or country group of origin and their shares of world emissions ordered by emission volume for the 21 top emitters (countries that account for 80 percent of total emissions and for 70 percent of the world population). Importantly for the purposes of the present chapter, the figures include emissions from agricultural activity and land use change.

On a production basis, developed countries now account for less than 40 percent of total emissions with a declining trend, while the four top developing country emitters - China, India, Brazil and Indonesia – alone account for 33 percent of global emissions with a rising trend. It is evident from the Table that a significant contribution to GHG mitigation efforts from these and other developing countries is required to bring

2. In IPCC terminology, the terms very likely, likely, and as likely as not mean likelihoods of 66-100, 33-66, and 0-33 percent respectively. Note that among all no-mitigation baseline scenarios reviewed in the AR5 "none is consistent in the long run with the pathways in the two most stringent RCP scenarios …, with the majority falling between the 6.0 and 8.5 pathways" (Clarke and Jiang 2013, 17).

3. See e.g. New et al. (2011), Thornton et al. (2011), PIK (2013).

emissions on a sustainable path. Even if the developed Annex I countries do hypothetically cut emissions to zero over night, the total would remain well above – and diverge further from – the least-cost sustainable path outlined above without further mitigation efforts beyond current developing country pledges. It is noteworthy in this context that the developing country origin share of *cumulative* GHG emissions (again including those from agriculture and land use change) since 1850[4] is now roughly equal to the developed country share, and it has been estimated by den Elzen et al. (2013) that this share will reach 56% by 2020.

To avoid any misinterpretations here: this is not a normative discussion about climate justice. The sole purpose is to show where geographically a large portion of future mitigation action must necessarily take place to achieve the climate stabilization goal – it is not an argument about who is morally responsible to pay for such mitigation action.

***Are LDC Emissions Really Irrelevant from a Mitigation Perspective?***

The least developed countries contribute a small but non-negligible 5% (Table 1). However, this share is bound to rise significantly over the first half of the 21st century as a result of population and income growth, and more so if a carbon-intensive growth path is taken. This can be demonstrated with a simple back-of the-envelope calculation: Let E and N denote total annual LDC emissions and population respectively. Proportional differentiation of the accounting identity $E = (E/N) \cdot N$ yields $g_E = g_{E/N} + g_N$. Defining the elasticity of per-capita emissions with respect to per-capita income Y/N as $\varepsilon = g_{E/N} / g_{Y/N}$, we obtain $g_E = \varepsilon \cdot g_{Y/N} + g_N$. The latest UN medium-variant population projections see the total population of today's LDCs grow from 832 (Table 1) to 1,726 million over the period 2010-50, which equates to an average annual growth rate of $g_N = 0.0184$, i.e. 1.84 percent. With an assumed moderate annualized per-capita LCD income growth of $g_{Y/N} = 0.03$ over the same period[5] and setting $\varepsilon$ to a moderate 0.3[6], the average annual emission growth rate

4. Cumulative emissions are significant because they determine current atmospheric GHG concentration levels and hence climate change,

5. Many LDCs reported far more impressive growth rates in recent years.

6. Under this assumption, a one-percent increase in per-capita income is associated with a sub-proportional 0.3 percent increase in per-capita emissions. See e.g. Jobert, Karanfil and Tykhonenko (2013) for recent empirical evidence on the relation between income and emissions at low-income levels and further reference to the empirical literature. Estimates of $\varepsilon$ vary widely across studies and countries.

would be $g_E$ = 0.0274. Thus, total LDC emissions would nearly triple from 2.3 (Table 1) in 2010 to $2.3 \cdot (1+g_E)^{40} \approx 6.8$ $GtCO_2e$ / year in 2050, even though emissions per head rise only moderately from 2.8 (Table 1) to 3.3 $tCO_2e$ under these assumptions. With only a slight increase in $\varepsilon$ to 0.4 and in $g_{Y/N}$ to 0.04, the same calculation would lead to LDC emissions of 9.0 $GtCO_2e$ / year with per-capita emissions of 5.2 in 2050 - that is nearly half of the total global emissions permissible in 2050 under the least-cost mitigation path outlined above.

These basic calculations indicate that the widely held view that LDC emissions are largely irrelevant from a global mitigation perspective does not hold up well to closer scrutiny. Moreover, the widespread perception that these countries must focus exclusively on the promotion of growth unconstrained by low-carbon considerations and on adaptation measures to bolster their future resilience to climate change impacts should also be reconsidered.

An even simpler way to demonstrate the basic problem with this is view is to just calculate the global average GHG emission levels per head in 2050 consistent with the goal to reach 20 $GtCO_2e$ by then: with a projected world population of 9.3 billion (UNDESA 2011a; medium variant) that is 2.15 $tCO_2e$ / head. As shown in the last column of Table 1, the LDCs as a group are already slightly above that level, and any significant increase in that level would necessitate even deeper cuts by other countries and would further increase the likelihood that the +2°C goal is missed by a wide margin.

**Table 1. Greenhouse Gas Emissions 2010 by Region**

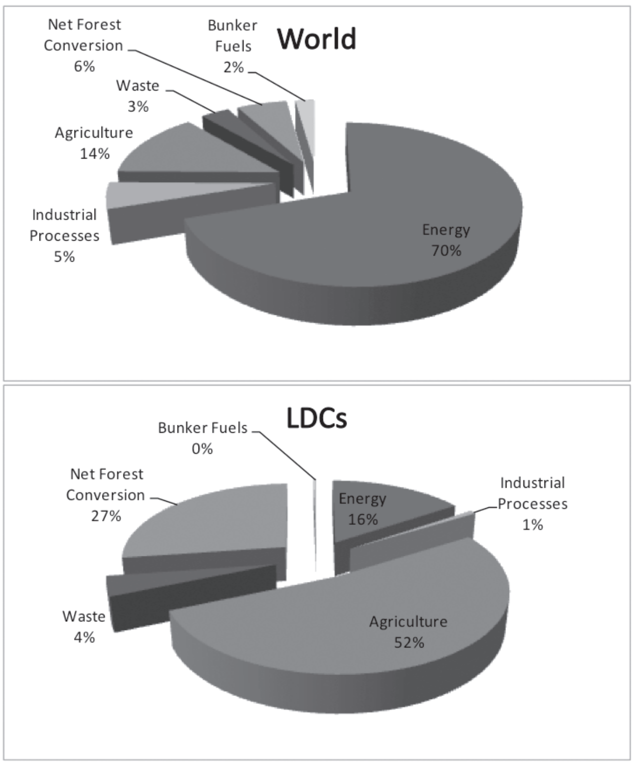
| | Emissions | Share | Cumulated Share | Population | Share | Emissions per capita |
|---|---|---|---|---|---|---|
| | *Gt CO2e* | *%* | *%* | *Mill* | *%* | *t $CO_2e$/head* |
| **China** | 10.1 | 21.4 | 21.4 | 1,341 | 19.4 | 7.5 |
| **United States** | 6.8 | 14.4 | 35.7 | 310 | 4.5 | 21.9 |
| **European Union (27)** | 4.8 | 10.2 | 45.9 | 500 | 7.3 | 9.6 |
| **Russian Federation** | 2.3 | 4.9 | 50.9 | 143 | 2.1 | 16.2 |
| **India** | 2.3 | 4.9 | 55.7 | 1,224 | 17.7 | 1.9 |
| **Brazil** | 2.1 | 4.5 | 60.3 | 195 | 2.8 | 11.0 |
| **Japan** | 1.3 | 2.8 | 63.0 | 127 | 1.8 | 10.2 |
| **Indonesia** | 1.2 | 2.5 | 65.5 | 240 | 3.5 | 4.9 |
| **Australia** | 0.7 | 1.6 | 67.1 | 22 | 0.3 | 33.5 |
| **Iran** | 0.7 | 1.5 | 68.6 | 74 | 1.1 | 9.8 |
| **Canada** | 0.7 | 1.5 | 70.1 | 34 | 0.5 | 21.4 |
| **Mexico** | 0.7 | 1.5 | 71.6 | 113 | 1.6 | 6.3 |
| **South Korea** | 0.7 | 1.4 | 73.1 | 48 | 0.7 | 14.2 |
| **South Africa** | 0.6 | 1.2 | 74.3 | 50 | 0.7 | 11.2 |
| **Saudi Arabia** | 0.5 | 1.1 | 75.4 | 27 | 0.4 | 20.1 |
| **Argentina** | 0.5 | 1.0 | 76.4 | 40 | 0.6 | 11.3 |
| **Venezuela** | 0.4 | 0.8 | 77.2 | 29 | 0.4 | 13.3 |
| **Ukraine** | 0.4 | 0.8 | 78.0 | 45 | 0.7 | 8.5 |
| **Turkey** | 0.4 | 0.8 | 78.8 | 73 | 1.1 | 4.8 |
| **Malaysia** | 0.3 | 0.7 | 79.5 | 28 | 0.4 | 12.0 |
| **Pakistan** | 0.3 | 0.7 | 80.2 | 174 | 2.5 | 1.9 |
| **Sum (Average)** | 37.8 | 80.2 | | 4,837 | 70.1 | (7.8) |
| **World** | 47.2 | 100.0 | 100.0 | 6,869 | 100.0 | 6.8 |
| **Annex I Countries** | 17.7 | 37.5 | | 1,207 | 17.5 | 14.7 |
| **Non-Annex I Countries** | 29.5 | 62.5 | | 5,689 | 82.5 | 5.2 |
| **Least Developed** | 2.3 | 5.0 | | 832 | 12.1 | 2.8 |

Source: World Resources Institute CAIT 2.0 Data Base (accessed January 2014).
Note:"Annex I" countries are the established industrialized countries (i.e. OECD members as of 1992 plus Eastern European economies in transition) with emission reduction obligations under the Kyoto protocol, while "Non-Annex I" countries are developing countries without such obligations.

### *The Decomposition of Present GHG Emissions by Sector*

The two panels of Figure 1 show the 2010 GHG emission shares by broad type of activity for the world as a whole and for LDCs respectively. While on a global scale, anthropogenic emissions are dominated by energy-related activities, in LDCs as a group, agriculture and land use change account for nearly 80 percent of the total. It should be noted that emissions from agriculture and land-use change are more difficult to measure than energy emissions, and some estimates in the literature record far higher global shares for the former than the World Resources Institute estimates reported here. The future evolution of these shares depends obviously on the qualitative features of the growth paths taken over the coming decades.

**Figure 1. Greenhouse Gas Emissions by Source 2010**
*(Percentage shares in total GHG emissions)*




Source: Author's calculations based on World Resources Institute CAIT 2.0 Data Base (accessed January 2014).

## 3. The Case for Low-Carbon Growth in Low-Income Countries

A key message of the previous section is the necessity to reconsider the dominant notion that poorer countries in general and LDCs in particular should focus on achieving growth and poverty reduction along conventional lines first and start worrying about cuts in carbon emissions at a later stage. This notion rests primarily on the argument that the adoption of low-carbon technologies raises costs and consumer prices in relation to conventional alternatives, entailing adverse impacts on growth and hence poverty alleviation. A slow down in growth-driven poverty reduction implies in turn a higher vulnerability to climate change impacts. Moreover, early mitigation action would divert attention, funding and scarce planning capacity away from more pressingly needed adaptation investments. Further arguments in support of the "grow first – decarbonise later" view are that low-carbon technologies can be expected to be available at lower costs in the future, and that on intertemporal equity grounds, the current poor should not be obliged to incur consumption sacrifices in favor of future, supposedly wealthier, generations.

However, this view requires qualification for a number of reasons. Most importantly, it violates basic economic efficiency principles – and in doing so ignores a potentially large source of gains from international exchange for low-income countries: to achieve a given global GHG emission target at minimum cost, the marginal GHG abatement costs would have to be equalized across all regions of the world. In plain language, it makes no sense to install low-carbon technologies in rich region A at a cost of $50 per ton of $CO_2e$ avoided as long as the same amount of emission reduction can be achieved at a cost of $10 per ton in poor region B. Such mitigation cost differences imply the presence of potentially large mutual gains from carbon credit transactions between developed and developing countries. Quantitative estimates show a huge potential for these mutual gains. A recent model-based global study by Akimoto et al. (2010) indicates a far larger near-term low-cost emission reduction potential up to 2020 in the developing non-Annex I countries than in the in the developed Annex-I countries (Table 2). This finding is consistent with the meta analysis of results from similar model-based studies with a time horizon towards 2030 by van Vuuren et al. (2009), which finds unanimous agreement among existing estimates that the largest mitigation potentials are in non-OECD countries.

**Table 2. Estimated GHG Emission Reduction Potentials in 2020**

*(Deviations from 2020 baseline in GtCO2e/year at abatement costs <0 and <20 US$/tCO2e)*

| | < 0 $/tCO2e | < 20 $/tCO2e |
|---|---|---|
| USA | 1.7 | 2.4 |
| EU27 | 1.2 | 1.8 |
| All Annex-I | 3.3 | 4.3 |
| China | 6.9 | 10.6 |
| India | 3.3 | 4.3 |
| Brazil+Indonesia+South Africa | 1.2 | 1.7 |
| Other Non-Annex I | 3.9 | 6.2 |
| World | 20.2 | 30.1 |

Source: Akimoto et al (2010: Table 4) and author's calculation.
Notes:"Annex I" countries are developed countries with emission reduction obligations under the Kyoto protocol, while "Non-Annex I" countries are developing countries without such obligations. The baseline assumes constant emission intensities.

In the absence of a full global cap-and-trade system, the Kyoto flexible mechanisms including the Clean Development Mechanism (CDM) as well as the upcoming REDD+ (Reducing Emissions from Deforestation and Degradation) scheme are in conception key devices for the realization of the mutual gains arising from abatement cost differences across regions and must be scaled up significantly under the emerging post-Kyoto climate finance architecture. As far as the envisaged new market-based mechanisms that will supersede or complement the CDM provide full funding and technical assistance for early mitigation action in poorer countries from developed country sources, domestic growth prospects need not be adversely affected, and the recipient regions may benefit from additional ancillary benefits as elaborated below. A sufficiently high carbon price is a necessary precondition for the effectiveness of any such market-based mechanism in mobilizing low-carbon investment flows from richer to poorer countries at scale. This in turn will require a global climate agreement with stringent binding targets for the major emitters. Proposals favoring a system of voluntary pledges are in this respect "about as useful as a chocolate tea pot", as former UK Climate Secretary Chris Huhne has put it.[7]

Taken at face value, the presence of mitigation options with a negative abatement cost in Table 2 would mean possibilities for immediate mitigation measures with positive net gains even in the absence of payments flows from rich countries. The presence of such negative-cost mitigation options in poor countries undermines in itself the basic

7. Cited in Harvey (2011).

premises of the "develop first – decarbonize later" position.[8]

A further argument in favor of the early adoption of a low-carbon growth path – that applies specifically to the least developed regions with a rudimentary present energy infrastructure, emphasizes the benefits of avoiding a high-carbon technology lock-in right from the start. Given the long-lived nature of energy plant and infrastructure investments and the associated high cost of premature scrapping, choosing low-carbon modes of development now will reduce the economic burden of GHG gas mitigation in the future (OECD 2013; Byrne et al. 2011; Bowen and Fankhauser 2011).[9] Moreover, as technical progress in the energy sector will shift to low-carbon technologies, once a global climate deal is eventually reached, LDCs that have embarked on a traditional high-carbon development trajectory will be stuck with a stagnant type of technology and will not be able to benefit from this technical progress (Bowen and Fankhauser 2011).

Another economic reason for embracing a low-carbon growth strategy is the avoidance of prospective adverse impacts on future export growth performance. Such adverse trade impacts would arise if countries with strong mitigation efforts impose border tax adjustments on carbon-intensive imports from countries on a high-carbon growth path, or if better-off consumers – including households belonging to the growing middle class in developing countries – switch their preferences to green low-carbon alternatives (e.g. Rowlands 2011; Bowen and Fankhauser 2011).

The literature identifies a further range of co-benefits for countries adopting a low-carbon development strategy. Such ancillary benefits include the effects of reduced air pollution on mortality and morbidity, greater energy security and the relaxation of foreign exchange due to reduced dependence on fossil fuel imports, and potential positive net employment effects that arise if "green" low-carbon job creation in the

8. Economists tend to be sceptical about models and arguments that suggest the existence of unpicked dollar bills on the sidewalk. Capital market imperfections and incomplete information are among the most obvious explanatory factors for the presence of unexploited negative-net-cost investment opportunities, given that upfront investments are required to reap the stream of future net negative operating costs (that arise, for example, due to large fuel cost savings as a result of investments in energy efficiency or a switch to renewables).

9. Essentially the same lock-in argument applies to non-energy infrastructure investments and planning decisions with a largely irreversible character such as in the areas of transport and urban development– see Pye et al. (2010).

course of the low-carbon transformation exceeds "brown" job destruction.

Such co-benefits figure prominently in the existing literature on pro-poor low-carbon development. Indeed much of this literature appears to be entirely fixated on the identification and propagation of win-win measures that promise the simultaneous achievement of mitigation and poverty reduction objectives by co-incidence.[10] From a political economy perspective, this fixation is understandable, given that prospects for double or triple wins open up opportunities for the formation of alliances among multiple policy actors with differing priorities in support of such measures. However, an exclusive focus on such synergetic measures unduly narrows the space of potential policy options by ignoring a basic insight from the theory of economic policy in the tradition of Jan Tinbergen (1952), joint winner of the first Nobel Prize in Economics back in 1969: the best possible achievement of multiple policy objectives generally requires the combination of multiple policy instruments.

In the present context, this means that a narrowly conceived pro-poor low-carbon growth strategy that rules out policies with a high mitigation potential but without co-incidental pro-poor benefits - or with adverse primary distributional side effects - is likely to generate inferior outcomes compared to a strategy that combines such mitigation policies with the application of feasible redistributive measures.

## 4. How Pro-Poor is Low-Carbon Growth? A Closer Look

*Poverty Implications of Low-Carbon Growth in the Energy Sector*

Any consideration of the poverty implications of low-carbon growth must start from the fact that presently some 1.3 billion people lack access to electricity (IEA 2013a), another billion people only have access to unreliable electricity (Casillas and Kammen 2010), and about 2.6 billion people rely on traditional biomass, such as wood, dung and charcoal for cooking and heating purposes (IEA 2013a).

Given that achieving universal access to modern energy services is a co-

10. Proponents of "climate-smart" development strategies go one step further by promoting the pursuit of "triple win" policies that generate adaptation co-benefits on top of mitigation and poverty reduction benefits.

requisite for the eradication of extreme poverty, these figures might at first sight suggest a fundamental conflict between the global climate stabilization and poverty elimination goals. However, a recent scenario analysis by the International Energy Agency (IEA 2010) suggests that it is technically and economically feasible to reach universal access to a basic level of modern energy services by 2030 with an increase in $CO_2$ emissions of merely 0.8 percent relative to a 2030 baseline scenario in which 1.2 billion remain without electricity access.[11]

In the IEA universal access scenario all urban and peri-urban households are connected to the national grid by 2030, while in rural areas 70 percent of the new access is provided via decentralized mini-grid and off-grid systems including solar photo-voltaic, mini-hydro, wind, biomass and geothermal systems. In the recent low-carbon development literature, the deployment of such decentralized renewable energy systems is widely seen as a promising and economically viable approach to reduce energy poverty in remote rural areas. Apart from the direct poverty reduction impacts associated with electrification in general (such as the extensions of hours available for income generation and education activities), the provision of these systems is seen to generate further pro-poor growth benefits by creating local jobs in related hardware manufacturing, distribution, installation and maintenance.[12]

A recent study by Deichmann et al. (2011) for Ghana, Ethiopia and Kenya uses spatial modeling in combination with engineering cost estimates to determine where stand-alone renewable energy generation is a cost-effective alternative to centralized grid supply. The results indicate that decentralized renewables are competitive mostly in remote

11. Global electricity generation rises by 2.9 percent and oil demand by one percent relative to the 2030 baseline levels. In the baseline scenario, global $CO_2$ emissions in 2030 are 21 percent higher than in 2008. Chakravarty and Tavoni (2013) consider a more ambitious global energy poverty eradication scenario that includes the provision of electricity and fuels to increase productivity in agriculture, commercial activities and transport to 3.4 billion energy-poor people, in addition to universal access to basic energy services to satisfy basic human needs for 1.8 billion people by 2030. In this scenario, global final energy consumption rises by 7 percent relative to the baseline.

12. See e.g. UNEP/UNCTAD/UN-OHRLLS (2011), World Bank (2012), UNDESA (2011b), Casillas and Kammen (2010), Grantham Institute (2009). Of course, the extent to which such green job creation is directly pro-poor depends in particular on the skill intensity of these jobs and the empirical evidence for developing countries is weak in this respect (Dercon 2014). For a detailed systematic review of the empirical evidence on the benefits of increased renewable energy capacity for poor people see Pueyo et al. (2013).

rural areas, while grid-connected supply is the cheaper option in more densely populated areas where the majority of households in these countries reside. These findings confirm that decentralized renewable energy can play an important role in expanding rural energy access in Sub-Saharan Africa (SSA), but the results also underscore the need to pay attention to the evolution of the fuel mix for centralized power generation.

As Collier and Venables (2012) point out in this respect, Africa is well endowed with potential for hydro and solar power, but lacks capital, skills and governance capacity. Since distributed solar power is very capital and skill-intensive, the authors conclude that the international community must provide support by increasing Africa's supply of these scarce factors. In line with the argument in section 2, the CDM is seen as one of the appropriate instruments to provide this support.

Timilsina et al. (2010) investigate the potential of reducing energy-related GHG emissions via the CDM across 44 countries in SSA through the CDM. The study looks at a wider range of low-carbon technology options and finds that over 3,200 CDM projects that meet the eligibility criteria could be developed in the region. The cumulated GHG mitigation potential over the 10-21 year CDM project cycle is estimated to amount to 9.8 $GtCO_2$. However, the realization of this potential is contingent on effective assistance in overcoming a range of implementation barriers that partly explain the very low number of CDM projects in the region up to the present. The barriers to implementation identified in this study include inter alia lack of infrastructure, institutional capacity and local skilled labor as well as potential foreign investors' perceptions of SSA as a high-risk region.

In addition to electrification, the IEA (2010) Universal Access Scenario also envisages the provision of access to clean cooking facilities (in the form of LPG stoves or advanced biogas/biomass stoves) for the 2.8 billion people still relying on traditional biomass in the 2030 baseline scenario. Recent estimates suggest that the associated emission reductions could exceed 1 Gt $CO_2e$ per year (Lee et al. 2013) – that is a significant figure in relation to the global emission targets outlined in Section 2. The pro-poor co-benefits of a suitably subsidized roll-out of clean efficient stoves is evident. According to World Health Organization estimates, currently in-door air pollution causes 2 million premature deaths per year (WHO 2011), or more annual deaths than are caused by malaria, tuberculosis or HIV (UNDESA 2011b). In addition to the direct health impacts and health-related productivity gains, the pro-poor ancillary benefits include fuel collection and cooking time savings. A global cost-benefit analysis of a hypothetical intervention that provides access to clean stoves for 50 percent of the population lacking such access in 2005 by Hutton, Rehfuess and Tediosi (2007) reports a benefit-cost ratio on the order of sixty.

***Distributional Implications of Fossil Fuel Subsidy / Tax Reform***

To achieve the transition to a low-carbon growth trajectory in market-based economies, relative prices between fossil fuels and low-carbon energy sources play a decisive role. It is critical that the fossil fuel prices faced by market participants reflect the long-run marginal social costs associated with GHG emissions in order to incentivize the required structural transformation of the energy system as well as to induce energy efficiency investments and shifts to less carbon-intense demand patterns. Fossil fuel subsidies distort relative prices and pervert incentives exactly in the opposite direction. Their swift phasing-out must be part of any effective low-carbon growth strategy.

According to the latest IEA (2013a) estimates, fossil-fuel consumption subsidies worldwide amounted to US$544 billion in 2012, a large portion of which is attributable to developing and emerging countries. Separate estimates for OECD countries based on a different methodology suggest indirect public support measures for fossil fuel production and use in developed countries on the order of US$45-75 billion per annum in recent years (OECD 2011). At a global scale, fossil fuel subsidies are six times higher than the financial support given to renewables (IEA 2013b). Phasing out these subsidies could provide around half the emissions reductions needed over the next decade to reach a trajectory that would limit global warming to +2°C.

Fossil fuel subsidies in developing countries are commonly justified as a means to make modern energy services affordable to the poor, and their removal is widely seen to hurt poor households disproportionally. Fact is, however, that fuel subsidization is a grossly inept instrument to target the poor. Using data for a sample of 20 developing countries, Arze del Granado, Coady and Gillingham (2012) show that on average across sample countries, households in the top income quintile receive 42.8 percent of the benefits from fuel subsidies while the bottom quintile receives only 7.2 percent. This implies that the average burden to government budgets of transferring one dollar to the poor quintile is a mindboggling US$13.89, as nearly 93 percent of the subsidy leaks to the higher quantiles.[13]

This is not to deny that the direct impacts of fuel subsidy cuts on fuel prices and on the prices of other goods via input-output linkages viewed in isolation will hit the poor, along with better-off households and production sectors intense in the use of fossil fuels or fossil-fuel-based power. But the ultimate distributional impact of such cuts, as well as their political feasibility, depends crucially on how governments use the additional fiscal space created by the reduced burden on government budgets.

As illustrated by a recent background study by Willenbockel and Hoa (2011) for UNDP (2012), adverse distributional and growth side effects of fossil fuel subsidy cuts are by no means inevitable. A dynamic scenario analysis based on a general equilibrium suggests in particular that adverse impacts on poor households can be neutralized (or turned into pro-poor impacts) by using part of the government savings arising from the subsidy cut for compensating cash transfers. Using the additional fiscal space to foster additional productive and more energy-efficient investments may actually raise income and consumption for all households in the medium run. The same argument applies to the hypothetical introduction of a carbon tax, also considered in this study, as the direction of the first order effects is essentially equivalent to that of a fossil fuel subsidy cut. The general tenor of these findings is broadly in line with the results of similar *ex-ante* general equilibrium simulation studies surveyed by Ellis (2010) and Boccanfuso et al. (2008). In short: fossil fuel subsidies are definitely not pro-poor – their elimination can be.

### *Poverty Implications of a Low-Carbon Transition in the Agriculture and Forestry Sector*

Direct GHG emissions from agriculture (Figure 1 above), exclusive of

13. The average figures mask even more extreme cases of bad policy targeting (taking the pro-poor motive for such subsidies at face value) that become apparent by looking at the disaggregated results for country groups and fuel types in Arze del Granado, Coady and Gillingham (2012: Table 12). E.g. in Africa, only 2.2 percent of gasoline subsidies reach the bottom quintile, implying a budgetary burden of over US$45 to transfer a single dollar to the poorest quintile through this instrument.

forest conversion into agricultural land, consist primarily of $N_2O$ (nitrous oxide) associated with fertilizer use, $MH_4$ (methane) associated with enteric fermentation emissions from livestock and emissions from rice paddies and manure, and to a lesser extent, of net $CO_2$ fluxes to the atmosphere associated with degradation of organic soils in tropical regions (Smith et al. 2008, 2013; Olander et al. 2013).

Potential mitigation measures include various changes in land and livestock management practices as detailed in Smith et al. (2008; 2013) and Lal (2011). As far as adverse direct and indirect land use change effects that could lead to a net *increase* in emissions can be avoided, biofuel production may be seen as a further option for mitigation action in the agricultural sector.

Smith et al. (2008) estimate the *technically* feasible global technical GHG mitigation potential from agriculture excluding fossil fuel offsets from biofuels by 2030 to be in the order of 5.5 to 6 Gt $CO_2e$ per year with *economic* potentials of 1.5 to 1.6, 2.5 to 2.7 and 4.0 to 4.3 at carbon prices of up to US$20, 50 and 100 per ton of $CO_2e$ respectively. The additional economic mitigation potential of replacing fossil fuels by biomass energy from agriculture is estimated to be 0.64, 2.24 and 16.0 Gt $CO_2e$ per year for the same three marginal abatement cost ranges.

However, any consideration of the potential contributions of agriculture in developing countries to GHG mitigation must take into account that the combination of population growth and rising per-capita incomes that will be accompanied by a shift towards more livestock-intense diets in parts of the world will translate into a substantial increase in the demand for agricultural output between now and the middle of the century. These demand-side drivers are bound to intensify the competition for land and water, particularly in low-income regions with high population growth and a high present incidence of undernutrition.[14]

The need to adapt to the emerging impacts of climate change that are already locked into the system even under the most optimistic assumptions about future mitigation efforts adds to the pressure for low-income regions. Long-run agricultural productivity trends as well as short-run yield variability are directly affected by climate change and the associated expected increases in extreme weather events. A growing

14. Government Office for Science (2011); Godfray et al. (2010).

number of studies suggest that climate change may well reduce the productivity of farming in precisely those regions of the world where undernutrition is already most prevalent.[15]

Moreover, climate change mitigation policies aimed at the energy sector that raise fossil fuel prices would drive bioenergy demand upwards even in the absence of biofuel mandates and further intensify the competition for land. An extensification response in the form of converting forestland to farmland is obviously not a sustainable option, as net forest conversion would further add to emissions and reinforce the problem.

It is precisely this confluence of pressures on agricultural systems that led the UK Government Foresight Report on the future of food and farming (Government Office for Science 2011) to the conclusion that the increase in the global food supply must be based on sustainable intensification. Sustainable intensification means simultaneously raising yields, increasing the efficiency with which inputs are used and reducing the GHG emissions associated with food production. It is a core principle of the wider notion of a climate-smart agriculture (CSA) that seeks to "(i) sustainably intensify production systems to achieve productivity increases, thereby supporting the achievement of national food security and development goals; (ii) increase the resilience of production systems and rural livelihoods (adaptation); and (iii) reduce agriculture's GHG emissions (…) and increase carbon sequestration (mitigation)" (Branca et al. 2012).

A gradual move to a growth path based on this conception in the rural areas of SSA and South Asia with support from developed countries is in principle a pro-poor strategy, as it would raise returns to agricultural labor over time and speed up the structural transformations required to achieve the longer-term aim of eradicating extreme poverty. Pretty, Toulmin and Williams (2011) review 40 sustainable intensification projects with a coverage of 12.8 million ha of land across 20 African countries. They report an average yield increase across these projects by a factor of 2.13, benefiting 10.4 million farmers and their families.[16]

15. See Willenbockel (2014) for further reference. See also Nelson et al. (2014).

16. For further reference to empirical case study evidence on yield improvements and poverty impacts associated with the adoption of sustainable intensification practices see inter alia UNEP (2011), Cooper et al. (2013), ILO (2012: Ch.2), World Bank (2012: Ch.5), Shames et al. (2012).

The potential role of biofuel production within pro-poor low-carbon growth strategies remains a highly contested issue. The suitability of traditional food-crop-based first-generation biofuels, except for sugar cane based fuels, for the achievement of significant net GHG reductions is increasingly being called into question. However, various recent global scenario studies exploring feasible emission pathways to achieve the +2°C goal see an indispensable role for second-generation ligno-cellulosic biofuels in the future energy mix.[17] These emergent advanced second-generation biofuels are based on non-edible inputs, including crop and forest residues, grasses (switchgrass, miscanthus) or fast-growing trees (poplar, willow, eucalyptus) that can be grown on marginal and degraded land not suitable for food crop production and are expected to have a far higher net GHG reduction potential than conventional first-generation bioenergy feedstocks (Lotze-Campen et al. 2014; OECD 2013).

For parts of SSA in particular, the hope is that a carefully regulated allocation of marginal land to next-generation bioenergy production could avoid the risks of harmful effects on poor people widely associated with a large-scale conversion of land for commercial first-generation biofuel production.[18] This includes risks such as the uncompensated loss of access to land for smallholders with precarious customary land tenure rights and adverse food security impacts. Lynd and Woods (2011) envisage a large future potential of pro-poor benefits for Africa offered by an integration of second-generation bioenergy conversion technologies into agricultural value chains and outline the requirements for a realization of these benefits.

Through their implications for land use and access to land, mitigation measures in agriculture are closely interconnected with measures to achieve reduced emissions from deforestation and forest degradation (REDD), and the potential poverty impacts of the latter are likewise subject to controversial debate. A major bone of contention in the voluminous pertinent literature is how alternative design options for the REDD+ carbon finance scheme under a global post-Kyoto climate agreement affect the livelihoods of poor forest users. There are concerns as to how safeguards can be established to ensure that the interests of national elites and international investors do not override the rights of

17. See Lotze-Campen et al. (2014) for reference to these scenario studies.

18. See e.g. Cotula, Dyer and Vermeulen (2008) and Mitchell (2011).

local forest communities and that an equitable share of the REDD+ benefits reaches the poorest members of these communities.[19]

Meanwhile, the UNFCCC 19th Conference of Parties in December 2013 has agreed upon the Warsaw Framework for REDD+, which specifies the key design features of the future scheme that would take effect if a global deal is reached in 2015. The Framework includes safeguard clauses that aim to ensure that REDD+ is implemented in equitable ways and in accordance with a country's sovereignty. Notably, it contains a requirement for recipient countries of carbon finance to publish periodic information on how these safeguards are being addressed and respected.

## 5. Concluding Remarks

The point of departure and motivation for this chapter is the joint proposition that there will be no lasting global poverty eradication without low-carbon growth and no global low-carbon transition without poverty reduction. Or as Nicholas Stern (2009) has put it emphatically, "(t)he two defining challenges of our century are overcoming world poverty and managing climate change. If we fail on one, we fail on the other." Thus, the aims of equitable or pro-poor growth and low-carbon growth are intrinsically linked and need to be addressed together.

A closer look at the basic merciless algebra of global GHG emissions and low-cost mitigation pathways reveals an important message: the prevailing view that the emission paths of today's least developed countries are largely irrelevant from a global mitigation perspective is demonstrably mistaken. In fact, average LDC emissions per capita are already higher now than the maximum average global per-capita emissions permissible in 2050 if the +2°C target is to be reached at manageable mitigation costs. Thus, the widely held view that over the next few decades these countries should focus exclusively on the promotion of growth unconstrained by low-carbon considerations and on adaptation measures to bolster their future resilience to climate change impacts, needs to be reconsidered.

19. E.g. Brown, Seymour and Peskett (2008) and Funder (2009) fur further elaboration. For alternative critical perspectives see Leach and Scoones (2013) and Fairhead, Leach and Scoones (2012).

Fortunately, there are a number of good economic reasons why it could be in LDCs' own self-interest to adopt a low-carbon growth strategy at an early stage. In particular, (i) the large potential for low-cost mitigation measures in the developing world including LDCs provides opportunities for substantial mutual gains from carbon credit transactions between developed and developing countries; (ii) choosing low-carbon modes of development now will reduce the economic burden of GHG gas mitigation in the future by avoiding a high-carbon technology lock-in; (iii) the avoidance of potential adverse impacts on future export growth performance in the case of border tax adjustments and shifts in consumer preferences to low-carbon varieties in other countries; (iv) the realization of gains from lower outdoor / indoor pollution; and (v) improvements in energy security and the relaxation of foreign exchange constraints due to less dependence on fossil fuel imports.

But how pro-poor is the transition to a low-carbon growth path? The existing literature on pro-poor low-carbon development identifies a range of clear synergies between mitigation and poverty reduction objectives, but as the selective discussion of the prospects for the transition to a pro-poor low-carbon path in the agriculture, forestry and energy sectors of low-income countries in this chapter indicates there are also trade-offs. A narrow conception of pro-poor low carbon growth strategies that focuses exclusively on the implementation of coincidental win-win measures aims too short, if redistributive measures are feasible that could reverse the ultimate equity outcomes of policies with high mitigation impact but adverse primary impacts on poverty. The removal of fossil fuel subsidies and the introduction of a carbon tax discussed in this chapter illustrate the point. The direct price impacts of these mitigation policies are bound to hit the poor along with the better-off, but the joint use of distributive measures could in principle generate a positive net impact on the poor. More generally, multiple policy objectives call for the use of multiple policy levers.

The key message of this chapter is that a success of the adoption of pro-poor low-carbon strategies by low-income countries with significant mitigation potential along the lines outlined above requires development cooperation efforts between high- and low-income countries on an unprecedented scale. This includes the completion and implementation of a comprehensive global climate agreement with binding targets and effective and sufficiently funded mechanisms for the transfer of carbon finance flows as an essential prerequisite.

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## Chapter 7

# Structural Transformation, the Quality of Growth and Employment Outcomes

Xavier Cirera[1]

## 1. Introduction

The emphasis in economic growth as the main driver of economic development has been shifting in the last decade to include a more nuanced view of the characteristics of the economic growth process. As a result, more attention is being paid to understanding the "quality" of economic growth in terms of facilitating development outcomes. Chief among these elements is the impact of economic growth on the quality of employment.

Traditional economic development models *a-la-Lewis* (1954) link the process of economic development to the type of economic growth experienced, which translates into changes in standards of living through a process of structural change. In these models, economic development can be characterized by the reallocation of employment from low productivity "traditional" sectors, such as agriculture, to high productivity "modern" sectors, such as manufacturing. As productivity growth in agriculture accelerates, labor is transferred from agriculture to industry. Accordingly, when the share of employment in higher productivity sectors grows, more people are employed in higher wage sectors and enjoy better labor conditions. Structural change, therefore, allows the linking of economic growth to the quality of employment by looking at the type of sector productivity growth and reallocation of factors of production that drives the economic growth process.

One critical driver of economic growth in the last decade in developing countries, especially in Africa and Latin America, has been the large export boom in primary commodities. This has resulted in further specialization

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of the production base of these countries in natural resources and agriculture. One risk of this pattern of growth is that it potentially locks employment in some of the poorer countries into low productivity sectors, minimizing the transformational potential of employment growth in reducing poverty and vulnerability. This type of "negative" structural change has been documented empirically by some authors (see for example McMillan and Rodrik 2011 for Latin America and Africa).

The objective of this paper is to shed some light on the link between structural change and employment outcomes, such as unemployment and some indicators of the quality of employment. We complement the existing literature by analyzing structural change beyond the reallocation of employment across sectors and investigate the impact of structural change on different labor outcomes. Specifically, we focus on two key elements. First, we test whether the pattern of growth in developing countries is one of "jobless" growth. Second we analyze one dimension of labor quality where there is data available, security of tenure and career prospects (UNECE 2010), using indicators such as unemployment, informality of employment or vulnerability of the labor force.

The paper is structured as follows: Section 2 briefly summarizes some of the literature on structural change and the links to labor outcomes. Section 3 describes the dataset used. Section 4 describes the evolution of several indicators of employment quality and based on the results, estimates a measure of structural change. Section 5 empirically analyzes the link between the type of growth pattern and employment quality indicators. The last section provides some brief conclusions.

## 2. Structural transformation, economic growth and labor outcomes

Several studies have analyzed the process of structural change in developing countries. These are mainly motivated by a concern about the patterns of production common in some developing countries that are based on primary commodities and low sophistication/ technological intensity products. Key among these concerns is the continuous decline in the importance of the manufacturing sectors in the economy in some countries.

Growth in the manufacturing sector is credited with having significant positive economic and social spillover effects into other sectors and the entire economy. Kaldor (1967) stated through his "growth laws" that growth in the industrial and manufacturing sector is correlated with larger economy-wide growth. Increasing returns to scale and learning by doing imply that growth in the manufacturing and industrial sector translates into significant productivity growth (Kaldor 1967). In addition, other authors have suggested that manufacturing employment growth helps to create a middle class that forces institutional improvements, resulting in further growth and better living standards. As a result, a strand of the development economics literature has emphasized the importance of the manufacturing sector as the critical element for structural change and a key engine for the improvement of labor standards and institutions.

Szirmai (2012), for example, looks at the issue of structural change across regions. The author suggests that Africa and some Latin American countries have become an exception in terms of structural change. While between 1980 and 2005 the share of manufacturing in total output continued to increase in many Asian economies, there has been a process of deindustrialization in Latin America and Africa. Concretely, in the 22 African countries for which data was available, manufacturing output ranged between 8.5% and 13.3% of GDP, with an 11% average for the continent. Memedovic and Lapadre (2010), focusing mainly on sub-Saharan countries, identified three different periods of structural change. The first, in the 1970s, corresponded to strong increases in value added, extractive industries. The second occurred in the period 1980-1995 with a large expansion of the services sector, which was later negated after 1995, as regional specialization in raw material production deepened, to the detriment of manufacturing and services.

In a recent study McMillan and Rodrik (2011) have empirically analyzed the issue of structural change for a sample of developing countries. The authors calculate labor productivity changes for a set of countries with available information for the period 1990-2005. The authors follow the standard decomposition of aggregate labor productivity growth in two components (see Section 3 for a detailed explanation). The first component is the growth that is accounted for within-sector productivity growth, which is related to increases in sector efficiency over time and rationalization of productive units as countries face, for example, more competition from opening up markets and integration into the world economy.

The second component, between-sector growth, is related to the contribution of labor productivity growth that corresponds to labor shifting to higher productivity sectors – the structural change component. This labor reallocation measure is the critical element in understanding the direction of labor flows and the potential impact on labor outcomes. McMillan and Rodrik (2011) find a negative contribution of the structural change component - the between-sector measure- to average labor productivity growth in Latin America and Africa, while this relationship is found to be positive in Asia. This would suggest that labor reallocations in the Latin American and African regions are mainly directed to less productive sectors. The authors show that the main factors that determine this "negative" structural change pattern are high commodity prices and the pattern of comparative advantage in these regions.

These findings are, however, contested by other authors. While there is a significant amount of evidence indicating the loss of importance of the manufacturing sector in most economies, other studies suggest that the structural change component is positive, although small, in most developing countries. Regional aggregate results mask significant differences across countries. For example, the estimated structural change component in McMillan and Rodrik (2011) for Africa is positive in four out of the nine countries of the sample. More recently, Kucera and Roncolato (2012) estimate the structural change decomposition for a sample of countries and find that the structural change component has contributed positively to labor productivity growth in most countries. A similar result is reached in the World Development Report (World Bank 2013), which implies that some of the regional average results might be driven by a few large countries. Kucera and Roncolato (2012) re-estimate the labor productivity growth decomposition with the McMillan and Rodrik (2011) dataset adding an interactive term, "within*between" components, to capture whether the reallocation of labor happens to sectors with declining or growing labor productivity. The results suggest that with the interaction term, the negative structural change finding in McMillan and Rodrik (2011) is significantly reduced.

In addition to whether the structural change component is positive or negative, it is important to compare its contribution to the within-sector growth component. This is especially important when considering potential labor outcomes. Kucera and Roncolato (2012) emphasize that the within-sector component tends to be larger for most countries than the structural change component. This finding is also corroborated empirically by Ocampo et al. (2009) as well as Timmer and de Vries (2009). The relevance of these results is related to the fact that often within-sector productivity growth is explained by a significant adjustment of operating firms in the sector. More productive firms expand and less productive firms exit the market (Foster et al. 2008). This is translated into significant reallocation of workers, with some exiting the labor market or becoming employed elsewhere. The total net effect is unclear, and when employment creation is low in most productive firms, the resultant pattern of productivity growth is one of potential "jobless" growth.

The hypothesis of "jobless" growth has been analyzed in the literature, but it does not appear to be supported by the evidence, which finds a positive correlation between output growth and employment growth. Nevertheless, Kucera and Roncolato (2012) find a weaker relationship between output growth and employment growth and a negative relationship between productivity growth and employment growth in developing countries. The authors suggest that "jobless" growth may be a problem for some developing countries, especially in Asia.

One problem with some of this literature is the fact that the dichotomy between manufacturing, modern sectors, and agriculture, natural resources assumed in some studies, has become blurred in the last decades with the emergence of services. The services sector is the largest sector in terms of creating added value and employment in almost all developed and developing countries, and only in some countries with large agriculture and natural resource sectors such as DRC, Ethiopia or Liberia, does the services sector not dominate. In addition, the services trade has expanded significantly in recent years in line with the emergence of global production fragmentation. This implies that when analyzing structural change, rather than looking at manufacturing shares only as the "modern" or high productive sector, one must consider more generally the reallocation of employment from low to high productivity sectors. Including services makes the analysis challenging, because some knowledge services are highly productive while some other sector services are likely to have low productivity.

Overall, this literature suggests that there is a link between the pattern of economic and productivity growth and labor outcomes. Most of the studies, however, focus on the impacts on employment creation. One assumption when it comes to considering the quality of employment is that employing more people in higher productivity sectors not only creates employment and raises wages but also reduces vulnerability or informality by strengthening labor market institutions. In addition, employing more people in natural resource-related sectors might increase worker vulnerability and adversely affect labor institutions in the medium run by for example increasing income inequality and reducing the size of the middle class. The final labor outcome, however, depends on the interaction between labor sector changes and labor institutions.

When thinking about labor outcomes it is important to consider quality attributes. Employment changes can have different implications depending on whether they are based on bad working conditions, lack of security or child labor. Therefore, it is important to analyze whether the impacts on labor outcomes from structural change translate into better or worse labor quality indicators.

Defining labor quality, however, is a complex task since it has many dimensions. UNECE (2010) defines seven dimensions of the quality of employment: 1) safety and ethics of employment, 2) income and benefits from employment, 3) working hours and balancing work and nonworking, 4) security of employment and social protection, 5) social dialogue, 6) skills development and training, and 7) workplace relationships and work motivation. Although, including most of the potential dimensions are necessary in providing an overall picture of employment quality, the main difficulty of implementing this framework is the lack of available indicators, especially for developing countries. In addition, one additional dimension of quality that also needs be considered is the (lack of) opportunities in the labor market for new entrants.

In this paper we operationalize the concept of labor quality by using a set of available indicators for developing countries produced by the ILO: specifically youth unemployment, informal employment and vulnerable employment. These correspond mainly to elements of job security and job opportunities, although they also have embedded some elements such as social protection. In the next sections we look empirically at this issue and analyze the impact of different growth patterns on labor outcomes associated to unemployment and these quality of employment indicators.

## 3. Data and evolution of labor outcomes indicators

### *3.1 Data sources*

We use two main sources of data for the empirical analysis. Labor outcomes data is from the ILO Key Labor Market Indicators (KLMI) available at LABORSTAT.[2] We focus on four main indicators: unemployment, youth unemployment, employment in the informal sector and vulnerability of employment.

The first indicator measures the unemployment rate and helps to test the hypothesis of "jobless" growth: whether the impact of productivity growth is mainly in reducing labor intensity with an overall zero or negative effect on employment. The second indicator is the youth unemployment rate, those unemployed between 15 and 24 years old, which we use to analyze whether certain patterns of economic growth are more conducive to allowing entry for younger people into the labor market. The third indicator, which we use to analyze the impact on the quality of employment, is the number of people employed in the informal sector.[3] This allows us to analyze the effect of growth on reallocating labor from the informal to the formal sector. The last indicator used to measuring the quality of employment is the share of vulnerable employment in total employment. Vulnerable employment is defined as those self-employed without employees and those contributing to family labor. Although self-employment should not necessarily be considered a more vulnerable category of employment, especially in developed countries, the evidence suggest that as countries develop, fewer people are self-employed in traditional activities or employed in helping with family activities, and more are employed in industry and services.[4] As discussed above, while this set of indicators is not a comprehensive list of proxies that could capture all dimensions of the quality of employment, they measure some of the most important dimensions around the quality of employment, and more importantly, provide enough data to allow some empirical analysis.
Table 1 tabulates basic statistics for unemployment and the quality of employment variables in the dataset by income group as determined in

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2. www.ilo.org/kilm

3. The ILO defines informal employment as "the estimated number of persons in informal employment to the total number of employed persons in the non-agricultural sector". http://laborsta.ilo.org/informal_economy_E.html

4. www.ilo.org/kilm

2010. The most complete series for a larger number of countries are unemployment rates, followed by youth unemployment. Data for vulnerable employment is available for 162 countries. In the case of informal employment, data is scarce and only available for 41 countries, 15 of which have more than one observation over time and only three of which are high-income countries. Some of the data for low-income countries is rarely available and in some cases presents quality problems. As a result, in the empirical analysis we use one low-income group that includes low- and low-middle income countries. Also, one important element to clarify is the need to contextualize some definitions of the variables. For example, low unemployment rates in low-income countries are more the result of having fewer people satisfying the definition of being formally unemployed, while being underemployed in rural areas. While unemployment is not likely to be a good measure of underemployment, it is a critical measure to test the hypothesis of "jobless" growth and the transition of employment to the formal sector.

**Table 1. Basic statistics on quality of employment variables**

| Income group | Stats | unemployment | Youth unemployment | Informal employment | Vulnerable employment |
|---|---|---|---|---|---|
| **High income** | Mean | 7.69 | 16.62 | 32.96 | 12.07 |
| | N | 1046 | 932 | 15 | 778 |
| | std. Dev | 4.26 | 8.81 | 10.98 | 7.05 |
| **Low income** | Mean | 4.95 | 10.06 | 67.08 | 79.30 |
| | N | 78 | 42 | 6 | 51 |
| | std. Dev | 4.25 | 9.46 | 10.50 | 13.83 |
| **Low middle income** | Mean | 10.57 | 20.82 | 56.27 | 49.36 |
| | N | 403 | 241 | 41 | 287 |
| | std. Dev | 9.13 | 13.98 | 13.68 | 15.78 |
| **Upper middle income** | Mean | 11.29 | 23.43 | 46.49 | 30.46 |
| | N | 635 | 449 | 85 | 448 |
| | std. Dev | 7.21 | 13.37 | 12.85 | 13.12 |
| **All** | Mean | 9.19 | 18.90 | 48.67 | 26.37 |
| | N | 2162 | 1664 | 147 | 1564 |
| | std. Dev | 6.60 | 11.53 | 14.83 | 20.51 |

Source: Author's own elaboration from KILM (ILO 2013)

Data on value added, labor shares, GDP, population, endowment and sector shares has been obtained from the World Development Indicators (World Bank 2013). We use data for the period 1990-2011, covering a period of more than two decades and all countries. Data on employment shares by aggregate sector is very limited to a few observations and not for all countries, which makes estimating measures of structural change very challenging. All GDP variables are in 2005 US$ prices. In order to capture endowments we use population, for labor endowments, and natural resource rents as a percentage of GDP, for natural resource endowments.

Since labor market outcomes also depend on labor regulations, we use the rigidity of the labor market regulations index developed by the Fraser Institute as part of the Economic Freedom Indicators (Gwartney et al. 2012). This indicator ranges from 0 to 10, with higher scores indicating less rigidity of labor regulations. The index is a composite that includes rigidity in hiring regulations and minimum wage, hiring and firing regulations, centralized collective bargaining, working hour regulations, mandated cost of worker dismissal and conscription. Unfortunately the dataset is available year by year only from 2000. Therefore, the empirical analysis using this variable uses mainly data from 2000 onwards.

### *3.2 Evolution of labour outcome indicators*

Table 2 shows the incidence of the quality of labor indicators in terms of top and bottom countries, while Table 3 shows the evolution over time of these indicators by income level group. Regarding unemployment rates, these appear above 30% in a few developing countries from all regions. However, when looking at countries with the lowest unemployment rates the data indicates that Gulf States and some low-income SSA countries have rates close to zero. While this is likely to reflect the reality for Gulf States; for low-income SSA countries this suggests the extent of unemployment discussed earlier. This makes comparisons between countries in this region difficult, suggesting a need to focus on changes over time of these indicators. When looking at evolution over time, we find that unemployment rates are larger in the last five-year period than in the first five-year period for high-income and upper-middle countries. This is largely related to the impact of the 2008 financial crisis, but it also shows significant weaknesses of the growth pattern in these countries in relation to employment creation.

In regard to vulnerable employment, this is concentrated mainly in low-income agriculture intensive countries in SSA, where most people do not have access to formal employment and work in subsistence agriculture. On the other hand, it is lower in Gulf States where most people are formally employed by companies. Vulnerable employment rates are low in high-income countries and very high, more than 50% in low-income countries, suggesting that as countries develop vulnerability of employment decreases. Looking over time, vulnerable employment rates have decreased across countries at all income groups, however, this reduction has been disappointing, especially for low income countries with a modest weighted average decrease of 1.18 points. Youth unemployment follows a similar pattern to unemployment rates in terms of country incidence. Youth unemployment tends to be larger than adult unemployment. It also has increased in high-income countries as compared to the second part of the 1990s.

**Table 2. Top and bottom 5 countries based on selected labor indicators**

| Unemployment (%) | | Informality (%) | | Vulnerable employment (%) | | Youth unemployment (%) | |
|---|---|---|---|---|---|---|---|
| Djibouti | 51.50 | India | 83.50 | Burundi | 94.40 | Kosovo | 72.64 |
| Kosovo | 47.43 | Mali | 81.80 | Chad | 93.70 | Marshall Islands | 63.40 |
| Macedonia | 33.93 | Bolivia | 75.10 | Burkina Faso | 93.03 | Macedonia | 60.25 |
| Armenia | 32.33 | Madagascar | 73.60 | Rwanda | 92.50 | Guadeloupe | 56.49 |
| Solomon Islands | 31.90 | Peru | 73.33 | Sierra Leone | 92.40 | Bosnia | 55.38 |
| Benin | 1.10 | Timor-Leste | 17.80 | Bahrain | 2.11 | Nepal | 3.00 |
| Rwanda | 1.05 | Moldova | 15.90 | Kuwait | 2.10 | Qatar | 1.45 |
| Kuwait | 0.98 | Macedonia | 12.60 | Tuvalu | 2.00 | Benin | 1.25 |
| Chad | 0.70 | Poland | 10.95 | U. A. E. | 1.40 | Burundi | 0.70 |
| Burundi | 0.50 | Serbia | 6.10 | Qatar | 0.43 | Rwanda | 0.70 |

Source: Author's own elaboration from KILM (ILO 2013)

**Table 3. Evolution of labour indicators 1995-2010**

| | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | Difference 2007-11/ 1995-99 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Unemployment** | | | | | | | | | | | | | | | | | | |
| High income | 8.24 | 8.74 | 8.07 | 8.06 | 8.21 | 7.63 | 7.56 | 7.87 | 7.90 | 7.55 | 7.12 | 6.45 | 5.76 | 5.76 | 7.97 | 8.66 | 8.35 | -0.96 |
| Low and low middle income | 8.41 | 8.27 | 11.29 | 7.60 | 9.43 | 8.33 | 10.86 | 13.32 | 9.49 | 11.30 | 8.75 | 10.50 | 10.10 | 12.14 | 10.14 | 7.27 | 6.97 | 0.32 |
| Upper middle income | 10.56 | 10.85 | 12.27 | 11.81 | 12.78 | 12.00 | 12.42 | 11.99 | 12.98 | 12.26 | 11.14 | 11.16 | 10.56 | 10.92 | 10.85 | 10.81 | 10.76 | -0.87 |
| **Youth unemployment** | | | | | | | | | | | | | | | | | | |
| High income | 17.19 | 17.60 | 16.70 | 17.03 | 17.02 | 15.53 | 16.50 | 17.26 | 17.39 | 16.91 | 15.82 | 14.62 | 13.83 | 13.74 | 18.45 | 19.33 | 19.09 | -0.22 |
| Low and low middle income | 17.52 | 13.15 | 21.64 | 16.83 | 18.62 | 14.58 | 18.35 | 21.83 | 19.56 | 21.73 | 19.02 | 20.00 | 23.21 | 25.69 | 23.03 | 19.66 | 15.52 | 3.87 |
| Upper middle income | 19.64 | 22.34 | 22.11 | 23.86 | 26.10 | 23.08 | 25.79 | 25.21 | 24.37 | 24.85 | 24.28 | 24.27 | 22.92 | 22.81 | 23.95 | 25.93 | 24.47 | 1.20 |
| **Vulnerable employment** | | | | | | | | | | | | | | | | | | |
| High income | 12.07 | 12.79 | 12.00 | 12.53 | 12.73 | 12.30 | 12.39 | 12.29 | 12.35 | 11.68 | 11.50 | 11.68 | 11.07 | 10.82 | 10.82 | 10.84 | 10.73 | -1.57 |
| Low and low middle income | 47.56 | 57.32 | 46.12 | 53.09 | 53.10 | 55.47 | 57.24 | 54.87 | 60.62 | 57.40 | 62.04 | 55.98 | 50.01 | 48.12 | 50.11 | 53.66 | 49.38 | -1.18 |
| Upper middle income | 31.91 | 32.61 | 30.97 | 31.15 | 32.98 | 32.43 | 30.87 | 29.93 | 32.33 | 30.86 | 31.19 | 29.55 | 28.67 | 27.99 | 26.80 | 26.93 | 23.33 | -5.18 |

Source: Author's own elaboration from KILM (ILO 2013)

**Figure 1. Evolution of informality countries with data available**

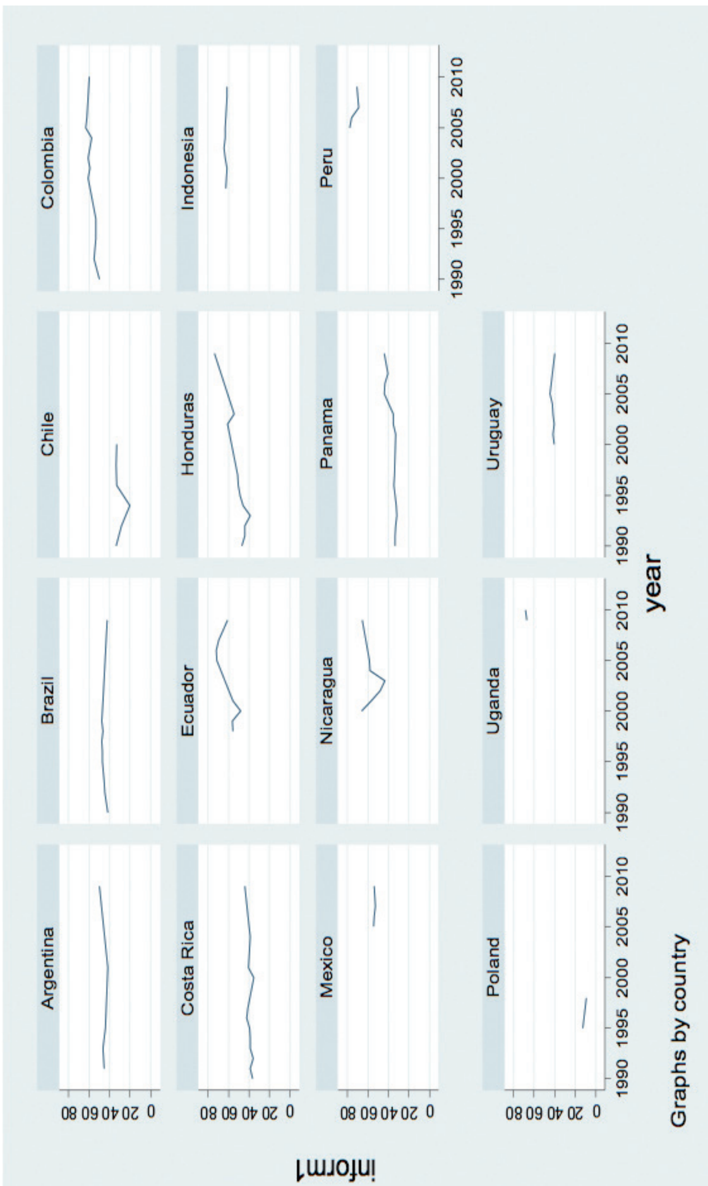
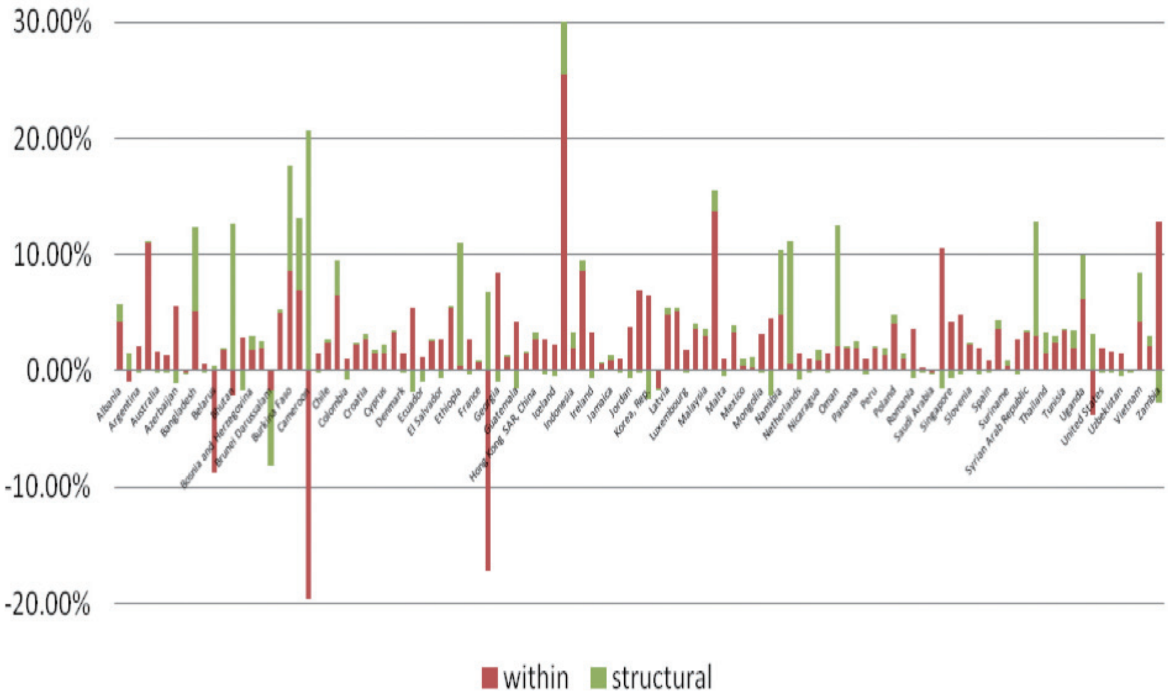


**Figure 2. Value added per worker growth- within[a] and structural components**




[a] Within component relates to productivity growth within the sector, structural component is the growth component from reallocation across sectors.

Regarding informality of employment, this is very large especially in some middle income countries such as India or Peru and other low income countries across all continents, suggesting that informality might be embedded in particular institutional contexts. In terms of low-informality for the countries with data available, which mainly excludes high income countries; this appears low in Eastern Europe and former Soviet Union republics. Figure 1 shows the evolution of informality for those countries with more than one observation over time. Interestingly, informality appears to have increased or stayed at similar levels in most countries.

These indicators suggest that the pattern of economic growth has not resulted in substantial improvements in the quality of employment indicators used in this analysis. This is likely the result of the recent financial crisis, but also it suggests that some of the high growth in developing countries have perhaps not had the full transformative potential desired for these countries.

## 4. Quality of labor and structural change across developed and developing countries

### *4.1 Measuring Structural change*

In order to characterize structural change we calculate direct measures of structural change following the decomposition of labor productivity growth suggested in the literature (McMillan and Rodrik 2011). The decomposition separates the aggregate growth in value added per worker into two components (equation 1); where *VL* is value added per worker in sector *i* and year *t* and *s* is the employment share in sector *i* and year *t*. The first component, the within-sector productivity growth, captures the part of value added growth per worker that corresponds to sectoral productivity growth. The second component, the between or structural change growth, captures the part of the productivity growth that corresponds to labor shares being reallocated to higher or lower productivity sectors. When the structural change component is negative, labor is being reallocated into lower productivity sectors.

$$\Delta VL_t = \sum_{i=n} s_{it} \Delta VL_{it} + \sum_{i=n} \Delta s_{it} VL_{it} \qquad \textbf{(1)}$$

A critical element in calculating the decomposition in (1) is the choice of sectors. Data on sector employment share is very scarce. Some studies use a sample of countries with detailed sector data from existing input-output tables (McMillan and Rodrik 2011; Kucera and Roncolato 2012; Timmer and de Vries 2009). The advantage of using more sectors is that it allows a more nuanced description of the productivity growth pattern. However, it restricts the analysis to a very small number of countries, usually larger and higher income countries.[5] Therefore, in order to have a measure that we can extend to as many countries as possible and can be used in the econometric analysis, we estimate a simpler version of the decomposition based on only two sectors, agriculture vs. non-agriculture. This reflects a more traditional structural change measure of reallocation away from agriculture, but also implies masking large within-sector heterogeneity in the non-agriculture sector.

To estimate equation (1) we use sector employment shares and value added for the agricultural and other sectors available in WDI (2013). We use those countries with at least two years of information available. In total we have information for 117 countries, 41 high income, 37 upper middle-income, 28 low middle-income and 11 low-income countries. The period analyzed varies country by country, but in around 70% of cases we are able to measure value-added peer worker change from late 1990s or early 2000s to the period 2007-2011.

### *4.2 Structural change measures*

Table 4 shows the results aggregated by income group of applying the decomposition proposed in equation (1) to the dataset. For the analysis, we have excluded outlier countries with very low or very large components – values below the 1st percentile and above 99th percentile since these are likely to indicate the bad quality of the data.[6] The estimates are a weighted average using country GDP as weights.

5. McMillan and Rodrik (2011) carry out the analysis for 11 countries, primarily middle-income countries.

6. Almost all of these outliers are in the low-income group and therefore only affect the results for this group. When including outliers, the results for the low-income group suggest a structural change component of 5% and within growth of 6.25%.

**Table 4. VA decomposition by income group[a] (GDP weighted)**

| | VA/L% | within | structural |
|---|---|---|---|
| High income | 1.54% | 1.65% | -0.11% |
| Low income | 11.94% | 4.24% | 7.70% |
| Low middle income | 15.57% | 12.30% | 3.28% |
| Upper middle income | 4.78% | 3.41% | 1.37% |

[a] Excludes outliers defined as those countries with structural change component in the 1st and 99th percentile. Source: Author's own elaboration from WDI.

Value added per worker increased very modestly in high-income countries and very significantly in low middle-income and low-income countries. In general within-sector productivity growth is larger than structural change, with the exception of low-income countries. The size of the structural change coefficients is consistent with economic development models where structural change components are larger at lower levels of development, since more people are reallocated to higher productivity sectors outside agriculture. In the case of high-income countries the structural change term is even negative. These results are different than McMillan and Rodrik (2011) and more in line with Kucera and Roncolato (2012) aggregates. In both cases, these use a more disaggregated sector dataset, although for a smaller set of countries. Structural change estimates are also positive for SSA in our dataset, where value added per worker increased by 3.18%: 2.45% corresponding to within-sector growth and 0.72% to structural change.

Individual results are plotted in Figure 2 above, excluding countries with extreme values, and the results for top and bottom performing countries are summarized in Table 5. India is the country with the largest value added per worker growth, mainly explained by high productivity growth of the non-agricultural sector, services. A similar pattern, although with lower growth is followed by Maldives. In terms of structural change Cameroon, Bhutan, Ethiopia, Nepal and Oman are the countries with larger positive structural change; and the Dominican Republic, Morocco, Korea, Zambia and Brunei the ones with the larger negative structural change. In 47 countries structural change is negative, while in the remaining 64 structural change is positive, which suggest large diversity of results regarding structural change. Finally and in line with the literature, within productivity growth is the main driver of value added per worker growth. In 97 of the 117 countries with data available, within productivity growth is larger than the structural change component.

**Table 5. Top and bottom countries' VA decomposition**

| VA/L% | | within | | Structural change | |
|---|---|---|---|---|---|
| India | 31.53% | India | 25.53% | Cameroon | 20.65% |
| Burkina Faso | 17.65% | Maldives | 13.65% | Bhutan | 12.64% |
| Maldives | 15.53% | Zambia | 12.83% | Ethiopia | 10.64% |
| Cambodia | 13.11% | Armenia | 11.07% | Nepal | 10.45% |
| Tanzania | 12.79% | Senegal | 10.57% | Oman | 10.33% |
| Ukraine | -0.69% | Bhutan | - 2.15% | Dominican Rep. | -1.77% |
| Kyrgyz Republic | -1.52% | Ukraine | -3.79% | Morocco | - 2.10% |
| Brunei | -8.09% | Belarus | -8.82% | Korea, Rep. | -2.43% |
| Belarus | -8.37% | Gabon | -17.15% | Zambia | -2.77% |
| Gabon | -10.30% | Cameroon | -19.68% | Brunei | -6.42% |

Source: Author's own elaboration from WDI

These results suggest significant heterogeneity of experiences regarding structural change. This tends to be larger in low-income countries, but within each income group there are significant differences. More importantly, within-sector productivity growth tends to be the main driver of productivity growth.

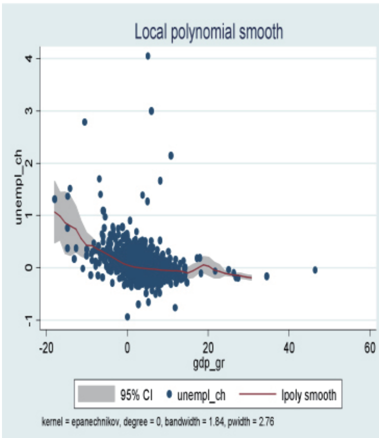
### *4.3 Unemployment, quality of employment and economic growth*

Before looking more formally at how different patterns of economic growth affect the quality of employment, we briefly explore whether countries changes in labor outcomes indicators are highly correlated with economic growth. Figure 3 shows non-parametric plots of changes in the four labor quality indicators and the average rate of growth. Specifically, we compute the year-to-year rate of change of the four variables average in the 1990s and the 2000s, and plot these rates against the average rate of growth for the period for each country. This allows us to explore whether it is likely that economic growth is the main driver of the path in these variables.

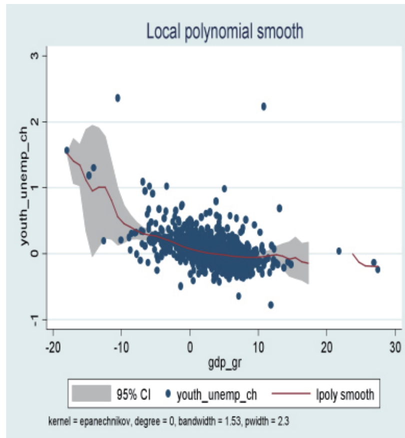
Panels (a) and (c) show the plots for unemployment rates and youth unemployment rate changes. Although, some of the points lie outside the confidence interval, the plots depict a potential negative relationship, and suggest that economic growth might be an important driver in reducing both types of unemployment. Panels (b) and (d) for informality and vulnerable employment, on the other hand, show no clear relationship between economic growth and changes in these variables. This suggests that other factors might be important drivers of change in these labor outcomes.

**Figure 3. Non-parametric plots**

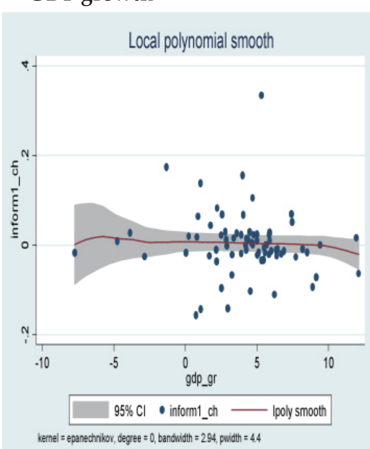
**(a) Unemployment rate change and GDP growth**



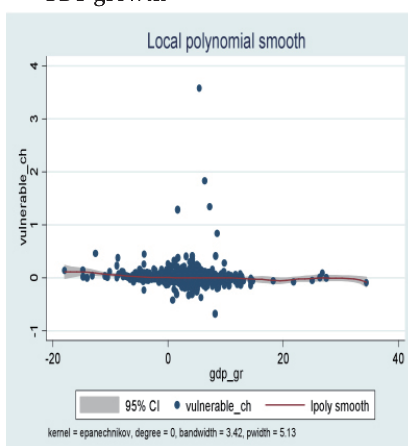

**(b) Youth unemployment rate change and GDP growth**




**(c) Informality rate change and GDP growth**




**(d) Vulnerable rate change and GDP growth**




The relationship between growth, structural change and labour outcomes are further explored in the next section.

## 5. Growth pattern, structural change and labor outcomes

### *5.1 Specifications*

In this section we examine empirically the impact of the pattern of growth and structural change on different quality of labor outcomes. We use a two-stage methodology. In the first stage, we estimate a reduced form equation where labor market outcomes are a function of income per capita, income growth and structural characteristics of the economy. In the second stage we analyze directly the impact of structural change measures on labor outcomes.

Specifically in the first stage we estimate equation (2) below:

$$L_{it} = \beta_0 + \beta_1 GDP/cap_{it} + \beta_2 \Delta GDP_{it} + \sum \delta_k Str_{kit} + \lambda_i + \lambda_t + u_{it} \qquad (2)$$

Each labor outcome (*L*) in country *i* in year *t* is explained by a set of variables. We proxy structural characteristics of the economy (*Str*) using labor endowments (population), rents from natural resources as a share of GDP, manufacturing value added as a share of GDP and agriculture value added as a share of GDP. These variables attempt to capture how differences in the pattern of sectoral growth (i.e. growth via manufacturing sector or agriculture) impact quality of labor outcomes.

We also use an augmented specification that takes into account the degree of flexibility of the labor market as defined in section 3. Unfortunately, for this variable we only have data available from 2000, which represents a significant drop in the number of observations. This augmented specification also includes an interactive term between GDP growth and a dummy for SSA and a dummy for the Latin America and the Caribbean Region. This interactive term aims at capturing whether the effect of economic growth is different in these regions given the more natural resource-based economic growth prevalent in these economies.

The final dataset covers the period 1990-2001 and includes more than 160 countries. Data availability for labor outcomes is, however, problematic for many low income and developing countries, limiting, therefore, the size of the dataset to be used for the estimations. Equation (2) is estimated in logarithms and using country fixed effects and year dummies. In order to estimate directly the impact of structural change on labor outcomes in a second stage we average the dataset and add as regressors the different structural change components estimated from equation (1). The advantage of this approach is that it allows the use of direct structural change measures. The main disadvantage, however, is the significant loss of observations since we lose the panel structure and

rely only on a cross-section of countries.
Specifically, we estimate equation (3):

$$L_i = \beta_0 + \beta_1 GDP/cap_{it} + \beta_2 Growth_i + \beta_2 lab\_freedom_i + u_i \qquad (3)$$

We use different proxies for economic growth and sources of growth. The first specification uses GDP growth, the second value added per worker growth; then we use the measure of structural change calculated above and the measure of within-sector productivity growth. These two decomposition measures are then interacted with a dummy for low-income countries to test whether their effects on labor outcomes are different at lower levels of development. All variables are averaged for the period 1990-2011. In total, we have data for around 100 countries, with the exception of informal employment that given the low availability of data, only 36 observations, we omit from the analysis in this section.

***5.2 Results***

Table 6 shows the main results for the four types of labor outcomes. Looking at the estimates of the base line specification that maximizes the number of observations (odd columns), both the level of GDP per capita and the rate of economic growth reduce unemployment and youth unemployment. Interestingly and in line with the non-parametric plots in the neither previous section, neither income per capita nor GDP growth appear to be robust predictors of employment in the informal sector or vulnerable employment.

The results regarding the structure of economic growth and endowments are also interesting. Countries with larger labor endowments measured by population appear to have larger unemployment, youth unemployment, informal employment and vulnerable employment; although for youth unemployment and vulnerable employment the estimated coefficients are only marginally significant. The coefficient on natural resource rents to proxy for the size of the extractive sector is positive but only marginally significant for youth unemployment. A more puzzling result is related to the impact of manufacturing value added. The estimated coefficients are positive and marginally significant for unemployment and youth unemployment. This would suggest that increases in manufacturing productivity might reduce labor intensity and generate unemployment, although the low significance of the coefficients suggests that we should interpret the results with caution. Finally, agriculture value added does not appear to explain any of these labor outcomes.

Looking at the augmented specifications (even columns) allows us to analyze the impact of different labor institutions, proxied by the labor regulations freedom index. Including this variable, however, reduces significantly the number of observations to half of the sample. The labor institutions index does not appear to be a significant predictor of these labor outcomes; and it is only negative and marginally significant for the unemployment rate specification, suggesting that more flexible labor markets have lower unemployment rates.

**Table 6. Fixed effects estimates: Quality of labor indicators**

| | (1) log (unemp) | (2) log (unemp) | (3) log(youth_ unempl) | (4) log(youth_ unempl) | (5) log (informal) | (6) log (informal) | (7) log (vulnerab) | (8) log (vulnerab) |
|---|---|---|---|---|---|---|---|---|
| log(GDP_cap) | -0.594** | -1.272*** | -0.847*** | -1.536*** | -0.369 | -0.786 | -0.220 | -0.166 |
| | (0.268) | (0.297) | (0.189) | (0.285) | (0.263) | (0.582) | (0.141) | (0.215) |
| GDP_growth | -0.00923** | -0.0108** | -0.0145*** | -0.0164*** | 0.00529* | 0.0124 | 0.00198 | 0.00408 |
| | (0.00388) | (0.00415) | (0.00386) | (0.00442) | (0.00263) | (0.0242) | (0.00186) | (0.00342) |
| log(popul) | 0.839** | 0.425 | 0.666* | 0.762 | 2.085*** | 1.326* | 0.496* | 0.417 |
| | (0.327) | (0.612) | (0.358) | (0.706) | (0.607) | (0.692) | (0.266) | (0.439) |
| log(natres_rents) | 0.0167 | 0.0160 | 0.0270* | 0.00721 | 0.0411 | 0.0767* | -0.00289 | 0.0199 |
| | (0.0142) | (0.0243) | (0.0150) | (0.0336) | (0.0422) | (0.0384) | (0.0131) | (0.0214) |
| log(manuf_VA/GDP) | 0.199* | 0.218* | 0.314** | 0.209 | -0.0812 | -0.638*** | 0.0129 | -0.0859 |
| | (0.111) | (0.127) | (0.121) | (0.140) | (0.117) | (0.112) | (0.0618) | (0.0649) |
| log(agri_VA/GDP) | -0.114 | -0.170 | -0.127 | -0.170 | -0.117 | 0.116 | 0.00206 | 0.0890 |
| | (0.0878) | (0.103) | (0.0856) | (0.110) | (0.0900) | (0.100) | (0.0568) | (0.0641) |
| log(lab_freedom) | | -0.221* | | -0.0986 | | -0.0217 | | 0.112 |
| | | (0.114) | | (0.142) | | (0.143) | | (0.0698) |
| GDP_gr*SSA | | 0.00172 | | -0.0223 | | -0.121* | | 0.00311 |
| | | (0.0301) | | (0.0252) | | (0.0630) | | (0.0137) |
| GDP_gr*LAC | | -0.00114 | | 0.0123 | | -0.00415 | | -0.00739** |
| | | (0.00649) | | (0.00767) | | (0.0190) | | (0.00299) |
| Constant | -6.673 | 6.253 | -1.237 | 3.924 | -27.02** | -10.43 | -3.018 | -2.439 |
| | (6.630) | (10.30) | (6.506) | (12.16) | (9.997) | (10.77) | (4.331) | (7.384) |
| Observations | 1764 | 691 | 1359 | 568 | 143 | 74 | 1297 | 583 |
| R-squared | 0.155 | 0.393 | 0.204 | 0.372 | 0.508 | 0.628 | 0.075 | 0.089 |
| Number of i | 161 | 113 | 142 | 97 | 39 | 34 | 136 | 95 |

All specifications with country and year fixed effects. Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

**Table 7. OLS estimates: Unemployment rates**

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| GDP/cap | -0.000115*** | -0.000138*** | -0.000103*** | -0.000103*** | -9.96e-05*** | -0.000107*** |
| | (2.56e-05) | (3.00e-05) | (2.72e-05) | (2.74e-05) | (2.78e-05) | (2.75e-05) |
| GDP_gr | -0.523 | | | | | |
| | (0.331) | | | | | |
| VA/L gr | | -31.71** | | | | |
| | | (14.51) | | | | |
| structural | | | -10.03*** | -10.58*** | | |
| | | | (3.505) | (3.853) | | |
| Struct*low income | | | | 5.647 | | |
| | | | | (12.66) | | |
| within | | | | | 6.970*** | 9.060*** |
| | | | | | (1.999) | (2.525) |
| Within*low income | | | | | | -26.11** |
| | | | | | | (10.09) |
| lab_freedom | 0.559* | 0.755** | 0.564 | 0.528 | 0.563 | 0.501 |
| | (0.327) | (0.377) | (0.368) | (0.367) | (0.378) | (0.367) |
| Constant | 8.596*** | 7.500*** | 7.039*** | 7.241*** | 6.798*** | 7.372*** |
| | (2.057) | (2.141) | (2.069) | (2.043) | (2.088) | (2.057) |
| Observations | 134 | 107 | 107 | 107 | 107 | 107 |
| R-squared | 0.096 | 0.134 | 0.140 | 0.142 | 0.105 | 0.147 |

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

**Table 8. OLS estimates: Youth unemployment rates**

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| GDP/cap | -0.000188*** | -0.000238*** | -0.000184*** | -0.000218*** | -0.000187*** | -0.000236*** |
| | (4.65e-05) | (5.13e-05) | (5.33e-05) | (5.90e-05) | (5.42e-05) | (5.52e-05) |
| GDP_gr | -0.878 | | | | | |
| | (0.745) | | | | | |
| VA/L gr | | -58.87*** | | | | |
| | | (17.14) | | | | |
| structural | | | -6.408 | -2.933 | | |
| | | | (5.134) | (3.486) | | |
| Struct*low income | | | | -124.0** | | |
| | | | | (56.29) | | |
| within | | | | | 0.583 | 0.713 |
| | | | | | (2.966) | (2.639) |
| Within*low income | | | | | | -240.5*** |
| | | | | | | (36.97) |
| lab_freedom | 0.709 | 1.391** | 1.065 | 1.479** | 1.132 | 1.461** |
| | (0.638) | (0.626) | (0.686) | (0.676) | (0.691) | (0.654) |
| Constant | 19.14*** | 15.32*** | 14.58*** | 13.03*** | 14.26*** | 13.66*** |
| | (4.116) | (3.820) | (3.872) | (3.868) | (3.865) | (3.716) |
| Observations | 125 | 104 | 104 | 104 | 104 | 104 |
| R-squared | 0.082 | 0.140 | 0.079 | 0.140 | 0.070 | 0.194 |

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

**Table 9. OLS estimates: Vulnerable employment rates**

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| GDP/cap | -0.00114*** | -0.000915*** | -0.00103*** | -0.00103*** | -0.000968*** | -0.000965*** |
| | (0.000132) | (0.000149) | (0.000147) | (0.000148) | (0.000145) | (0.000140) |
| GDP_gr | 1.882* | | | | | |
| | (0.981) | | | | | |
| VA/L gr | | 137.2** | | | | |
| | | (67.35) | | | | |
| structural | | | -2.421 | -7.792 | | |
| | | | (47.35) | (50.49) | | |
| Struct*low income | | | | 10.50 | | |
| | | | | (96.46) | | |
| within | | | | | 74.35** | 10.68 |
| | | | | | (34.27) | (58.43) |
| Within*low income | | | | | | 123.3* |
| | | | | | | (73.84) |
| lab_freedom | -1.835 | -1.124 | -0.526 | -0.556 | -0.380 | -0.323 |
| | (1.463) | (1.467) | (1.426) | (1.423) | (1.426) | (1.394) |
| Constant | 54.46*** | 45.79*** | 48.19*** | 48.36*** | 43.97*** | 44.82*** |
| | (8.966) | (7.703) | (8.182) | (8.138) | (7.808) | (8.020) |
| Observations | 124 | 100 | 100 | 100 | 100 | 100 |
| R-squared | 0.410 | 0.417 | 0.341 | 0.341 | 0.384 | 0.420 |

Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

The impact of the interactive GDP growth*region dummies does not appear statistically significant for unemployment and non-unemployment rates. In the case of informal employment the SSA interactive term suggests that, at least in SSA, economic growth reduced informal employment. Similarly, economic growth appears to reduce vulnerable employment in Latin America. Finally, manufacturing value added growth reduces informality when we reduce the sample to the 2000s.

Overall, these results suggest that economic growth does not result in "jobless" growth since on average it reduces unemployment rates. This is in line with recent evidence for East Asian countries (Hanusch 2012) and consistent with recent estimates of the elasticities of employment to economic growth in OECD countries (Cazes et al. 2011). It is possible, however, that when TFP growth in the manufacturing sector is large, this results in fewer jobs. On the other hand, large agriculture value added or dependency on natural resources does not seem to impact unemployment rates. Informal and vulnerable employment does not seem to be determined by income growth or income per capita; only by the population size.

Tables 7 to 9 show the OLS estimates for each labor outcome separately. Starting with unemployment rates in Table 7, the results suggest that, as expected, countries with larger income per capita tend to have lower unemployment rates. Interestingly, growth rates do not significantly impact unemployment rates, which is likely the result of growth rates tending to be more extreme, both positive and negative, in developing countries with larger unemployment rates. On the other hand, countries with larger TFP growth tend to have lower unemployment. When we look at the decomposition of this growth, the results suggest that countries with larger positive structural change tend to have lower unemployment rates, while countries with larger within-sector productivity growth tend to have more unemployment; with the exception of low-income countries where both components reduce unemployment. This suggests that when most of the productivity growth is not reallocated to higher productivity sectors, the unemployment outcomes are worse. Finally, the labor freedom index is positive but only statistically significant in the specification using value added per worker.

Table 8 shows the estimates for youth unemployment. The results are somehow similar to total unemployment. Countries with higher income per capita and TFP growth tend to have less youth unemployment. The structural change coefficients are not statistically significant, which suggests that youth unemployment depends on other factors not related to structural change. The interactive term suggests that structural change and within-sector productivity reduces youth unemployment only for low-income countries, but this could be explained by other factors. One potential explanation is the fact that population growth and new entrants to labor markets are much larger in low-income countries, and this is being captured by the interactive term.

For the case of vulnerable employment in Table 9, the results are more puzzling to interpret. As expected countries with lower income per capita tend to have more vulnerable employment, but countries with larger GDP, TFP growth and within-sector productivity growth tend to have more vulnerable employment. This may be related to the definition used of vulnerable employment - those self-employed, without other employees, and those contributing to family labor – where growth processes are increasing self-employment and, therefore, the measure of vulnerability. Structural change does not appear to impact vulnerability of employment.

Overall, these results suggest that productivity growth is likely to be the critical element to reduce unemployment. More importantly, a growth pattern of productivity growth based on positive structural change, reallocation of workers to more productive sectors is also key in reducing unemployment rates, while within-sector productivity appears positive for low income countries only. On the other hand, the type of structural change does not appear to be a relevant element affecting the quality of labor indicators used in the paper.

## 6. Conclusions

This paper has analyzed one important aspect of the quality of growth; its capacity to deliver higher quality of employment. One key element arising from traditional development economic theories is the importance of structural change and the reallocation of workers from low to high productivity sectors in explaining improvements in labor markets and standards of living. The concept of structural change is significant in the reallocation of workers from low to high productivity sectors. Given the observed pattern of commodity-based economic growth in many countries in the developing world in the last decades, especially in Africa and Latin America, some concerns about how this type of growth has been impacting employment in developing countries and the possibility that these countries experience "jobless" growth have emerged.

Our findings suggest that economic growth might not result in "jobless" growth since, on average, it appears to reduce unemployment rates over time. As expected, countries with larger income per capita tend to have better quality of labor outcomes. More importantly, TFP growth and positive structural change appear to be critical elements in reducing unemployment, while within-sector productivity might increase unemployment in higher income countries via reducing labor intensity, but decreasing unemployment in low income countries.

In addition, the paper complements the existing literature on structural transformation by analyzing an unexplored dimension of structural transformation, the impact on labor quality indicators such as youth unemployment, informality and vulnerability. The important result of the paper is that while the effect of the growth process on employment levels is significant, the impact on vulnerable and informal employment does not appear to be explained by the type of economic growth pattern. This suggests that other unexplained factors, such as the quality of labor institution, might be a more important factor explaining the quality of employment than economic growth.

In terms of policy implications, the findings emphasize the importance of productivity growth in reducing unemployment and the significant contribution of structural change, which suggests the importance of guarantee labor opportunities in higher productivity sectors. This can be problematic in countries with large comparative advantages in terms of primary commodities. In terms of the quality of labor indicators, more empirical work is necessary to fully understand these determinants and the role of labor market institutions.

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**Chapter 8**

# The Elusive Quest for Inclusive Growth in Sub-Saharan Africa: Regional Challenges and Policy Options

Bruno Losch

## 1. Introduction

Sub-Saharan Africa (SSA) exemplifies the issue of the quality of growth. While the sub-continent has been under the spotlight for several years for its strong recovery and dramatic growth rates, persistent poverty - in spite of real progress - and growing social and political risks highlight the fragility and the uncompleted nature of the growth process. SSA is a case of economic growth without structural transformation, productivity advances and effective human development.

The paper recapitulates first the reasons for new narratives about sub-Saharan Africa; it is a reminder that the fragility of current narratives is due to poor analytical perspective and limited evidence. It then reviews the main characteristics of the diverse African trajectories and their common challenges related to an incipient economic transition and a strong on-going demographic transition. The remarkable boom of the labor force currently underway questions the absorption capacity of the sub-Saharan countries' economies within the highly competitive context of globalization and under the constraints of climate change and resource depletion. The paper finally addresses possible options for an inclusive and sustainable process of change and reaffirms the importance of investing in development strategies.

## 2. Changing narratives and blind spots about growth in SSA

***From the "hopeless continent" to a "rising Africa"?***

In 2011 and 2013, within a period of fourteen months, *The Economist* published two special issues devoted to Africa, under the titles, "Africa Rising" and "Aspiring Africa," thereby apologizing for having run "The

Hopeless Continent" as a headline a decade earlier.[1] Without ignoring the difficulties still to be overcome and differences between countries, this optimistic view was based on the sustained growth rate of the region following the long recession of the 1980s and 1990s. Over the last ten years, average per capita income grew by 30 %, as the region resisted the global crisis. Six of the ten fastest growing economies in the world during the 2000s were in SSA (Angola, Chad, Ethiopia, Mozambique, Niger, Rwanda), all above a 7% annual growth rate – meaning a doubling of the GDP within 10 years. This expansion is expected to continue for the next decade.

While this performance is, in part due to the price of raw materials, this was not the only factor, as some countries did also progress rapidly without the benefit of resource extraction. This economic growth has been accompanied by some improvement in other indicators of human development (such as secondary education, life expectancy) and the liberalization of political life marked by regular elections in many countries. Other drivers of change are a strong urban growth, a booming young population, a rising middle class, and the rapid adoption of mobile telephony, accompanied in some countries by a revolution of credit. These are all the ingredients of a "*new Eldorado for investors*": after admiring the growth of Asian dragons and tigers, and Latin American jaguars, an enthusiastic literature has been brimming with "*Lions on the Move*" and an "*Emerging Africa*" where "*Poverty is Falling... Much Faster Than* [we] *Think*." [2]

However, sub-Saharan Africa’s realities also display otherwise mixed pictures: while many conflicts came to an end during the last decade (Liberia, Sierra Leone) or more recently (Côte d'Ivoire), the fragility of the Sahel has been highlighted by the war in Mali. Other "smoldering" conflicts continue or have been developing in Guinea-Bissau, Nigeria, CAR, the Horn of Africa and Kenya, DRC. Several countries face political stalemates that paralyze progress in implementing changes (Madagascar, Zimbabwe), while others are “vitrificated” by “big men”: presidential monarchies (Burkina, Cameroon, Chad, Congo, Uganda) or even hereditary presidencies (Equatorial Guinea, Togo, Gabon). Even in rapidly growing countries, the widening inequality leads to economic,

1. Respectively, December 3, 2011, March 2, 2013, and May 13, 2000.

2. Respectively in *Le Monde*, January 1, 2013, and titles of books published by the McKinsey Global Institute (2010), Radelet (2010), and Sala-i-Martin and Pinkovskiy (2010).

social and political tensions: in 2013, 39 of the 49 SSA countries are situated in the last 50 places in the UNDP's Human Development Index (UNDP 2013), and only four SSA countries are among the 80 countries "where it is better to be born" – apart from South Africa (which came 53rd), they were in the last places.[3] This situation is reflected in the distress experienced by African youth, plagued by unemployment, underemployment, and despondency (Solignac-Lecomte 2013).

***A debate obfuscated by the GDP ideology***

The overall discussion on African growth, rising middle classes and "emergence" is based on the GDP paradigm that says little about the real wealth and health of an economy and its sustainability in the long run (Fioramonti 2014). GDP growth does not mean structural transformation and welfare improvement for the majority of the population, i.e. a virtuous process of economic and social change.

In SSA, among the main issues contributing to the mystification of the debate is the tragedy of African statistics (Devarajan 2013). The collapse of statistical systems (national accounts, sectorial data and even population censuses), their many biases (e.g. spatially blind information), and the importance of the informal economy, which largely escapes reporting, leads to poor and misleading numbers (Jerven 2013), incorrect knowledge bases and high risks of inappropriate policies targeting inadequate objectives.

Additionally, GDP statistics fail to report the depletion of energy, minerals, forests, soil fertility (etc.), which are critical components of sustainability. This perspective requires specific attention to the case of SSA due to the importance of extractive resources and agriculture as well as their contribution to GDP. The World Bank adjusted net savings statistics show that African countries have been depleting their wealth over the last twenty years in an unsustainable way, with resource-rich countries being the main contributors to this negative trend (World Bank 2011; AfDB et al. 2013; Aglietta in this volume).

## 3. Many national trajectories but common challenges

The challenges for Africa are very specific because its structural

3. The "where-to-be-born" index is prepared by the Economist Intelligence Unit. In 2013, Angola, Kenya, and Nigeria are respectively ranked 77th, 79th and 80th.

transformation has been lagging in comparison to other regions of the world. The process of structural transformation refers to the change in the sectorial and spatial distribution of economic activities illustrated by the evolutionary pathway followed by European economies (and countries of European settlement) and replicated in several other parts of the world.

Based on statistical evidence (Johnston and Kilby 1975; Timmer 2009), a stylized summary of this process and its main determinants shows the gradual transition from an agriculture-based economy to one based on industry and then on services, in conjunction with a shift from rural to urban areas. This was made possible by the energy shift to fossil fuels that started at the end of the 18$^{th}$ century. The shift was indeed the cause of profound technological changes and impressive productivity gains, which led to wealth accumulation and then the transfer of labor and capital from one sector to another. This process was accompanied by an increase in income and demand and its diversification. It benefited from the demographic transition[4] at the origin of an improved ratio between the working and non-working population, i.e. less dependent and more economically active people. In this process of change, agriculture played an initial role and was the first driver of accumulation. Productivity gains have been accompanied by a massive exit of workers from agriculture, their migration to the cities, to other regions or to other countries.

The evolutionary vision, which was formalized after the Second World War (Rist 2003), is the source of mainstream thinking on development. It is based on the idea of a step-by-step catching up (Rostow 1960) with the most advanced countries in terms of technical, economic and social progress (generally and prosaically reduced to per-capita GDP); and it is reinforced by the similarities observed in the trajectories of some Latin American and Asian countries.

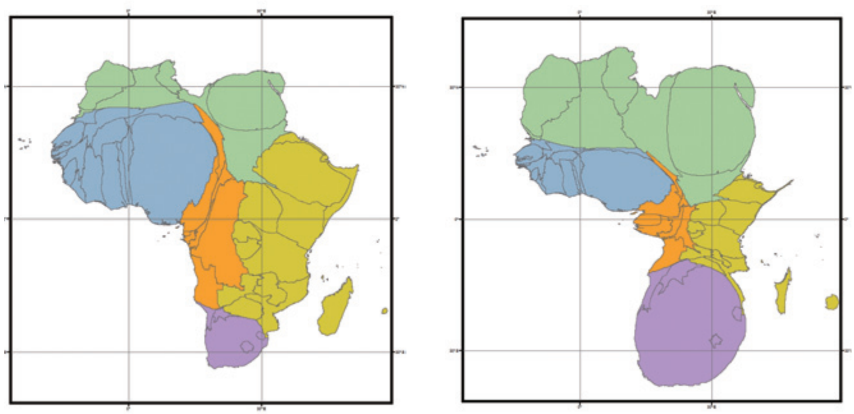
### *An incipient economic transition*

Compared to this reference pathway, sub-Saharan Africa has experienced rapid changes characterized by huge process towards urbanization and a rapid economic growth in the last decade; but it

4. The demographic transition is the result of improvements in health and lifestyles, facilitated by mass education, which lead to the reduction in mortality and birth rates.

remains, with South Asia, the poorest region in the world. The "African lions" of McKinsey (2010) are deprived of 35% of their GDP when North Africa is subtracted. Moreover, SSA only represents 45% of the total wealth of the continent when South Africa (20% of the overall GDP) is withdrawn. However, together, it comprises 75% of its population (see Map 1).

**Map 1. African countries weighted by population (2010) and GDPs (2009)**



Source: Losch 2013b and Cirad Cartography Unit, based on World Population Prospects 2010 and World Development Indicators
Note: In this cartogram, sizes in km2 are replaced by population and GDP values; colors correspond to UN regional groupings for Africa.

Current GDP per capita is very low: in 2010, 27 of the 49 countries in SSA were in the low-income countries group according to the World Bank (<$1,025/person/year), including 13 countries with per capita income under $500. Thirteen others were in the lower middle-income group (between $1,025 and $4,035), seven were in the upper middle income group (between $4,035 and $12,475); and the oil-booming Equatorial Guinea, with only 700,000 inhabitants, has been propelled into the high-income countries group (with $20,700/person/year, equivalent to South Korea or Portugal).

Nevertheless, when looking at the major economic aggregates, SSA structurally changed little over the last fifty years and remains permanently marked by the weight of its primary sector and the exploitation of its natural resources (Magrin 2013). Agriculture, mining and energy account for over 50% of GDP for 17 countries, between 40 and 50% for nine countries and between 30 and 40% for nine others. The manufacturing sector is extremely limited: only 18 countries have an industrial added value exceeding 10% of GDP and seven countries reach the threshold of 15%. These results show a deep structural inertia, where only services and construction, driven by urban growth, have developed. SSA is a region of urbanization without industrialization, a very specific situation in the economic history of the world.

This African exception is explained by the historical conditions of the integration of the continent into the global economy (Grataloup 2007), with a late and restrictive colonial rule resulting in young and small states. When they were only entering their twenties, and before they had the opportunity to consolidate their institutions or to implement modernization policies, these new countries were simultaneously projected into the international competition of globalization and submitted to the sharp constraints of structural adjustment.

In comparison, several Asian countries, which had the same level of relative wealth fifty years ago but another historical background, grew steadily and rapidly, despite pessimistic perspectives.[5] Their growth process was characterized by a sharp decrease of agriculture and the development of manufacturing (see Figure 1). Over the same period, African growth was much lower, and especially marked by its volatility (see Table 1), which raises the question of the sustainability of the recent growth trend (Devarajan and Fengler 2013), characterized by the position of raw materials, construction and services, and the relative weakness of investment (Ali and Dadush 2010).

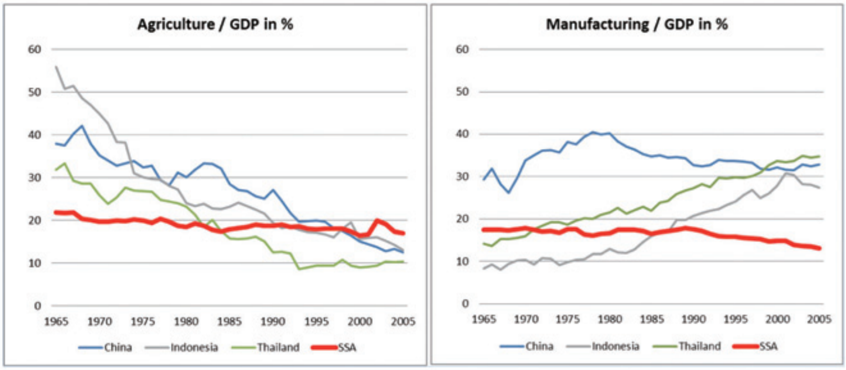
**Table 1. Regional dynamics of GDP per capita growth (1960-2007)**

| | % per year | variation coef. |
|---|---|---|
| North Africa & Middle East | 2,06 | 1,68 |
| Sub-Saharan Africa | 0,72 | 3,10 |
| Latin America & Caribean | 1,73 | 1,38 |
| East Asia & Pacific | 5,44 | 0,76 |
| South Asia | 2,72 | 0,99 |

Source: Arbache and Page 2007

5. See Myrdal's "Asian Drama" (1968)

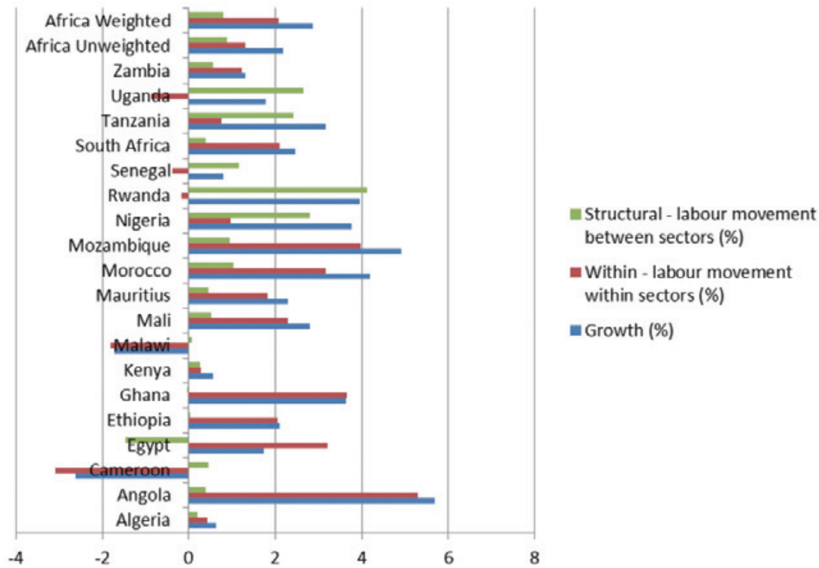
**Figure 1. Evolution of GDP structure:**
**SSA versus East and South-East Asia (1965-2005)**




Source: Losch et al. 2012 based on World Development Indicators

However, if the prices of mineral resources or agricultural products have played a clear part in the recent trend, they do not tell the whole story. Among the 49 SSA states many differences exist (highlighted above), which relate to resource endowment, access (landlocked countries), colonial legacies, post-independence history, institutions and governance. If many oil-exporters à-la-Equatorial Guinea are heavily dependent on international markets and little diversified, some countries, especially in East Africa (Ethiopia, Uganda, Rwanda), are progressing rapidly without benefiting from extractive resources. Processes of structural change are even more uneven. Reliable data are missing but, when looking at reallocation of labor within or between sectors (McMillan et al. 2013), a couple of countries show a progressive shift due to the development of more diversified exports with higher value and technological contents (Uganda, Tanzania, Rwanda, but also Senegal or Nigeria - see Figure 2).

**Figure 2. Structural change in SSA:
Focus on labor movement in 19 countries (2000-2005)**




Source: based on McMillan et al. (2013)

Nevertheless, these slight changes in the labor force structure of SSA do not modify, in absolute terms, the remaining importance of agriculture in the economically active population. With the exception of South Africa, where employment in agriculture is marginal, for reasons related to the very specific history of the country, agriculture still occupies 50-60% of the labor force in the vast majority of SSA. This rate rises to 75% and higher in some countries (Sahel, East Africa). The broad definition of agricultural employment,[6] however, does not signify exclusive occupation in agriculture: multiple activities are a characteristic of rural households (Losch et al. 2012). Other sectors of employment are mainly services (trade and transport first and, marginally, government, banking), construction and public works boosted by urban growth, and handicrafts. Employment in manufacturing remains extremely low - a few hundred thousand jobs in most countries (and often less).

6. According to the FAO, the economically active population in agriculture corresponds to the number of all employed and unemployed persons engaged in or seeking work in agriculture, hunting, fishing or forestry.

A cross-sectional feature of this employment structure is the importance of what is commonly called the informal economy or sometimes the popular economy. There is no standardized definition and the notion of the informal is disputed, but the informal economy is generally defined in the negative, that is, by saying what it is not (Charmes 2011). The informal economy is businesses that are not declared or registered with the tax authorities, do not apply accounting rules or economic and social labor standards (such as regulations related to hiring, firing, minimum wage and working conditions).

This informal sector corresponds with the bulk of sub-Saharan African economies because it includes agriculture, comprised almost exclusively of family farming,[7] and also because urban employment happens mainly through self-employment activities or small businesses (Beaujeu et al. 2011). Thus the informal economy supposedly employs 75 to 95% of the sub-continent's workers (Jütting and Laiglesia 2009), with the exception of South Africa, where the rate would be only 50%. The specificity of this informal economy is its great flexibility, which gives it a strong resilience against hazards, a situation that is balanced by high risks, low to very low levels of remuneration and underemployment (low number of hours worked per worker). These features explain the very low quality of African growth: the high rates of the 2000s do not translate into inclusive forms of employment.

***An on-going and delayed demographic transition***

These low-transforming African economies are facing a unique demographic reality characterized by unprecedented growth and the lasting importance of their rural population. SSA is the last region of the world to be engaged in the process of demographic transition and the process is far from complete: the population growth has been strong over the past four decades (more than 2.5 % per year) and it has lasted longer than originally projected due to continued high fertility rates in many countries, leading the United Nations to revise their latest projections upward in 2012[8] : in 2050, SSA's population should reach a total of slightly above 2 billion people, with the population continuing to grow until after

7. There is a limited business/corporate sector, mainly for agricultural exports (agro-industrial plantations, large mechanised farms). It represents little in terms of jobs and even less in relative terms: in countries where such agricultural businesses are best established (in East and Southern Africa in particular), the numbers rarely exceed 100,000 jobs compared to the millions of family farms.

8. By nearly 10% for the medium fertility variant.

2100. SSA will overtake China and have two and a half times more people than Europe (a reversal of the relative weights of Europe and Africa in less than a century).

This population growth will also be accompanied by a change in the age structure of the population, with strong growth of the labor force - and therefore of the demand for jobs - and a gradual change in the activity ratio (active/inactive people). With one inactive for every active person in the 1980s and 1990s, this ratio was close to one, reaching a "record" in world history. It was a major economic disadvantage for Africa, which was hit at the same time by the impact of structural adjustment policies, and it led to a significant increase in poverty (see Figure 5). Over the same period of time, China had two active for every one inactive person (and has a 2.5 ratio today), which is a radical difference in terms of productive capacity and possible increase in individual wealth and living standards (see Figure 3).

The progressive improvement of the activity ratio in SSA will be a major advantage in terms of growth and the region will progressively reap its "demographic dividend."[9] However, the convergence with the rest of the world in terms of fertility reduction is lagging (Guengant and May 2013) and the ratio of two active for one inactive person should only be reached after 2050.[10] Most importantly, this improvement in the activity structure of the population will only play its leverage role if it is combined with adequate public policies and a favorable economic and institutional environment (productive investment, capacity building, innovation and productivity enhancement). If not, the demographic bonus (many workers) could turn into a "penalty" (many jobless), and result in major social and political tensions.

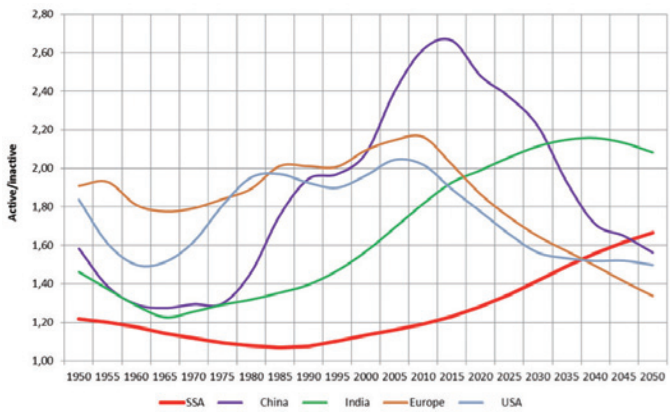
The other feature characterizing African demographic changes is the spatial distribution of the population. The gradual shift of the global population to the cities is a major phenomenon in world history, with the tipping point reached at the end of the 2000s. SSA did not escape this process with the urban population increasing tenfold since independence. But the subcontinent is still mainly rural, with around

9. The demographic dividend constitutes a unique moment in the dynamic of a population. After this window of opportunity (also named the "demographic bonus") the ageing of the population leads to a progressive decrease of the activity ratio – a process broadly at play in China and Europe.

10. SSA is the only region in the world where the labor force will continue to significantly increase after this date.

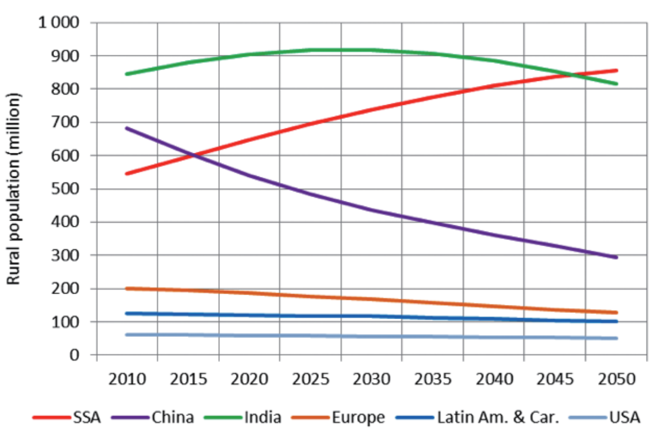
65% in 2010, and it will remain rural until the mid-2030s due to a slowing down in the pace of urbanization – a consequence of limited labor opportunities and low paid informal jobs. Above all, SSA is the only region of the world, along with South Asia, where rural population will continue to grow – a consequence of today's spatial distribution and strong birth rates – and it is the only one where this growth will continue after 2050 (Figure. 4). With 300 million additional rural people by that date, the sub-African rural population will increase by 57%.

**Figure 3. Activity ratio by major countries and regions (1950 – 2050)**




Source: Losch 2013a, based on World Population Prospects, 2010 Revision

**Figure 4. Expected rural population by major countries and regions (2010 – 2050)**

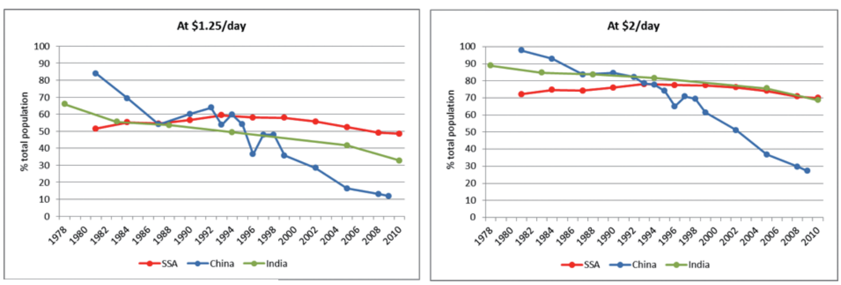



Source: Losch 2013a, based on World Urbanization Prospects, 2011 Revision

### *The "African Equation"*

With a fourfold increase of the population over the last fifty years, the economies of the sub-continent were able to absorb a huge demographic push. However, because of the recession of the 1990s and of an insufficient and volatile economic growth process over the long run, living standards have been stagnating and massive persistent poverty remains: on average most people (70%) remain below the threshold of $2 PPP per person per day, and 50% of the population are under the $1.25 poverty line – a major difference with China and also with India where progress has been significant – notably in terms of extreme poverty reduction (Figure 5).

**Figure 5. Poverty headcount ratio (in $ PPP)**




Source: World Development Indicators

The burning issue here is the continuing population growth and the massive change in scale: while SSA's population increased by 560 million people between 1970 and 2010, it will increase by 1.1 billion over the same time period between 2010 and 2050 (and possibly more). This means a dramatic "job challenge" for Africa (Bhorat and Naidoo 2013), which can be more accurately described when considering the yearly cohort of new workers entering the labor market.[11] For a medium-sized country such as Senegal, almost 300,000 young people reach working age every year, or 5 million over 15 years (two and a half times the population of a city like Dakar today). Seen at the level of the whole of SSA, this means a yearly cohort of around 17 million, which will increase and add up to 330 million by 2025 (i.e. nearly the current population of the United States).

11. The annual cohort of workers entering the labor market, or reaching the age of finding an income-generating activity, is 1/10 of the 15-24 year age group. This is a flow instead of a change in the total number of workers, which takes into account people moving from the 15-64 age group to the supposedly inactive 65+ group (a disputable criteria in countries without a formal labor market and generalized pension system – the case of SSA).

These are not projections: on a 15-year time period, these new workers have already been born. Based on the existing distribution of population and trends in migration to cities, two-thirds of these new workers are likely to be in rural areas (Losch 2012).

These magnitudes in numbers allow an articulation of the African equation: with their undiversified economic structure, where the weight of primary and especially agricultural activities is dominant, and where the weakness of industrialization does not offer mass employment alternatives, how will SSA economies absorb their booming labor force? What are the possible and realistic absorption sectors?

Lessons from past transitions are especially instructive but they also help to point out differences: the "moment in time" matters and replication is not an option because economic, institutional, and geopolitical environments have changed.[12] For sub-Saharan Africa, the challenge is to succeed in its structural transformation in the new international regime of a liberalized global economy. SSA also has to manage new constraints related to struggles over resources and the impact of climate change, as the region will be one of the most impacted. It will have to manage these challenges without benefiting from the same economic policy options that other countries before them did – a consequence of new international regulations.[13]

## 4. Policy options for a sustainable and inclusive growth process

The question of the sectors of absorption of the new African workforce is therefore a real challenge for public policy, which must invest in public goods, facilitate and support private initiatives and promote the development of economic activities. This employment challenge is recognized by the international community, as evidenced by the recent publication of numerous reference documents, such as the World Bank's

12. For instance, the importance of European hegemony (colonization, imperialism) for European transitions, including mass migration of European settlers, or import-substitution policies in Latin America based on protectionism, or state-lead development in Asia.

13. Chang (2002) emphasizes the difference in status between countries according to their hegemonic or subordinate position. In particular, he recalls how the richest countries now wish to prevent others from applying the policies they had themselves implemented (especially those of protection and subsidies) and which they sometimes continue even today.

*World Development Report* (WDR) 2013 focusing on employment (World Bank 2012) or the *African Economic Outlook 2012* (AfdB et al. 2012).[14] The challenge is clearly to identify the most strategic policy options capable of transforming this workforce potential, and the possible demographic dividend,[15] into a veritable engine of growth and development (i.e. an engine of economic and social inclusion).

***Reengaging in development strategy design***

In order to meet the challenge of employment and inclusiveness, the imperative is to reinvest in development strategies, which articulate long-term visions and sectorial approaches based on a realistic analysis of the structural situation of every national economy, regional grouping and their international environment. Regional institutions and some African governments (like Ethiopia, Rwanda, Kenya) are increasingly reengaging in such a perspective, given that it had been obscured by the limitations of structural adjustment and market-only policies.

The need to address structural change and to implement transformative policies through willing developmental states is becoming a "credo" and "structural transformation" a buzzword. The African Union Commission engaged in the drafting of the *Africa Vision 2063* with a transformative agenda as a guideline; the 2012 World Economic Forum for Africa focused on *Shaping Africa's Transformation*; the African Development Bank's new 10-year strategy puts Africa's transformation at the center; the Economic Commission for Africa (ECA) titled its 2011 Economic Report on Africa, *Governing Development in Africa: The Role of the State in Economic Transformation* (UNECA 2011); and the African Center for Economic Transformation (ACET), an Accra-based think tank, is now publishing an *African Transformation Report* and has proposed an *African Transformation Index* (ACET 2014).

The common objective is undoubtedly to support and strengthen the process of change towards more diversified economies, with higher added value and qualified jobs – a prerequisite for improved living standards. It is clear however that this diversification is a gamble in an

14. See also the ILO report on employment trends for youth (ILO 2012), the report of the Africa Commission on the potential of African youth (Africa Commission 2009), the work of the FAO on the employment of rural youth (van der Geest 2010) and the special report on African youth employment (Filmer and Fox 2014).

15. It represents a limited window of opportunity because the dividend is only "distributed" over a few decades, until the ageing population reverses the active / inactive ratio.

increasingly integrated global economy. Globalization offers many new opportunities in terms of access to new markets. It also facilitates access to knowledge and technical progress, which the richest countries today did not have when they engaged in their transition. But globalization also means constraints, because of rising asymmetries in productivity and competitiveness.[16] Local firms must compete with foreign companies - especially those from large emerging countries like China - on a “stormy open field” (Birdsall 2006) characterized by the instability of the world economic environment; and the challenges are rising, not only in international markets but also in domestic markets through imports.

There is however a dead angle in this discussion on competition: if the existing asymmetries affect only the overall economic situation of a country, they also impact the local dimension of structural change, since international competition weakens local links between agriculture, industry and urbanization, which have contributed greatly to economic transitions in the past (UNRISD 2010). Easier access to imports has notably modified urbanization patterns because cities (especially large cities) often resort to imports rather than make use of local economic resources. There is therefore a spatial dimension in structural transformation and an issue of reconnecting places and urban and rural areas. Most of the efforts of policy makers are to identify the best possible sectors for diversification and the ones with a potential for competition, but a realistic assessment is most often missing about the priorities with regard to the job challenge. In order to define an adequate time sequence, public policies have to be based on regional and sectorial distributions of activities and people.

***Sectorial priorities***

The large majority of African economies is still defined by the weight of the primary sector (agriculture and mining), the population is still predominantly rural, and its activity structure is characterized by the overwhelming importance of the informal economy both in agriculture and the large range of urban activities (household enterprise sector). And yet, the debate is raging, with extremely contrasting points of view between proponents of industrialization and the strengthening of urban dynamics on the one hand, and proponents of "agriculture first" on the

16. In the case of SSA, the difference in average productivity with other developing countries is 1 to 5, and 1 to 100 with OECD countries (UNCTAD 2006).

other hand. This debate is also blurred by aid agencies, which sometimes adopt contradictory positions, such as the World Bank, which developed a detailed argument on the central role of agriculture in development in its WDR 2008 (World Bank 2007), and then focused on the prominent role of the process of agglomeration and economic density brought about by urbanization in its WDR 2009 (World Bank 2008).

What are the major arguments? As far as the "industrialists" are concerned, only manufacturing can meet the scale of the challenges facing Africa: agricultural productivity is too low and the expected progress too slow to allow for a rapid escape from poverty; the solution for the future of the rural poor lies in the cities.[17] The major arguments refer to the change in the international economic environment that would offer new opportunities for industrialization: an improved business climate in many countries, the gradual increase in manufacturing costs in Asia due to higher wages (especially in China), and the prospects offered by task-based production rather than the manufacture of end products (UNIDO 2008). This new type of industrialization, or light manufacturing (Dinh et al. 2012), is a consequence of the development of outsourcing and intra-firm trade that characterizes globalization. It is more accessible to late developers to the extent that it requires less capital and technical and managerial skills, and remains doable in a more fragile economic and institutional environment (AfDB et al. 2014). This approach could also develop in the service sector, based on the potential offered by new information and communication technologies, where outsourcing is developing quickly.

There are undeniable areas of diversification and opportunities for SSA: its growing workforce and the increased costs of production experienced by its main competitors in the developing world will gradually strengthen its competitiveness; and it is not unrealistic, in absolute terms, to imagine a future Africa being the "factory of the world", that could take the place of China. Using this comparative advantage approach, ACET (2013) has already identified priority sectors: agroprocessing, the garment industry and component assembly. But it is important to take into account the necessary timeframe for an effective industrial development with regard to the current structural situation, lessons from the past, and the massive demand for jobs. There has not been significant industrialization in SSA over the last fifty years despite

17. Several writings by Paul Collier illustrate this vision (Collier 2008, 2009).

formidable urbanization.[18] Examples of industrial free trade zones have produced mixed results and, most importantly, they have only helped create, depending on the country, tens of thousands of jobs whereas hundreds of thousands of jobs or millions are required annually. It means that the possible new comparative cost advantages, which will arise very progressively, are insufficient.[19] Heavy investments are needed in infrastructure, training and support for businesses; and even with such investments, it will be impossible to create millions of industrial jobs each year in the near future to meet the demand for jobs.[20] These reminders show the importance of prioritizing support for existing activities, which are mostly those of the informal urban and rural sectors. This does not mean ignoring the necessary process of industrialization: governments must improve the business climate in order to facilitate private investment, but they must also deal with the overwhelming number of household enterprises.

Regarding the informal urban sector, there is a certain shift in the view of policy makers, with greater consideration of the potential for modernization (Fox and Sekkel Gaal 2008, Beaujeu et al. 2011). If there is an informal (sponge-like) buffer-type sector characterized by very low productivity,[21] there is also an informal sector with a great potential for modernization based on significant production factors and strong innovation dynamics (Ranis and Stewart 1999). This sector, which is a major provider of urban employment, should be supported.

This discussion of the rural informal sector side, which includes the majority of the active population in most African countries, brings us to the second side of the debate on the sectorial priorities for action, ideas championed by the "pro-agriculture" group. The first argument is about the "basic arithmetic" of large numbers (Headey, Bezemer and Hazell 2010) – even with another decade of growth as good as or even better

18. Yet this urban growth offered all the economic benefits of density touted by the WDR 2009 (World Bank 2009).

19. Competitiveness cannot be reduced solely to costs; it includes product quality and production capacity (the volume of supply).

20. In the case of China, the "township and villages enterprises" policy, which was the backbone of rural industrialisation, is an interesting yardstick. Between the 1960s, when the policy was initiated, and the 1990s a maximum of 135 million jobs were created (Vendryes 2012).

21. This buffer sector absorbs surplus labor, especially related to rural depopulation. It represents many "odd jobs" and incomes can sometimes be lower than in rural areas.

than the past one, structural transformation and the change in employment structure will be slow (Fox et al. 2013); and absolute number of workers in agriculture will not shrink but grow and continue to challenge the rural economy.

The driving force of agriculture, its intersectoral effects, its role in rural poverty reduction and rural diversification are basics of the literature on economic development (Johnston and Mellor 1961, Johnston and Kilby 1975), and on African development in particular (Delgado et al. 1998, Diao et al. 2007). Improving agricultural performance was a major factor in explaining the rapid progress achieved in East and South East Asia (World Bank 2007). Several recent studies have confirmed the comparative potential of agricultural growth with respect to urban development: Dorosh and Thurlow (2012) have shown, on the basis of growth models applied to Ethiopia and Uganda, that even if cities are still the unquestionable source of growth and structural change in the long term, it is actually agricultural activities that are likely to have the fastest impact on poverty reduction.

The real strategic challenge today is to identify the right development model for agriculture in Africa. Because of a generally weak performance in the past (Benoit-Cattin and Dorin 2012), there is very significant room for improvement. However, new investments by new players promoting large-scale farming[22] have reopened the old "small vs. large scale" debate about the relative merits of different sizes and types of farms (Losch and Fréguin Gresh-2013). This risky discussion, which could result in adopting inappropriate modernization pathways, tends to obscure a central issue: the need to increase production, while creating employment in agriculture, as well as in upstream and downstream activities, by strengthening value chains and improving the incomes of farmers - which are the levers of rural demand and economic diversification (Losch et al. 2012).

In this context, and in order to secure the maximum impact, the primary target of public policy in this area should be the broad masses of farmers and family farms. They offer a great potential for the integration of

22. These new investments were triggered by the fear of shortages of agricultural products, revived since the crisis of agricultural prices in 2008-2009, and by the new needs for biofuel. They are favored by the (debatable) reputation for available land on the continent and the willingness of many governments to attract foreign capital (Cotula et al. 2009).

young people (Brooks et al. 2013), provided that attention is paid to improving working conditions in order to make farming more attractive (Proctor and Lucchesi 2012; Sumberg et al. 2012). Agricultural development in other parts of the world demonstrated the true development capacity of family farms when they received the necessary support (Bélières et al. 2014). A recent comparison between African, Brazilian and Thai agriculture, whose successes are undisputed despite very different contexts, has shown that African producers are competitive at the farm-gate level, and would be competitive on international markets if recurring obstacles in supply and marketing were removed (World Bank 2009).

***Territorial priorities***

Beyond sectorial discussions, there is a need to take into account the spatial realities of the continent. African rural areas have profoundly changed in recent decades due to demographic growth and increasing densification of population. They have also changed as a result of urban development itself that occurred not only through growth in numbers but also in terms of spatial dimensions: new urban areas have emerged as a result of the progressive development of rural towns, and this on-going process is dramatically reshaping the territorial structure of many regions of the subcontinent.

The Africapolis work (Denis and Moriconi-Ebrard 2012) highlights a large emerging megapolis in the Gulf of Guinea, rooted in Nigeria (the most populous country), and developing many offshoots along the West African coast and the Sudanese region, as well as demographic hotspots like the Nairobi – Kampala corridor, the northern part of the Great Lakes region, the Ethiopian highlands and, of course, the South African conurbation. In these regions, the vast majority of the rural population is located within 50 km of a city of at least 50,000 inhabitants.

It is obvious that in this type of new configuration, where transportation infrastructure facilitate mobility and access to markets, the springs of economic dynamism and diversification opportunities are incommensurate when compared to more remote areas. This "new emerging *rurality*" (Losch, Magrin and Imbernon 2013) is completely invisible in the official statistical systems. However, beyond these analytical difficulties, another reality is emerging: poverty often persists, including in these highly populated and connected rural areas

(Losch et al. 2012). This raises the question of the quality of urbanization (i.e., the type of services and infrastructure provided by the city, the urban assets, without which urbanization cannot really play its driving and catalyst role for economic development) and rural diversification.

The weakness of urban assets in secondary cities appears as a common feature of African urbanization. The urban framework is most often asymmetrical and features one big city – generally the capital city – provided with significant amounts of equipment and services on one side, and the many lagging regional cities and local towns, missing basic infrastructure, on the other side. Recent works on the relationship between type of urbanization, poverty and inequality have highlighted the importance of intermediate urbanization and the economic functions it provides (Christiaensen and Todo 2009; Christiaensen, de Weerdt and Todo 2013). In Africa, this "missing middle" is a major obstacle for an inclusive growth process: it accelerates concentration and spatial exclusion, and contributes to the growing costs of metropolization (Paulais 2012). This situation provides strong arguments for strengthening the development of intermediate cities and this territorial priority could contribute to the overall process of structural transformation.

***Breaking the rural-urban divide and decompartementalizing public policies***

One of the major problems of development policies today is their highly segmented conception. Sectorial policies as well as urban policies and rural policies are siloed and this stove-piping results in a major obstacle to a spatially inclusive growth model. Beyond the need to develop regional integration leveraged by major infrastructure, which in the long term will also help to open up economic areas and to enhance domestic and continental trade, it is a proactive approach to territorial development that will produce the initiatives and innovations needed to boost economic and social development.

As reminded by Rodrik (2013), in the new phase of the world economy, East Asian style growth rates will be difficult to sustain by Asian countries themselves and to attain by other developing countries, and growth will depend first "on what happens at home". In sub-Saharan Africa, a proactive approach to territorial development means consolidating urban-rural linkages, and providing the network of medium-sized cities with the urban assets needed to foster local dynamics and to facilitate their connection to metropolitan areas. Agriculture will have to play its role, taking advantage of the potential of the African domestic market and of external opportunities, since growth in agricultural incomes will reinforce rural demand that drives economic diversification at the regional level.

Therefore, public policies for structural transformation should combine territorial development tools and support for promising economic sectors, the construction of infrastructure, policy dialogue between actors at the local level, and the reinforcement of human capital. This integrated approach rooted in renewed development strategies should be a major attribute for consolidating the quality of growth.

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Chapter 9

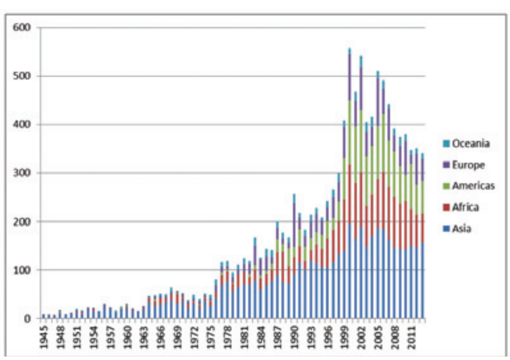
# What are the Macroeconomic Impacts of Natural Disasters? - The Impacts of Natural Disasters on the Growth Rate of Gross Prefectural Domestic Product in Japan

Go Shimada

## 1. Introduction

Typhoon Haiyan, one of the strongest storms ever recorded, swept across the central Philippines with gusts of up to 200mph (320km/h) on November 8, 2013. It has been estimated that the cost of reconstruction will reach almost US$6 billion. Japan also suffered huge earthquake on March 11, 2011, the Great East Japan Earthquake, the fourth largest in recorded history. The earthquake caused a major tsunami on a scale that occurs only once every few hundred years, claiming around 20,000 lives. As the following figure shows, in the last two decades there has been an upward trend in the number of disasters.[1]

**Figure 1. Regional Distribution of the Number of Natural Disasters**




Source: Author's calculation (2014) based on the data by the EM-DAT/CREDS.

1. The EM-DAT database constructed and maintained by the Centre for Research on the Epidemiology of Disasters (CRED 2010). The EM-DAT database is global, and contains natural disaster data (e.g., geophysical, meteorological and climatological natural disasters) from 1900 to the present.

As the frequency of disasters increases rapidly, the need to build social resilience becomes more and more important.

So far, there has been widespread debate over the long-term economic and macroeconomic impacts of natural disasters (Skidmore and Toya 2002). Economic analysis of natural disasters has only just started. In the past, only a small number of papers attempted empirical analysis, but the number has been growing over the last few years. There is no consensus as to whether natural disasters have positive or negative impacts. There is a strong need for more empirical studies.

As we will see in detail in the next section, previous literature has failed to capture the heterogeneous characteristics of natural disasters. Most studies use the number of disasters occurring across countries as an explanatory variable. Considering the nature of most disasters, their direct impacts are local rather than national. Hence, for empirical study, it seems more appropriate to use disaggregated data to capture the heterogeneous nature of disasters. For example, in the case of Japan, prefectural data on disasters is available. Utilizing these data, we would be able to capture a better picture of the macroeconomic impacts. Furthermore, most studies analyse the correlation between economic growth and the number of natural disasters. Since natural disasters have different effects depending on various conditions (e.g. the impact of earthquakes is different depending on their magnitude), it seems more appropriate to use data such as the total amount of damage expressed in monetary terms and the number of victims (including both dead and injured), rather than the number of disasters, to capture the real impacts.

To tackle these issues, this paper investigates the impacts of natural disasters on the growth rate of gross prefectural domestic product, utilizing the 47 prefectural governments' unbalanced panel data for Japan for twenty years from 1975 to 1995.

## 2. The macro-economic impacts of natural disasters in previous research

There is an on-going debate, as we will see, on whether disasters have positive or negative macroeconomic impacts. Some analysts have found that natural disasters are detrimental to economic growth, but others have found them to be a form of "Schumpeterian creative destruction."

There is a need for more empirical study, and this paper aims to contribute to this debate.

Disasters can be classified into three categories, according to the Center for Research on Epidemiology of Disasters (CRED, 2010): natural disasters, technological disasters (e.g. industrial accidents), and man-made disasters (e.g. war, financial crises). This paper focuses only on natural disasters. Macroeconomic impacts can be different depending on the time frame (short term or long term). This section reviews existing studies that classify these two frameworks. Many past studies have used cross-country panel data, which is available from EM-DAT. However, there are very few papers that examine the impacts on a specific country (e.g. Noy and Vu 2010, on Vietnam; Rasmussen 2004, on several Caribbean islands). This paper is an attempt to contribute further to the discussion.

**2.1 Short-and middle-term impacts of disasters**

The analyses of short- and middle-term impacts vary. The field of studies on the economic impacts of disasters started with the short-term effects on the economy. The growth model approach to natural disasters was first introduced by Dacy and Kunreuther (1969). They found that Gross Domestic Product (GDP) tends to increase immediately after a natural disaster. This analysis was supported by empirical studies by Albala-Bertrand (1993a; 1993b). They developed an analytical model of disasters and response and collected data on disasters (28 disasters in 26 countries during 1969–79). Using before–after statistical analysis, Albala-Bertrand found that the following variables increase: GDP, capital formation, twin deficits, and agricultural and construction output. He concluded that capital loss is unlikely to have a profound effect on growth and that a very moderate response expenditure may be sufficient to prevent the growth rate of output from falling.[2]

Chaveriat (2000) and Hochrainer (2009), however, found a mixed picture. Chaveriat found a pattern of GDP decreasing in the year of the disaster, followed by growth over the subsequent two years. The growth

2. He found no long-run effects in developing countries. His finding was that in developing countries aggregate negative effects lasted only two years. Hence, he concluded that natural disaster effects are primarily a "problem of development," but essentially not a "problem for development." Tol and Leek (1999) also found positive impacts on GDP in the short term following a natural disaster, explaining that the disaster destroys the capital stock and increases the flow of new production.

results from the high investment in fixed capital. The paper also argued that the short-term negative impacts depended on the scale of the disasters (e.g. the loss-to-GDP ratio). Hochrainer studied the counterfactual versus the observed GDP. He also examined the disaster impacts of factors such as vulnerability, hazard, and exposure of assets. He found that in the medium term (up to five years) natural disasters often lead to negative consequences. As these empirical studies show, views on the short- and middle-term impacts vary.

**2.2 Long-term economic growth**

Natural disasters can have long-term effects through various causal relations. Those causal relations include destruction of schools, the crowding out effect of reconstruction expenditure on private investment, worsening fiscal balance leading to inflation, and environmental damage to agriculture, fishing, and forestry (Rasmussen 2004).

Skidmore and Toya (2002) extended the short-term analysis to long-term economic impacts by examining the causal linkage among disasters. They counted the frequency of natural disasters from 1960-1990 across countries and pursued an empirical investigation.[3] Their regression found that climatic disasters have positive and statistically significant impacts on the growth of TFP (Total Factor Productivity). On the other hand, geological disasters are generally statistically insignificant.

The findings of Sawada, Bhattcharyay and Kotera (2011) are in line with Skidmore and Toya (2002); that is, that disasters have positive effects on economic growth, especially climatic disasters. They quantitatively assessed and compared various natural and man-made disaster impacts using 189 cross-country panel data from between 1968 and 2001. The empirical findings were as follows. First, in the short term all disasters had negative impacts on GDP per capita. This is particularly true of climatological disasters, conflicts and financial crises. Second, in the long term natural disasters had very strong positive impacts on the growth of GDP per capita. Sawada, Bhattcharyay and Kotera (2011)

3. They have three hypotheses. First, they stated that disaster risks could have both positive and negative ambiguous impacts. They argued that the impact could be negative by lowering the expectation on the rate of return on physical capital, but would also lead to increased investment to meet the needs of disaster management. Second, regarding human capital, they followed the endogenous growth theory (Lucas 1988; Azariadis and Drazen 1990). They argued that a low expected rate of return on physical capital could shift to a human capital increase, then to a higher rate of economic growth.

argued that this counterintuitive positive growth effect was a result of the "Schumpeterian" creative destruction process.

Contrary to the findings of Skidmore and Toya (2002) and Sawada, Bhattcharyay and Kotera (2011), the results of the research by Cuaresma et al. (2008) showed a different picture. They argued that the view expressed by Skidmore and Toya on "Schumpeterian" creative destruction is different from that of Schumpeter himself (1950). Schumpeter's view on creative destruction stressed the importance of "competition" in a perfectly functioning market as an engine for technological progress, but Skidmore and Toya use the same term as more literal interpretation only for technological replacement after a disaster. The paper tested the validity of the Schumpeterian view expressed by Skidmore and Toya by means of a gravity equation to examine the correlation between transfer of technology and disasters in developing countries in the long term. Cuaresma Hlouskova, and Obersteiner (2008) found that disasters are negatively correlated to the adoption of new technology from abroad, and only countries with a higher level of development benefit from the introduction of technology after disasters.

Similarly, Noy (2009) found that 1) the amount of property damage caused by disasters is a negative determinant of GDP growth and 2) there is no correlation between the number of victims (killed or affected) and growth of GDP. He studied the determinants of macroeconomic output decline, using a linear regression model approach, and found that countries with the following factors are resilient to initial disaster shocks and further worsening of the macroeconomy. The factors he discussed are 1) higher rate of literacy, 2) better institutions, 3) better per capita income, 4) higher degree of openness to trade, and 5) higher levels of government spending.

The other empirical study that argues that natural disasters have negative impacts on economic growth in the long term is Benson and Clay (2003), while World Bank (2003) and Rasmussen (2004) found that natural disasters have no significant impact on economic growth. Rasmussen studied several Caribbean islands. He found that developing countries tend to be affected the most by natural disasters. Small island states have a high frequency of natural disasters. The paper identified a median reduction of the growth rate of 2.2 percentage points in the year of the event, but found that the long-term effect of natural disasters was indeterminate.[4]

From this review of previous literature, we see that there is no consensus as to the macroeconomic impacts of disasters. There is a strong need for more empirical studies on the consequences. Accumulating this knowledge will certainly contribute to policy planning for recovery after a disaster. One of the common problems with previous literature is the treatment of data. Almost all of the previous literature uses the EM-DAT database constructed and maintained by the Centre for Research on the Epidemiology of Disasters (CRED).[5] The EM-DAT database is global, and contains natural disaster data from 1900 to the present. It seems, however, that past literature has failed to capture the heterogeneous characteristics of natural disasters. Most studies use the number of disasters in a country as an explanatory variable. Considering the nature of a disaster, its direct impacts are local rather than national. For example, Okinawa is far to the south of the Japanese mainland and is prone to experience more hurricanes than Tokyo. The case is similar for Hawaii and the USA. Hence, for empirical study, it seems to be more appropriate to use disaggregated data to capture the heterogeneous nature of disasters. For example, in the case of Japan, prefectural data on disasters is available. Utilizing these data, we are able to capture a better picture of the impacts.

Furthermore, most studies, like that of Skidmore and Toya (2002), analyse the correlation between the "number" of natural disasters and economic growth. Again, natural disasters have different effects depending on various conditions (e.g. an earthquake's magnitude). Therefore, rather than the number of disasters, it seems more appropriate to use data such as the total amount of damage and the number of victims to capture the real impacts, because the number of people affected indicates the direct impacts of the disaster.[6]

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4. Rasmussen (2004) provides a box reviewing studies on the macroeconomic implications of natural disasters such as 1) an immediate decrease in economic output; 2) a worsening of external balance; 3) deterioration in fiscal balances; and 4) poverty increase.

5. According to the CRED homepage, the database is compiled from various sources such as UN agencies, NGOs, insurance companies, research institutions, and press agencies.

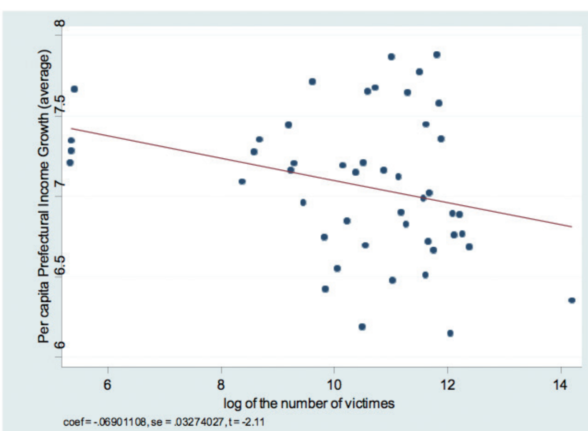
6. Noy (2009) disaggregated the EM-DAT data by region. He found that island countries are on average twice as vulnerable to disasters as other countries.

## 3. Initial evidence on disasters and economic growth

Before going into detail, this paper will present an initial analysis using a simple correlation between disasters and long-term economic growth for the 47 prefectures of Japan using the same analytical framework as Skidmore and Toya (2002) (Figure 2). The vertical axis shows the average annual per capita growth rate over the 1970–98 period. The horizontal axis measures the likelihood of a natural disaster. Skidmore and Toya presented the relationship between the total number of disasters and per capita GDP growth. As discussed above, instead of the number of disasters, in this paper the natural log of the number of victims was used as a better indicator to grasp the impact of natural disasters.[7]

This regression line shows a statistically significant negative correlation between the number of victims and economic growth. The coefficient is -0.069. This seems to be very small, but the absolute value of the coefficient is still greater than that of Skidmore and Toya (2002), which is 0.0033. On the basis of this number they argued that disasters have positive impacts. Naturally, the impacts of a natural disaster on economic growth are small, but this estimate is statistically robust.

**Figure 2. Per capita prefectural income growth and disaster**




Source: Author's calculation.

7. This paper uses absolute figures rather than relative figures. The previous literature uses both. This is because absolute figures sometimes capture the real impact of a natural disaster better. Furthermore, past studies, such as Skidmore and Toya (2002), examined the impact using both relative and absolute figures, and found the same results each time.

## 4. Data

For more detailed empirical analysis, this paper used the variables listed in Table 1. The definitions and data sources are also listed in Table 2. As discussed in the literature review section, this paper uses prefectural disaster data. The database is unbalanced panel data, covering all 47 Japanese prefectures for twenty years from 1975–1995. The maximum amount of total damage is huge because of the Great Hanshin Awaji Earthquake in 1995.

On the other hand, there is no prefectural data available on the number of disasters to actually hit a prefecture classified into geophysical disasters, meteorological disasters, and hydrological disasters. Therefore, unlike other past studies, this paper will not compare the impacts of each class of disaster. Furthermore, past studies differentiated between rich and poor countries, but in the case of Japan the gap between prefectures is small, and in many cases people can easily move from one prefecture to another. Therefore, this paper will not classify prefectures into income groups.

**Table 1: Descriptive Statistics**

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| GPDP | 1128 | 7,560,000,000,000 | 10,900,000,000,000 | 667,000,000,000 | 86,100,000,000,000 |
| Pgex | 1360 | 656,000,000 | 761,000,000 | 46,600,000 | 7,030,000,000 |
| Pgexrcv | 1360 | 8365957 | 8,859,131 | 19,000 | 124,000,000 |
| Tot_damage | 1340 | 373,000,000,000 | 4,220,000,000,000 | 1,000,000 | 137,000,000,000,000 |

Source: Author's calculation.

**Table 2: Definitions and sources of variables**

| Variable | Description | Source |
|---|---|---|
| GPDP_r | Growth of gross prefectural domestic product (at current price) | Cabinet Office, Government of Japan |
| Pgex_r | Growth of prefectural government expenditure | Ministry of Internal Affairs and Communication (Chihou Zaisei Nenpou) |
| Privtcapstx_r | Growth of prefectural private capital stock | Takero Doi (2002) |
| Tot_damage | Total amount of prefectural damage in Japanese Yen | White paper by the Fire Defense Agency (each year) |

Source: Author's calculation.

## 5. Methodology

In order to set the stage for the analysis, this section presents an analytical framework for empirical analysis, which modifies the model of Noy (2009) and Noy and Vu (2010).

$$\log \Delta Y_{i,t} = \alpha_i + \beta \log \Delta Y_{i,t-1} + \gamma \log Dis_{i,t-1} + \mu \Delta \log X_{i,t,.} + \varepsilon_{i,t}$$

where $\Delta Y_{i,t}$ is the annual GDI (Gross Domestic Income) growth rate. *i* is a prefectural index to capture prefecture-specific effects, and *t* is the time index. $Dis_{i,t-1}$ is the measure for disaster magnitude, estimated by the amount of direct damage. Since disaster affects the following year, this is the disaster lag variable. $\Delta X^1_{i,.}$ is control lagged variables (such as growth of prefectural government expenditure and growth of prefectural private capital stock). This model includes a GDI growth lag following Islam (1995).

Islam (1995) also stated that a time span of just one year is too short because the short-term business cycle may influence the estimation results over such brief spans, so he proposed five-year time intervals. This is because his study focused on convergence. Unlike literature on convergence, the impacts of external shocks such as disasters differ year by year, especially during the first several years. Hence, instead of five-year time intervals, this paper employs annual data.

The lagged dependent variable might correlate with the error term. If this is the case, the conventional panel data analysis methods (pooling cross-sections across time, fixed effects, and random effects) are not consistent. These estimators are consistent only when all regressors are not correlated to the error term. In order to correct for the bias arising from the presence of a lagged dependent variable, this paper also employs the Prais-Winsten estimation, PCSE (panel-corrected standard error), and the system General Method of Moments (GMM) estimator (Noy and Vu 2010; Roodman 2003). The Prais-Winsten estimation is a method of multiple linear regression with AR(1) and exogenous explanatory variables. The Prais-Winsten standard errors account for serial correlation; the OLS standard errors do not. The PCSE (panel-corrected standard error) handles the issue of cross-section heteroskedasticity (Beck and Katz 2004). The presence of heteroskedasticity makes the OLS standard errors inconsistent. PCSE improves on OLS standard errors with respect to panel heteroskedasticity, but not other issues. The system GMM is used to tackle other possible biases by endogeneity and omitted variables in addition to the bias. Arellano and Bond (1991) first established the "difference-GMM" estimator for dynamic panels (Roodman 2003). Arellano and Bond's estimation starts by transforming all regressors, by differencing, and uses the GMM. The method regards lagged dependent variables as not exogenous and predetermined. A problem with the original Arellano–Bond difference-GMM estimator is that if there is an issue of a random walk of endogenous variables, the estimation becomes a biased coefficient estimation.

To tackle the above problem, Blundell and Bond (1998) articulated an improvement on augmented difference GMM by Arrelano and Bover (1995), adding more assumptions that the first difference of instrument variables are uncorrelated with the fixed effects, allowing more instruments to be introduced and making them exogenous to the fixed effects. The augmented estimator is called "system GMM." The command xtabond2 implements both estimations by Stata. The major advantage of the system GMM estimation, compared with the di□erence GMM, is that this approach effectively controls for autocorrelation and heteroskedasticity.

The system GMM estimation corrects for omitted variable bias by eliminating fixed effects through first-differencing, and for endogeneity bias using lagged endogenous regressors as effective instruments. In our system of GMM estimation, the lagged dependent variable is considered to be endogenous. This paper employs one-step estimation and implements the Hansen test to verify whether the instruments really satisfy the orthogonality condition (uncorrelated with the error term), and also implements the AR(1) and AR(2) test for autocorrelation.

## 6. Estimation results: The impacts on economic growth

The results are presented in Tables 3, 4, 5, 6, 7, 8 and 9. Each table shows the results from a different time lag of *tot_damage*, starting from 1 year to 20 years. As Table 3 shows, the F-test result (Prob>F=0.6189) indicates that the pooling model is more appropriate than the fixed effects estimation. Considering this, the Breusch and Pagan test and the Hausman test were implemented. The Breusch and Pagan test result (Prob > chibar2 =1.0000) indicates that the pooling regression model is more appropriate than the random-effects model. The Hausman test result (Prob>chi2 = 0.0000) means the fixed effects model is better than the random effects model. These three tests confirm that the pooling is the most suitable.

According to pooling, random effect, and fixed effect estimates, the results became significantly negative in years 3, 5, 6, 9, 10, 11 and 15. In these years, all three estimations returned the same results. In addition, fixed effect estimation returned statistically negative results in years 12 and 14. In sum, the conventional panel data analyses show negative impacts of natural disasters not just in the short term but in the long term as well.

The results of the Prais-Winsten estimation agreed, finding statistically negative results in years 1, 3, 4, 5, 6, 7. 8. 9, 10, and 11.[8] The negative impacts of natural disasters further were confirmed by the PCSE estimation. All estimated results became significantly negative. Due to the unbalanced nature of the panel, results were estimated until the 16-year lag. The results of the system GMM confirmed the impacts. The results of the Hansen test, AR(1) and AR(2) imply that, in most cases, the instruments are orthogonal to the error term and the error term is not autocorrelated in the system GMM estimation. The system GMM results became negative and consistent all through the years.

## 7. Conclusion

This paper analysed the economic impacts of natural disasters by utilizing the 47 prefectural panel data of Japan for twenty years. What can we conclude from the empirical findings above? The initial empirical study of "average annual per capita growth rate over the 1970–98 period" and "natural log of the number of victims" showed a negative and statistically significant relationship. In the following detailed study, this paper employed the conventional panel data analyses (pooling, fixed effects, and random effects), Prais-Winsten and PCSE and the system GMM.

Unlike several previous studies, which found positive long-term effects of natural disasters, this paper found that the impacts of natural

8. The Prais-Winsten estimation did not estimate in year 16 because convergence was not achieved.

disasters measured by total value of damage on economic growth are robustly negative according to our analyses. This study indicates that the impacts from natural disasters are long lasting. This conclusion is concurrent with what happened to the city of Kobe, one of major cities of Japan, after the earthquake in 1995 (Shimada 2014 and forthcoming). The economic gap between Kobe and the rest of Japan widened until 2003, and then after 2004, the economic trend in Kobe equalled that of the rest of Japan, but the city still has not totally 'filled the gap'. As the impacts are long lasting, it seems necessary to consider proactive recovery policies, not only short-term but also long-term.

As we showed, most previous literature used cross-country data of the number of natural disasters, and failed to capture the heterogeneous nature. As this study showed, it seems to be more appropriate to use disaggregated data. The findings of this paper are specific to Japan. In the future, more analysis using this kind of disaggregated data will be necessary from other regions and countries especially in developing countries where natural disasters hit harder than in developed countries. Further, it will be desirable to control other factors, which effect on economic growth other than natural disasters.

## Table 3. Estimation result 1

**Dependent Variable : Growth of gross prefectural domestic product**

| | Pooled | Random Effect | Fixed Effect | prais-winsten | PCSE | System GMM one step | Pooled | Random Effect | Fixed Effect | prais-winsten | PCSE | System GMM one step | Pooled | Random Effect | Fixed Effect | prais-winsten | PCSE | System GMM one step |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Log (Growth of gross prefectural | 0.2466 | 0.2466 | 0.1883 | 0.4321 | 0.2606 | 0.1632 | 0.2548 | 0.2548 | 0.1983 | 0.4224 | 0.2716 | 0.2219 | 0.2398 | 0.2398 | 0.1814 | 0.3747 | 0.2443 | 0.1955 |
| domestic product) (Lagged) | [6.77]*** | [6.77]*** | [4.93]*** | [12.49]*** | [3.74]*** | [2.69]*** | [7.06]*** | [7.06]*** | [5.25]*** | [12.23]*** | [5.48]*** | [4.15]*** | [6.68]*** | [6.68]*** | [4.83]*** | [10.75]*** | [6.75]*** | [3.36]*** |
| Log (growth of prefectural | 0.1526 | 0.1526 | 0.1468 | 0.1335 | 0.1476 | 0.1062 | 0.1513 | 0.1513 | 0.1468 | 0.1347 | 0.1415 | 0.096 | 0.1381 | 0.1381 | 0.1353 | 0.1262 | 0.1354 | 0.0985 |
| government expenditure) | [4.91]*** | [4.91]*** | [4.61]*** | [4.48]*** | [2.82]*** | [3.45]*** | [4.86]*** | [4.86]*** | [4.62]*** | [4.49]*** | [3.23]*** | [3.06]*** | [4.47]*** | [4.47]*** | [4.27]*** | [4.17]*** | [3.65]*** | [3.27]*** |
| Log (growth of prefectural private | 1.0098 | 1.0098 | 1.3818 | 0.7074 | 0.7171 | 0.864 | 1.03 | 1.03 | 1.4237 | 0.7523 | 0.6751 | 0.7218 | 0.9455 | 0.9455 | 1.2829 | 0.7572 | 0.8445 | 0.9498 |
| capital stock) | [7.84]*** | [7.84]*** | [8.91]*** | [6.30]*** | [5.42]*** | [8.80]*** | [7.96]*** | [7.96]*** | [9.11]*** | [6.59]*** | [6.82]*** | [8.50]*** | [7.39]*** | [7.39]*** | [8.29]*** | [6.52]*** | [10.52]*** | [11.36]*** |
| Log (Total amount of prefectural | -0.0212 | -0.0212 | -0.0108 | -0.0287 | -0.0429 | -0.047 | | | | | | | | | | | | |
| damage) (lagged 1 year) | [-1.63] | [-1.63] | [-0.63] | [-2.44]** | [-2.18]** | [-4.09]*** | | | | | | | | | | | | |
| Log (Total amount of prefectural | | | | | | | -0.006 | -0.006 | 0.021 | -0.013 | -0.0357 | -0.0277 | | | | | | |
| damage) (lagged 2 years) | | | | | | | [-0.43] | [-0.43] | [1.13] | [-1.04] | [-2.41]** | [-2.86]*** | | | | | | |
| Log (Total amount of prefectural | | | | | | | | | | | | | -0.0556 | -0.0556 | -0.0691 | -0.0456 | -0.0636 | -0.0696 |
| damage) (lagged 3 years) | | | | | | | | | | | | | [-4.22]*** | [-4.22]*** | [-4.04]*** | [-3.68]*** | [-5.08]*** | [-6.21]*** |
| _cons | -0.7075 | -0.7075 | -1.3576 | -0.3743 | | | -0.8927 | -0.8927 | -1.7341 | -0.5817 | | | -0.2509 | -0.2509 | -0.6299 | -0.2063 | | |
| | [-2.72]*** | [-2.72]*** | [-4.33]*** | [-1.63] | | | [-3.30]*** | [-3.30]*** | [-5.20]*** | [-2.41]** | | | [-0.95] | [-0.95] | [-1.96]* | [-0.85] | | |
| N | 837 | 837 | 837 | 837 | 837 | 837 | 839 | 839 | 839 | 839 | 839 | 839 | 838 | 838 | 838 | 838 | 838 | 838 |
| R-squared | 0.2795 | | 0.2767 | 0.4154 | 0.823 | | 0.2813 | | 0.2819 | 0.4043 | 0.8223 | | 0.295 | | 0.2946 | 0.3829 | 0.8279 | |
| Adj-R-squared | 0.276 | | 0.2307 | 0.4126 | | | 0.2779 | | 0.2363 | 0.4014 | | | 0.2916 | | 0.2497 | 0.3800 | | |
| AR (1) | | | | | | 0.001 | | | | | | 0.001 | | | | | | 0.001 |
| AR (2) | | | | | | 0.332 | | | | | | 0.354 | | | | | | 0.342 |
| Hansen Test | | | | | | 0.002 | | | | | | 0.002 | | | | | | 0.002 |
| Breusch and Pagan Lagrangian multiplier test | | Prob > chibar2 = 1.0000 | | | | 0.426 | | | | | | 0.377 | | | | | | 0.392 |
| F Test | | Prob > F=0.6189 | | | | 0.215 | | | | | | 0.215 | | | | | | 0.207 |
| Hausman Test | | | Prob>chi2 = 0.0000 | | | | | | | | | | | | | | | |

* p<0.1, ** p<0.05, *** p<0.01
Source: Author's calculation.

## Table 4. Estimation result 2

**Dependent Variable : Growth of gross prefectural domestic product**

| | Pooled | Random Effect | Fixed Effect | prais-winsten | PCSE | System GMM one step | Pooled | Random Effect | Fixed Effect | prais-winsten | PCSE | System GMM one step | Pooled | Random Effect | Fixed Effect | prais-winsten | PCSE | System GMM one step |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Log (Growth of gross prefectural domestic product) (Lagged) | 0.242 | 0.242 | 0.1821 | 0.417 | 0.2512 | 0.2218 | 0.2265 | 0.2265 | 0.159 | 0.3652 | 0.2271 | 0.1252 | 0.2354 | 0.2354 | 0.172 | 0.4045 | 0.2428 | 0.1486 |
| | [6.51]*** | [6.51]*** | [4.64]*** | [11.76]*** | [5.85]*** | [3.96]*** | [6.32]*** | [6.32]*** | [4.26]*** | [10.49]*** | [5.45]*** | [2.07]** | [6.40]*** | [6.40]*** | [4.44]*** | [11.48]*** | [9.76]*** | [2.41]** |
| Log (growth of prefectural government expenditure) | 0.1439 | 0.1439 | 0.1386 | 0.1265 | 0.1273 | 0.0870 | 0.1331 | 0.1331 | 0.1206 | 0.1218 | 0.1328 | 0.0926 | 0.1478 | 0.1478 | 0.1402 | 0.1321 | 0.1435 | 0.1039 |
| | [4.50]*** | [4.50]*** | [4.22]*** | [4.12]*** | [3.73]*** | [2.73]*** | [4.33]*** | [4.33]*** | [3.86]*** | [4.06]*** | [4.70]*** | [3.12]*** | [4.74]*** | [4.74]*** | [4.39]*** | [4.39]*** | [6.96]*** | [3.24]*** |
| Log (growth of prefectural private capital stock) | 1.0463 | 1.0463 | 1.4139 | 0.7743 | 0.7229 | 0.7172 | 0.9914 | 0.9914 | 1.4202 | 0.783 | 0.9787 | 1.1605 | 1.0308 | 1.0308 | 1.4136 | 0.7761 | 0.7957 | 0.9332 |
| | [8.18]*** | [8.18]*** | [9.14]*** | [6.88]*** | [9.12]*** | [7.45]*** | [7.88]*** | [7.88]*** | [9.46]*** | [6.87]*** | [10.70]*** | [8.30]*** | [8.04]*** | [8.04]*** | [9.17]*** | [6.83]*** | [11.00]*** | [8.59]*** |
| Log (Total amount of prefectural damage) (lagged 4 years) | -0.0126 | -0.0126 | -0.0059 | -0.0143 | -0.0393 | -0.0255 | | | | | | | | | | | | |
| | [-0.92] | [-0.92] | [-0.34] | [-1.13] | [-3.19]*** | [-1.99]** | | | | | | | | | | | | |
| Log (Total amount of prefectural damage) (lagged 5 years) | | | | | | | -0.0881 | -0.0881 | -0.1371 | -0.0769 | -0.0893 | -0.1004 | | | | | | |
| | | | | | | | [-5.72]*** | [-5.72]*** | [-6.55]*** | [-5.39]*** | [-6.07]*** | [-4.64]*** | | | | | | |
| Log (Total amount of prefectural damage) (lagged 6 years) | | | | | | | | | | | | | -0.0328 | -0.0328 | -0.039 | -0.0286 | -0.057 | -0.0605 |
| | | | | | | | | | | | | | [-2.04]** | [-2.04]** | [-1.72]* | [-1.96]** | [-4.71]*** | [-4.20]*** |
| _cons | -0.832 | -0.832 | -1.4396 | -0.5903 | | | -0.0335 | -0.0335 | -0.2372 | 0.0317 | | | -0.6286 | -0.6286 | -1.1402 | -0.4622 | | |
| | [-3.20]*** | [-3.20]*** | [-4.75]*** | [-2.55]** | | | [-0.13] | [-0.13] | [-0.77] | [0.13] | | | [-2.33]** | [-2.33]** | [-3.50]*** | [-1.92]* | | |
| N | 835 | 835 | 835 | 835 | 835 | 835 | 835 | 835 | 835 | 835 | 835 | 835 | 834 | 834 | 834 | 834 | 834 | 834 |
| R-squared | 0.2757 | | 0.274 | 0.3994 | 0.8212 | | 0.3021 | | 0.3105 | 0.3895 | 0.83 | | 0.2781 | | 0.2762 | 0.3921 | 0.8226 | |
| Adj-R-squared | 0.2722 | | 0.2277 | 0.3965 | | | 0.2987 | | 0.2665 | 0.3865 | | | 0.2746 | | 0.2299 | 0.3891 | | |
| AR (1) | | | | | | 0.001 | | | | | | 0.000 | | | | | | 0.001 |
| AR (2) | | | | | | 0.325 | | | | | | 0.442 | | | | | | 0.347 |
| Hansen Test | | | | | | 0.218 | | | | | | 0.215 | | | | | | 0.210 |

* p<0.1, ** p<0.05, *** p<0.01

Source: Author's calculation.

## Table 5. Estimation result 3

| | Pooled | Random Effect | Fixed Effect | prais-winsten | PCSE | System GMM one step | Pooled | Random Effect | Fixed Effect | prais-winsten | PCSE | System GMM one step | Pooled | Random Effect | Fixed Effect | prais-winsten | PCSE | System GMM one step |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Log (Growth of gross prefectural | 0.2476 | 0.2476 | 0.1855 | 0.4095 | 0.2667 | 0.207 | 0.2225 | 0.2225 | 0.1521 | 0.3584 | 0.2412 | 0.182 | 0.2017 | 0.2017 | 0.1235 | 0.3361 | 0.2201 | 0.163 |
| domestic product) (Lagged) | [6.84]*** | [6.84]*** | [4.89]*** | [11.78]*** | [9.28]*** | [3.60]*** | [5.90]*** | [5.90]*** | [3.81]*** | [9.78]*** | [7.50]*** | [3.19]*** | [5.19]*** | [5.19]*** | [3.00]*** | [8.90]*** | [12.14]*** | [2.68]*** |
| Log (growth of prefectural | 0.1434 | 0.1434 | 0.1351 | 0.1291 | 0.1347 | 0.093 | 0.1219 | 0.1219 | 0.1122 | 0.1129 | 0.1156 | 0.080 | 0.0907 | 0.0907 | 0.0795 | 0.0863 | 0.0868 | 0.053 |
| government expenditure) | [4.57]*** | [4.57]*** | [4.19]*** | [4.25]*** | [4.92]*** | [2.87]*** | [3.72]*** | [3.72]*** | [3.34]*** | [3.51]*** | [4.28]*** | [2.54]** | [2.65]*** | [2.65]*** | [2.26]** | [2.56]** | [7.27]*** | [1.63] |
| Log (growth of prefectural private | 1.0424 | 1.0424 | 1.4235 | 0.7913 | 0.7279 | 0.814 | 1.1089 | 1.1089 | 1.5229 | 0.8917 | 0.7794 | 0.862 | 1.1628 | 1.1628 | 1.6343 | 0.9466 | 0.8709 | 0.924 |
| capital stock) | [8.11]*** | [8.11]*** | [9.22]*** | [6.93]*** | [15.24]*** | [9.04]*** | [8.21]*** | [8.21]*** | [9.28]*** | [7.24]*** | [10.19]*** | [9.18]*** | [8.24]*** | [8.24]*** | [9.51]*** | [7.31]*** | [8.83]*** | [8.95]*** |
| Log (Total amount of prefectural | -0.0173 | -0.0173 | -0.0184 | -0.0158 | -0.047 | -0.046 | | | | | | | | | | | | |
| damage) (lagged 7 years) | [-1.10] | [-1.10] | [-0.82] | [-1.11] | [-4.96]*** | [-3.63]*** | | | | | | | | | | | | |
| Log (Total amount of prefectural | | | | | | | -0.02 | -0.02 | -0.0155 | -0.02 | -0.0515 | -0.052 | | | | | | |
| damage) (lagged 8 years) | | | | | | | [-1.20] | [-1.20] | [-0.66] | [-1.30] | [-3.79]*** | [-4.09]*** | | | | | | |
| Log (Total amount of prefectural | | | | | | | | | | | | | -0.0376 | -0.0376 | -0.055 | -0.0383 | -0.0643 | -0.059 |
| damage) (lagged 9 years) | | | | | | | | | | | | | [-2.20]** | [-2.20]** | [-2.28]** | [-2.41]** | [-3.68]*** | [-3.91]*** |
| _cons | -0.8039 | -0.8039 | -1.3574 | -0.6078 | | | -0.8421 | -0.8421 | -1.4883 | -0.6555 | | | -0.7294 | -0.7294 | -1.2767 | -0.5376 | | |
| | [-3.04]*** | [-3.04]*** | [-4.29]*** | [-2.57]** | | | [-3.06]*** | [-3.06]*** | [-4.60]*** | [-2.60]*** | | | [-2.57]** | [-2.57]** | [-3.86]*** | [-2.05]** | | |
| N | 832 | 832 | 832 | 832 | 832 | 832 | 785 | 785 | 785 | 785 | 785 | 785 | 739 | 739 | 739 | 739 | 739 | 739 |
| R-squared | 0.2781 | | 0.2793 | 0.3921 | 0.8202 | | 0.2544 | | 0.2542 | 0.3408 | 0.8054 | | 0.2393 | | 0.2395 | 0.3236 | 0.7925 | |
| Adj-R-squared | 0.2746 | | 0.2331 | 0.3892 | | | 0.2506 | | 0.2034 | 0.3374 | | | 0.2351 | | 0.1843 | 0.32 | | |
| AR (1) | | | | | | 0.001 | | | | | | 0.002 | | | | | | 0.001 |
| AR (2) | | | | | | 0.335 | | | | | | 0.316 | | | | | | 0.309 |
| Hansen Test | | | | | | 0.208 | | | | | | 0.201 | | | | | | 0.220 |

* p<0.1, ** p<0.05, *** p<0.01
Source: Author's calculation.

## Table 6. Estimation result 4

**Dependent Variable: Growth of gross prefectural domestic product**

| | Pooled | Random Effect | Fixed Effect | prais-winsten | PCSE | System GMM one step | Pooled | Random Effect | Fixed Effect | prais-winsten | PCSE | System GMM one step | Pooled | Random Effect | Fixed Effect | prais-winsten | PCSE | System GMM one step |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Log (Growth of gross prefectural | 0.1762 | 0.1762 | 0.0974 | 0.2629 | 0.1958 | 0.129 | 0.1468 | 0.1468 | 0.0603 | 0.1152 | 0.1601 | 0.095 | 0.149 | 0.149 | 0.0471 | -0.0677 | 0.1657 | 0.073 |
| domestic product) (Lagged) | [4.37]*** | [4.37]*** | [2.30]** | [6.61]*** | [4.82]*** | [2.10]** | [3.52]*** | [3.52]*** | [1.36] | [2.75]*** | [2.60]*** | [1.46] | [3.34]*** | [3.34]*** | [1.00] | [-1.52] | [6.54]*** | [1.06] |
| Log (growth of prefectural | 0.0798 | 0.0798 | 0.0753 | 0.0781 | 0.0772 | 0.052 | 0.0655 | 0.0655 | 0.0608 | 0.0655 | 0.063 | 0.030 | 0.0506 | 0.0506 | 0.0415 | 0.0379 | 0.046 | 0.015 |
| government expenditure) | [2.25]** | [2.25]** | [2.07]** | [2.21]** | [1.82]* | [1.61] | [1.79]* | [1.79]* | [1.61] | [1.79]* | [1.28] | [0.94] | [1.33] | [1.33] | [1.06] | [1.01] | [2.86]*** | [0.49] |
| Log (growth of prefectural private | 1.2223 | 1.2223 | 1.7231 | 1.0736 | 0.9351 | 1.070 | 1.1991 | 1.1991 | 1.6908 | 1.2517 | 0.9407 | 1.035 | 1.2127 | 1.2127 | 1.7851 | 1.5434 | 0.8997 | [7.18]*** |
| capital stock) | [8.09]*** | [8.09]*** | [9.48]*** | [7.50]*** | [10.63]*** | [9.40]*** | [7.66]*** | [7.66]*** | [8.88]*** | [7.85]*** | [11.35]*** | [8.67]*** | [7.24]*** | [7.24]*** | [8.81]*** | [8.28]*** | [8.59]*** | |
| Log (Total amount of prefectural | -0.0483 | -0.0483 | -0.0869 | -0.0488 | -0.075 | -0.087 | | | | | | | | | | | | |
| damage) (lagged 10 years) | [-2.68]*** | [-2.68]*** | [-3.42]*** | [-2.84]*** | [-4.72]*** | [-4.88]*** | | | | | | | | | | | | |
| Log (Total amount of prefectural | | | | | | | -0.0457 | -0.0457 | -0.0711 | -0.0455 | -0.0712 | -0.074 | | | | | | |
| damage) (lagged 11 years) | | | | | | | [-2.38]** | [-2.38]** | [-2.60]*** | [-2.34]** | [-4.50]*** | [-4.39]*** | | | | | | |
| Log (Total amount of prefectural | | | | | | | | | | | | | -0.0317 | -0.0317 | -0.0473 | -0.0333 | -0.0632 | -0.073 |
| damage) (lagged 12 years) | | | | | | | | | | | | | [-1.55] | [-1.55] | [-1.68]* | [-1.52] | [-3.34]*** | [-3.03]*** |
| _cons | -0.7134 | -0.7134 | -1.1406 | -0.5722 | | | -0.6598 | -0.6598 | -1.1703 | -0.7096 | | | -0.8039 | -0.8039 | -1.5132 | -1.0651 | | |
| | [-2.28]** | [-2.28]** | [-3.09]*** | [-1.93]* | | | [-2.00]** | [-2.00]** | [-3.01]*** | [-2.11]** | | | [-2.24]** | [-2.24]** | [-3.59]*** | [-2.70]*** | | |
| N | 692 | 692 | 692 | 692 | 692 | 692 | 644 | 644 | 644 | 644 | 644 | 644 | 598 | 598 | 598 | 598 | 598 | 598 |
| R-squared | 0.2313 | | 0.2393 | 0.2729 | 0.7769 | | 0.2065 | | 0.2044 | 0.1945 | 0.7585 | | 0.1947 | | 0.202 | 0.1372 | 0.7382 | |
| Adj-R-squared | 0.2269 | | 0.18 | 0.2687 | | | 0.2015 | | 0.1373 | 0.1895 | | | 0.1893 | | 0.1291 | 0.1314 | | |
| AR (1) | | | | | | 0.002 | | | | | | 0.007 | | | | | | 0.005 |
| AR (2) | | | | | | 0.304 | | | | | | 0.325 | | | | | | 0.409 |
| Hansen Test | | | | | | 0.194 | | | | | | 0.142 | | | | | | 0.157 |

* p<0.1, ** p<0.05, *** p<0.01
Source: Author’s calculation.

## Table 7. Estimation result 5

**Dependent Variable: Growth of gross prefectural domestic product**

| | Pooled | Random Effect | Fixed Effec | prais-winsten | PCSE | System GMM one step | Pooled | Random Effect | Fixed Effec | prais-winsten | PCSE | System GMM one step | Pooled | Random Effect | Fixed Effec | prais-winsten | PCSE | System GMM one step |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Log (Growth of gross prefectural domestic product) (Lagged) | 0.1493 | 0.1493 | 0.0425 | -0.1 | 0.1745 | 0.094 | 0.1375 | 0.1375 | 0.0242 | -0.0992 | 0.1682 | 0.100 | 0.1378 | 0.1378 | 0.0126 | 0.1917 | 0.1639 | 0.074 |
| | [3.19]*** | [3.19]*** | [0.84] | [-2.13]** | [3.27]*** | [1.32] | [2.82]*** | [2.82]*** | [0.46] | [-2.03]** | [2.72]*** | [1.42] | [2.74]*** | [2.74]*** | [0.23] | [3.84]*** | [3.00]*** | [0.96] |
| Log (growth of prefectural government expenditure) | 0.0571 | 0.0571 | 0.0438 | 0.0418 | 0.0552 | 0.025 | 0.0697 | 0.0697 | 0.0459 | 0.0517 | 0.0569 | 0.018 | 0.1057 | 0.1057 | 0.0671 | 0.1116 | 0.1018 | 0.062 |
| | [1.42] | [1.42] | [1.05] | [1.06] | [0.94] | [0.78] | [1.53] | [1.53] | [0.98] | [1.17] | [1.00] | [0.51] | [2.15]** | [2.15]** | [1.31] | [2.26]** | [2.20]** | [1.60] |
| Log (growth of prefectural private capital stock) | 1.2892 | 1.2892 | 1.8865 | 1.6759 | 0.8499 | 0.930 | 1.3217 | 1.3217 | 2.0062 | 1.7131 | 0.9095 | 1.006 | 1.2702 | 1.2702 | 2.0095 | 1.1713 | 0.8555 | 1.005 |
| | [7.33]*** | [7.33]*** | [8.66]*** | [8.52]*** | [8.76]*** | [7.67]*** | [7.15]*** | [7.15]*** | [8.80]*** | [8.29]*** | [8.78]*** | [7.03]*** | [6.51]*** | [6.51]*** | [8.24]*** | [6.18]*** | [7.03]*** | [7.05]*** |
| Log (Total amount of prefectural damage) (lagged 13 years) | -0.0124 | -0.0124 | -0.012 | -0.0034 | -0.0563 | -0.055 | | | | | | | | | | | | |
| | [-0.58] | [-0.58] | [-0.40] | [-0.15] | [-2.77]*** | [-2.99]*** | | | | | | | | | | | | |
| Log (Total amount of prefectural damage) (lagged 14 years) | | | | | | | -0.0262 | -0.0262 | -0.0582 | -0.0236 | -0.0691 | -0.072 | | | | | | |
| | | | | | | | [-1.14] | [-1.14] | [-1.81]* | [-0.96] | [-3.21]*** | [-2.84]*** | | | | | | |
| Log (Total amount of prefectural damage) (lagged 15 years) | | | | | | | | | | | | | -0.0257 | -0.0257 | -0.0437 | -0.0264 | -0.0698 | -0.080 |
| | | | | | | | | | | | | | [-1.05] | [-1.05] | [-1.30] | [-1.10] | [-3.09]*** | [-3.96]*** |
| _cons | -1.1173 | -1.1173 | -1.9992 | -1.5272 | | | -1.0725 | -1.0725 | -1.8067 | -1.4482 | | | -1.08E+00 | -1.08E+00 | -1.98E+00 | -9.78E-01 | | |
| | [-2.97]*** | [-2.97]*** | [-4.46]*** | [-3.74]*** | | | [-2.67]*** | [-2.67]*** | [-3.86]*** | [-3.31]*** | | | [-2.54]** | [-2.54]** | [-3.97]*** | [-2.37]** | | |
| N | 558 | 558 | 558 | 558 | 558 | 558 | 517 | 517 | 517 | 517 | 517 | 517 | 482 | 482 | 482 | 482 | 482 | 482 |
| R-squared | 0.1964 | | 0.2026 | 0.1375 | 0.7239 | | 0.2059 | | 0.2231 | 0.1612 | 0.7165 | | 0.2067 | | 0.2225 | 0.2312 | 0.6995 | |
| Adj-R-squared | 0.1906 | | 0.124 | 0.1313 | | | 0.1997 | | 0.1397 | 0.1546 | | | 0.2 | | 0.1323 | 0.2248 | | |
| AR (1) | | | | | | 0.011 | | | | | | 0.004 | | | | | | 0.011 |
| AR (2) | | | | | | 0.370 | | | | | | 0.267 | | | | | | 0.342 |
| Hansen Test | | | | | | 0.079 | | | | | | 0.206 | | | | | | 0.146 |

* p<0.1, ** p<0.05, *** p<0.01
Source: Author's calculation.

## Table 8. Estimation result 6

| | Pooled | Random Effect | Fixed Effect | PCSE | System GMM one step | Pooled | Random Effect | Fixed Effect | prais-winsten | System GMM one step | Pooled | Random Effect | Fixed Effect | prais-winsten | System GMM one step |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Log (Growth of gross prefectural domestic product) (Lagged) | 0.118 | 0.118 | -0.0068 | 0.1531 | 0.042 | 0.0975 | 0.0975 | -0.0415 | -0.2775 | 0.519 | 0.0969 | 0.0969 | -0.0632 | -0.2524 | 0.033 |
| | [2.24]** | [2.24]** | [-0.12] | [4.80]*** | [0.55] | [1.71]* | [1.71]* | [-0.67] | [-4.97]*** | [0.66] | [1.59] | [1.59] | [-0.95] | [-4.20]*** | [0.40] |
| Log (growth of prefectural government expenditure) | 0.1219 | 0.1219 | 0.0841 | 0.1126 | 0.055 | 0.1142 | 0.1142 | 0.0696 | 0.0491 | 0.241 | 0.0998 | 0.0998 | 0.0589 | 0.0381 | 0.033 |
| | [2.30]** | [2.30]** | [1.52] | [3.47]*** | [1.37] | [2.04]** | [2.04]** | [1.18] | [0.96] | [0.57] | [1.65] | [1.65]* | [0.92] | [0.67] | [0.77] |
| Log (growth of prefectural private capital stock) | 1.3256 | 1.3256 | 2.0471 | 0.8516 | 1.354 | 1.4871 | 1.4871 | 2.3084 | 2.1901 | 1.063 | 1.5602 | 1.5602 | 2.4188 | 2.1794 | 1.138 |
| | [6.31]*** | [6.31]*** | [7.84]*** | [5.97]*** | [9.00]*** | [6.40]*** | [6.40]*** | [7.97]*** | [8.11]*** | [8.04]*** | [6.21]*** | [6.21]*** | [7.77]*** | [7.42]*** | [7.03]*** |
| Log (Total amount of prefectural damage) (lagged 16 years) | -0.0232 | -0.0232 | -0.0494 | -0.073 | 0.083 | | | | | | | | | | |
| | [-0.89] | [-0.89] | [-1.35] | [-2.81]*** | [-4.86]*** | | | | | | | | | | |
| Log (Total amount of prefectural damage) (lagged 17 years) | | | | | | -0.017 | -0.017 | -0.0529 | -0.0151 | -0.088 | | | | | |
| | | | | | | [-0.58] | [-0.58] | [-1.30] | [-0.49] | [-4.16]*** | | | | | |
| Log (Total amount of prefectural damage) (lagged 18 years) | | | | | | | | | | | -0.0116 | -0.0116 | -0.0435 | -0.0301 | -0.108 |
| | | | | | | | | | | | [-0.35] | [-0.35] | [-0.95] | [-0.86] | [-4.18]*** |
| _cons | -1.22 | -1.22 | -2.0287 | | | -1.5396 | -1.5396 | -2.4196 | -2.2477 | | -1.7227 | -1.7227 | -2.6862 | -2.1494 | |
| | [-2.69]*** | [-2.69]*** | [-3.78]*** | - | | [-3.02]*** | [-3.02]*** | [-3.93]*** | [-4.00]*** | | [-3.11]*** | [-3.11]*** | [-4.03]*** | [-3.44]*** | |
| N | 437 | 437 | 437 | 437 | 437 | 394 | 394 | 394 | 394 | 394 | 350 | 350 | 350 | 350 | 350 |
| R-squared | 0.2075 | | 0.2256 | 0.6754 | | 0.2161 | | 0.2475 | 0.1892 | | 0.2204 | | 0.2547 | 0.1978 | |
| Adj-R-squared | 0.2002 | | 0.1253 | | | 0.208 | | 0.1378 | 0.1808 | | 0.2113 | | 0.13 | 0.1885 | |
| AR (1) | | | | | 0.017 | | | | | 0.016 | | | | | 0.026 |
| AR (2) | | | | | 0.382 | | | | | 0.264 | | | | | 0.426 |
| Hansen Test | | | | | 0.117 | | | | | 0.073 | | | | | 0.053 |

Source: Author's calculation.

**Table 9. Estimation result 7**

| | Pooled | Random Effect | Fixed Effect | prais-winsten | System GMM one step | Pooled | Random Effect | Fixed Effect | prais-winsten | System GMM one step |
|---|---|---|---|---|---|---|---|---|---|---|
| Log (Growth of gross prefectural domestic product) (Lagged) | 0.0924 | 0.0924 | -0.0675 | 0.2641 | 0.047 | 0.0576 | 0.0576 | -0.0963 | 0.2733 | 0.0334 |
| | [1.44] | [1.44] | [-0.92] | [4.21]*** | [0.50] | [0.81] | [0.81] | [-1.20] | [4.01]*** | [0.42] |
| Log (growth of prefectural government expenditure) | 0.1371 | 0.1371 | 0.0979 | 0.1557 | 0.061 | 0.102 | 0.102 | 0.0384 | 0.112 | 0.0134 |
| | [2.03]** | [2.03]** | [1.32] | [2.31]** | [1.16] | [1.37] | [1.37] | [0.46] | [1.51] | [0.25] |
| Log (growth of prefectural private capital stock) | 1.5011 | 1.5011 | 2.2993 | 1.1347 | 0.943 | 1.4333 | 1.4333 | 2.2543 | 0.929 | 0.9764 |
| | [5.66]*** | [5.66]*** | [6.67]*** | [4.69]*** | [5.22]*** | [4.65]*** | [4.65]*** | [5.70]*** | [3.37]*** | [5.31]*** |
| Log (Total amount of prefectural damage) (19 year lag) | 0.0155 | 0.0155 | 0.0012 | 0.0149 | -0.081 | | | | | |
| | [0.42] | [0.42] | [0.02] | [0.44] | [-2.69]*** | | | | | |
| Log (Total amount of prefectural damage) (20 year lag) | | | | | | 0.0016 | 0.0016 | -0.0426 | -0.0044 | -0.0911 |
| | | | | | | [0.04] | [0.04] | [-0.69] | [-0.12] | [-2.81]*** |
| _cons | -1.9553 | -1.9553 | -2.9552 | -1.5617 | | -1.7103 | -1.7103 | -2.4644 | -1.0749 | |
| | [-3.47]*** | [-3.47]*** | [-4.35]*** | [-2.98]*** | | [-2.61]*** | [-2.61]*** | [-2.97]*** | [-1.83]* | |
| N | 308 | 308 | 308 | 308 | 308 | 263 | 263 | 263 | 263 | 263 |
| R-squared | 0.2115 | | 0.2352 | 0.2875 | | 0.1546 | | 0.1849 | 0.2131 | |
| Adj-R-squared | 0.2011 | | 0.0864 | 0.2781 | | 0.1415 | | -0.0074 | 0.2009 | |
| AR (1) | | | | | 0.022 | | | | | 0.017 |
| AR (2) | | | | | 0.365 | | | | | 0.214 |
| Hansen Test | | | | | 0.054 | | | | | 0.025 |

* p<0.1, ** p<0.05, *** p<0.01
Source: Author's calculation.

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# Part IV

# *Multiple Paths towards Quality Growth*

## Chapter 10
# Industrial Transformation and Quality of Growth

Akio Hosono

## 1. Introduction

The emphasis and priorities in international aid policy have changed significantly since the end of the Cold War. Even within the last two decades, dominant aid policy has shifted from macro-oriented structural adjustment to poverty reduction with concrete social sector targets, and subsequently to a search for a new source of growth (Ohno 2013, 1). As the *World Development Report 2013* (World Bank 2012, 87) reminds us, the conventional wisdom was then to focus on growth and assume that improved living standards will follow. This is the main tenet behind "growth strategies", "growth diagnostics", and "binding constraints analysis," all of which aim to identify and remove obstacles to economic growth. (87)

More recently, increasingly greater attention is being paid to "quality" of economic growth, in terms of its relations with jobs, the environment, learning, accumulation of skills and capabilities, innovation, and so on. Quality of growth was featured in Vinod et al. (2000), which explored issues of faster and better growth. In Asia and the Pacific region, APEC leaders gathered in Yokohama in 2010, and agreed on an "APEC Growth Strategy."[1] The strategy stressed that "the quality of growth" needs to be improved, so it will be more balanced, inclusive, sustainable, innovative, and secure. Ten months later, the World Economic Forum's Summer Davos in Asia held its annual meeting focusing on "Mastering Quality Growth," where sustainability, inclusion, fairness, balance, and technology and

1. "The APEC (Asia Pacific Economic Cooperation) Leaders' Growth Strategy" was agreed on Nov. 14th, 2010. It is referred to here as the "APEC Growth Strategy." APEC comprises 55% of real global GDP, 44% of global trade, and 40% of the global population. The APEC Growth Strategy mentions that APEC senior officials should report to leaders in 2015, for their review, on APEC's progress in promoting APEC Growth Strategy (APEC 2010, 12). Regarding the 22nd. APEC Economic Leaders' Declaration in 2014, see Section 2 of this paper.

innovation were highlighted (World Economic Forum 2011, 3).
On the other hand, in recent policy debates on growth and development, including the post-2015 discussions, structural transformation has been featured much more. The Report of the High-Level Panel of Eminent Persons on the post-2015 Development Agenda is titled "A New Global Partnership: Eradicate Poverty and Transform Economies through Sustainable Development" (hereinafter referred to as "The Report of HLP on the post-2015 Agenda"). The panel concluded that the post-2015 agenda needs to be driven by five big transformative shifts,[2] including a call for the transformation of economies for jobs and inclusive growth. Likewise, focusing on economic transformation, the latest report of Asian Development Bank (ADB 2013a), mentions that development is distinct from aggregate growth, which can occur without significant transformation, as has happened in some oil-rich economies. This report highlights key components of structural transformation.[3]

Therefore, there now seems to be more of a consensus on the importance of quality of growth on the one hand and structural/industrial transformation on the other. However, we need to recognize that there is considerable diversity between countries in the agendas in regard to both the quality of growth and transformation. In the former agenda, countries that depend a lot on natural capital[4], the focus of their quality of growth agenda could be sustainability. On the other hand, countries that are exposed to higher risk of natural disasters have to focus on resilience and human security. Some low income countries are strongly concerned with under-nutrition, which persists in spite of considerably high rates of growth as has happened in Sub-Sahara African countries.

There is also diversity in the transformation agenda. Challenges facing countries in terms of structural transformation are different as they move along the development path and changes in endowment. They could have different foci on infrastructure, human resource development, technological innovation and so on. In some countries, industrial

2.The five big transformative shifts are: "Leave no one behind", "Put sustainable development at the core", "Transform economies for jobs and inclusive growth", "Build peace and effective, open and accountable public institutions", and "Forge a new global partnership" (High-Level Panel of Eminent Persons on the Post-2015 Agenda 2013, 7-12).

3. The five components are reallocation of factors of production; diversification, upgrading, and deepening of the production and export baskets; use of new production methods and processes and different inputs; urbanization; and social changes (ADB 2013a, 3-5).

4. Regarding natural capital, see Section 5.

challenges are shaped by special circumstances affecting particular groups, such as resource-rich countries, land-locked countries, small countries, countries located close to large consumer markets, and so on (World Bank 2012, 190). Thus, a typological approach could be useful to address these diversities. JICA and JBIC (2008) distinguish, first of all, resource-rich countries and resource-poor countries. The World Bank (2012) identifies eight categories of "job challenges", including resource-rich countries, urbanizing countries and conflict-affected countries. Obviously, individual countries' growth strategies need to address their own transformation agenda as well as quality of growth agenda.

The main objective of this paper is to obtain insights into the "quality of growth" in terms of the above-mentioned attributes, namely, balanced, inclusive, sustainable, innovative, and secure aspects of growth, as well as the relationship with "structural transformation," drawing principally on selected outstanding cases of what we term "industrial development"[5] that have resulted in a remarkable economic transformation and growth in a country or in regions of a country. These cases presented here are the automobile industry in Thailand, the transformation of the "Cerrado" in Brazil from barren lands to a source of high-productivity agriculture, the garment industry in Bangladesh, and salmon farming in Chile.

The next section will discuss key issues and the analytical perspective of quality of growth and economic/industrial/structural transformation. Section 3 will review briefly the process of outstanding industrial development of the four cases. Then sections 4, 5, 6, 7 and 8 will discuss interrelationships, synergies and trade-offs among transformation and each of five attributes of quality of growth drawing on experiences of the outstanding cases. The final section (Section 9) presents some concluding remarks.

## 2. Key issues and analytical perspective

The above discussion implies that the major challenge developing countries face is to transform their economies to achieve high-quality growth.

5. As regards the definition of industry, see the last paragraph of this section.

***Key issues of high "quality growth"***

Concerns about quality of growth have been increasing especially in Asia Pacific region. The leaders of APEC gathered in 2009 to chart a new growth paradigm for the Asia-Pacific region and agreed to formulate a comprehensive long-term growth strategy (APEC 2009, 1; APEC 2010, 2). As mentioned above, APEC leaders agreed on the APEC Growth Strategy in 2010, which highlighted "five growth attributes" and affirmed that, "APEC aims to achieve balanced, inclusive, sustainable, innovative, and secure growth" (2). The report of the "World Economic Forum Annual Meeting of the New Champions 2011: Mastering Quality Growth" (Summer Davos in Asia) stated that the Chinese premier's comprehensive plans underscored the many dimensions of the quest for quality growth, a concept with which the participants enthusiastically embraced. These included sustainability, inclusion, fairness, balance, and technology and innovation (World Economic Forum 2011, 3).

Many of the Asia Pacific countries also emphasize the importance of quality of growth. The new generation of Chinese leaders and the government set out an ambitious and comprehensive agenda for structural reforms in the "Decision by the Third Plenum Session of the Chinese Communist Party" held in 2013 in which, in addition to rebalancing the economy, other goals such as mitigating social inequality, protecting the environment and addressing climate change, addressing rural urban divide, and improving the quality of growth, are placed high in the policy agenda (Wang, Wang and Wang 2014, xi). In Japan, the *Annual Report on the Japanese Economy and Public Finance 2012* featured growth with "quality" (Japan. Cabinet Office 2012, 226). Some other countries of Asia including Malaysia, Thailand, India, Bhutan, and Vietnam, have been introducing a similar concept both explicitly and implicitly. For example, Malaysia launched a "New Economic Model", a framework of both inclusive and sustainable growth in 2012 (UN-ESCAP 2013, 8). Recently, in 2014, the Japanese Government posted a draft of the new "Development Cooperation Charter" to replace the "Official Development Assistance (ODA) Charter" for public comment. It highlights one of the most important challenges of development: "'high quality growth' and poverty reduction through this growth," in which inclusiveness, sustainability and resilience are stressed.

Most recently, the 22$^{nd}$ APEC Economic Leaders' Declaration: Beijing Agenda for an Integrated, Innovative and Interconnected Asia-Pacific

(APEC 2014, 7) stated that, "We agree to strengthen macroeconomic policy coordination with a view to forging policy synergy, and creating a sound policy environment for the robust, sustainable, balanced and inclusive economic growth in the region." The declaration emphasized especially innovative growth: "We recognize innovation as an important lever for economic growth and structural reform" (7).

In terms of enhancing the analytical perspective of quality of growth, a report published by Economic and Social Commission for Asia and the Pacific (UN-ESCAP), titled *Shifting from Quantity to Quality: Growth with Equality, Efficiency, Sustainability and Dynamism* (UN-ESCAP 2013), deserves special attention. The report presents a holistic framework, distinguishing three dimensions of quality of growth: environmental, social and economic. It highlights five key determinants of quality of growth: inclusiveness in relation to environmental, social and economic benefits, efficiency and productivity in the use of natural, human and manufactured capital, structural transformation that promotes social and economic values, balanced investment in all forms of capital, and limits in the economic, social and environmental spheres (UN-ESCAP 2013, 7).

While all the above-mentioned documents emphasize the quality of growth, their foci are not necessarily the same. However, they commonly give a high priority to inclusiveness and sustainability. In addition, both APEC and Summer Davos documents refer to balanced growth and innovative growth. On the other hand, some aspects of secure growth of the APEC Growth Strategy, such as food security and food safety, infectious disease preparedness, control of non-communicable diseases and strengthening health systems, are included in the concept of inclusive growth of other documents. Likewise, while resilience constitutes an attribute of quality growth in the Japanese Development Cooperation Charter, maximizing business and community resilience is included in the secure growth concept in the case of the APEC Growth Strategy.

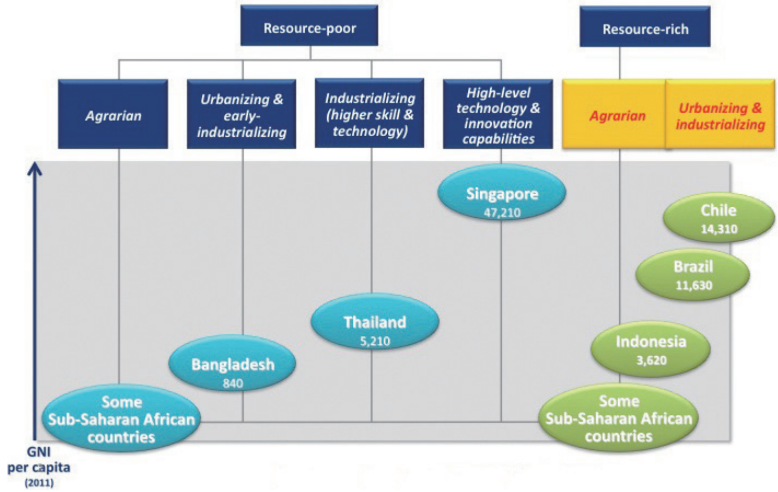
As such, in summary we could safely say that the cited documents coincide in the importance of inclusiveness and sustainability as high priority attributes of growth. They draw on outcomes of discussion on these attributes over a decade as reviewed in the following section. Innovative growth and balanced growth are attracting attention more recently and have been included in the APEC Growth Strategy and the Summer Davos documents. APEC's Beijing Agenda emphasized innovative growth especially. Secured growth and resilience are explicitly indicated in the APEC Growth Strategy and in Japan's Development Cooperation Charter respectively, while they are included in the concept of other attributes of growth in other documents. We could conclude that, so far, APEC Growth Strategy could be considered as the most comprehensive and widely agreed framework for quality of growth. Accordingly this paper uses this framework as the principle reference for the quality of growth and focuses mainly on two aspects, inclusiveness and sustainability, paying due attention to other aspects of quality of growth as well.

***Relationship between quality of growth and transformation***

To start with, we summarize some of the basic aspects of economic/industrial/structural transformation, on which there has been growing consensus in recent years. First, we understand that transformation is crucial and creates a virtuous circle of growth and further transformation, as the ADB's report (ADB 2013a) envisages. The report argues that when structural transformation creates a virtuous circle, it leads to higher growth and higher income per capita, and these induce further changes in the structure of the economy. This implies that a transformation agenda features basically in the drivers of growth, while a quality of growth agenda focuses on the desired attributes of growth, which appear to be related to both means/process and ends of growth, as discussed later.

Secondly, there is no standard model for transformation. As mentioned above, the transformation agenda differs among countries: for example, countries with a very high proportion of the population living in rural areas, early-industrializing countries, urbanizing countries, countries that need transformation from a labor-intensive to a knowledge-intensive economy, overcoming the middle-income trap. Figure 1 roughly illustrates the diverse transformation agenda with examples of some selected countries. Hence, from this viewpoint, there is no "one size fits all"-type standard model for transformation, although the common denominator of transformation is industrial structural change of an economy that generates growth.

**Figure 1. Diverse economic transformation agenda(Selected cases)**




Source: Prepared by the author, GNI per capita (2012) from World Development Indicators database, World Bank.

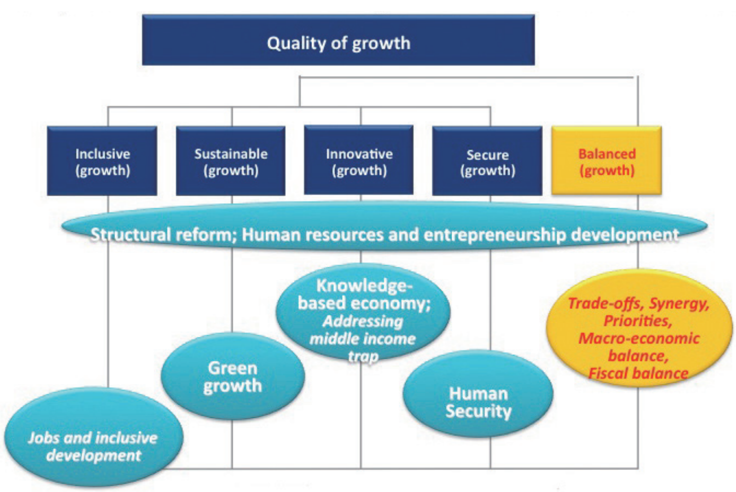
Thirdly, it appears that structural transformation is closely related to changes of endowments or assets and changes in comparative advantage, as well as higher efficiency of economy, innovation and technological progress. As Vinod et al. (2000) illustrate with the use of a framework of asset accumulation, growth, and welfare, "investments in physical, human and natural capital, together with many policy reforms, contribute to technological progress and the growth of total factor productivity (TFP), thereby boosting growth" (xxvi).

The nexus between changing endowments or asset accumulation and transformation could be more clearly explained by changing or dynamic comparative advantage. According to Noman and Stiglitz (2012), the "old" policies focused on improving economic efficiency within a static framework, "but the essence of development is dynamic. What matters, for instance, is not comparative advantage as of today, but dynamic comparative advantage" (7). Lin (2012), likewise, discusses 'changing comparative advantage,' arguing that "the more effective route for their learning and development is to exploit the advantages of backwardness and upgrade and diversify into new industries according to the changing comparative advantages determined by the changes in their endowment structure" (73).

Among key components of structural transformation identified by ADB (2013a), are reallocation of factors of production, diversification, upgrading, and deepening of the production and export baskets, and use of new production methods and processes and different inputs. These are intimately related to the changing or dynamic comparative advantage.

As such, quality of growth needs to be discussed in the context of transformation, because it is a driver of growth and could be related to different attributes of growth. As discussed above, the most widely agreed on and one of the most comprehensive definitions of quality of growth appears to be that of the APEC Growth Strategy, namely, to improve quality of growth focusing on five desired attributes for economic growth. In the action plan of the Growth Strategy, structural reform, human resource and entrepreneurship development, green growth, knowledge-based economy and human security are mentioned. Figure 2 roughly illustrates diverse quality of growth agenda with some selected examples of concrete actions to address the agenda.

**Figure 2. Diverse "quality of growth" agenda (selected cases): Examples of concrete actions to achieve growth with different desired attributes**




Source: Prepared by the author, based on APEC Growth Strategy (2010)

Therefore, the central theme could be to analyze the relationship between transformation and quality of growth, bearing in mind a distinct transformation agenda with a specific industrial structure. This analytical approach could elucidate aspects that might be overlooked or be invisible when economic growth is discussed at a macro level, where industries are treated collectively at an aggregate level. The quality of growth agenda and industrial transformation agenda could be different among countries due to different combinations of industries or industrial structures they have or intend to have.

We use the term 'industry' very broadly to refer not only to the manufacturing sector but also agro-business, modern agriculture, aquaculture, transport, logistics, tourism and any other activities that produce goods and services that are new in the country and that require significant human (and social), physical, natural (and environmental) capital as well as accumulation of knowledge and capabilities.

## 3. Outstanding cases of industrial development and transformation[6]

This section consists of very brief thumbnail sketches of four outstanding cases of industrial transformation. More details in terms of the impact of transformation on quality of growth will be provided in later sections of this paper. These sketches stress the positive aspects of the cases, while some challenges will be mentioned later.

***Thailand automobile industry***

In 1995, Thailand's annual automobile exports were less than half a billion US dollars, well below exports from India and Malaysia. In 2008, exports approached 28 billion US dollars, making Thailand the largest automobile exporter in the ASEAN region, and by 2012, Thailand was the seventh largest exporter in the world. Production of 1 million cars was achieved in 2005 and 2.5 million cars in 2012.

It is estimated there were about 690 first-tier parts makers, 30 percent of them Thai majority joint venture companies, and 23 percent of them pure Thai companies, and 1,700 second- and third-tier parts makers, most of them locally owned small and medium enterprises (SMEs), supporting the automobile industry in Thailand in 2010 (Natsuda and

6. Analysis of these cases is based on another of the author's papers (Hosono 2013). See the paper for details of these cases. In addition to these cases, the author also drew on nine case studies included in JICA/JBIC (2008).

Thoburn 2011, 8). At present, the automobile industry is the principal engine for growth in Thailand's economy. "The Detroit of Asia" envisaged once by the Thai government is now a reality and an "automobile belt" has been established from Ayutthaya to the Eastern Seaboard. As Athukorala and Kohpaiboon (2011) point out, "the automobile industry has been the target of industrial development in many countries as a driver of growth – a source of employment, technological expertise, and a stimulus to other sectors through backward linkages…. But only a handful of developing countries have managed to develop an internationally competitive automobile industry." [7]

Development of an automobile industry requires skilled labor and supporting industries to provide up to 20,000 to 30,000 parts and components. Supporting industries and automobile assembly plants are closely related and provide externalities to each other. Furthermore, the development of supporting industries for automobile industries takes years because they need a prolonged process of accumulation of knowledge and capabilities, especially in the formation of human resources and learning about technology.

***Brazil's Cerrado agriculture and agro-industrial value chain***

Starting from the mid-1970s, the tropical savanna of Brazil, called the Cerrado, transformed itself into one of the world's most productive grain-growing regions in just a quarter of a century, realizing modern upland farming in a tropical region for the first time in human history (Hosono, Magno Campos da Rocha and Hongo, forthcoming). This remarkable transformation has become known throughout the world as the 'Cerrado Miracle'(The Economist, 2010). Today, Brazil is one of world's major grain-producing countries, and in 2012 exported the world's largest volume of soybeans. Dr. Norman E. Borlaug, who received the Nobel Peace Prize for his work related to the Green Revolution, rated the development of agriculture in the Cerrado as one of the great achievements of agricultural science in the 20th century. This agricultural transformation not only increased the production of competitive commodities such as soybeans, corn, coffee, sugar, and cotton, but it also enabled the development of food value chains both inside and outside the Cerrado region. While the

7. It goes without saying that the automobile is a complex product, consisting of a large number of parts and components that involve different production processes and factor proportions. Many of these parts and components are manufactured by independent suppliers in other industries such as textiles, glass, plastic, electronics, rubber products, as well as steel and other metals (Athukorala and Kohpaiboon 2011, 1) .

production of broiler chicken and pork had been growing steadily in the 1990s, this growth accelerated at the end of the decade and resulted in a sharp increase in meat exports.

***Bangladesh garment industry***

In 1981, ten years after Bangladesh achieved independence, raw jute and jute goods were its major exports, corresponding to 68 percent of total exports. In 2011, garments and textiles constituted 85 percent of total exports, of which 76 percent corresponded to garments. These industries' business entities amounted to 50 percent of all manufacturing establishments in the country (UNCTAD 2012, 11). Today, the garment industry has 5,000-6,000 factories with 7-8 million workers using the assembly-line method of production. The wages of the workers in these industries are around 35 percent higher than the national average (11). Exports as a percentage of GDP tripled between 1990 and 2010, with much of the increase in the thriving ready-made garment industry, which is highly intensive in female labor (WB 2012, 197). This Bangladeshi success story is remarkable because, as a recent World Bank study highlighted, "the country was often held out in the development literature as a hopeless case" (197).

***Chile's salmon industry***

Aquaculture has been growing globally, and made up 49.4 percent of the global fish harvest in 2012, compared with 16.4 percent in 1990, in what is called the "blue revolution," to draw a comparison with agriculture's "green revolution" ("Aquaculture Satisfies the Demand for Fish" 2014; OECD 2008, 85). One of the most impressive cases of the blue revolution is Chile's salmon farming and processing industry. Salmon did not exist in Chile four decades ago.

Now, Chile is one of the world's top salmon-exporting countries, ranked on a par with Norway. It is no exaggeration to describe this as a "miracle." Moreover, Chile is a resource-rich country highly dependent on copper exports. In 2011, exports of mineral ores and their refined products corresponded to more than 60 percent of total exports, 52 percent of which are copper ore and refined copper. Creating a new industry in a highly mineral resource-rich country is considered to be difficult due to Dutch disease and other factors.

***Enabling factors of transformation***

The four cases show how distinctive critical factors for industrial transformation identified by several recent studies interact in practice. Learning and accumulation of knowledge and capabilities are essential. Its process is gradual, incremental and, generally, path-dependent. However, the process is critical for changing the endowments to attain dynamic comparative advantage. In most of the cases, the government or public institutions facilitated the process. In all the cases, the constant improvement of the capabilities of those involved in the new industries was crucial.

Change of endowments is also attained by infrastructure construction and technological innovation. They often trigger or accelerate industrial development and transformation. In these cases, effective institutions accomplished the role of facilitator or catalyzer of transformation. First of all, many of them had been created for specific purposes and had a long-term vision and sense of mission. Second, most such institutions regarded public-private interaction, consultation or coordination to be of the highest priority. Third, most of these institutions adapted flexibly to changes in the global market and phases of industrial development.

These findings generally confirm the conclusion of a report of JICA/JBIC (2008) regarding decisive factors of economic growth found in the Asian experience. They are the mid- to long-term vision for development and strategies, flexibility in responding to a changing environment, government's close ties with the private sector, and harnessing the private sector's capacity to the maximum. The report also highlights the following as growth-driving functions: development of infrastructure, human resource development and upgrade of the credit market. (11; 17-18)

## 4. Transformation and "inclusive aspects" of quality of growth

***Key issues and analytical perspective***

In recent years, "inclusive development" has attracted increasing attention in the international community. In 2007, the World Bank's president declared the contribution to inclusive and sustainable globalization to be the vision of the World Bank group. The Japan International Cooperation Agency (JICA) incorporated the term "inclusive" into its vision in 2008. A year later, the Asian Development Bank (ADB) positioned inclusive growth as one of the three agenda items in its long-term strategic framework of "Strategy 2020" (ADB 2009). As was mentioned, the APEC Growth Strategy was agreed in 2010 and "inclusive growth" was featured in the document as one of the five desired attributes for growth[8]. The close relation between transformation and inclusive growth was also highlighted in the Report of HLP on the post-2015 Agenda, which emphasizes the importance of transforming economies for jobs and inclusive growth as one the five high-priority transformative shifts.

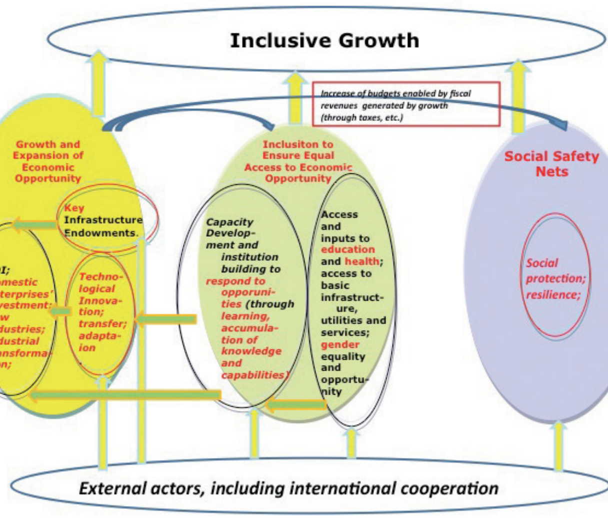
The definition of inclusive growth in recent literature explicitly or implicitly explains the intrinsic relationship between transformation, and jobs and inclusive growth. In several studies, such as the ADB's "Framework of Inclusive Growth Indicators (FIGI)", inclusive development is understood to include, among others things, three fundamental components (or pillars): development of productive jobs, equal access to economic opportunities by expanding human capacities, and social protection.[9]

The first component refers to the creation of jobs, which in terms of transformation means a change of industrial structures through the creation of new industries, diversification of industries, and up-grading of industries with subsequent impacts on the creation of jobs or increase of demand in the labor market, particularly through good jobs. The second component, on the other hand, is related to the capacity of workers to be able to respond to new opportunities for jobs. Assuring equal access to opportunities by education, training and skill means improvement of the capacity to respond to demands in the job market. The third component is to strengthen the safety net to protect the chronically poor, or those who are not yet able to participate in the process (see Figure 3).

8. As for definition of and recent discussion on inclusive growth, see Kozuka (2014).

9. This definition is based on ADB's Framework of Inclusive Growth Indicators (FIGI) (ADB 2013b), which is similar to the definition of Ali et al. (2007) and Zhuang and Ali (2010). FIGI asserts that the outcomes of inclusive growth are achieved through the three policy pillars of (i) sustained economic growth and development of productive jobs and economic opportunities, (ii) social inclusion to ensure equal access to economic opportunity by expanding human capacities, and (iii) social safety nets to protect the chronically poor and to address the risks and vulnerabilities of the population. (3)

**Figure 3: Relationship between transformation and inclusive growth**




Note: This figure roughly illustrates the relationship between the main components of "inclusive growth." Words in italic are added by the author.
Source: Author. Based on discussion of main text, Hosono (2014) and ADB (2013: p.4).

The Report of HLP on the post-2015 Agenda coincides with this view. It considers the creation of opportunities for good and decent jobs and secure livelihoods as the first priority in transforming economies for jobs and inclusive growth. The report also mentions that people need the education, training and skills to be successful in the job market and respond to demands by business for more workers (8-9). These two aspects precisely correspond to the first two components of the ADB's FIGI. They are, so to speak, the two main wheels of "inclusive growth" that should be well articulated to become the driving force of the growth.

However the matching of these two components, creation of employment opportunities and enhancement of capacity of people to respond to the opportunities, is not always easy. FIGI's second pillar, "social inclusion to ensure equal access to economic opportunity," includes the directive "access and inputs to education and health." This is a fundamental aspect of the pillar, because basic education is essential for human capital to enhance its capacity; however, in order for people to respond to changing demand in the process of industrial transformation, advanced capacity development is required and knowledge and capabilities need to be embodied in individuals and organizations. As Cimoli, Dosi and Stiglitz

(2009, 2) put it, "a 'great transformation' entails a major process of accumulation of knowledge and capabilities … Certainly, part of such capabilities builds on education and formally acquired skills. However, at least equally importantly, capabilities have to do with the problem-solving knowledge embodied in organizations — concerning, for example, production technologies, marketing, labor relations, as well as 'dynamic capabilities' of search and learning".

In order to reflect this aspect, which is essential for the two pillars of inclusive growth to become well articulated or well matched, "capacity development and institution building to respond to opportunities (through learning, accumulation of knowledge and capabilities)" has been added by the author (in italics) into the second pillar of the Figure 3.

***Findings from case studies***

In the four cases presented in Section 3, new industries that emerged from scratch created jobs and enabled people to participate in the growth. In this process, it was crucial there were people who were capable of responding to the new opportunities created. Through this process, transformation with inclusive growth took place.

In the case of the Bangladeshi textile and apparel industry, the changes in rural society in this country have been profound and are related closely to the massive mobilization of female workers by the garment industry located mainly in two big cities: Dhaka and Chittagong. Generally speaking, urbanizing countries like Bangladesh are endowed with abundant unskilled labor and these countries' integration into the world economy can lead to the development of light manufacturing industries (World Bank 2012, 197).

Several factors interacted in order for this change to take place. Modernization of agriculture, based on technology adoption, enabled farmers to shift from low-yield, single crop, deep-water rice to double cropping of short maturity, high-yield rice, as well as the well-known rapid spread of microfinance and construction of rural infrastructure, were among major factors that changed the rural society of Bangladesh (World Bank 2012, 197). More specifically, rural roads, irrigation, market facilities and other rural infrastructure, micro-credit, school education and so forth, provided by NGOs, central and local governments and donors, all together enabled the remarkable agricultural and rural development of Bangladesh over the last three decades. In this process, the rural development programs of the government and donors were implemented effectively by the Local Government Engineering Department (LGED), which played a critical role in the provision of rural infrastructure.[10] Micro-credit and related services were also effectively extended by NGOs including BRAC and Grameen Bank. The Jamuna Multipurpose Bridge, inaugurated in 1998, as the largest construction project in Bangladesh history, has been a major channel for integrating the lagging western region of the country with the leading eastern region, enabling cheaper transportation of gas, electricity and telecommunications, and enhancing the labor mobility of the western region (Hossein et al. 2012, 11).

This whole process enhanced the mobility and readiness of low-opportunity-cost labor in rural Bangladesh and changed gradually, but steadily, the endowments of the country.[11] The mobilization of this labor was triggered by the Desh-Daewoo garment project. As Rhee (1990) stated, "development is a dynamic process in which self-generating mechanisms may emerge once action is initiated…. To start on the path of development in an outward-oriented direction, a first spark must be created." That spark was the collaborative effort of a domestic catalyst (Desh) that mobilized the necessary local resources and a foreign catalyst (Daewoo). It was a process in which the synergy between creation of jobs by development of a new garment industry and enhancement of capacity of people to respond to new opportunities took place.

In the case of the Thai automobile industry, engineers and skilled/semi-skilled labor was crucial to making the industry viable, competitive and inclusive. Development of the car assembly industry by foreign direct

10. The role of LGED in rural development cannot be overemphasized. LGED is one of the largest public sector organizations in Bangladesh, with a staff exceeding 10,000 and a development budget accounting for 14% (FY2009-10) of the total development budget of the government. For details of LGED, see Fujita (2011).

11. We should remember that a pessimistic appraisal was common in regard to the role of women in the labor market in Bangladesh. This caused pessimism about the country's growth, due to, among others, the fact that most East Asian countries had the advantage of a high initial female labor force participation rate at the start of the growth process (World Bank 2012 and other studies). As Hossain et al. (2012, 29) emphasized, none of the predictions were able to anticipate that women would offer the secret ingredients of success that was achieved in Bangladesh, in areas from exports to schooling to microcredit use. The dramatic nature of the increase in female participation in the growth of ready-made garment (RMG) workers is a case in point.

investment created employment opportunities in Bangkok and later in the newly developed Eastern Seaboard. As in the case of Bangladesh, this was enabled by a series of infrastructure projects. To make the Thai automobile industries competitive and at the same time inclusive, small and medium enterprises (SMEs) were essential and they were encouraged by several policy measures.

In order to develop supporting industries (SMEs) for the Thai automobile industry, one of the specific and very effective policies is considered to be the implementation of the LCR (local contents requirement) system. In order to comply with the LCR, automobile assembly companies in Thailand had to increase the local content of components produced by themselves, to ask their component suppliers in their countries of origin to invest in Thailand, or to support local Thai firms to produce components of a required quality standard.[12]

Based on extensive field research, Yamashita (2004) concluded that, "the process of adaptation to the LCR enabled the accumulation of a very wide range of automobile parts industries and formation a pool of skilled technicians and engineers, both of which are indispensable for the development of the automobile industry" (5).[13] Through this process, assembly companies have offered continuous technological support to local supporting industries. In addition to these specific aspects, it should also be highlighted that Thailand has been making efforts for years to strengthen education in engineering and training related to industrial skills.

In the case of the Cerrado development, employment opportunities were created first by the new agricultural development of soybeans, and other grains enabled by technological and institutional innovations as well as infrastructure development. However, massive employment opportunities have been further created by the expansion of the value chains around Cerrado agriculture, composed of agricultural and livestock processing activities.

Engineers and skilled workers as well as technology for agricultural and livestock processing had been accumulating over a long period in the

12. The LCR encouraged car assemblers to produce parts locally by themselves or to purchase them from local companies. This was not easy because supporting industries in Thailand did not exist. Assembling companies had to start the process of localization from scratch. Following this, the LCR was raised incrementally through 1994 up to 60 percent for pick-up trucks with gasoline engines and 72 percent for those with diesel engines.

13. Yamashita (2004, 5). Translation is by the author.

southeastern agricultural zone, and there was also access to an extensive labor force from all over Brazil. By accessing this labor force, including engineers and workers, the Cerrado region managed to build a competitive agricultural, livestock, and processing value chain, which has enabled high-value-added processed food to be produced and employment expanded in this region.

There are many organizations participating in the value chain. For example, in the western Bahia, one of the typical Cerrado agricultural regions, the Western Bahian Technology and Research Center (CPTO) coordinated with a branch office of Brazilian Agricultural Research Corporation (Embrapa) on testing, research, and technological development, and the resulting technologies were provided to producers through regional producer support organizations such as the Agricultural Cooperative of Western Bahia (COOPROESTE).

This process produced a massive migration to inland states from all over Brazil, in particular, from southeastern and northeastern states, and contributed to inclusive development with expanded employment.These cases provide evidence regarding the necessity of advanced capacity development in order for people to respond to changing demand in the process of industrial transformation. In this regard, the APEC Growth Strategy indicates concrete actions to promote inclusive growth, such as promotion of SMEs, MEs and entrepreneurship development, promotion of more inclusive access to finance and financial services to facilitate access to finance for SMEs, MEs, women entrepreneurs, and vulnerable groups, as well as promotion of job creation, human resource development, and active labor market policies.[14] These actions are considered to be effective based on the above case studies.

## 5. Transformation and "sustainability aspect" of quality of growth

### *Key issues and analytical perspective*

Transformation and sustainability is becoming one of the central themes of the development agenda. Generally, emphasis is put on the necessity of transforming the actual economic structure into a more sustainable or

14. Other actions for inclusive development included the APEC Growth Strategy are enhancements of social resilience and social welfare through means such as improving social safety nets and supporting vulnerable groups, creation of new economic opportunities for women, elderly, and vulnerable groups, and the promotion of tourism.

green one. "Green Growth" is a part of the "Action Plan for the APEC Growth Strategy" (APEC 2010, 10-11). Five years before this strategy was agreed on by APEC leaders in 2010, "green growth" was adopted at the Fifth Ministerial Conference on Environment and Development in Asia and the Pacific (MCED) as a strategy for achieving sustainable development and for achieving Millennium Development Goals 1 (poverty reduction) and 7 (environment sustainability) (UN-ESCAP 2013, 26). The green growth approach adopted by the MCED sought to harmonize economic growth with environmental sustainability, while improving the eco-efficiency of economic growth and enhancing the synergies between environment and economy. As such, green growth is a concept that was coined in the Asia and the Pacific region in 2005.

Later, an OECD-DAC report, "Natural Resources and Pro-Poor Growth: the Economics and Politics," focused on the economic dimensions of natural resource management and intended to encourage decision makers to recognize the contribution of natural resources to pro-poor growth and the importance of policies encouraging the sustainable management of these resources (OECD 2008, 26). Furthermore, a more recent OECD report titled *Towards Green Growth* provided the following definition of green growth: "Green growth means fostering economic growth and development, while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies (OECD 2011, 4).

Finally at the worldwide level, the Rio+20 Conference in 2012 featured green growth. Its outcome document, *The Future We Want* stated that, "we express our determination to address the themes of the conference, namely a green economy in the context of sustainable development and poverty reduction, and the institutional framework for sustainable development" (United Nations Conference on Sustainable Development 2012, 2) .

The concept of green growth has also been endorsed by United Nations Environment Program (UNEP). Its recent document titled *Towards a Green Economy* (UNEP 2013) expounds the aims of transforming society into one that can grow economically while increasing environmental quality and social inclusiveness. UNEP defines a green economy as one that results in "improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities" (UNEP 2010, quoted in UNEP 2013, 9). The UN-ESCAP document proposes a "system change for quality of growth: turning tradeoffs between the three dimensions of sustainable development, into synergies" (2013, 16). In this document the three dimensions of growth qualities are ecological quality, economic quality and social quality.

Through this process since the MCED meeting of UN-ESCAP in 2005, the concept of green growth, has been increasingly mainstreamed in international debates on sustainable and inclusive development and is therefore closely related to the quality of growth, as the APEC Growth Strategy indicates. As in any process of development, although sustainability and environmental aspects should be fully taken into account as the above documents discuss in a general framework, special attention to these aspects is needed in cases of transformation in which "natural capital" is the essential endowment that enables the transformation.

While natural capital assets are not created by human activity, their quality and capacity to yield goods and services, and therefore their value as productive inputs, are affected by it (OECD 2008, 30). Understanding the synergies between the three dimensions of the growth qualities is normally the most difficult in the cases in which natural capital plays the crucial part of transformation. Analysis of these cases could give us a clue towards an effective approach to quality growth with sustainability and inclusiveness.

***Findings from case studies***

Two of this paper's outstanding cases, Cerrado agriculture and Chile's salmon aquaculture, are cases in which human activity, particularly technological innovation or adaptation increased the value of natural capital: Cerrado land and southern Chile's seashore. A remarkable transformation of a vast region of Cerrado and southern Chile took place utilizing natural capital, which was not necessarily used before as an input for production of goods and services. However, special attention has been needed to address the risk of sustainability due to the possible degradation of or other consequences to the natural capital.

Furthermore, it is necessary to bear in mind the potential value of natural capital. For example, the Cerrado has become known as the savanna zone with the world's richest biodiversity (Brazil. Ministry of the Environment 2010). Plants in the Cerrado cope with the unique stresses of extreme nutrient shortages, high soil acidity, and high aluminum saturation, and are believed to have evolved to protect themselves against damage from ants and wildfires, making them a valuable genetic resource.

In the case of the Cerrado agriculture, from the outset, active environmental conservation measures were implemented. As well as adhering strictly to the 20% legal reserve (50% in Tocantins and other states) in individual farms, to prevent the legal reserve areas from becoming a haphazard patchwork of points, efforts were advanced to create joint strengths of reserve land through a "condominium" model, as well as the formation of micro-corridors of reserve land made up of individual reserves. Moreover, measures to preserve agricultural environments have been actively promoted, such as the introduction of contour cropping, crop rotation, and no-till farming (direct planting).

The government of Brazil conducted a series of broad and varied initiatives aimed at environmental conservation. In the Cerrado region, the government especially pursued a balance between Cerrado agricultural development policies and environmental conservation policies. This could be considered as a pioneering initiative for sustainable transformation of unused land into fertile agricultural land. In 1998, Brazil enacted the Environmental Crimes Law, and in 2000 the Forest Code was amended to impose stricter legal reserve percentages on landowners and to enable the trading of reserve land with the land of other forested landowners. Also in 2000, the National System of Nature Conservation Units (SNUC) was established. This system was designed to organize categories for native reserves and both protect and restore the biodiversity found in their ecosystems.

The Environmental Conservation Expansion Program, which is meant to efficiently manage expansive areas of privately owned land using satellite imaging technology, was launched through Presidential Directive 7029 at the end of 2009, and the government also decided to introduce the Rural Environmental Registry (CAR, Cadastro Ambiental Rural, in Portuguese).[15] In October 2012, the Ministry of Environment

15. A registry that uses a GIS to determine the borders of each farm, as well as the legal reserve and preservation districts in each part of owned land. Upon the request of a farm, expert contractors prepare digitized drawings of the land usage status inside each farm area. These electronic data are incorporated into Integrated Environmental Monitoring and Licensing databases operated by state government environmental agencies.

issued a decree that established the obligation of registering all A registry that uses a GIS to determine the borders of each farm, as well as the legal reserve and preservation districts in each part of owned land. Upon the request of a farm, expert contractors prepare digitized drawings of the land usage status inside each farm area. These electronic data are incorporated into Integrated Environmental Monitoring and Licensing databases operated by state agricultural land in Brazil in accordance with CAR within a year (or in two years if authorized by the President). As of July 2013, 25 states and the Federal District (DF) had agreed to participate with CAR.[16] The National System of CAR (SiCAR; Sistema National de Cadastro Ambiental Rural, in Portuguese) was established by Presidential Directive in October 2012. Moreover, Brazil's environment conservation policy was further strengthened by Law 12651 and Law 12727 (amendment to Law 12651), enforced in 2012.

In spite of the impressive increase of agricultural production in Cerrado in the last 3 to 4 decades, land used by "Cerrado agriculture" has not increased as fast as the rate of production growth. This is due to the remarkable improvement of yield per hectare. According to the Brazilian Institute of Geography and Statistics (IBGE) farm census, 61.36% of the growth of agricultural production (soybeans, rice, edible beans, corn, cotton and coffee) in the Cerrado during the period between 1970 and 2006 was provided by yield growth, while the rest, 38.64%, was due to expansion of the planted area.

As a result of the development of Cerrado agriculture, the areas used for crops amounted to 21.6 million hectares in 2002, occupying 10.5% of the total Cerrado biome, which is estimated at 204.7 million hectares, according to an analysis based on LANDSAT satellite images.[17] The same analysis showed that about 26% of Cerrado, 54.2 million hectares, was occupied by "improved pasture" (or cultivated pasture) in 2002. Hence, the sum of cropland and improved pasture, which could be considered as total "farm land" for agriculture and livestock production, amounted to 75.7 million hectares, equivalent to 37% of the total of

16. According to the announcement of the Minister of the Environment on July 4$^{th}$, 2013.

17. This is the result of research to map land use in Cerrado at a scale of 1:250,000 using the methodology of Landsat image segmentation. The research was supported by the Project of Conservation and Sustainable Utilization of Brazilian Biological Diversity of the Ministry of Environment, World Bank Global Environment Facility and IBGE, among others. The results were published in 2008. (Sano et al. 2008)

Cerrado.[18]

In the case of Chilean salmon farming, it was crucial to establish a regulatory framework for many aspects of the salmon industry, especially environment and quality standards for the aquaculture industry. In other words, what was needed was so-called "institutional infrastructure," including laws, regulations, and environment and quality standards. Mr. Mitsuo Sakai, who participated in the Japan Chile Technical Cooperation (PTTC) for salmon farming in 1980s noted that, "by starting technology transfer activities concerning feed development and fish disease control early, the PTTC project forestalled the problems the farming industry faced later, including concerns about the spread of salmonid bacterial kidney disease (BKD), and the paucity of feed for the feeding culture business that had traditionally used living feed rather than fish meal." He concluded by saying, "These technology transfer activities anticipated technical problems that would arise in the early stages of the development of the Chilean salmon industry, and thus devised precautionary measures, including the development of necessary technologies" (Sakai and Ishida 2002).

However, the Chilean salmon industry experienced a sanitary crisis caused by Infectious Salmon Anemia (ISA) in 2007. This experience demonstrated how natural resource-based activities such as salmon sea farming need to be supported not only by advanced production technology, but also by scientific knowledge on the local environment so that appropriate local regulatory institutions to manage the use of common resources can be established. This case also demonstrates that progress in production capabilities may not be sufficient to ensure long-term sustainability in natural resource-based industries in which natural capital plays an important role. Institutional change took place as a reaction to the sanitary crisis in 2007 in Chile: the Aquaculture Law to modify the existing General Law of Fishery and Aquaculture enacted in 2010 was an important milestone. This modification granted more authority to the government to ensure sustainable management of aquaculture.

18. As there are urban areas in the Cerrado, which amount to 0.4%, and reforested areas corresponding to 1.5%, the total areas with some kind of land use were equivalent to 39% of Cerrado's total land. The remainder, 61%, had no changes caused by human activities, and were considered to be "natural Cerrado".

As discussed above, the quality of growth extends to green growth concepts. UN-ESCAP (2013, 27) argues that, "Policies and investments that promote green growth seek to improve the "eco-efficiency" of growth, which involves minimizing resources use and negative environment impacts per unit of benefit generated by the economy…. Green growth is a pre-requisite for building a green economy characterized by substantially increased investments in economic activities that build on and enhance the earth's natural capital or reduce ecological scarcities and environmental risks..." The above-mentioned cases are examples of the efforts to promote green growth defined as above.

## 6. Transformation and the "innovative aspect" of quality of growth

***Key issues and analytical perspective***

Noman and Stiglitz (2012, 7) emphasize that "long-term success rests on societies' "learning" – new technologies, new ways of doing business, new ways of managing the economy, new ways of dealing with other countries." Related to this notion of a "learning society" is the view of Cimoli, Dosi, and Stiglitz (2009, 2) that great industrial transformation "entails a major process of accumulation of knowledge and capabilities, at the level of both individuals and organizations." A learning society and learning economy are featured in Stiglitz and Greewald (2014). They contend that, "most of the increases in standard of living are, as Solow suggested, a result of increases in productivity—learning how to do things better. And if it is true that productivity is the result of learning and that productivity increases (learning) are endogenous, then a focal point of policy ought to be increasing learning within the economy; that is, increase the ability and the incentives to learn, and learning to learn..." (5-6). The innovative aspect of quality of growth precisely deals with learning and accumulation of knowledge and capabilities. From this point of view, quality of growth is improved if growth is accompanied by an endogenous process of learning and innovation that would produce further growth with transformation.

As was cited above, the ADB report (2013a, 5) argues that when structural transformation creates a virtuous circle, it leads to higher growth and higher income per capita, and these induce further changes in the structure of the economy. In this virtuous circle, capabilities and learning matter. The report explains that countries' structural transformation patterns differ in both direction and pace due to, along with demand and supply factors and demographic and geographic variables, such factors as (1) good organizational capabilities that encompass all the tacit knowledge necessary to produce a good or deliver a service; and (2) specific policies and actions (e.g. those that pertain to education and the technological learning needed to compete internationally); institutions (that have developed historically and facilitate or retard structural transformation); and politics, which often work jointly to determine the direction and pace of structural transformation.

The APEC leaders' Beijing Agenda for an Integrated, Innovative and Interconnected Asia-Pacific (APEC 2014, 7) not only emphasizes the importance of innovative growth but also its intrinsic relationship with transformation. The Beijing Agenda affirms that, "We realize that the prospects for the shared prosperity of APEC will depend on innovative development, economic reform and growth in the region, which are complementary and mutually reinforcing. We recognize that the Asia-Pacific region is at a crucial stage of economic transformation. We are committed to accelerating the pace of reform and innovation, and exploring new growth areas with the goal of bolstering the position of the Asia-Pacific as an engine of world economic growth." (7) [19]

Currently, in terms of innovative growth, industries of which main resource is natural capital have much more difficulty investing in knowledge and technological breakthrough than other productive sectors such as manufacturing and services due to the high degree of site specificity caused by the biological nature of this type of production and due to the normally large number of stakeholders (farmers and fishers) involved. In addition to the above, there is the general difficulty appropriating the benefits from knowledge generation. These conditions create higher barriers to investment in knowledge and technology under the market mechanism in general, and especially for activities based on natural capital such as agriculture and fishery. The case of the Cerrado

19. Regarding this aspect, the APEC Growth Strategy stated four years ago: "The adoption of policies that foster an enabling environment of innovative growth will be increasingly crucial for future prosperity. Technology breakthrough and information and communication technologies (ICTs) play a significant role as a primary driver of economic growth, and innovation in new products and services can enhance progress on critical global issues..." (APEC 2010, 6-7).

agriculture and agro-industry value chain discussed below could be relevant from this perspective of the innovative aspects of quality of growth.

***Findings from the case study on the Cerrado agriculture and agro-industrial value chain***

The importance of the innovative aspect of quality of growth could be understood most clearly through the contribution of the Brazilian Agricultural Research Corporation (Embrapa) to the continuous development of Cerrado agriculture and its value chain. This solid and highly effective institution was essential to continuously achieve the technological innovations required for Cerrado agriculture. A strong "national innovation system (NIS)" in the area of agriculture has been developed around the institution of Embrapa in the case of Brazil.[20]

From the perspective of the innovation system, Embrapa could be considered one of the most important hubs or coordinators of the agricultural sector innovation system and a part of NIS. Embrapa established and led the "National System of Agricultural Research" (Brazil. Ministry of Agriculture, Livestock and Supply and JICA 2002, 26 of Part 4). This system has "an excellent structure and aims at the technological development and its diffusion in an efficient and effective manner." The system was designed for collaboration and exchange of technical information among more than 400 organizations over the whole country, with the participation of state research companies, university research organizations, agricultural research departments in private companies, and others.

## 7. Transformation and "secure growth", including "human security", and resilience aspects of quality of growth

***Key issues***

It is unnecessary to say that, in the transformation process, efforts should be made to minimize natural and human risks to growth. Preparedness or resilience for emergencies, natural disasters, infectious diseases need to be enhanced. Nutrition, food security and food safety should be essential. In other words, human security should be realized. The APEC Growth Strategy included secure growth as an attribute of

20. Regarding the concept of the national system of innovation, see Malerba and Nelson (2012).

the quality of growth and stated: “We seek to protect the region’s citizens’ economic and physical well-being and to provide the secure environment necessary for economic activity.” This strategy refers to resilience in relation to preparedness for emergencies and natural disasters: “APEC will identify gaps in disaster risk reduction approaches in the region and develop practical mechanisms to maximize business and community resilience...” (APEC 2010, 9). Japan’s Development Cooperation Charter explicitly includes resilience as one of the attributes of high quality growth. It emphasizes that, in the concept of high quality growth, inclusiveness, sustainability should be combined with resilience enabling people to cope with and recover from diverse types of shocks including economic crisis and natural disasters.

***Findings from case studies***

Secure growth and resilience are the most recent foci of discussion related to quality of growth and are closely related to other attributes such as inclusiveness and sustainability. Further discussion is needed to see if secure growth and resilience can be sufficiently addressed by inclusiveness and sustainability. From the perspective of industrial transformation, the cases of Bangladesh garment industry and Chile’s salmon farming appear to be relevant. The case studies could provide some insight into the above-mentioned question.

The case of the Bangladesh apparel industry elucidates the secure aspect of industrial transformation. An apparel factory fire in November 2011 that killed 117 workers and the collapse of a building housing several factories located in the outskirts of Dhaka in April 2012, causing the tragic death of 1,129 workers and injuries to about 2,500 workers, brought the occupational security issue to the world’s attention. A new study by the International Labour Organization Research Department (ILO 2013) warns that unless a comprehensive set of labor market and social policies are introduced, Bangladesh will be unable to maintain its economic momentum and improve living standards in a sustainable way.

In the case of the Chilean salmon industry, the development of this new industry might have succeeded in creating ‘productive employment’, or employment that yields sufficient returns to labor to permit workers and their dependents to live at the level of consumption above the poverty line (ILO 2009). However, a part of this ‘productive employment’ might not be always considered as ‘decent work,’ or work that provides security (health, pensions, security against job loss), equity (equity of conditions and opportunities for all the workers) and adequacies (appropriate working hours, absence of coercion) (ILO 2012). This is largely due to the lack of well-established labor legislation, including a labor code capable of adequately regulating labor relations at the company level in Chile. For instance, employment without contract and social security for employees was the standard practice in some small-scale salmon farming firms in Chile.

These cases show the necessity of providing the secure environment for economic activity, which is an attribute of quality of growth not fully addressed by inclusiveness and sustainability of growth.

## 8. Synergy, trade-offs and other relationships among attributes of quality of growth and transformation

Both APEC and Summer Davos documents refer to balanced growth. The APEC Growth Strategy states: "We seek growth across and within our economies through macroeconomic policies and structural reforms that will gradually unwind imbalances and raise potential output" (APEC 2010, 2). The Summer Davos 2011 document affirms that, "Imbalances in national economies and the global economy are ingredients of crisis and have to be addressed to mitigate the risks from volatility and uncertainty" (World Economic Forum 2011, 3).

As fiscal balance is an important part of balanced growth, this obviously would limit the capacity of government to increase expenditure to improve quality of growth in terms of some of the attributes. For example, conditional cash transfer (CCT), which effectively contributes to the access of poor people to education and health, has to be carefully carried out within fiscal constraints. The cost of Bolsa Familia, which has been a successful CCT in Brazil that resulted in significant improvement in education and in the decrease of the mortality rate of children under five years of age, was around 0.5% of GDP. Brazil, as a middle-income country, has been able to afford this cost. The benefits of Bolsa Familia have been really remarkable compared with its cost. However, some low-income countries with serious budget constraints could not afford CCT on the same scale as Brazil.

In this regard, the analysis of Lopez et al. (2008) on fiscal policies for better results in terms of quality of growth seems highly relevant. "Fiscal policy is important for allocating resources to maintain a balance between the three key assets of society: human capital, physical capital, and natural capital, which are critical for the quantity and quality of growth....Fiscal policy is therefore a powerful instrument, capable of affecting the orientation of asset accumulation and economic growth in a dramatic way" (p. 17).

From this perspective, a holistic approach to quality of growth while bearing in mind its different attributes together appears to be essential, because there are instances in which transformation and quality of growth could be achieved together and could produce synergies, for example, between inclusiveness, sustainability, and innovative virtuous process, as mentioned in Sections 4, 5 and 6, especially from a long-term perspective. Furthermore, while in the short term, inclusive growth could need external resources to assure people of equal access to opportunities through, among other things, education and health, the necessary resources could be endogenously generated in the medium and long terms by transformation with inclusive growth, due to increases in tax and other revenues derived from expansion of industrial activities or economic transformation. On the other hand, as the investment in three types of capital, human, natural and manufactured capital, is the key for transformation and quality of growth (UN-ESCAP 2013, 7), quality of such investment could be crucial for quality of growth. Japan's Development Cooperation Charter considers it important to catalyze private sector investments to contribute to inclusiveness, sustainability, resilience, and capacity development in order that such investments facilitate "high quality growth."

Not all attributes and transformations can be achieved simultaneously or in the short term. Synergies, trade-offs, priorities and sequences could be important for both transformation and quality of growth agendas. Not only financial resources, but also effective institutions for achievement of high-quality growth are essential. Therefore, a comprehensive and holistic approach could be necessary for "quality of growth" and "transformation" discussion. In this regard, both the APEC Growth Strategy and UN-ESCAP document (2013) provided such approach. The former document states that APEC members cannot continue with "growth as usual" and "the quality of growth" needs to be improved in terms of the five attributes (APEC 2010, 1-2). The latter provided a "framework for quality of growth by building a virtuous cycle of investment in people and nature—a growth path which is more closely aligned with sustainable development" (UN-ESCAP 2013, 30).

## 9. Concluding remarks

This paper was intended to discuss and gain insights into the interrelationship between transformation and attributes of quality of growth. Based on this discussion, the following points should be highlighted.

First, transformation and quality of growth need to be considered in a holistic manner as a comprehensive target to be achieved. The APEC Growth Strategy could be regarded as a pioneering initiative with a holistic framework to attain such target. For the transformation agenda, the quality of growth with attributes such as being balanced, inclusive, sustainable, innovative and secure, should be fully taken into account, bearing in mind the interrelationship, synergy and trade-offs among them.

Second, as the transformation agenda is different among countries of distinctive characteristics such as those with a high proportion of subsistence agriculture, urbanizing economies, early industrializing economies, those in the middle-income trap, and so on, measures to transform their economies and attain desired attributes of quality of growth could be different, and there is no standard model of growth strategy to address challenges of transformation with growth with improved quality.

Third, it might be more realistic to design measures to attain the desired attributes of growth quality alongside development of specific industries, with which structural transformation is taking place, bearing in mind the specific transformation and quality of growth agendas.

Fourth, on the other hand, the interrelationship among attributes of quality of growth and industrial transformation is complex and, therefore, a holistic and comprehensive approach is needed with due attention to macro-economic balance and stability, fiscal balance, synergy, trade-offs and so on. The discussion on quality of growth and industrial transformation deserves a further in-depth analysis.

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Chapter 11

# The Governance of Natural Resource Wealth: Some Political Economy Considerations on Enhancing Social Investment[1]

Andrés Mejía Acosta

## 1. Introduction

The presence of non-renewable natural resource revenues (oil, mineral and gas) represents both an opportunity and a challenge to provide the funds necessary to lift poor countries out of the poverty trap. When adequately invested, revenues accrued from taxation of the extractive industries (EI), royalties, contracts and licensing fees have tremendous potential to boost economic activity, increase employment and improve investment on development sensitive sectors (education, nutrition, health). But the extraction and allocation of natural resource revenues can also make countries more vulnerable to prevailing problems associated with resource curse, including Dutch disease, slower economic growth, triggering of violent conflict, corruption, rent seeking and political instability (Ahmad and Singh 2003; Auty 2004; Bauer 2013; Karl 1997; Ross 2007).

It has been well argued that the strength and quality institutional arrangements can play an important role in mitigating the resource curse (Ross 2007). Institutions can safeguard the effectiveness and impact of social investments by increasing, for example, the accountability and transparency in the use of natural resource revenues, allocating revenues into high return investments, allowing for greater voice and participation in decision making and imposing sanctions on corrupt behavior (Mejía Acosta 2012).

The governance of natural resource revenues can be improved (at least) at three different levels. At the extraction stage, governments make

1. This paper builds on previous work done by the author on "*Extractive Industries, revenue allocation and local politics*" (co-authored with Javier Arellano Yanguas) (UNRISD 2014).

strategic decisions regarding when and how to obtain taxes and rents from extractive companies, whether this is done through concessions or negotiating licensing fees, the share of state participation in the extraction, production and distribution, and whether revenues are independently managed by state owned companies or whether they accrue directly to the country's budget. Secondly, governments decide whether to save, spend or further invest these revenues. Revenues could be put into stabilization funds to protect the economy from the volatility of commodity prices, ensure a smooth flow of revenues and avoid macroeconomic mismanagement. Natural resource revenues could also be saved for future consumption, or redistributed according to budgetary allocations, specific territories where the extractive industry is located, transferred to local governments or devolved directly to citizens. Thirdly, governments can strategically decide how to spend these resources by prioritizing specific types of high return investments, infrastructure or enhancing human capital through skills formation.

This paper argues that political institutions, and in particular the choice of fiscal rules governing the allocation of natural resource revenues, can have a significant impact on the quality of growth. So far, the policy and scholarly debates about revenue allocation have not necessarily linked revenues to types of investments, partly because of the availability and reliability of data but also due to difficulty of measuring impact at the expenditure level. This paper offers a contribution to that debate by discussing in greater detail and, with the help of some selected countries for which data is available, the political decisions governing the allocation of natural resource revenues at the subnational level. This paper does not venture into an evaluation or review of the development impact of different spending modalities. Rather, it discusses the political choice behind distribution modalities, between central and subnational governments and across subnational governments, to illustrate some of the inherent distributive trade-offs and some of their consequences for government spending.

The paper proceeds as follows. The first section explores some political economy considerations to explain how different actors and specific intraregional bargains can be instrumental in the adoption of different allocation formulas. The next section briefly discusses the potential impact of allocation modalities to enhance the impact of social spending and maximize the quality of growth. The last part provides a conclusion and develops an agenda for future research, including some of the remaining empirical and methodological challenges necessary to provide an understanding of the meaning and measurement of social investment and its relationship to the quality of growth.

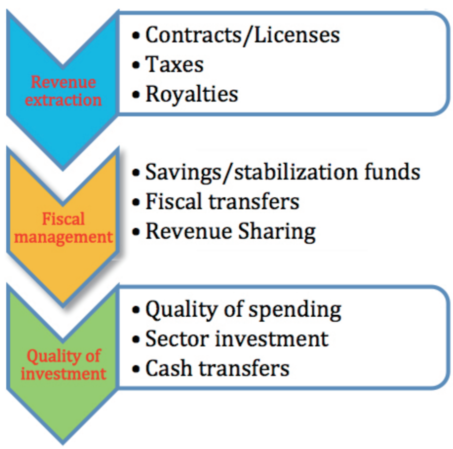
## 2. Managing natural resource revenues effectively

The commodities boom of the last decade, has given countries that are rich in non-renewable natural resources a windfall of revenues that has exceeded all fiscal expectations and has made a significant contribution to boosting growth. But the pressing question for governments, policymakers and scholars is how to turn the commodity bonanza into a stable source of growth that delivers on socially desirable outcomes. In other words, how can the commodities boom contribute to enhancing the quality of growth? From the perspective of managing public finances, it is key to establish, *ex ante*, what is the main expectation for managing natural resource revenues, whether in the creation of long term savings, investment or direct spending, fairness in the allocation of funds, macroeconomic stability, strong local ownership, or other factors. To that extent, there are multiple instruments that could help to smooth future revenues from volatile fluctuations, maximize the accrual of fiscal revenues, generate savings and investment mechanisms, guarantee the transparency and accountability of management, and the design of distribution or allocation mechanisms that privilege social investment to benefit the population. In practice, these mechanisms can be combined with –and sometimes contradict- one another: for example, accumulating revenues into a well-protected stabilization or savings fund may fuel citizen concerns about the need for immediate spending; similarly, deciding to invest current revenues in education will trigger debates about the long term benefits of investment on infrastructure or human capital.

From a political economy perspective, these critical questions represent dilemmas of redistribution and therefore pose more fundamental questions of political cooperation, feasibility and commitment towards adopting, implementing and sustaining one or more mechanisms. For example, the increased volume of investment for the provision of public services such as health and education may not be a sufficient condition for success if social investment lacks transparency in the administration of such funds or there is no strategic vision that is linked with development objectives (Mejía Acosta 2012, Bennett 2002).

The following chart illustrates how there are three interlinked stages in the processes of translating natural resource wealth into long-term social investment. The design, implementation and sustainability of each mechanism will depend less on the technical features of each allocation formula and more on the political bargains and distribution agreed between the main stakeholders.

**Figure 1. Translating natural resource wealth into quality growth**




This paper will mostly focus on the intermediate stage of the process, the fiscal management, and will discuss some of empirical and methodological challenges to understanding the quality of investment. Exploring these stages requires addressing two related questions. The first issue is to determine who has a claim over ownership of the resources or, put in other terms, to what extent do political actors outside the central government have the leverage to demand a share or benefit from the wealth accruing from the extractives sector. In most cases, the executive at the national level has the primacy over decision-making, but the degree to which other actors have a credible claim and the distributional mechanisms can vary a great deal (Arellano and Mejía Acosta 2014). In some cases, the shared "ownership" may be embedded in specific constitutional rules, but in other cases, ownership and allocation is subject to a continuous and repeated political bargaining between different stakeholders.

The second question refers to the mechanisms set in place to promote a transparent and accountable management of extractives revenues. The main concern is that extracting and allocating natural resource revenues almost inevitably leads to enhanced opportunities for rent seeking and political capture (Auty 2004; Haysom and Kane 2009). In general, the space for mismanagement of funds is inversely proportional to the presence of legal frameworks, independent judiciaries and the existence of effective checks and balances. Transparency and accountability mechanisms, including the reporting, auditing and monitoring the management of revenues will enhance legitimacy and could contribute to an effective investment of natural resource rents (Bennett 2002). In practice however, most of the transparency and accountability initiatives are located and strengthened at the national level, but there is significant variation regarding the extend and effectiveness to which these initiatives can encourage better governance at the local level (Mejía Acosta 2013).

In this section we examine four different instruments used to manage revenues from the extractive industries (to spend, save or invest): stabilization funds, saving funds, revenue sharing formulas and direct cash transfers. We explore how these instruments work, what the main arguments for the adoption of such mechanisms are, who the main stakeholders supporting such instruments are, and what are the main expectations in terms of performance.

***Stabilization funds***

Sovereign wealth funds (SWF) are government-owned resources accrued from pensions, privatization income, investment revenue of state owned enterprises, natural resource revenues, and so on. A common feature in the case of the extractives sector is that revenues tend to fluctuate widely depending on international commodity prices thus creating the potential to destabilize the country's macroeconomic goals. Stabilization funds are one of the instruments designed to manage these fiscal flows. Stabilization SWFs are created to build up fiscal reserves when commodity prices are high and draw reserves down when prices are low. The adoption of stabilization funds is the most classic mechanism adopted by resource rich countries to dampen the fiscal and economic impact of boom and bust cycles while restoring countercyclical spending. Stabilization funds can effectively contribute to long term fiscal planning if there are clear and enforceable rules to ensure contributions into the fund during boom times and constraint over the conditions under which these funds can be withdrawn or used during bust periods. Stabilization funds such as Chile's Economic and Social Stabilization Fund (ESSF) are usually considered most effective for managing mining revenues (Havro and Santiso 2011).[2]

The case of Chile illustrates that the effective adoption and management of a stabilization fund needs to be developed in the context of a sound fiscal policy with an overall budget strategy and clear fund targets. The formulation can be aided by a MTEF to help limit the expenditure of short run expenditure responses to rapidly changing resource revenue (Davis et al. 2003). From a political perspective, a well-managed stabilization fund tends to work better in a context of consolidated state institutions, preferably where there are greater constrains on the discretionary use of executive power (Bagattini 2011). Greater political party competition, an independent civil service and a well-educated civil society are other factors contributing to the success of such stabilization funds. Citizens can be actively involved in the monitoring and enforcement of transparency and accountability mechanisms including regular reporting, auditing and press releases. Conversely, stabilization funds are most likely to be undermined in a context of increased fiscal uncertainty, in a context where the executive power concentrates discretionary decision-making power, or when existing rules may change depending on political circumstances.

***Savings funds***

Savings funds constitute an alternative mechanism for dampening the fiscal and economic impact of volatile commodity prices, with a focus on saving those revenues for future generations. According to Dumas (2011), there are three factors that are critical for the success of saving funds: a) to disassociate the decision on how much should be saved from what to be saved, b) to create a separate account to directly deposit all natural resources revenues and to ensure proper transparency and governance principles to account for those deposits, c) to control and minimize the discretion for determining the level of transfers and disbursements out of the fund.

2. The ESSF receives fiscal surpluses, which are above 1% of GDP. Its investment strategy is intended to diversify assets in the fund, putting 15% of the portfolio into variable income assets, 20% in corporate fixed income papers and gradually adjust liquid assets (SWF Institute 2014).

The Government Pension Fund of Norway is an example of a savings fund. Originally created in the late sixties, it had two components: The Government Pension Fund - Global (formerly known as The Government Petroleum Fund) was established as a fiscal tool to encourage counter cyclical spending in the nineties. The Government Pension Fund - Norway was initially established as The National Insurance Scheme Fund in 1967. While the GPF Global derives its financial backing from strategic investments from the surplus wealth produced by Norwegian oil income, the GPF derives its income from pension contributions. It is calculated that the total value of the GPF Global is around $893bn USD, making it the biggest sovereign wealth fund worldwide today.[3]

The GPF Global aims to smooth the path of spending out of volatile oil revenues whereas the GPF Norway seeks to accumulate long-term savings from the oil revenues to cope with rising pensions and related expenditures on an aging population. All revenues accrue to central government and the funds are integrated into the budget process that is controlled by the Ministry of Finance (Havro and Santiso). The centralized control of the fund allows the government to absorb fiscal fluctuations and ensure a better distribution of funds to minimize inter-regional disparities. Another element of success is the well-developed structure of its institutions, capable of adopting and implementing good fiscal policies, coupled with a professionalized and independent staff to manage these policies.

Despite the existence of good governance principles, the Norwegian government has not been exempt from considerable political pressure to spend. Although the Norwegian parliament has the authority to allocate oil revenues into the budget within an estimated 4% of the petroleum earnings, Norwegian MPs have been under increasing public pressure to increase government spending beyond the 4% action rule (Havro and Santiso 2011).

***Revenue sharing formulas***

The adoption of revenue sharing formulas is predominantly driven by the need to distribute natural resource wealth between the central government and resource rich territories. This formula emerges as a convenient way to transfer fiscal resources to sub-national governments

3. Sovereign Wealth Fund Institute. http://www.swfinstitute.org/fund-rankings/

to promote a more equal redistribution of wealth. While the principle of redistribution is generally uncontested, the actual form of the distribution has been subject to intense debate. Some of the pressing questions regarding the allocation of intergovernmental transfers debate over the exact location of extraction points, the territorial ownership of such resources, and the merits of potential beneficiaries. At the end of the day, central governments centralize tax collection activities and they retain considerable decision-making capacity over the share of revenues, allocation criteria and other conditionalities imposed on potential beneficiaries. Thus, central governments are key actors in the rents allocation game. Some of the distributional criteria include:

*Fairness:* In this scenario, the central government ensures that resources are allocated according to the districts' own levels of production. This criterion suggests that many non-producing districts would not receive allocations or may be seriously marginalized from distribution. There are several difficulties stemming from this direct type of distribution. One problem is that it highlights and deepens horizontal inequalities across districts and regions: those districts that generate more revenue will continue to receive greater transfers, potentially creating a problem of "regional resource curse." An associated problem can emerge if larger transfers from the central government reduce the need to extract non-oil taxation, thus creating greater dependency from the national government and potentially volatile natural resource revenues. One last pitfall, in cases where revenues are transferred directly to autonomous territorial units, is that this reduces the incentives to ensure transparent expenditure management. If regional or local governments feel they are "entitled" to receiving specific allocations, they would feel less compelled to account for those transfers back to the central government.

*Equality:* Under this distribution criterion, central governments would favor a compensation formula to address existing inequalities. Revenue sharing formulas can be adapted to allocate rents proportional to the existing population, to equalize and improve the provision of public services between provinces, to proportionally reduce poverty rates or any other socioeconomic indicators, or to balance expenditure patterns between the national and regional levels. Another potential use for revenue sharing formulas is to compensate provinces, districts and indigenous people for the exploitation of natural resources and associated environmental damage (Haysom and Kane 2009). An immediate problem associated with this type of revenue sharing is that it is difficult to determine the relevant jurisdiction entitled to receive the resources. If a particular local district or municipality is home for a mine, should the neighboring districts also benefit or should the region in which the district is located?

Revenue sharing formulas increase the sense of ownership for the recipient localities, but this does not necessarily translate into stronger regional and local governments. Regions are more likely to claim autonomy where political parties or regional movements are stronger. They are more likely to be accountable to the needs and demands of their own population rather than the conditionalities imposed by the central government.

***Direct Cash Transfers***

The mechanism of a cash transfer involves a direct transaction of natural resource revenues from the central government to individual citizens in the form of direct regular payments. The underlying assumption is that natural resource wealth increases the available fiscal space to finance development goals, it encourages greater levels of social expenditure and enables new social policy initiatives (Hinojosa 2012). The underlying logic behind the "oil to cash" argument is that a direct transfer will enhance the "social contract" between individuals and oil rich states. The resource revenues would have a direct income benefit for the poorest segments of society as it increases individual purchasing power (Moss 2011). Direct cash transfers can also increase individuals' capacity to pay taxes and thus enhance incentives for greater government accountability. With a personal stake in the government's budget, the citizens could hold governments accountable for the provision of goods and services (Gillies 2010). Cash transfers it is argued, would also create a demand for increased budget transparency and accountability in the management of public finances (Tsalik 2003).

The evidence supporting this argument is mixed. Evaluating the only case in which this mechanism has been adopted, Michael Ross argues that Alaska is a prime example of inefficient spending: "the distribution of petrodollars to individuals has substituted for a broad based tax system, a personal income tax, and even a sales tax" (Ross 2007, 273). The results are fairly negative, including chronic budget deficits, unfinished public works projects, lower productivity and spending patterns that privilege consumption over investment (Ross 2007). In the context of dire public finances, Alaska has also threatened to abandon the administration of other public services like school systems or health care. Ross argues that the Alaska example raises additional concerns for the applicability or desirability of direct cash transfers in countries where there is less rule of law, less educated populations and less citizen engagement (Ross 2007). The main concern is that, in the absence of credible democratic institutions, direct cash transfers further fueled rent seeking and clientelisic behavior that existed prior to the organized transfer of resources.

Inevitably, any cash transfer mechanism will have to be implemented alongside centrally-controlled revenue smoothing mechanisms and significant central government investment on to improve the service delivery infrastructure (schools, hospitals). Other relevant factors in ensuring effective distribution include whether these funds are centrally administered or not, whether subnational districts have the bureaucratic and technical capacity to spend wisely, or whether local authorities are politically aligned with the government coalition in the capital city, to mention a few factors (Gonzales 2014).

The next section offers a comparative perspective to understand institutional variation in the design of revenue sharing formulas across several countries.

## 3. The politics of redistributing extractive revenues across different regions

This chapter claims that the choice of distributional formulas, the actual share of natural resource revenues distributed and the political affinities between central and subnational governments are contributing factors that enhance (or undermine) the quality of government investment. Further, it is plausible to assume, although not explicitly tested, that the efficiency, transparency and targeting of government spending should have a direct impact on the quality of growth triggered by the extractives sector.

The existing literature on intergovernmental transfers from center to the periphery identifies a basic trade-off between fairness and equity (Bird and Smart 2002; Schroeder and Smoke 2002). The notion of fairness should tend to privilege a distribution that rewards each region's fiscal efforts in generating their own revenues, financing their own expenditure and responsibly managing their own debt commitments. This principle however, may go against a (re)distributive logic, that demands greater government investment in more depressed areas where revenue collection is insufficient, spending needs are high and growth rates are stagnating. Thus, the key challenge for policymakers is to ensure a basic level of subsidiarity while minimizing rewards for poor performers or fiscal laziness.

Following the work by Arellano and Mejia Acosta (2014), the next section discusses some of the existing criteria used to transfer natural resource revenues from the central to subnational governments (vertical distribution) as well as the formulas used to redistribute wealth between producing and non producing territories (horizontal distribution).

**3.1 Vertical distribution of revenues from the EI**

From a technical perspective, the purpose of (vertical) fiscal transfers is to ensure that the revenues and expenditures assigned to each territorial level are approximately balanced and match their administrative responsibilities (Bird and Smart 2002, 900). According to this criterion, the share of fiscal transfers plus local level revenues should match the revenue needed by subnational governments to fund the public services they are responsible for (Schoeder and Smoke 2002).

From a political perspective, national executives (presidents or prime ministers) are likely to prefer to centralize revenues to maintain fiscal discipline, to centralize policy planning and to minimize liabilities (such as the growth of subnational debt). National executives are likely to agree to decentralize if they need to secure the support of regional/ local elites in their governing coalition, if they need to build up legislative majorities, and/or if they need to build a broader base of electoral support with citizens (Gonzalez 2014).

The presence of a commodities bonanza is likely to exacerbate this distributive dilemma. Voters and local governments are likely to demand a larger share of fiscal transfers from the national government, especially if the government benefits from windfall rents without the corresponding fiscal effort to generate those revenues. The rents obtained from the extraction of mineral or oil exports, may also generate a sense of entitlement among the population if citizens feel this is part of their national wealth, and in some cases, this "right" has been enshrined in the constitutions of the countries (Ahmad and Mottu 2003; Ross 2007)

The decentralization literature acknowledges that greater fiscal transfers are likely to happen when the money follows pre-existing levels of administrative and political decentralization (Falleti 2010, O'Neil 2005). In other words, the relative strength of regional and local opposition political groups is likely to increase the pressure for effective fiscal decentralization. These groups in turn may choose to bargain with the central government regarding the "appropriate" level of public services as well as the "matching revenues" needed to sustain them.

Table 1 illustrates some of the findings reported by Arellano Yanguas and Mejia Acosta (2014) regarding the vertical and horizontal distribution of revenues in ten resource rich countries (oil and mining). The Table summarizes the distribution of EI-revenues for countries for which we found reliable and comparative data. The chosen sample is by no means representative of regional or income distribution patterns. Nevertheless it offers a rich variation of institutional mechanisms, showing how revenues have been distributed to regional, state and local government levels, the type of revenue exploited and the date of the last reform (Arellano and Mejia Acosta 2014). The selected countries are Bolivia, Brazil, Colombia, Ghana, Ecuador, Indonesia, Mexico, Nigeria, Papua New Guinea and Peru. The data shows significant variations between a) countries with low levels of decentralization if subnational governments receive less than 10% of state revenues (Ecuador, Ghana and Papua New Guinea); b) *medium* if subnational governments receive between 10% and 50% (Colombia, Mexico and Indonesia); and c) *high* if subnational governments receive more than 50% of EI-revenues (Bolivia, Brazil, Peru and Nigeria).[4]

4. These data do not include reports on the distribution of profits from state-owned oil and mining companies, generally managed by national governments, which may further reinforce a centralist bias.

**Table 1. Models of decentralisation of EI revenues in a group of selected countries***

| | | | Bolivia (oil and gas) | Brazil** (oil and gas) | Peru (mining and gas) | Nigeria (oil) | Colombia (oil since 2011) | Mexico (oil) | Indonesia (oil) | Ecuador (oil) | Ghana (mining) | Papua New Guinea (oil and gas) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type of revenue transferred | | | Royalties and IDH | Royalties and participation | Royalties and income taxes | Total oil revenue | Royalties | Total oil revenue | Total oil revenue | Total oil revenue | Royalties | Royalties |
| Date of the last reform | | | 2007 | 1989 | 2004 | 1999 | 2011 | 1978 | 2004 | 2010 | 1992-1999 | 1998 |
| Degree of decentralisation | | | High | High | High | High | Medium | Medium | Medium | Low | Low | Low |
| Vertical Distribution | | National government and centralised funds | 37% | 31% | 45% | 46% | 52% | 83% | 85% | 98% | 91% | 93% |
| | | Regional/state governments | 37% | 45% | 12% | 36% | 48% | 17% | 3% | 1% | 5% | 3% |
| | | Local governments | 26% | 21% | 43% | 18% | | — | 12% | 1% | 2% | 2% |
| | | Private landlords | | 3% | — | — | | — | — | — | 2% | 2% |
| Horizontal distribution | Devolution | Producing region/state | 28% | 45% | 12% | 13% | 10% | — | 3% | 1% | 5% | 3% |
| | | Producing localities | 13% | 17% | 5% | — | | — | 6% | 1% | 2% | 2% |
| | | Localities in producing regions | — | 4% | 38% | — | — | — | 6% | — | — | — |
| | | Total devolution | 41% | 66% | 55% | 13% | 10% | — | 15% | 2% | 7% | 5% |
| | Formula based | Region/state | 9% | — | — | 23% | 38% | 17% | — | — | — | — |
| | | Localities | 13% | — | — | 18% | | — | — | — | — | — |
| | | Total formula-based | 22% | — | — | 41% | 38% | 17% | — | — | — | — |

Taken from: Arellano Yanguas, Javier and Andrés Mejía Acosta. 2014. "*Extractive Industries, Revenue Allocation and Local Politics*" (UNRISD 2014).
*Some data on percentages reflect quantities for some specific years.
** In March 2013 the Brazilian parliament approved the reform of the criteria to distribute oil royalties more evenly across the country; however, the law is currently under revision by the Constitutional Court.
Sources: Agustina, Dian, Ahmad, Nugroho and Siagianl (2012), Banful (2011), Departamento Nacional de Planeación-Colombia (2012), Energy Sector Management Assistance Programme (2005), Illedare & Suberu (2012), Morgandi (2008).

The data does not support the premise that greater fiscal decentralization follows pre-existing administrative or political decentralization. Federal countries, with existing administrative mandates towards decentralization of responsibilities, do not necessarily transfer greater resources. Although Brazil and Nigeria nominally allocate more EI wealth to their regions, other federations like Mexico transfer less than 20% of revenues. Conversely, unitary countries (countries with formally centralized governments) like Bolivia or Peru redistribute up to 55% of revenues to subnational units (Ahmad and Singh 2003, Miranda 2009, Arellano and Mejia Acosta 2014). A closer look reveals that federal states like Brazil, Nigeria and Mexico tend to channel most transfers to the state level government; state governments receive more than twice the share of revenues than local or municipal governments (45% to 21% in Brazil and 36%% to 18% in Nigeria). The opposite is true in unitary countries like Peru and Indonesia, where decentralization tends to benefit local level governments at the expense of state level units. In Peru, 43% goes to municipalities compared to 12% to regions and in Indonesia, the ratio is 12% to 3% (Arellano and Mejia Acosta 2014).

While the formal territorial organization may not be a decisive factor in the allocation, federal states would arguably be better equipped to effectively process the administrative and fiscal demands of managing natural resource revenues at the local level. These ratios suggest that "if confronted with the need to decentralize, the national executive prefers to favor the local level as the targeted group, since mayors pose less of an electoral and financial threat than governors" (Falleti 2010, 47). Even in Bolivia where there was a more equitable revenue distribution across the three tiers (37%, 37% and 26% respectively), the government introduced changes to gradually shift transfers *away* from regional *prefecturas* and towards financing cash transfer schemes formally administered by municipal governments as a way to defuse the growing political opposition and increase their political leverage over local governments (Arellano and Mejia Acosta 2014; Miranda 2009).

**3.2 Horizontal distribution of revenues from the EI**

A second relevant dimension is the nature of horizontal or interregional distribution of EI revenues. As discussed earlier, the main policy challenge from the central government is to reconcile a fair allocation of transfers according to regions' own fiscal efforts and more egalitarian criteria to compensate those regions that need greater government investment. Consequently, the design of interregional transfers could promote a more progressive distribution if richer districts tend to subsidize poor ones or they could reinforce existing income inequalities between districts (Rodden 2006). In the case of the distribution of extractive industry revenues, the main dichotomy is whether to allocate EI revenues solely to territories that host extractive activities or promote a wider redistribution.

In a previous work, Arellano and Mejia Acosta (2014), we discussed three types of mechanisms depending on their potential beneficiaries: a) devolution b) formula-based participation, and c) direct allocation from the central government. In practice, countries combine two or more criteria when adopting reallocation formulas.

***a) Devolution***

The purpose of devolution is to transfer revenue, or a proportion of it, to jurisdictions associated with the extractive activity, either because these are producing regions where the extractive income is generated in the first place or because they host some infrastructure for exploitation (mainly ports).[5]

This mechanism aims to compensate the producing regions for the extracted benefit or the negative externalities (e.g. environmental) linked to the extractive activity. The criterion of origin compensates for the mineral extraction per se, and fiscal transfers seek to develop in principle other types of capital (human, physical, etc.) to enhance the developmental potential of those territories. The second criterion seeks to compensate the negative externalities associated with extraction in the producing or neighboring districts. In this sense, transfers take into account environmental damage as well as the need to improve physical infrastructure (roads, the electrical grid, etc.) and to increase public services in order to respond to the likely increase in population (Brosio 2003).

The allocation of transfers to producing regions may further increase the inequality between producing and non-producing regions, may translate problems of revenue volatility to producing regions, and could undermine the region's own fiscal efforts to collect taxes given the abundance of central transfers.

5. According to Ahmad and Mottu (2003, 228), this mechanism is known as "derivation" but we prefer to use the term "devolution".

***b) Allocation from the central government***
This is an intermediate scenario where central governments consolidate the management to promote a more strategic investment of resources and to minimize the fiscal liability of uncontrolled subnational expenditure. These transfers could take the form of research and development or regional investment funds that are allocated on an annual basis from a central budgetary account, or revenues could be allocated through competitive investment grants aimed at supporting specific types of projects.

There are two potential problems with centrally managed allocations. First, competitive grants have the potential of reinforcing pre-existing economic inequalities and power asymmetries between subnational governments, especially if districts with greater technical or bureaucratic capabilities have a better chance to apply for and win competitive grants. The other problem is that they may allow space for discretionary spending and protracted negotiations around the allocation and adequate purpose of such transfers (Arellano and Mejia Acosta 2014).

***c) Formula-based participation***
The use of a pre-determined formula to distribute the revenue raised nationally can bring certainty and equality in the redistribution of natural resource revenues between producing and non-producing jurisdictions. The adopted formulas can take into account the different needs and characteristics of each jurisdiction, the size of the population and territory, pre-existing social and economic inequalities, and in some cases fiscal effort.

The adoption of distribution formulas underlines a basic paradox of fiscal decentralization and interregional transfers. A redistribution of revenues that compensates territories for the lack of infrastructure, weak tax collection or high indebtedness levels may in fact reward poor fiscal management and further undermine fiscal efforts. Conversely, the formula may compromise central government transfers to relatively affluent and fiscally prudent districts (Bird and Smart 2002). Finally, formula based redistributions tend to generate entitlements, which are fairly difficult to reverse or amend in the long run once a practice has been set in motion.

Elsewhere, we have shown significant variation in the existing modalities for horizontal or interregional distribution (Arellano and

Mejia Acosta 2014). Table 1 illustrates that highly decentralized countries like Bolivia and Nigeria tend to benefit both producing and non-producing districts through devolution and formula based mechanisms. Nigeria prioritizes the participation of all the subnational governments through formula-based participation (41% of revenues) and devolves a smaller proportion (13%) to the producing states (Kâ Diongue, Giraud, and Renouard 2011). Bolivia by contrast, has privileged devolution to producing districts (41% of revenues) but has also allowed redistribution to non producing states (22%) (Arellano and Mejia Acosta 2014).

In contrast, Brazil and Peru tend to only privilege devolution of revenues to the producing region or states and localities in producing regions (66% and 55% of revenues respectively). In more recent times, Brazil has moved towards the provision of essential infrastructure to support extractive activities in neighboring jurisdictions: the ports from where oil, gas and minerals are exported, and the territories crossed by roads, pipelines, and railways. The Brazilian Congress even adopted legislation in 2013 to redistribute oil revenues among all federal states and has initiated legislation to allow the use of oil-related revenues for the education sector. The initiative however has been blocked through an appeal to the constitutional court by the three producing states that would benefit most from direct devolution of such revenues.

Colombia, a moderately decentralized country, has also adopted a combination of devolution and formula-based mechanisms to distribute oil royalties (and some mining revenue) across all subnational jurisdictions (Rausch 2009). In Indonesia, oil-related transfers go exclusively to the producing areas (provinces and districts), although the central government discounts 50% of the value of these transfers from ordinary fiscal transfers (Morgandi 2008, 23-24) as an indirect way to reallocate revenues to other needs. More recently, a percentage of the EI-revenue has been given to the jurisdictions adjacent to the producing ones but such transfers remain highly controversial because the benefits and negative externalities do not always coincide with official legal and political boundaries. In Mexico, EI-revenues are proportionally distributed across the entire country through an allocation formula (Arellano and Mejia Acosta 2014). Finally, countries that are highly centralized like Ecuador, Ghana and Papua New Guinea, tend to devolve the small share of transfers to producing regions only.

## 4. The politics of distributing EI revenues and their development consequences

The distribution of EI revenues across subnational governments needs to address two policy challenges. The first challenge is to determine the optimal level of subnational transfers that allows sufficient subnational autonomy to manage revenues without undermining centralized planning. The second dilemma is to identify who benefits from those transfers so that not only the producers of EI wealth are properly compensated but so are their neighboring and less wealthy jurisdictions. The previous sections discussing existing vertical and horizontal distribution formulas illustrate great variation in the choice of distribution formulas. The sections suggest that variation is not always consistent with the amount or nature of resources but they rather reflect the outcomes of specific political negotiations between national and subnational actors over time. This section explores the factors influencing these political bargains.

### 4.1 Vertical distribution of EI revenues

From a political economy perspective, one of the main determinants of variation is the degree of political organization and mobilization that subnational governments have had vis-à-vis the central governments over time. In countries where local elites have been traditionally strong (Bolivia, Brazil) and have achieved considerable political and administrative autonomy, the central government has had to compromise and allow for greater distribution of rents with subnational governments. In Bolivia, the local exporting and mining elites organized along regional lines have played a significant role in the export economy (Laserna 2009). With the advent of the commodities boom, local demands have put pressure on the central government to adopt a direct hydrocarbons tax (IDH) in 2005 that distributes over 50% of mining rents to subnational governments. In Brazil, state governors have long been a critical part of the governing coalition in the center, and even after the 1998 constitution reduced the direct influence of state governors a good level of decentralization was maintained. In both cases, the strong presence of subnational politics explains a high degree of fiscal decentralization that also included the distribution of EI revenues during the commodities boom.

By contrast, the absence of an active political pressure from subnational governments explains why dissimilar countries like federal Mexico and Unitary Ecuador are not very decentralized. In the case of Mexico, the subnational pressures have been traditionally contained or managed by the party in government for many decades. This is particularly true for the management of EI rents that were maintained by the centrally-controlled oil company PEMEX. The more recent political liberalization of Mexican democracy since the late nineties has not been sufficient to push for greater decentralization in the management of oil revenues most of which remain under control of the central government. In Ecuador, subnational governments (provinces and municipalities) demanded greater fiscal decentralization in the mid-nineties, but without a solid base of political support, they obtained a mild response from the central government allowing a transfer of 15% of central government spending to be invested in regional governments (Mejia Acosta and Albornoz 2010). Furthermore, this mild allocation did not include the specific transfer of EI revenues, so local governments could not benefit from the advent of the commodities after 2004. Instead, the Correa administration, inaugurated in 2006, found mechanisms to further centralize the management of fiscal and EI revenues (Basabe et al. 2010).

### 4.2 Horizontal distribution of EI revenues

The puzzle of distributing revenues across different jurisdictions is usually addressed through political bargaining between resource rich districts, resource poor and central governments. All things being equal, resource rich elites would have a preference to maximize direct devolution of EI revenues to compensate for the value of resources extracted or the negative externalities associated with extraction. A greater share of revenues would also allow local elites greater independence from central government influence on spending policies. Resource poor districts however, would have a preference and demand for greater (re)distribution of EI revenues considering that these districts indirectly support extractive activities (and need better ports and road infrastructure for example) or making a claim for improved redistribution to address pre-existing socio economic inequalities (Arellano Yanguas and Mejia Acosta 2014). From the perspective of the central government however, a broader redistribution (across all districts) would be preferred if that contributes to consolidating its bases of electoral support (Gonzalez 2014). Likewise, a more targeted devolution to producing districts only would be preferred if this helps to consolidate the governing coalition at the center.

The cases of Colombia, Peru and Brazil illustrate different scenarios of political bargaining. In the case of Peru, the local elite with the support of mining companies has strongly bargained for a direct devolution of revenues from the central government in the form of a *mining canon*. These transfers are distributed to producing regions, provinces and municipalities but not outside extractive jurisdictions (Orihuela 2012). Benefiting regions have also resisted further government attempts to generate saving funds or compensation funds that are transferred to other regions (Arellano Yanguas and Mejia Acosta 2014). Brazil provides a similar illustrative case, where producing regions have resisted further attempts by the central government to distribute the extractive wealth to non-producing regions. As discussed, the government passed legislation to distribute potential oil revenues to benefit education but the redistribution has been challenged through a constitutional appeal by three resource rich states.

Colombia provides an interesting example where the central government defused some potential opposition of resource rich *departments*. It launched a legislative proposal aimed at "spreading the jam across the whole toast" when it came to distributing the wealth from the EI sector (Garcia Tapia 2011; Garcia Villegas and Espinosa Restrepo 2011). The government obtained support from the majority of legislators who in turn, sought greater government investment on projects that would further their chances of re-election. Not only were the representatives from producing districts in a relative minority but they were also interested in direct government investment, so the new legislation was approved in July 2011 (Arellano Yanguas and Mejia Acosta 2014). The reform dramatically reduced the share of royalties received by subnational governments (from 80% to 10%) but it also centralized the governments' decision-making ability, thereby giving the central government greater say in the way Regional Compensation and Development funds were invested (Arellano Yanguas and Mejia Acosta 2014).

**4.3 Distributional consequences for enhancing the quality of growth**

One of the key arguments advanced by this chapter is that the different mechanisms of intergovernmental transfers and the underlying political bargains that sustain them are key to understanding the effectiveness of government spending. It is through these institutional configurations that any windfall of natural resource revenues will have a positive impact on the quality of growth. While the link between the choice of distributional mechanisms and the underlying shape of the political bargain was illustrated in the previous section, there is insufficient or inconsistent empirical evidence to test the second claim. Little is known about the actual impact of those transfers on fostering sustainable development outcomes such as social spending or developing human capital.

This section will offer a brief discussion of pathways and factors that may contribute to enhancing the positive impact of government spending on social outcomes. While the empirical discussion here features some Latin American cases for which there is detailed knowledge on the quality of expenditure, generalizations to other contexts must be made with caution. The selected countries all are not low-income countries; they all display established democratic institutions and fiscal rules, and allow for an active participation of political parties and organized civil society.

All things being equal, the allocation of EI revenues should promote quality investments of funds when these are: a) fairly distributed across different constituents without privileging a particularly powerful or well organized group; b) allocated in consistent and predictable patterns without being excessively vulnerable to economic or political cycles; c) efficiently allocated so that they prioritize investment in high return sectors or have a demonstrable long term impact; and d) are managed in a transparent and accountable manner (Hallerberg et al. 2009).

The scarce existing evidence seems to suggest that the promise of decentralized social spending does not necessarily ensure improved outcomes; rather, it is the centralized planning, management and administration of these funds that is more likely to create coordination, monitoring and strategic investment. Empirical studies suggest that despite the extraordinary amount of transfers to mining regions over the last decade, social indicators have not improved by a comparable proportion (Arellano Yanguas 2011, 2012, Loayza, Mier y Teran and Rigolini 2013). This is partly due to the lack of managerial capacity at the subnational level, the reduced political horizons that encourage short-term investments and the lack of effective checks and balances that allow for widespread rent seeking (Arellano Yanguas 2011, 2012).

At the other end of the spectrum we find a country like Ecuador that has centralized the planning, management and allocation of EI rents in the hands of the executive and has produced visible improvement in the range of social indicators (Mejia Acosta and Albornoz 2010). The improvements are most likely associated with the centralized management of revenues from the commodities bonanza. Paradoxically, this increased fiscal (re)centralization has come at the price of reducing the political and administrative autonomy of local governments as well, in a way that local mayors would only increase their ability to gain re-election if and when they can show a clear association to the executive branch. Further analysis is also needed to evaluate the transparency and sustainability of this type of investment when it is heavily centralized in the hands of the executive branch. Far from making sweeping generalizations, this paper argues that the formation of stable, transparent and inclusive coalitions should contribute to improving the quality of spending of natural resource revenues.

## 5. Conclusions

This chapter has offered a partial explanation and a testable claim about the link between natural resource revenues and the quality of growth. The partial explanation looks at the different nature of existing revenue allocation mechanisms and the underlying political and institutional configurations that sustain these policy choices. The chapter relies on evidence from a selected range of cases to illustrate some of the policy dilemmas and political trade-offs for allocating windfall revenues between central and subnational governments. The testable claim is that these distributional mechanisms and the political bargains sustaining them, should have an impact on the type and quality of government investments over time. The preliminary and incomplete evidence in this regard suggests that this is a promising agenda for future research.

The section below summarizes the most salient conclusions and pending themes.

1. The sole presence of political institutions or fiscal rules is not a sufficient predictor of actual distribution patterns. The review confirms the notion that fiscal decentralization alone is not a good predictor of increased devolution. Some of the countries with formally centralized (unitary) governments may actually concede equal or greater fiscal autonomy to subnational territories than to those with formal decentralized or federal structures. However, the

review suggests that the existing strength and political leverage of local elites is a stronger predictor of greater decentralization. In contrast, where local elites have limited political or economic influence, the central government is more likely to recentralize the allocation of funds regardless of the fiscal formula.

2. The allocation of rents across producing and non-producing districts (horizontal association) is mildly associated with levels of decentralization. Highly centralized systems tend to adopt devolution formulas benefiting producing districts only, whereas formally decentralized systems tend to benefit both producing and non-producing territories. Central governments are able to promote a more distributive (inclusive) allocation of natural resource revenues when they can effectively mobilize non-producing districts and/or defuse the power of producing districts (as illustrated in Colombia). When elites in producing districts are strong and mobilized, it is likely that distribution formulas will continue to block a broader distribution of wealth (as in the case of Peru).

3. In both cases of vertical and horizontal distribution, the chapter shows a consistent pattern of path dependency that is consistent with the existing literature: once distributional reforms have been adopted, these become very hard to change over time unless there is a dramatic realignment of the relevant political actors. These major political shifts can be produced after elections or as a response to nationwide mobilizations for greater redistribution.

4. There is inconclusive evidence to claim which allocation formula is more likely to enhance the efficiency of government investments. Preliminary evidence discussed in this paper suggests that it is the centralized management and allocation of funds that appears to be associated with improved social outcome indicators and conversely, an extreme devolution to weak subnational units may in fact reinforce rent seeking practices. In principle, this idea should challenge the proposed benefits of fiscal decentralization established in the literature. Looking ahead, more work is needed to explore the mediating variables through which a more (de) centralized allocation and revenue management is likely to improve government investment. Some pending themes include the analysis of discretionary management of funds, the

effectiveness of transparency and accountability initiatives, and the capacity of local governments to effectively administer central government funding.

5. Finally, much more work is needed to systematically measure, analyze and compare the impact of natural resource revenues on social spending and how this links to quality of growth. One way of approaching the question is to compare multiple cases based on the funding modalities adopted at sector level (education, health, nutrition) and measure these against specific social indicators (e.g. improved school enrolment or reduced stunting rates) over time. This would be an empirical way to assess the contribution of the commodity revenues on enhancing the quality of growth across the developing world.

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