Population and natural resources

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Introduction

by
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The theme of the environment and its management in view of the sustainability of living standards has today taken on paramount importance. This renewed interest has been spurred by a series of recent and worrying developments, particularly the rise in world food prices, the volatility of hydrocarbon resource prices and the accelerating trends of global warming. Because of this, the concept of ecological crisis has returned centre stage; in other words, the notion that improvements in human well-being may sooner or later be curbed by the limited supply of natural resources rather than by economic or technical factors, such as work force, availability of physical and human capital, or technological capabilities.

One of Jared Diamond's major contributions in his latest book, *Collapse*, published in English in 2005 and translated into French in 2006 with the title, *Effondrement,* is his attempt to grasp the reasons that explain why the leaders of societies threatened by major ecological crises fail to come up with adequate solutions, and thus expose their societies to the risk of disappearing. Historical examples of such failures are far from lacking and point up the urgency of today's situation. Two kinds of factors can cause collapse. First, there is ignorance, understood as the difficulty to perceive and understand

the real issues of ecological risk. This may stem from the innate characteristics of human nature, such as landscape amnesia, which prevents human actors from becoming aware of changes to their surroundings as these occur only very gradually. But it can also result from the inability to understand and link up the relationships of causality between observed facts and the human behaviour that is responsible for their emergence.

The second cause of failure comes into play when the leaders of the societies concerned do understand the relations of causality at work but refuse to intervene with the required level of determination. Two typical situations come to mind here. In the first case, the actions needed to solve the ecological crisis would jeopardise the well-being of the minority in power, who oppose such actions in order to protect their individual interests. In the second, known as the "tragedy of the commons", there is no hierarchy in terms of power and all of the actors concerned would benefit from adopting the restrictive measures likely to re-establish the ecological balances under threat. Yet although they are incapable of coordinating their efforts and even though they follow a strategic rationality - meaning that they are able to anticipate the effects of their actions on others as well as the counter effects of others on themselves - they tend to avoid the remediation measures required. In other words, far from being the result of irrational behaviour, the destruction of ecological balances originates in decisions that are rational at an individual level. The collective disaster, or social ineffectiveness, should thus be attributed to decentralised (uncoordinated) strategic interactions of intelligent but selfish agents.

In the article published in the present volume, inspired by an analogy with the practices of crisis therapy, Jared Diamond further develops the theme of crisis and the reactions it causes. The main theme, which provides the through-line for his two-tier exploration of personal crises and societal crises, is the capacity of human beings (and leaders of societies) to radically put themselves into question when circumstances call for this after a major challenge has arisen.

The next three articles, on the other hand, each deal with concrete measures or policies that can solve a specific problem related to natural resources. Jean-Marie Baland, Professor at Namur University (Belgium), whose research findings identify firewood consumption as a major cause of the degradation (rather than deforestation)

of the Himalayan forests in India and Nepal, discusses the importance of alternative energy sources to help reduce this consumption. The substitute sources (particularly natural gas) tend to be more readily available in urban areas than in rural areas. The solutions to forest degradation, however, are not limited to technical means such as developing alternative energies. They can also come through institutional channels, such as changes in property rights. Using systematic and carefully collected data, the author rigorously demonstrates that decentralised systems involving forests managed by village communities are more effective than State forestry systems. Moreover, the longer these community user groups have existed, the more effective they are, which doubtless reflects their accumulated experience in mobilising at the local level.

The article by Alan Gelb and Sina Grasmann, both from the World Bank, addresses the efficiency of managing oil rents. Here the question is not that of knowing how to ensure the resource is renewed, as oil inevitably becomes totally depleted, but rather of knowing how to attenuate or even cancel out the effects of shocks linked to the frequent and dramatic fluctuations in international market prices, and how to ensure better long-term growth in countries whose sub-soil contains abundant resources. The authors confirm that the "resource curse", or in other terms the negative relationship between the wealth of natural resources and various indicators of growth and development (including infant mortality rates), is a very real phenomenon. Yet, it is highly dependent on initial conditions relating to governance and human capital: oil-exporting countries are less likely to experience the "resource curse" if they have strong institutions and a high stock of human capital.

Having established this observation, Gelb and Grasmann discuss in detail a number of mechanisms likely to promote better management of oil rents, particularly the setting up of special funds to manage national wealth, direct transfer of rents to citizens (accompanied by increased taxes and lower subsidies), and outside "hard" pressures (through direct conditionality mechanisms) or "soft" pressures (via internationally recognised norms).

Finally, the article by Michael Carter, from Wisconsin University (Madison), is to be read in the context of growing pressures from the demand for agricultural products. The basic idea here is that agricultural potential in terms of technology is greatly under-exploited in poor rural economies where smallholdings predominate. This situation

stems from the high imperfection of inter-temporal rural markets (credit and insurance), a fact that tends to constrain the investment that is needed to increase agricultural productivity. For example, small farmers are obliged to set aside savings to cope with the event of negative external shocks (illness, unfavourable weather conditions…) insofar as they do not have other means of covering their risks through disaster loans for example. As these savings need to remain sufficiently liquid, they are not available for medium or long-term investment.

The proposal is thus to set up micro-insurance programmes such as index insurance, in which payouts are not based on individual outcomes but rather on an aggregate index correlated to these outcomes (e.g. rainfall). The savings on transaction costs generated by this type of financial instrument (measure of individual results or claims is unnecessary), as well as the way it avoids the problems of moral hazard (as individual subscribers cannot influence the probability of receiving a payout) make the formula one that is worth trying out in the poorer villages of developing countries. Experiments of this kind are currently in progress and their evaluation findings will inform us whether this is really a promising pathway to greater investment and agricultural productivity in these countries.

The questions addressed in this edition inevitably cover only limited aspects of the natural resource issues. They nonetheless have the advantage of showing how the application of rigorous economic reasoning and the use of detailed empirical data can help to further reflection on the solutions that need to be found for the complex problems arising from the growing scarcity of natural resources.

Abstracts

Crisis and evolution

Coping with change

Jared Diamond

How can individuals and societies cope with change? This article deals with the individual and collective possibilities to adapt to extreme situations such as crisis. The modern world requires such changes, for example to adapt and mitigate climate change and allow societies to survive. This article begins with a review of a series of individual characteristics and actions that allow one to overcome a crisis. It then tries to show to what extent these actions may be relevant at a country level, by analyzing historical or contemporary situations.

Key words: crisis, adaptation, selective change, identity, way of life

Drawing public policies

Forest degradation and the role of public authorities

Jean-Marie Baland

This study examines the determinants affecting the degradation of the Indian and Nepalese Himalayan forests. On the basis of a set of field studies, we will justify the need

for government intervention to reduce anthropogenic pressure on forests, and primarily the stress resulting from firewood collection. Pressure on resources will most likely continue over the coming years due to: (1) regional population growth; (2) improved standards of living; and (3) low household awareness of the cost of collecting wood. We will go on to assess the impact of two government policies: subsidies on alternative sources of energy, such as gas; and the amendment of property rights. More specifically, we will show that the creation of community-managed forest areas has had a very beneficial impact on the state of these forests, with results that are superior to those of the highly protected State forests.

Key words: economy, forest management, alternative energy resources, property rights, natural resources, Indian Himalayas

Sustainable strategies for managing the natural capital

Confronting the oil curse

Alan Gelb and Sina Grasmann

Does a strong natural resource endowment tend to promote growth and development or to retard it? In particular, is oil a blessing or a curse? Cross-country studies suggest that the impact of resources depends on initial conditions: exporters with stronger institutions and more human capital are less likely to experience a "resource curse". Oil exporters face distinctive challenges. Potential "governance deficits" in the face of large point source rents may cause slower growth, and extreme revenue volatility exposes countries to increased uncertainty and instability that can offset the benefits of mineral wealth. This paper presents lessons from past experience, provides a comparative analysis of exporters' trajectories through the start of the current oil boom, and it considers approaches for creating agents of restraint and mechanisms of accountability that can help support better policies for managing oil rents and spending them more effectively.

Key words: oil, Dutch disease, development trajectory, economy

Promoting innovations

Inducing innovation: risk instruments for solving the conundrum of rural finance

Michael Carter

The theory of induced agricultural innovation suggests that there is a path of appropriate technological change, even for economies characterized by rapid population growth and increasing land scarcity. While some have given a quietistic interpretation to this theory — market signals alone are adequate to spur needed agricultural growth — recent experience suggests otherwise. This paper first considers the evidence on rural financial markets: how and why they tend to constrain the accumulation and investment needed for agricultural productivity growth, especially in economies in which small farms predominate. The paper will then consider a new generation of risk-management interventions designed to alter the conditions that lead to dysfunctional rural financial markets and ultimately crowd in both the institutions and the innovations needed for sustainable technological change in agriculture.

Key words: innovation, risk management, rural financial markets, agricultural productivity, Africa

Crisis and Evolutions

Coping with Change

by
Jared Diamond
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"The American way of life is non-negotiable."
Dick Cheney, Vice President of the United States of America

Although I disagree with our Vice President on many matters, and although I would word even the above formulation of his differently, in this case I do agree that he has succeeded in identifying a key issue facing the United States today: the issue of challenges to our way of life and to our core values. We Americans are wrestling with the question of whether we need to change our way of life and core values, especially in three aspects:

1. Our consumption rates, which have traditionally been high. Consumption rates are often confused with wealth and standard of living, with which they are correlated, but not tightly.

2. Our relations with countries overseas, especially ones that might threaten us. Our traditional foreign policy has been based on isolationism, punctuated by short-term military involvements. Now, we are trying to decide whether to be involved overseas militarily, non-militarily or not at all; whether our involvement should address just other nations' crises (as during World War I and II), or also their fundamental problems; and whether our involvement should be long-term, short-term or none at all.

3. How to balance rights of individuals against rights of society. Traditionally, the United States has been much more devoted to individual rights than have European countries and Japan.

Today, those traditional American values are under siege, especially because of three developments: the problems resulting from the disparity in wealth between the First World and the developing world; reverberations from the Sept. 11, 2001 terrorist attack on the United States; and tensions within American society itself. Americans are more troubled now, and going through (or in need of going through) more soul-searching, than at any other time in my life.

These questions interest me not only because I am an American living with the consequences of our core values, but also because these questions are related to a more general problem that was the focus of my recent book *Collapse: How Societies Choose to Fail or Succeed* (Diamond, 2005). A key variable, I thought, in a society's success or failure is its willingness to reappraise its core values. The Greenland Norse refused to reappraise, while Meiji Japan did reappraise, with outstandingly different outcomes. (The Greenland Norse all ended up dead, while Meiji Japan ended up as a world power).

I'm interested in reappraisals, or resistance to reappraisals, in the modern world. Openness to reappraisal is different today in Europe, Australia, New Guinea, Bhutan, Tibet, Israel, the U.S. and (once again) Japan. All of these countries are confronted with the question: Who are we? What is essential to our national identity? Is our self-defined identity still serving us well today?

More broadly, these questions are related to three other types of reappraisals that also interest me. One type involves tribal peoples reappraising themselves while struggling for survival in the modern world. For example, why among North American Indian groups (Native Americans), have Navajo and Pueblo Indians retained their cultural integrity better than almost any other group? A second type arises in our individual lives, in the form of the slow reappraisals that all of us make of our careers, marriages and friendships. The remaining type of reappraisal also involves our individual lives, but consists of the rapid reappraisals that many of us make of our entire selves in a time of acute personal crisis.

I shall discuss these four types of reappraisal in reverse order, starting with individuals in crisis, and ending with whole nations and Dick Cheney's statement about American society. Preliminarily, I think I have discerned a generalization about reappraisals that applies across all four of these levels.

1. Reappraisal During a Personal Crisis

My first example of coping with change involves individuals plunged into a personal crisis, when one is suddenly forced to question one's entire self. My interest in this area stems from the career of my wife Marie Cohen, a clinical psychologist. During the first year of our marriage, Marie trained in a clinical specialty called crisis therapy, at a community health center in Los Angeles. Clients came to that health center without prior appointments, in a state of "crisis", defined as them facing a challenge that they found insurmountable by their usual problem-solving methods.

Common causes of such a crisis were the break-up of a relationship, a separation from, or abandonment by, a loved one, or the prospect of a divorce; the death of one's child, spouse, sibling, or parent; the loss of one's job, or a job failure, or even a job promotion or success; retirement; or the diagnosis of a serious illness.

When the door of Marie's office opened and the next client walked in, Marie never knew what the issue would be with that person. But she knew that all of her clients would be in an acute personal crisis, because they had discovered that their previous ways of coping were no longer solving their problems. They were struggling either to find a new way of coping, or else to hold on to their old way. The crisis threw into question the client's long-established identity. Most of us have faced such a crisis in our own lives, or at least have lived with loved ones going through such a crisis.

The outcome of consultation sessions in health centers offering crisis therapy is variable. In the saddest cases, some clients attempt suicide or do commit suicide. Some clients can't figure out an alternative way of coping, revert to their old ways, and end up becoming crippled by grief at their loss, or job change or illness. In the best cases, however, they do discover a new and better way of coping, work through the crisis, and emerge stronger than before. This outcome lies at the root of the Chinese written

character for “crisis”, pronounced “wei-ji”, and consisting of two characters: the character meaning “danger” plus the character meaning “opportunity.” The German philosopher Friedrich Nietzsche expressed essentially the same idea in his aphorism: “What doesn’t kill us makes us stronger.”

A regular observation in crisis therapy is that something happens within a time span of about six weeks. We can’t live for a long time without *some* identity, although we can grieve, suffer or remain unemployed for a long time. Within six weeks, we either find a new successful way of coping, or we find a new maladaptive way, or we revert to our old way. How does the therapist deal with such a client?

The methods of crisis therapy were developed by Dr. Erich Lindemann in Boston after the Nov. 28, 1942 Coconut Grove fire, in which 491 people died. Boston hospitals were overwhelmed not just by the burn victims themselves, but also by relatives distraught because they knew that their husband or wife or child had died in a horrible way — by being burned to death. Some of the relatives succeeded in working through their grief, while others remained permanently devastated. What could a therapist do to help them?

Lindemann (1979) struggled to figure out how to assist both the survivors and the relatives to cope with their grief. He developed, and he and others subsequently elaborated, on the approach termed “crisis therapy”. It consists of no more than four to six hourly sessions, at intervals of a week. In contrast to other forms of psychotherapy that focus on chronic problems, underlying psychological issues or understanding childhood traumas, crisis therapy focuses just on the immediate crisis.

Typically, when a client presents himself/herself in a state of crisis, the client feels overwhelmed by a paralyzing, seemingly insurmountable, all-encompassing multitude of stresses. The therapist’s immediate goal in the first session is termed “building a fence”: *i.e.*, identifying what are the specific things that really have gone wrong during the crisis, so as to be able to say: “Here, inside the fence, is the specific problem in your life, but everything else outside the fence in your life is normal and OK.” (As we shall see, I think that the same issue of building a fence applies to whole societies — tribes or nations — in crisis). Often, the client feels relieved as soon as the therapist

formulates the problem and "builds a fence" around it. Then, the therapist can proceed to help the client explore alternative ways of selectively coping with the specific problem inside the fence.

The experiences of crisis therapists over the last 60 years have helped identify at least seven elements affecting a client's success in overcoming a crisis. The first element is that step of "building a fence". If a person in crisis doesn't succeed in building a fence, then he or she faces the prospect of change that would destroy his entire identity, and of course, one resists the prospect of such change. Hence, a key question is: what is there of your old self that you can hold onto, and what can you, and should, jettison? As we shall see later, that issue of selective change is key also to the reappraisal of core values by whole societies in crisis.

A second element is something called "ego strength", which includes, but is broader than, self-confidence. It is a sense of yourself, and contentment with yourself as an independent competent person; an acceptance of yourself for who you are; and an ability to tolerate strong emotions within yourself, to express yourself freely, and not to depend on other people for approval or even for your survival.

Ego strength comes especially from parents who accept you for who you are, and who don't expect you to fulfill their own dreams, and who don't expect you to be older or younger than you actually are, and who help you learn to tolerate frustration by not giving you everything that you want, and also by not depriving you of everything that you want. All of that background goes into the ego strength that helps one work through a crisis.

A third element involves the difference between a rigid or inflexible personality or character structure, as opposed to a flexible one. Rigidity or inflexibility can be the result of a previous history of abuse or trauma, or of an upbringing that offered no permission to experiment nor to deviate from the family norms.

A fourth factor is the availability (or lack) of models of alternative coping methods. This is a consideration familiar to all of us who have weathered a personal crisis. It provides a big advantage if there is someone (ideally, a real person with whom you can talk, but also even someone whom you don't know personally but about whose life you

have read) who has weathered a similar crisis, and has provided a model of coping skills that you can try to imitate yourself.

A fifth factor is the ability to tolerate uncertainty, ambiguity or failure at some initial attempts. It is quite likely that a person in crisis won't manage to figure out a new successful way of coping on the first try. It may take several attempts, trying different ways of coping to see whether they solve the crisis, and whether they are compatible with the rest of one's personality, until one finally finds a new way of coping that works. People who can't tolerate uncertainty or failure, and who give up the search early, don't arrive at a new way of coping.

The next-to-last consideration involves a clash with a "non-negotiable value", to use Dick Cheney's words. One has to figure out where to draw the line in changing oneself: what is essential to your identity, and what values would you refuse to change because you consider them non-negotiable? At what point do you say "I'd rather die, than change THAT"?

For example, many people consider adherence to their family or religion as non-negotiable; we are inclined to admire someone who refuses to betray his family or to recant his religion under duress in order to get out of a crisis. But we quickly enter a gray area in which it is not so easy to decide whether a value really is non-negotiable: for example, would you recant your religion if you perceived that it is false, inappropriate or fails you? Many survivors of Auschwitz concentration camp did recant their religion, reasoning "There is Auschwitz, therefore, there cannot be God".

The Norse who lived in Greenland as the most remote outpost of medieval Europe, from AD 984 until the early 1400s, defined their identity as being Christians, and that identity gave them the strength to survive for centuries in a difficult environment with little support from other people (Diamond, 2005). That identity eventually led the Greenland Norse to despise as pagans the Inuit (Eskimos), who reached Greenland in the 1300s. The Norse would rather have been dead than live like the Inuit, and that view extended to despising the Inuits' eating of fish, which the Greenland Norse did not do.

As a result, the Greenland Norse ended up starving to death, rather than eat fish: abstinence from eating fish was part of being Christian and distinguished them from

the Inuit. To us today, clinging to fish avoidance as a non-negotiable value essential to one's identity, even at the cost of one's life, seems like a mistake, rather than as something to admire.

A remaining factor contributing to success or failure in weathering a crisis is previous experience of successful coping. If you have had the experience of already coping successfully with some different crisis, that gives you confidence that you may be able to solve a new crisis as well. That contrasts with the sense of helplessness growing out of previous experience that, whatever you do, it won't help you.

That accumulated experience may explain why the Norse who settled Iceland around AD 870 founded a society that remained conservative for such a long time. Within the first few centuries of their occupation of Iceland, the Icelanders worked out a strategy for surviving in Iceland's unforgiving, fragile, difficult environment, even though it meant living as the poorest people in Europe. After developing that strategy, the Icelanders' experience was that, whatever innovation they tried, it made things worse rather than better. That frustrated the well-meaning Danes who governed Iceland for many centuries, and who proposed many ways to improve the Icelanders' condition, only to be met by an unvarying response of "No, we won't try it".

In short, while our background equips some of us better than others to master crises, we are not helpless victims of our parental upbringing. Instead, like the whole societies that I shall discuss later, we, too, as individuals have choices. Being aware of factors making you more likely to succeed or fail gives you the chance to address those factors consciously. For an individual in crisis, fundamental to making good choices is an honest, albeit painful, appraisal of which parts of you are working, and which are not; and selectively retaining your strengths, and replacing your weaknesses with new ways of coping. We shall encounter these themes again when we discuss societies coping with change.

2. Coping with Change

My second focus, coping with change, concerns individuals undergoing a *slow* reappraisal stemming from growing dissatisfaction with some specific facet of their life, rather than a crisis seemingly affecting their whole life.

Typical examples that many of us have faced, or will face, are reappraisals of our career, our marriage or our friendships. For example, many people become dissatisfied with their initial choice of career, think about switching careers and some people actually make a career change. But it's scary to make such a change.

We wonder: I think that a different career would appeal to me, but would I actually succeed at it? Do I have the right skills for the new career? Would I do better, or would it be safer, just to stick to my present career, which is more or less OK for me, even if it isn't fully satisfying? If I do decide to change careers, how can I make the transition from my present career? Should I make an abrupt switch, or should I instead try slowly to phase out my present line of work and gradually to devote more and more effort to a new line?

I'm especially interested in career reappraisals, because I've been through career switches three times: my search, between 1962 and 1968, for a parallel second career (while continuing my first career as a physiologist) resulted in my developing a parallel career on the ecology of New Guinea birds; my switch between 1980 and 1982, from cell physiology to physiological ecology; and my switch, between the early 1990s and 2002, from physiology to geography and environmental history.

There were also two switches that I considered seriously, but that I eventually rejected: a switch out of science into becoming a linguist in 1959, and becoming a musician in the early 1960s. In both of those cases, I abandoned the idea of switching, because I had to recognize that I had the interest but not the necessary talent. All of these reappraisals about career switches were not short, six-week crises for me; each was instead a long process lasting between two and 10 years. In addition to learning about career switches through self-introspection, I have watched many other people succeed or fail at career shifts.

2.1 Realistic reappraisals

A key issue in any career shift is an honest and accurate appraisal of one's professional ability – *i.e.*, again the theme of selective change. What aspects of your old career can you retain, and what should you jettison? What profession do your skills really suit you for? Some particular new career may appeal to you, but are your abilities really suited to it?

For example, I have one friend who started out as a theoretical physicist, and another who started out as a mathematician, both of whom became dissatisfied and switched into ecology while making use of their previous strengths, but the two of them did it in different ways. The theoretical physicist lacked ecological field experience and decided not to try to acquire it but instead continued to make theoretical models (as he had as a physicist), and he used those models to analyze existing ecological data or collaborated with field ecologists. The other friend, who started out as a mathematician, had been a bird-watcher as a boy, so that when he did switch into ecology, he decided to observe birds seriously. Both of these friends became great ecologists, but in different ways: the first was Robert May (*e.g.*, May, 1973), and the second was Robert MacArthur (*e.g.*, MacArthur, 1972).

2.2 Reappraisals that miss the mark

Contrast the story of my two friends with that of molecular biologists during the 1950s and 1960s, who had cracked the structure of DNA, the genetic code, and the molecular basis of immunology. Having gained self-confidence from their successes in genetics and immunology, some of them switched to studying neurobiology and the brain, which they saw as the next biological frontier. They hoped that that frontier would yield to their talents, just as had the frontier of molecular biology.

But the results of their switches into brain research were on the whole disappointing, because they failed to appreciate the need for a type of thinking in brain research that was different from the thinking that had been required in molecular biology and that had been well-matched to their talents. Molecular biology's frontiers during the 1950s and 1960s favored scientists with the power of reasoning about well-defined problems, involving a small body of facts that one could acquire while still young. In brain research, however, they found that they were now dealing with a messy system, unformulated problems, a huge body of facts, and the need for very complex measurements, rather than brilliant strokes of reasoning.

Another type of career switch that involves similar issues concerns composers of classical music who start out writing instrumental music, and who then try to broaden out into writing operas. The greatest opera composers have devoted themselves full-time to opera: Wagner, Verdi and Puccini wrote no memorable music other than

operas. Many great instrumental composers have tried to write operas, but opera demands skills at maintained, large-scale drama very different from the skills required to write a symphony, a string quartet or even songs.

Opera has exerted a fatal irresistible attraction for many non-operatic composers. Ones who tried it and failed included Antonin Dvorak, Cesar Franck, Franz Josef Haydn, Franz Schubert, Robert Schumann and Hugo Wolf. If only Schumann had written one more great piano concerto, instead of his unfortunate failed opera Genoveva (Daverio, 1997)! If only Cesar Franck had written one more fabulous violin and piano sonata, instead of his now-forgotten unfortunate four operas (Davies, 1973)!

Beethoven tried and succeeded at writing a single opera, Fidelio, but at enormous cost (Solomon, 1977). Even after his last revision of Fidelio, Beethoven wrote, "This whole opera business is the most tiresome affair in the world, for I am dissatisfied with most of it." Brahms (Swafford, 1997) and Mendelssohn (Todd, 2003) both toyed with writing an opera, but both resisted the temptation, and at least Brahms was surely right to resist: he recognized that he lacked the skill of sustained dramatic development, as demonstrated by the weakness of the closest thing to an opera that he wrote — his most disappointing large-scale work, the cantata Rinaldo.

3. Reappraisals at the Societal Level

Having discussed individuals coping with acute crises, and others coping with slower reappraisals of careers, let's now examine reappraisals on the part of entire societies.

Around the world today, and in recent centuries, non-European tribes have had to deal with the shock of European impact. That impact presents a tribe with a dilemma. On the one hand, a tribe must adopt some European culture and technology, if it is to survive. On the other hand, the tribe can't discard all of its tribal ways and adopt European culture wholesale, otherwise the tribe would lose its identity and merge into European society.

3.1 Papua New Guinea tribes

In my field-work in New Guinea for the last 45 years, I have observed very different outcomes among New Guinea's 1,000 tribes. Most successful have been those tribes that do adopt eagerly, but selectively; that retain pride in their tribal ways, or even belief in their tribal superiority; and that still live in, or return, to their traditional villages. Those societies have the tribal equivalent of ego strength that we discussed for individuals.

For example, one of the most successful tribes in Papua New Guinea is the Chimbu, first contacted by the outside world in the 1930s. The first Chimbu man that I met was still wearing a traditional grass skirt and could not read or write, but on the day that I met him he had just bought a sawmill for 100,000 Australian dollars in cash, which was only part of the wealth that he had accumulated.

I learned the story of this enterprising gentleman. Living in his grass hut in his village, he had noticed that European settlers in the area were planting coffee trees. He inquired about the purpose of the trees, and was told that they produced seeds for which Europeans would pay a lot of money. So he began developing coffee plantations himself, using the profits to develop more plantations, then using the further profits to buy his own fleet of trucks to take his coffee to market so as not to have to pay other people for their trucks, and he was now branching out into sawmills. That's an outstanding example of selective adoption of European culture.

Another illustration of the quickness of the Chimbu to adopt selectively came while I was working at a remote patrol post and airstrip called Karimui. There, the local people of the Tudawhe tribe were gentle, and somewhat uncurious and unambitious. Living at, or visiting, Karimui were a few Chimbu government workers and traders. When the first helicopter landed at Karimui airstrip, it was unlike anything that the local Tudawhe and Chimbu had ever seen before. The Tudawhe gathered excitedly around the helicopter, touched it, talked about it, and eventually walked away, or turned their backs and resumed their daily life focused on growing sweet potatoes.

The several Chimbu who happened to be at the airstrip, however, remained there, talked to each other, and then approached the helicopter pilot and began asking him questions. How far could the helicopter fly, and how long did it take to fly that distance?

How many kilograms of payload could it carry? Who owned the helicopter? How did one operate a business and earn money based on owning helicopters? On being told that the helicopter owner chartered it to prospective users, they inquired about what the charter costs per hour. They then walked away from the pilot for a few minutes, talked among themselves, and came back to the pilot with a proposal to charter the helicopter.

It turned out that those Chimbu had calculated that, if they chartered the helicopter to fly to an outlying village where birds of paradise were abundant and had not yet been hunted out, they could buy bird-of-paradise plumes cheaply at that village, fly them back in the helicopter to their Chimbu homeland where birds of paradise have been largely shot out and plumes command a much higher price than in the outlying village, and earn enough from the mark-up on plumes to pay for the helicopter charter and make a large profit for themselves.

That's an example of flexibility and selective change on the part of Chimbus (but not of Tudawhe), combining the traditional importance of birds of paradise in Chimbu culture with the possibilities opened by the availability of helicopters.

3.2 North American Indian tribes

The differences in Papua New Guinea between the Chimbu and the Tudawhe are mirrored by differences in North America among the approximately 187 Indian language groups living in North America at the time of European arrival 500 years ago (Jorgensen, 2007).

Dozens of those Indian languages have already disappeared, and most of those that are still living languages are in the process of disappearing, spoken by just old people (in numerous cases, just a few old people or even just one) and not being learned by children. If an anthropologist could have surveyed North America in AD 1492 at the time of Columbus' landfall in the Caribbean, the anthropologist would have found it difficult to predict which tribes would best succeed at remaining intact and retaining their language.

I doubt that the anthropologist would have foreseen that the only two North American Indian tribes with regular radio broadcasts in their language today are the

Navajo and the Yupik Eskimo, and that the North American language with by far the greatest number of speakers today is Navajo with 150,000 speakers, when the Navajo may have numbered only a few thousand people upon European arrival.

Many formerly much larger and more powerful Indian tribes are now no longer intact, and have lost or largely lost their language: for example, the Cherokee are now down to 11,905 speakers, the Hopi 5,264, the Mohawk 1,667, the Nez Perce 697, the Seneca 200, the Pawnee 4 (all of them elderly), the Klamath-Modoc 1 (elderly), and the originally formidable Narragansett none (Grimes 2000, Harrison 2007).

Why are there such large differences in cultural intactness among North American Indian tribes, as measured by language retention? Partly, it's a matter of geographic luck: the Navajo were lucky to be in a remote, barren area not coveted by whites, whereas the Cherokee and Narragansett had the misfortune to be living in good farm land on the East Coast from which white colonists expelled them.

However, there are cultural factors as well. The Navajo have been outstanding at selectively borrowing from European society while remaining intact and proud. The Navajo adopted sheep-herding, blanket-weaving, silver-smithing and trucks, but most of them still live in their traditional hogan dwellings and speak Navajo.

4. Reappraisals at the National Level

Finally, let's consider issues of coping with change at the largest scale: state societies changing — or refusing to change — their values when conditions change. At that level, too, change requires the national equivalent of ego strength, a willingness to reexamine one's national values, the skill required to change selectively, and the ability to build a fence.

I already mentioned the unsuccessful case of the Greenland Norse, who refused to change when conditions of cooling climate and the arrival of hostile neighbors required change, and who ended up dead as a result. In this concluding section, I shall mention the success stories of Meiji Japan and post-World War II Europe, and the unresolved stories of Japan, Europe and the United States today.

4.1 The case of Meiji Japan

The outstanding story of selective change in modern times is that of Japan during the Meiji Restoration beginning in 1868. The uninvited arrival of Commodore Matthew Perry's American fleet in a fortified Japanese harbor in 1853 forced the Japanese to realize that the policy of isolation maintained by Japan's military leaders (the Tokugawa shoguns) no longer worked to protect Japan against foreigners. Hence, beginning in 1868, Japan embarked on a crash policy of selective change and borrowing from the West, with the result that Japan became the only non-European country, other than Thailand, to succeed in avoiding colonization by Europeans.

Japan jettisoned its shoguns, and jettisoned its policy of isolation. In order to borrow selectively from Europe, Japan sent envoys to different European countries to learn what each country was best able to offer. For example, it learned ship-building and the principles of a modern navy from England, and it learned the principles of a modern army and constitutional government under an emperor from Germany. It built railroads and telegraphs on European models.

Within a few decades, Japan fought and defeated its much larger neighbor China, then a decade later Russia, then another decade later Germany. Japan adopted Western clothes and (selectively) economics. Despite these incredible changes, this country remained selective: Japan remained distinctively Japanese by continuing to prefer its complicated kanji writing system, retaining much of its culture, cuisine and religion, as well as retaining a belief in its uniqueness and superiority.

After World War II, Japan succeeded in another drastic reappraisal and selective change, when it jettisoned its long military tradition and its autocratic government. It rebuilt its economy to become one of the world's richest countries. Japanese today still wear Western clothes while writing in kanji. Today, though, Japanese core values are once again under assault. Japanese women in growing numbers are rejecting the traditional role expected of them, and are choosing not to marry Japanese men, with the result that Japan's proportional birthrate is the lowest in the world, far below the level necessary for maintaining Japan's population.

Despite the resulting aging of the Japanese population, as more and more old people require support from fewer and fewer younger people, Japan continues its traditional policy of refusing to accept immigrants and assimilate foreigners – the solution to the corresponding problem of declining birthrates and aging population adopted by Europe and the United States.

After centuries of virtual self-sufficiency under the Tokugawa shoguns, Japan has recently been plundering the forests and fisheries of other countries to become the world's leading importer of wood products and seafood. But by so doing, Japan is destabilizing its own trade partners and its ultimate suppliers of essential resources.

To recast Japan's traditional role for women, its traditional rejection of immigration in order to maintain a homogenously Japanese society, and the exploitation of the resources of other countries would require drastic selective change on the part of Japanese society. Japan has shown its capacity for drastic selective change twice in the last 140 years. Will Japan succeed in reappraising again? No one can predict the outcome. However, it is interesting at least to consider which of the seven factors I identified earlier as affecting an individual's success in overcoming a crisis, seem to be in Japan's favor for overcoming its national crisis today, and which factors might diminish one's optimism.

In Japan's favor, I think, stand four of my seven factors:

- Japan has historically been successful at building fences that set off problematic areas of Japanese society (*e.g.*, foreign relations during the Meiji era) from unproblematic ones (*e.g.*, comfortable acceptance of much of traditional Japanese culture);
- Japan continues to be imbued with national ego strength;
- It drew brilliantly on models of alternative coping methods in the Meiji era;
- It draws confidence today from that previous experience of successful coping.

But three of my seven factors seem less favorable for Japan:

- Perhaps an element of societal rigidity;
- Lack of Europe's and the United States' experience of wide policy swings

associated with real parliamentary democracy and permitting toleration of initial policy failures;
- Some traditional values that may be considered non-negotiable, despite their increasing mismatch to modern conditions.

Readers may ask themselves similar questions about prospects for reappraisal in modern Britain, continental Europe and the United States, all of which I shall now discuss.

4.2 Britain and Continental Europe after World War II

My next examples come from Europe, firstly Britain, after World War II. Britain's traditional identity was based on being a world power, masters of the greatest empire in history, owners of the world's strongest navy, and a belief in the British people as being tolerant, a belief made easier by the British population being homogeneously British, with little need to decide how tolerantly to behave towards other people within Britain itself.

Then came the abrupt decline in Britain's wealth and political power and the rise in its immigrant population after World War II. Four devastating blows within two years shocked the British people by making clear just how much conditions around them had changed: the debacle of the Suez Crisis of November 1956, when Britain was forced to recognize that it was no longer a world power capable of an independent foreign policy; the scrapping of Britain's last battleships in 1958; and the Nottingham and Notting Hill race riots of 1958, exploding the myth that the British were tolerant when actually confronted with large numbers of immigrants.

Those shocks triggered an agonizing reappraisal, which was at its peak during the years 1958 to 1962, while I was living in Britain. Most British people recognized then that something was wrong; some British concluded that it was necessary to change, and others sought to cling to the past. I recall a dejected British friend in those days telling me that Britain was on its way to becoming one of the poorest countries of Western Europe. But the British people did succeed in carrying out a selective reappraisal, as a result of which they no longer aspire to empire or command of the seas or a dominating independent foreign policy. And Britain is once again a rich

country and a leader in science and technology, partly integrated with Europe while remaining unmistakably British.

Continental Europe has been undergoing its own reappraisal for the last 60 years. For centuries, Europeans had viewed themselves as citizens of intermittently warring nation-states. World War II forced Europeans, at last, to recognize that their identity was no longer viable, because it had already cost the lives of tens of millions of Europeans in two world wars.

Europe then embarked on the path of economic and political unification that has resulted in the European Union as it exists today. To anyone familiar with traditional European outlooks until World War II, the progress towards political and economic unification that has already been achieved is incredible. But recent rejections of the proposed European Constitution illustrate that Europeans still have not completely resolved their basic dilemma: how to preserve the ancient diversity and competition between nations that made Europe strong, while incorporating that diversity and competition into a new European unity.

4.3 The United States

My remaining example at the level of the nation-state involves my own country, the United States, which is now undergoing its own agonizing reappraisal. It is becoming clear that three of our dearest core values no longer serve us well. One of those core values is our consumerism. The United States was able to become the richest country in the world, *i.e.* the one with the highest consumption rates, because for over two centuries a relatively modest population of Americans occupied much of a continent with seemingly unlimited resources.

But our consumerism no longer works in a modern world with shrinking resources, and when the population of the United States has surpassed 300 million. Our average per capita consumption rates are about 32 times those of developing countries (Diamond, 2005). These consumption rates are no longer sustainable, and we can no longer justify them by claiming that they are necessary for our high standard of living; Canada and Western Europe enjoy higher standards of living despite lower per capita consumption rates.

Our second core value under question is our individualism. The balance between individual rights and communal rights differs between the United States and Europe. For example, in the United States, land owners are usually free to cut down a tree on their own property; in Europe, local governments restrict that right of individuals. I have been watching that dilemma play out in debates over land development in the state of Montana, where my family and I spend our vacations each summer, and where individualism is stronger than almost anywhere else in the United States.

In our area of Montana's Bitterroot Valley, there were until recently no zoning restrictions on land use, with the result that the valley now has its largest cinema standing immediately next to its largest biotechnology plant, both in the middle of hayfields. Several decades ago, we Americans resolved our debate about individual rights to pollute with cigarette smoke the air breathed by others (*e.g.*, in airplanes and restaurants), in favor of communal rights.

But we have not yet resolved the corresponding debate over smoking into the whole atmosphere: we permit, and we even grant tax incentives to, owners of fuel-inefficient motor vehicles such as Humvees, despite the economic losses that the resulting global warming is already causing in many American states. Will we Americans reappraise our traditional favoring of individual rights over communal rights, when it no longer makes sense to do so?

The remaining traditional American core value up for debate involves our role overseas. Our first President, George Washington, famously advised us in his Farewell Address of 1796 to avoid entangling alliances. That isolationist policy was good advice at the time, when the Atlantic and Pacific oceans protected us from any enemy strong enough to be a threat. For nearly 150 years, our foreign policy continued to rest on that foundation of isolationism, punctuated by short-term military intervention in World War I, yielding immediately after the end of that war to a reversion to isolationism. Our current involvement overseas in Iraq and Afghanistan still consists primarily of military interventions.

The traditional value of isolationism, which worked as long as the oceans were an effective barrier, is now failing. Particularly since the World Trade Towers attack of Sept. 11, 2001, it is clear that the oceans no longer protect us from terrorists, nor from

emerging diseases and unstoppable waves of immigration. Will we Americans change the values underlying our traditional isolationism and short-term military role overseas? And will we start making heavy overseas investments in addressing the fundamentals that generate terrorism, disease and immigration?

In favor of addressing the fundamentals is that it would be cheap and efficacious to do so: it would cost only about $25 billion (an amount equal to the cost of just a few days of our military activities in Iraq) to launch a worldwide attack on the world's three most important infectious diseases, namely: AIDS, malaria and tuberculosis. It would cost only about $8 per year to protect each person in Africa's malaria zone against malaria, for a total of only a few billion dollars for all of the continent; mining and oil companies have succeeded in local examples of such malaria-control programs in southern Africa (Sachs, 2005). Family planning is very cheap, and it is desired by many people in the Third World.

Such changes in our foreign policy, a shift towards long-term emphasis on fundamentals, would go against our traditional core values. But, just as in the case of the individual client coming into my wife's crisis-counseling office, some of our traditional core values as a nation don't work anymore, and they don't enable us to cope.

I shall close by returning to Dick Cheney's phrase: "The American way of life is non-negotiable." The key question that one has to ask in that regard is: "Don't negotiate with whom?"

Our Vice President was surely implying, "Don't negotiate with other countries." Yes, of course, we won't negotiate with other countries about the American way of life. But, really, the ones with whom we have to negotiate are ourselves. No one is tougher to negotiate against than one's old self. It remains to be seen whether we Americans are willing to renegotiate with ourselves, selectively, the core values underlying the American way of life.

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Question/answer session with Jared Diamond "Coping with change"

Questions:

Alexander SARRIS (FAO). My question relates to the current international financial crisis. It concerns the first strategy you identified that allows a society to cope with a crisis: to become inward-looking. History, particularly during the 1930s, shows that financial crises can lead to increasing isolationism. What is your view on the protectionist measures that the present financial crisis may lead to, and on the problems governments may have in responding to pressures in this direction?

Johannes JÜTTING (OECD Development Centre). You explained that the ability to cope with a crisis could be analysed at different levels: at the level of the individual, the tribe or the nation. To my mind, what is missing here is the international level which I think would be relevant for issues such as climate change or the international financial crisis. What is your point of view on the role of international cooperation with respect to the ability of societies to cope with crises?

Jean-Claude DEVEZE (Inter-réseaux Développement rural). You use terms such as coping with change rather than driving change. Does this mean that a voluntarist approach should not be used to bring about change? My second question concerns how transformation at an individual level articulates with the collective level. Values, for example, play a role in individual behaviour, but at a collective level is the role of leaders and teams not a determining factor?

Pierre JACQUET (Agence Française de Développement). I have two questions. The first concerns the rhythm of change: should change be undertaken in response to a

specific shock or should it, on the contrary, be carried out on a permanent basis? In other words, should change be discreet or continuous, and how is this to be measured? My second question involves development aid activities: what would your advice be to a development agency in order to bring about structural change in the countries it is assisting? So, to take your example, how should we help - and indeed should we help - the Chimbu tribe, and how should we help - and should we help - the Tudawhe tribe?

Responses by Jared Diamond:

I should like to begin by answering the question I was asked about the need for one generation to die and another to be born in order for change to come about. In my view, this is a pessimistic way of looking at things. There are reasons to believe that change can occur within a single generation. To cite just one example, climate change. I would never have believed it possible for American public opinion on this issue to change so much in 2008. The explanation is not a change of generation but rather a turnaround in the opinion of people of my age, or the twenty-, thirty-, forty-year-olds, who have started to take the climate change issue seriously. This shift was even endorsed by the outgoing President himself.

Another question concerned the role that leaders play in change, and the question of at what level (individual or leadership) should change be initiated. I think that change needs to come from all levels. There are things that individuals can do. Individuals or NGOs can undertake actions and thus produce an impact on their own environment. Governments have a role to play in certain cases. For example, the American government alone has the authority to pass legislation banning lead in gasoline.

Several questions referred to international cooperation. It should be said that although an analysis of past civilisations can give us a better understanding of the present, the globalisation of the modern world is unique in history. The risk we are facing today is that of world collapse. In the past, societies were able to have an “individual” vision of failure: the collapse of one society did not have strong impacts on the rest of the world. Nowadays, this is no longer the case: when one society experiences serious problems, these now spread to all countries across the world. What is more, this does not only apply to problems experienced by major countries like the United States:

even when much poorer countries such as Somalia, Iraq or Afghanistan collapse, there are serious consequences, even for the United States. There is thus a risk of global crisis and, as a result, solutions must henceforth be found at an international level.

Finally, concerning the question on what advice to give to a development agency, I would say that a solution needs to be found enabling world growth to take place at a more sustainable level, otherwise there is a risk of global collapse. The differences in per capita consumption levels across the world need to be narrowed, by reducing those in developed countries and increasing those in developing countries. It is not possible for the West, and particularly the United States, to continue to consume thirty-two times more wood, water or fish than the rest of the world. As long as such marked disparities exist, emigration will continue, since young people today are no longer willing to wait two or three generations before attaining the developed countries' levels of consumption. The objective of development agencies should thus be to achieve a more equal balance between consumption levels across the different regions of the world.

Drawing Public Policies

Forest Degradation and the Role of Public Authorities: The Case of the Nepalese and Indian Himalayan Forests

by

Jean-Marie Baland

CRED, University of Namur, Belgium[1]

Introduction

Deforestation and forest degradation in the Himalayas are a major ecological concern in this region. The Himalayan range is one of the most unstable and fragile mountain areas in the world (Ives and Messerly, 1989). Deforestation tends to accentuate the disastrous consequences of earthquakes, and it is a significant contributing factor to landslides and flooding. This has a serious impact on the equilibrium of the Ganges and Brahmaputra river basins, and heightens the frequency of flooding in Bangla Desh (Metz, 1991). More generally, deforestation speeds up global warming and the destruction of the ozone layer.

The alpine zone of the Indian Himalayas (from 1 800 to 3 000 metres) is home to populations that rely mainly on agriculture and livestock-rearing for their livelihood.

1 I wish to thank my four colleagues who collaborated on the general research project that forms the basis of this report: Pranab Bardhan (University of California, Berkeley); Sanghamitra Das (ISI, Delhi); Dilip Mookherjee (Boston University); and Rinki Sarkar (CISED, Bangalore). I also extend my thanks to Catherine Guirkinger (CRED, Namur) for her detailed reading of this paper.

Their lives have a high degree of reliance on the forests adjoining their villages. Firewood, timber, fodder and leaf-litter for livestock are for the most part collected from these forests. The forests are also used for livestock grazing. Environmental degradation has a considerable impact in terms of reducing available resources and increasing the time required for their collection. Cooke (1998), for example, estimated that in Nepal during 1982-3, children from rural families spent roughly eight hours a day collecting firewood, water and fodder. By increasing the time required for collection, deforestation can lead to lower levels of health and education for these children (Kumar and Hotchkiss, 1988). A drop in firewood consumption can also weaken family members' resistance to disease (Amacher *et al*, 2001). For all these reasons, the degradation of the Himalayan forest is a priority issue not only for researchers but also for policymakers.

In the following pages, we first describe the characteristics of the Himalayan forest degradation on the basis of data from recent studies, and we attempt to identify the causes. As we shall see, firewood collection plays a vital role in this degradation. In the second section, we will examine recent data regarding household firewood consumption and the effects of subsidising alternative sources of energy. In the final section, concerning property rights, we will assess the performance of the different regimes of property management by local communities.

1. Degradation of the Himalayan Forest

1.1 Indicators for measuring Himalayan forest degradation

The few quantitative studies available confirm substantial degradation of the Himalayan forest over the last decades. For instance, using aerial satellite imagery, Prabhakar, *et al.* (2006) estimate that 61%[2] of forests in two districts of Uttarankhand are severely deteriorated (with crown cover less than 40%). This observation suggests that the present trend differs substantially from past developments, which were characterised more by deforestation, or in other words, the decline of forest area. Myers (1986) calculates, for example, that in Nepal between 1947 and 1980, forest cover of national territory dropped from 57% to 23%.

2 The 90% confidence interval is equal to 48%-73%.

In our own survey, which was conducted in 2002-3 and encompassed a large sample of alpine forests in the Indian Himalayas, we noted similar measures of degradation (Baland, *et al.*, 2007, 2008b).[3] Rather than working with satellite images, we used physical measurements taken directly in the forests. Various measures are available for assessing the state of a forest. The conventional forest management indicators measure the available tree stock and thus correspond more to long-run measures of biomass. These indicators include the following: (1) canopy cover (the amount of ground area covered by the canopy through which direct light passes),[4] which measures the density of foliage; and (2) basal area (the total area covered by the cross-sectional area of tree trunks per hectare), which measures the density of standing trees per hectare.

There are also short-run measures that reflect rather anthropogenic pressures on the forest, such as lopping (the proportion of a tree trunk that has been lopped), which is primarily the result of firewood and fodder collection. At stationary equilibrium, these measures should theoretically show a high correlation, with residual variations being explained by factors such as the type of soil, exposure to light or tree species. The problem, however, stems from the fact that pressure on the forest has varied considerably over recent decades, so that long-run measures such as basal area do not necessarily reflect the short-run degradation that becomes apparent when using the other measures.[5]

Table 1 below shows the mean values and the correlations obtained between these variables. We have also included the firewood collection time, which measures one of the direct impacts of forest degradation on households. Here, collection time corresponds to total collection time, which includes the time it takes to walk to the forest.

3 This involved a random sample of 185 villages in the alpine zone of Himachal Pradesh and Uttarankhand. We collected data on the 619 forests adjoining these villages, mainly by taking measures in 3 512 forest plots. Table 1, and Figures 1 to 3, are based on sub-samples of 399 forests in Uttarankhand.

4 This is, in fact, a similar measure to the *crown cover* indicator used by Prabhakar, *et al.* (2006), but as seen from ground level, rather than an aerial view.

5 In Baland *et al.* (2008b), we also measured the volume of wood per hectare (basal volume), which is another conventional measure of biomass and regeneration capacity (number of saplings above a height of 0.5 metres per hectare) and declines in the case of illegal felling or frequent grazing. Further measures of biological diversity or quality of tree species could be included. However, the main issue here is more about the quantity of available wood, and this explains our choice of the aforementioned measures.

Table 1.
Correlation coefficients and measures of forest quality in Uttarakhand

	Canopy cover (%)	Basal area (m2/ha)	Lopping (%)	Collection time (hr)
Canopy cover (%)	1.00			
Basal area (m^2/ha)	0.32	1.00		
Lopping (%)	-0.59	-0.21	1.00	
Collection time (hr)	0.06	0.13	-0.02	1.00
Mean (standard errors)	37.5 (11.1)	41.3 (24.6)	67.1 (13.2)	4 (1.2)

Source: Baland et al. (2008b). Number of observations: 399.

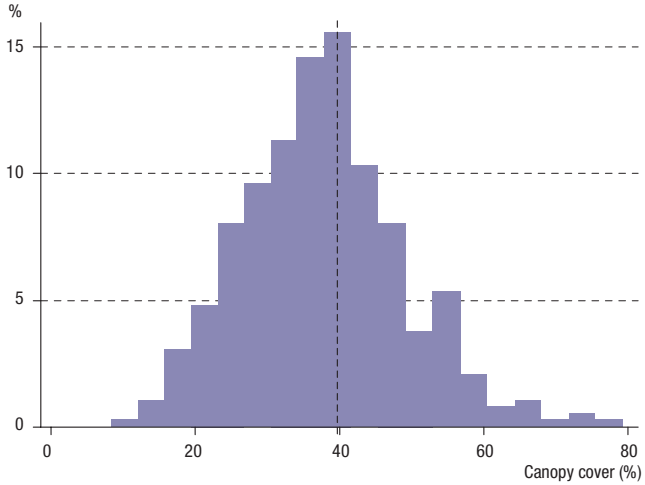
This table invites three comments. First, the correlation between the measures is somewhat weak, which justifies using them simultaneously so as to obtain a correct evaluation. Secondly, there is little correlation between collection time and the other measures. This is particularly important in ascertaining the impact of degradation on the villagers' behaviour, as we do not observe any substantial relationship between the degree of forest degradation and the time spent by the villagers on firewood collection.[6]

Finally, the mean values of canopy cover and lopping are alarming, and evidence severely degraded forests. By comparison, the conventional thresholds for non-degraded forests are 80% for canopy cover, 40 m^2/ha for the basal area and 15% for lopping (Thadani, 1999). We illustrate the distribution observed for each of these measures in Figures 1 to 3 below. We also use a vertical broken line to show the level corresponding to a "severely degraded" state of the forest.

More than half the forests evidence a severely degraded canopy cover (less than 40%), and the extent of lopping exceeds two-thirds of tree height. On the other hand, as shown in Figure 3, the tree biomass, as measured by the basal area, does not show deterioration. This means that most degradation is linked to excessive short-run exploitation, which is not yet visible in terms of a reduction in the volume of raw wood in the forest. In other words, even though the quantity of trees is satisfactory, they are in an especially poor state: most of their branches have been lopped or torn off, and

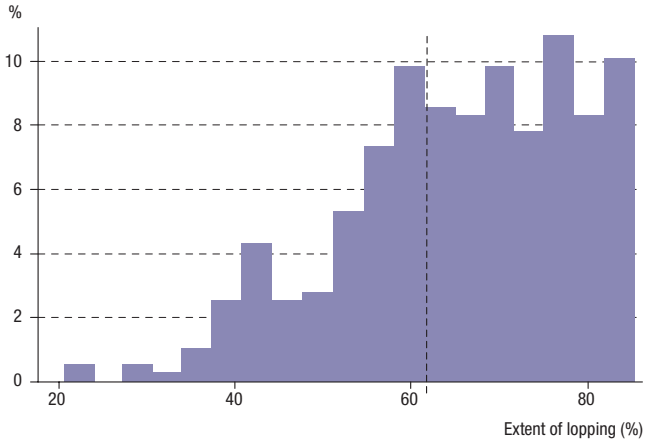
6 The low correlation is partly explained by the fact that within a single village, the collection times show little variance between the different types of forests; the villagers choose their collecting places on the basis of the time they expect to take (except when various attached forest rights have to be taken into account). A comparison between forests of different villages should produce a stronger correlation.

Figure 1.
Distribution of forests based on their canopy cover (Indian Himalayas, 2002-03)



Source: Baland et al. (2008b).

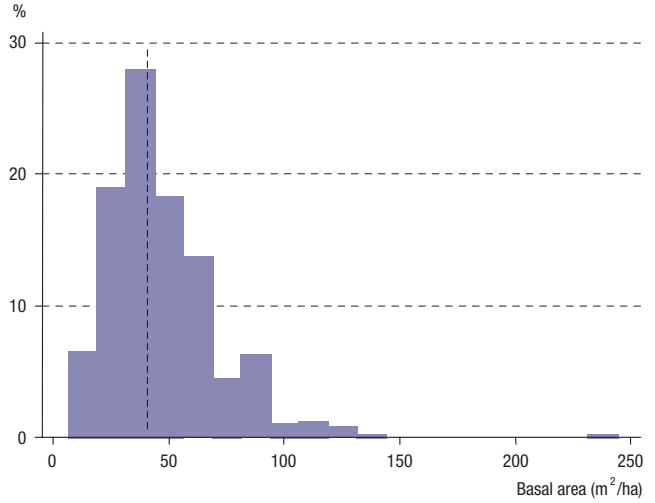
Figure 2.
Distribution of forests based on the extent of lopping (Indian Himalayas, 2002-03)



Source: Baland et al. (2008b).

their canopy density is much too low. The unhealthy quality of trees inevitably threatens their growth potential and their resistance to natural calamities (frost, drought, etc.). It thus drastically reduces the forest's capacity for future biomass production.

Figure 3.
Distribution of forests based on basal area (m^2/ha) (Indian Himalayas, 2002-03)



Source: Baland et al. (2008b).

The household surveys conducted confirm these trends. Over the last 25 years, the average firewood collection time has increased by an average of 60% (from 2.36 to 3.84 hours per firewood bundle), whereas the distance to the forest has only increased by 10%, on average (from 2.06 to 2.31 kilometres). These differing trends suggest that the cause of increased collection time is not so much the conversion of forest areas into agricultural land or pastureland but the degradation of forest quality.[7] More than 80% of the village respondents said they felt that forest quality was in decline. Forest degradation, rather than deforestation, thus seems to characterise changes in the Himalayan forest.

1.2 Causes of Himalayan forest degradation

Therefore, we set out to examine the causes of this degradation. These can be natural, such as fire- or snowfall-related damage, or anthropogenic. Among the man-

7 The household surveys show that the level of clearance for agricultural purposes is relatively negligible. Moreover, clearance mostly involves non-forested commons (60%). Clearance of forested areas only concerns 5% of cases.

related causes, a distinction should be made between those linked to the use of firewood, fodder collection and grazing, and those relating to tree-felling for commercial purposes or for timber removal. Table 2 illustrates the relative importance of these causes in each of the forest plots visited.[8] Although all the measures are not strictly comparable, anthropogenic pressures, particularly firewood collection, play a crucial role in forest degradation.

Table 2.
Degradation of forest plots according to each possible cause

	Percentage of forest plots in each category (n = 3512)	
Cause of degradation	Low-impact %	High-impact %
Grazing	30	70
Lopping	20	80
Wood-cutting	57	43
Forest fires	62	38
Snowfall	81	19

Source: Baland et al.

It is somewhat difficult to obtain reliable data on timber removal, chiefly because this activity is strictly controlled, and commercial exploitation is mostly forbidden. This said, our household surveys show one tree equivalent of timber is used by each household every five years for construction purposes. Assuming an average three-ton weight per tree, and an average of 80 households per village, this represents 48 tons of timber per year per village. This compares with the use of a little over 450 tons of firewood per year per village. In terms of biomass, timber removal for household construction accounts for scarcely 10% of the total mass of wood removed from the forest. Lopping for fodder, and particularly for firewood, thus seems to be the foremost cause of forest degradation.

8 The extent of degradation is deemed to be low in a plot (100 m2) if: the only visible signs of interference are livestock trails; if lopping is less than 30%; and if fewer than 3 branch stumps have resulted from wood-cutting, have been burnt by natural forest fires or have been ripped off by the accumulation of snow.

2. Poverty, Growth and Firewood Collection

2.1 Poverty and the environment

The environmental impact of overall standards of living and economic development is a pivotal question in debates on the environment. However, there are highly contrasting points of view on this subject. On one side, there is a pessimistic current dating back to the founding of the Club of Rome, based on the idea that economic growth will inevitably aggravate pressures on energy resources, which means that policy measures are required to moderate the impact of rising demands on the environment (cf. for example, *The Economist*, 2004). The World Economic Forum report (2006) underscores that: *"China and India are at inflection points in their development requiring them to sustain economic development, in particular to manage natural resource consumption and environmental degradation"* (World Economic Forum, 2006).

At the other extreme, we find the idea that poverty is one of the root causes of environmental degradation. Originally proposed by the 1987 Brundtland Commission and the Asian Development Bank (Jalal, 1993), this hypothesis implies that poverty reduction is a prerequisite to controlling environmental problems. As a recent World Bank report on India states: "*The shrinking common property resource base, the rapidly increasing human and livestock population, and poverty are all responsible for the tremendous degradation pressure on the existing forest cover*" (World Bank, 2000, Summary section). Following this logic, economic growth — assuming that it does indeed reduce poverty — could be sufficient to alleviate pressure on the environment.

A third, certainly more moderate viewpoint suggests that development and growth may initially aggravate pressure on environmental resources, but will subsequently alleviate this once a certain threshold is exceeded. In the literature, this hypothesis is referred to as the environmental Kuznets curve, according to which the relationship between per capita income and environment is an inverted-U curve (Barbier, 1997).

2.2 Poverty and deforestation

Firewood is the main source of household energy in the Himalayas. In the zone under study, firewood is used for cooking energy in the summer by 90% of households, and

gas by 9%. For cooking and heating in winter, firewood is used by 99% of households (Baland, *et al*., 2007). In Nepal, according to the World Bank Living Standard Measurement Survey conducted in 1995-6, villages use firewood as the prime source of energy, when it is available: 82% of households in 1995-6 and 75% in 2002-3. The second source of energy used (in 2002-3) was gas (Baland *et al.,* 2008b).

Considering the impact of firewood collection on forest degradation in the region, the basic question to be asked is: to what extent will future increases in income be linked to greater use of "modern" types of fuel (such as gas, electricity or kerosene) and to a lesser use of traditional fuels (such as wood, straw or cow dung)? There are basically two effects at play here. The first is the effect of direct income, which makes households wealthier, and increases their consumption of goods, as well as energy, at a constant cost. (The direct income effect can nonetheless be negative if firewood is considered as an inferior, less prestigious or more polluting source of energy.) The second effect is one of substitution: insofar as firewood is mainly collected by households, wealthier households have a higher opportunity cost for time spent collecting it, making the firewood more costly. The substitution effect is thus negative. The net effect is basically ambiguous and depends on the respective influences of the income effect and the substitution effect. An obvious factor in determining the net effect is the availability of alternative energy sources.

The hypotheses discussed in Section 2.1 are each based on a specific assumption as to the predominance of one of the effects over the other. For example, the environmental Kuznets curve implies that the income effect dominates the substitution effect at low levels of income. Unfortunately, rigorous studies separating out these effects are few and far between. Many studies are blighted by major methodological weaknesses, which we discuss in Baland, *et al*. (2008a).

These shortcomings, which range from questions about the definition of variables (for example, firewood-collection time, the quantity of wood consumed or the opportunity cost of time) to problems posed by incomparable situations (stemming from biases due to omitted variables) make it impossible to deduce a causal relationship. For example, if a wealthier village close to an urban centre is compared to a poorer, isolated village surrounded by forest, a negative relationship between firewood consumption and income might be observed. Yet this negative relationship obviously does not imply that

a general increase in income will reduce consumption of firewood. The impact of a specific economic policy measure thus cannot be assessed on the basis of this simple comparison.

Among the methodologically rigorous studies, Chaudhury and Pfaff (2004) use a large sample of households in Pakistan to evidence a clear transition from traditional to modern fuels as per capita income rises. A point of interest, however, is that this transition happens mainly in urban areas, where substitutes for firewood are more readily available. Foster and Rosenzweig (2002) find a small (but statistically significant) negative effect between firewood consumption and income in a large household sample of rural households in India. However, the Himalayan village context is different, mainly due to the easy access to firewood, the higher average level of poverty and the lesser availability of substitute sources of energy.

2.3 Income and firewood demand: Engel curves

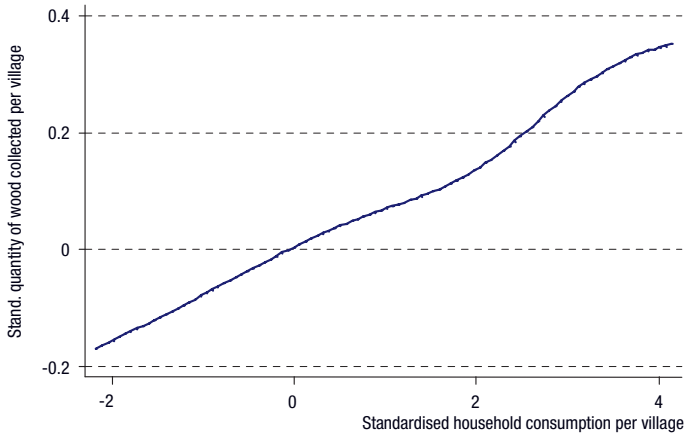
We therefore set out to study the relationship between income and firewood consumption in Nepal and the Indian Himalayas (Baland, *et al.,* [2007, 2008a]).[9] Simple

Figure 4.
Engel curves for firewood collection in Nepal (1995-96 and 2002-03)

Source: Baland et al. (2008a).

9 We use wood collection and consumption interchangeably, given the low amounts involved in commercial exploitation.

Figure 5.
Engel curve for firewood collection, Indian Himalayas rural zone (2002-03)



Source: Baland et al. (2008b).

Engel curves are presented in Figures 4 and 5 above. More specifically, we illustrate the relationship between the amount of firewood collected compared to the village average (in the number of standard deviations), and also household income compared to the village average (in the number of standard deviations, income being measured by consumption expenditures). In this way, we in effect compare the amount of firewood collected by different households within the same village (that is to say with respect to the village average). Figure 4 represents the Engel curve obtained for Nepal in 1995-6 and 2002-3, and Figure 5 the curve obtained for the Indian Himalayan villages that we surveyed in 2002-3.

The results are relatively clear: the Engel curves show an essentially increasing relationship between firewood collection and household income. In the Nepalese villages, this relationship is nonetheless concave, with the wealthiest households showing a turning point in the tail of the distribution (above the 95 percentile). On average, a 10% increase in income is associated with a 4% rise in firewood collection. The income effect thus seems to be largely positive and dominates the substitution effect. The results are very similar for India.

These findings are substantially corroborated by more sophisticated estimates (cf. Baland, *et al.*, 2007, 2008a, for further details). Finally, it should be noted that the concavity of the Engel curves could imply, all other things being equal, that villages for which income disparities are lower, on average consume more wood. The concavity measure in the present instance remains relatively weak, which means that this effect is probably not of great importance.

2.4 Income effect and substitution effect with respect to the demand for firewood

The following analytical approach is an attempt to assess the effect of income and substitution more directly. In the substitution effect, three major components should be distinguished: (1) collection time; (2) the opportunity cost of the collection time; and (3) the price of alternative energy sources. These three components are interlinked and play a joint role in the "substitution effect". For the decision-maker, however, they each hold a specific interest, since they provide answers to three different questions: (1) what happens if forest degradation continues; (2) what happens if some income-generating activities become more profitable; and (3) what happens if the price of gas decreases?

We shall begin with collection time. Our estimates show a mean elasticity of the quantities collected of -0.54 in India and -0.20 in Nepal with respect to the collection time.[10] This elasticity is not very high: on average, a doubling (!) of the collection time reduces the quantity of firewood consumed by only 20% to 54% at most. In other words, given an average collection time of 3.84 hours in India, a one-hour increase in collection time implies around 14% reduction in the amount of firewood consumed.

It is relatively easy to evaluate the impact of increased firewood collection time on the welfare of households. In fact, applying the envelope theorem, the monetary value of the extra time spent on firewood collection is equal to the shadow wage corresponding to the additional time required annually for firewood collection (we do not know the impact this time increase has on the collection time for other forest products). In the case of Nepal in 1995-6, the cost linked to a one-hour increase in collection time can

10 These estimates, however, are incomplete, as they do not take into account the impact of collection time on total household income. This question is complicated methodologically speaking. The figures shown here thus reflect at best a magnitude of the substitution effect.

be estimated as an income loss of around 2%.[11] In the case of India, the income loss is slightly lower, at around 1%. The direct impact of the local externality on the villagers' welfare is thus weak, which certainly explains the low elasticity of the quantity of firewood consumed in relation to the collection time.

The second component of the substitution effect is related to households' occupational structure, which defines the opportunity cost of collection time. This structure is itself defined by the type of assets owned by households. For example, a household that owns a large number of livestock spends a lot of time on grazing activities, particularly in the forests, and these activities greatly reduce the opportunity cost of collection time. On the other hand, a highly educated household involved in trading with a nearby urban centre will have a much higher opportunity cost.

The question here thus involves directly studying the impact of each asset on firewood collection, via its impact on the cost of collection. Each asset's impact on income can also be analysed, as the demand for energy also varies with the different types of assets. For example, it is likely that the winter stabling of livestock reduces a household's needs for heating. In Baland, *et al*. (2008a), we study these different effects, which are summarised in Table 3 below.

Despite likely errors in estimates, the results confirm the idea that productive assets do not all have the same impact on firewood collection. For example, livestock ownership

Table 3.
Elasticity of firewood collection with respect to various productive assets in Nepal

	Elasticity of direct income		Elasticity of substitution		Total elasticity	
Productive asset	1995-6	2002-3	1995-6	2002-3	1995-6	2002-3
Land	0.22	0.36	-0.19	-0.25	0.03	0.12
Livestock	+?	-0.25	0.50	0.50	0.50	0.25
Education	0.57	- ?	-0.39	-0.19	0.18	-0.19
Non-farm business assets	0.18	0.13	-?	-?	0.18	0.13

Note: The question mark indicates a non-significant coefficient of 10%.
Source: Baland et al. (2008a).

11 The data we use are based on average firewood collection of 79 bundles per household per year, a median shadow wage of Rs 6.4 per hour, and median consumption expenditure of Rs 30 675.5 per year. The total time spent collecting firewood in Nepal in 1995-6 was estimated to be around 400 hours per household per year.

is associated with a positive substitution effect, indicating a complementarity between livestock-rearing activities and firewood collection. On the other hand, land and education, and probably non-farm business assets, are associated with negative substitution effects.

The future impact of economic growth therefore crucially depends on the type of asset underpinning the growth. Growth based on modern assets, such as education and non-farm business assets, reduces firewood collection (on the basis of 2002-3 estimates), with a total net elasticity of -0.06: if these two assets increase by 100%, the demand for firewood declines by around 6%. On the other hand, growth based exclusively on traditional farm-related assets, such as land and particularly livestock, leads to an increased demand for firewood, with a total net elasticity of 0.37.

Moreover, total elasticity, equal to the sum of the elasticities of all the assets, is relatively high, being 0.89 in 1995-6 and 0.31 in 2002-3. Overall growth of all the assets, which leads to an equivalent growth of household income (economies of scale proved constant in our estimates), thus produces a significant increase in the demand for firewood. The Engel curves presented in Figures 4 and 5 already illustrated this phenomenon.

Finally, it should be noted that the elasticities obtained in 2002-3 are systematically lower than those in 1995-6. Even if the two samples are not totally comparable, this result is related to the fact that the use of gas as a source of energy, especially for cooking during the summer season, seems to have developed substantially over this period. It is also possible that the increase in income may have taken the average household closer to the turning point on the Engel curve, as shown in Figure 4 above.[12] This brings us to a discussion about the third component in the substitution effect, namely the availability of substitute fuels.

In Baland, *et al.* (2007),[13] we studied this question in the case of India. The most commonly found substitute fuel is gas in cylinders (LPG). In the villages where LPG is

12 It must also be pointed out that the Engel curve for 2002-3 shifts to the right compared with the 1995-6 curve, indicating that the decline in the demand for firewood intervenes at lower income levels.

13 It was more difficult to design a similar approach for Nepal, where the use of gas in 1995-6 was much less common. The 2002-3 data have yet to be analysed.

available, the elasticity of firewood collection with respect to the price of gas is fairly high. Given an average price of 300 rupees (Rs 300) per cylinder, we calculate the impact of an Rs 100 subsidy on the price of gas in Table 4. The reduction in firewood consumption is, as expected, larger in summer than in winter (27% and 19%, respectively), with a resulting 22% decrease in annual consumption. The effects are substantial at all income levels: even among the poorest households (in the first, or lowest, quartile of income distribution), the drop in demand for firewood is equal to 19%. According to our estimates, an Rs 200 subsidy would reduce firewood consumption by 40%.

Table 4.
Effect of an Rs 100 price decrease in the cost of an LPG cylinder

Season	Income level	% change in the amount of wood collected
All year	Mean	-22%
	First (lowest) quartile	-19%
	Second quartile	-22%
	Third quartile	-22%
	Fourth quartile	-26%
Summer	Mean	-27%
Winter	Mean	-19%

Source: Baland et al. (2007).

Certainly, the implementation of these subsidies encourages gas consumption, in such a way that the fiscal cost of such a measure could be very high. As we show in Baland, *et al.* (2007), this subsidy encourages 37% of the households to use an average of 1.07 gas cylinders per person, which represents a subsidy of at least Rs 107 per using household. With an average per capita consumption expenditure of Rs 8 646 per year, this corresponds to around 1.2% of total consumption expenditure. Based on overall consumption expenditures for all the villagers, this subsidy corresponds to an annual tax of 0.4%. In comparison, an increase of one hour of collection time reduces firewood consumption by 14%, and implies a direct household welfare loss of 1%. Subsidising gas thus appears to be a particularly promising alternative since for a relatively similar private cost to households, this policy avoids all the external costs linked to deforestation.

3. Decentralisation, Community Management and Forest Quality

3.1 Decentralisation movements in India and Nepal

For several years, policies have been adopted in both Nepal and India to transfer part of the rights relating to State forest management and use to local communities. This policy approach is grounded in the idea that degradation of common property resources, such as forests, results from an inadequate institutional framework, which does not provide rural households with suitable incentives for rational and sustainable resource management. While it is true that centralised State management (which often focuses on regulating resources) yields mitigated results in terms of environmental management (cf. Ostrom, 2000, for example), the performance of decentralisation policies concerning natural resource management by user communities is also called into question by many authors (Baland and Platteau, 1996).

Whereas decentralisation policies are able to develop complex mechanisms for allocating and distributing products from these resources, they often seem to be inadequate when it comes to setting up systems to protect such resources. This is particularly true when market expansion and population pressures come into play. Certain authors also criticise the idealised image of village "communities" put forward by some literature, basically drawing on case studies. They lay greater emphasis on the shortcomings of community participation programmes, underlining phenomena such as capture by village elites, the absence of accountability and monitoring procedures or insufficient knowledge and preparation of users (Abraham and Platteau, 2001; Mansuri and Rao, 2004). In the context of Himalayan forest management, the key question is thus the relative effectiveness of local community management *vis-à-vis* centralised State management.

In Nepal, a large-scale programme for forest resource management was launched in 1993. The programme's objective is to transfer the management of all accessible forests to local communities, via Forest User Groups (FUGs). This management implies controlling access to the forests, taxing forest products, hiring forest guards, launching plantation programmes, etc. Income generated by forest-related activities can then be used to finance local projects (roads, schools, temples, etc.).[14] This programme

14 Certain legal restrictions apply to the use of these funds. For example, 25% of revenue must be reinvested in work aimed at developing the forest.

expanded very swiftly, and it was estimated that in January 2007, 38% of the population was involved in an FUG.

In India, local forest management structures (known as Van Panchayats) were first created in 1931 by the colonial British government, primarily in Uttarankhand, in order to guarantee local communities the exclusive use of demarcated forest areas. This policy was vigorously pursued after independence, and by 1998 more than one-third of the region's villages had their own Van Panchayat. An estimated 10% of existing forests are now under Van Panchayat control.

Currently, three types of common property management regimes co-exist in Uttarankhand. State forests (*Reserve Forests* and *Demarcated Protected Forests*) are protected and managed by the State; access and use of these forests are subject to a great many restrictions, the Forest Department being responsible for their enforcement. Open-access forests (*Civil Soyam*) are forest patches with unrestricted rights of access (tree-felling for commercial purposes, however, remains prohibited); they correspond to open-access commons. Finally, the forests managed by the Van Panchayats are clearly demarcated forest patches, the use and exploitation of which (including planting programmes) are defined by the local Van Panchayat, sometimes with State support.

Since 2001, there has been a dramatic increase in Van Panchayats, as shown in Table 5. Under pressure from the Indian government, the number of Van Panchayats has almost doubled in five years. New rules were introduced to make it easier to create Van Panchayats (for example, approval by only one-fifth of the population is now required to create a Van Panchayat, instead of the previous one-third). The programme includes various infrastructure and planting projects, which are a source of employment for the villagers.

Table 5.
Number of Van Panchayats in Uttarankhand, India

Year	Number of Van Panchayats
1947	429
1993	3 635
2001	6 777
2006	12 089

Source: Sarkar (2008).

Some observers, however, have pointed out the villagers' lack of interest in these recently created community-managed forests, once the casual jobs related to planting and infrastructure work disappear. Some of the new Van Panchayats no longer meet, and in fact, exist only on paper (Sarkar, 2008). This situation seems to differ from that of the Van Panchayats that were set up much earlier, and which required greater mobilisation of the local community.

3.2 The impact of decentralisation policies in India and Nepal

Most existing surveys that compare State-managed forest with those managed by local communities underscore the relative effectiveness of the latter (*e.g.* Somanathan, 1991), but also the great disparities in their functioning and performance. These studies, however, have three major shortcomings. Firstly, they often cover only very narrow geographical areas (*e.g.* Ostrom, 1990; Somanathan, 1991; Gibson, McKean and Ostrom, 2000; Jodha, 2001; Varughese and Ostrom, 2001 or Shivakoti and Ostrom, 2002). Moreover, they often base their evaluations on how the management councils operate (existence of regulations, penalties, forest guards, etc.) or how the villagers perceive the state of the forests, and not on objective indicators that measure forest quality. Finally, they do not generally take into account the problems of selection: a Van Panchayat is formed because the villagers decide to create it, a fact that gives rise to a large selection bias. For example, it is possible that villages facing a more deteriorated forest environment have more to gain by creating active Van Panchayats to protect their forests. If forest quality is compared across villages, a positive correlation can be observed between the existence of a Van Panchayat and forest degradation.

The studies discussed below do not really suffer from these shortcomings, and in particular the problem of selection. For example, in Baland, *et al*. (2008b), we compared different types of forest in the same village. Somanathan *et al*. (2005) compare adjoining forests that have a different status. Edmonds (2001) compares villages where a community-managed forest is about to be created with villages in which this type of system already exists.

Edmonds (2001) studied the implementation of an FUG programme in Nepal. He uses the fact that these FUGs were set up gradually over time, and for 1995-6 he

compares villages where the programme was already in place with villages where a programme had not yet been implemented, all in a region with relatively similar ecological conditions. After controlling for a large number of household and village variables, he shows that setting up an FUG causes a 10% to 15% reduction in the amount of firewood collected by the households. This estimate is robust to a set of alternative methods and controls. Consequently, this FUG programme seems to have an effect on the quantities of firewood used.[15] Tree plantation and timber sales are also a key part of the programme, but we do not have a rigorous evaluation of this component.[16]

Somanathan, *et al.* (2005) have evaluated forest quality using data from satellite images for two regions of Uttarakhand. More specifically, they measure forests' crown cover (percentage of area covered by crown cover), and they classify forests into the three types of existing forest management regimes: Van Panchayat forest; open-access forest (unregulated); and State forest. They show that, on average, the crown cover of Van Panchayat forests is significantly higher than that of open-access forests (12% for broad-leafed forests), and similar to that of State-managed forests.

This finding is all the more remarkable since the Van Panchayats do not have the same rights as the Forest Department, especially as far as timber sales are concerned. In their comparisons, the authors take important factors into account, such as population density, closeness to the villages and the geographical attributes of the forests; State forests have better attributes and are further from the villages than the other types of forest. The authors then compare these results with forest management costs: in fact, the costs of State management are on average 13 times higher per hectare of forest than those for Van Panchayat management.[17]

In the same region, we also collected detailed information on the different types of forest management regimes in the villages surveyed (*i.e.* 399 forest in 83 villages). We

15 This is the case, even though the observations were made only three years after the formation of the FUGs. It is therefore likely that the long-run effects are greater.

16 According to a recent estimate, sales of wood could represent, on average, two-thirds of overall revenue generated by the FUGs in Nepal (Pokharel, 2008).

17 In 2002-3, management costs per hectare were equal to Rs 862 for a State-managed forest, as opposed to Rs 65 for a Van Panchayat-managed forest (Somanathan, *et al*., 2005).

were thus able to analyse the forest quality measures according to the different management regimes involved. With respect to the measures, we will only refer here to canopy cover, basal area and lopping (for further details, see Baland, *et al*., 2008b).

Table 6 reports results for the various regressions relating the impact of the different management regimes on the three measures of forest quality. These regressions, similar to those of Somanathan, *et al.* (2005), use a large number of control variables (in particular, the forest's aspect, distance from the village or altitude), and also village fixed effects. What we compare are thus the differences observed between forest patches managed by different regimes but adjoining the same village.

Table 6.
The impact of management regime on various measures of forest quality

	Canopy cover (%)	Basal area (m^2/ha)	Lopping (%)
Difference Van Panchayat and State forest	0	0	--
Difference Van Panchayat and Open-access forest	0	0	--
Old Van Panchayat and State forest	++	0	---
New Van Panchayat and State forest	0	--	-

Source: Baland et al. (2008b).

The results prove to be interesting: whereas there are few differences between open-access forests and State forests, the forests managed by Van Panchayats evidence a much lower rate of lopping. The collection of firewood and leaf-litter for fodder is thus less pronounced when the forest is managed by a Van Panchayat.[18]

This more rational use of forests mainly typifies the Van Panchayats created before 1980. They are also characterised by a higher biomass, as measured by canopy cover. On the other hand, the more recently formed Van Panchayats have a smaller basal area (this latter result may indicate that the formation of a Van Panchayat is related to forests that have a poorer quality to begin with).[19] The high performance of the older

18 It should also be noted that we did not observe any effect of increased firewood or fodder collection in neighbouring forests.

19 As in Somanathan, *et al*. (2005), everything seems to indicate that the more degraded forests are more likely to be converted into a Van Panchayat forest.

Van Panchayats can be explained by the fact that being grounded in effective community participation, they are probably better managed, and also because better monitoring of firewood extraction in Van Panchayat forests leads to a superior biomass in the long run.

By providing data that are complementary to that of Somanathan *et al.* (2005), this analysis confirms their results. Moreover, it shows that better forest quality is to a large extent linked to less usage in the short run. In this sense, this confirms the results of Edmonds (2001), according to whom the creation of an FUG reduces household firewood collection. In our study of firewood collection in India (Baland *et al*., 2007), we also observed a decline in firewood collection in villages where a larger percentage of the forests were under Van Panchayat management. We thus estimate that if all village forests were converted into Van Panchayats forests, this would reduce firewood collection by a little less than 20%.

Although setting up a formal community management structure is thus effective in terms of improving forest quality, it also has important effects with respect to redistribution, as it changes the rules for using and sharing forest products. In Nepal, some studies suggest that the local elite often dominate the FUG executive committee and sway its decisions to their own benefit. More particularly, the substantial funds generated by timber sales are invested chiefly in projects advantageous to this elite.[20] (Banjade *et al*. 2006; Malla *et al*., 2003; Pokharel, 2008; Timsina, 2003). This is reminiscent of the results obtained by Banerjee *et al*. (2001) in the sugar cooperatives of Maharashtra, in which the richest members secure rents for themselves by manipulating producer prices and using the cooperative's profits.

In the same vein, in a study of some twenty Gujarat villages, Agarwal (2007) shows how the creation of a forest management council (similar to the Van Panchayats) has excluded women — who are traditionally users of the forest — from participatory and decision-making structures and deprived them of their access rights to the forest. The women express their feeling of expropriation and exclusion as follows: *"If you were to attend meetings, the men will say, oh you haven't cooked my meal on time. What*

20 Pokharel (2008) estimates that around three-quarters of available funds are allocated to projects that benefit wealthier households.

happened to my tea?...(…) The meetings are considered for men only. (…) No one ever listened to my suggestions. (…) People don't like it when we speak, they think women are becoming very smart." (quoted by Agarwal, 2007, pp. 288-9). Agarwal concludes that women bear a large share of the costs linked to community forest management, whereas they only benefit very indirectly from the related advantages. *"How will we cook if we don't get wood from the forest? What do they expect us to do?"* (quoted by Agarwal, 2007: 291).

4. Conclusion

Without government intervention, the future of Himalayan forests is somewhat bleak. As we have shown, forest degradation in this region is primarily linked to the unregulated extraction of firewood and fodder, which leads to an alarming decline in the quality and resistance of the region's trees. Firewood collection is not highly sensitive to an increase in the time required for collection, which itself is a result of this degradation. On the other hand, pressure on resources is increasing due to population growth: over the last 25 years, the average number of households per village has doubled. In addition, the demand for firewood should also increase with a rise in the standard of living, unless such a rise results in a substantial development of non-agricultural activities.

We have studied the effects of two types of government intervention. The first involves offering a subsidy on gas, which is the main source of alternative energy. We show that for a relatively low cost, this policy can lead to a significant decrease in firewood consumption, especially during the summer months. The second involves developing community-based methods of forest management. The experience of Uttarankhand shows that local community management helps ensure a better quality of forest than that obtained through protected State forests. However, the measures and terms under which these community-management mechanisms are set up have a crucial impact on the extent of their success.

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Comment

by
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I am very grateful to AFD for inviting me to this exciting conference and giving me the opportunity to comment on Professor Jean-Marie Baland's fine research.

I will comment on those findings that interested me most. The first is the positive total elasticity of firewood consumption with respect to income. However, I suspect the authors may be exaggerating the size of this relationship in their figures. Their figures are at the household level (from what I can tell from Baland *et al.* 2008a), and so they conflate several effects. The most important of these effects is likely to be household size. At the very least, the authors should present the figures in per capita terms.

The second point is that it is possible that by using village fixed effects in their regressions, the authors may be over-controlling. Greater wealth can induce better transport infrastructure, thus reducing alternative fuel costs. This sort of effect is very natural over time as an economy grows. Having said this, I should point out that these results are, in fact, consistent with all-India rural data (Gundimeda and Köhlin, 2008). The all-India data estimate the expenditure elasticity of firewood consumption to be about 0.8 to 1, based on National Sample Survey data on rural households in India during 1999. Since the all-India data allow for between-village (and even inter-State) variation, the possible over-controlling mentioned above does not arise.

One of the interesting points to emerge in the Baland paper is that the relationship of firewood demand to income depends on the source of the change in income. This is an important contribution of this research. Different assets induce different opportunity costs for collecting firewood, and thus have different effects on firewood demand. This is what Baland calls the substitution effect. Table 3 suggests that income growth based on land and livestock leads to an increase in firewood consumption. These results are based on the data from Nepal for both survey years, 1995-96 and 2002-03. However, higher income based on education and non-farm business assets is associated with an increase in firewood collection when estimated from data for the first survey year, but a decrease in collection when estimated from data for the second survey year.

This suggests two possibilities to me. First, it is possible that the estimates are unstable simply due to some endogeneity or specification problem, rendering them unreliable. The more interesting possibility is the one favoured by the authors. There may have been an increase in the availability of substitutes like gas by the time of the latter survey, and this may have been what led to the negative effect on fuelwood consumption for non-agricultural assets.

It is unlikely we will see much by way of an increase in incomes coming from land and livestock in the Himalayas, given the fact that the extension of cultivation has come to a halt, and there are very limited possibilities for increasing livestock holdings given constraints on fodder supplies. On the other hand, we can expect a rapid improvement in education levels. These factors are likely, therefore, to slow the increase in fuelwood demand that higher population will bring. This is good news.

However, as the research strongly suggests, fuelwood collection is a major cause of forest degradation, so additional policy measures to reduce it are desirable since degradation has adverse consequences. At the global level, one of the adverse consequences is a loss of sequestered carbon.

But what about the local level? Here the loss from degradation measured by Jean-Marie and his collaborators is in terms of increased collection time for firewood. By estimating a production function for income, they got an estimate of the shadow value of labour hours. They used this to arrive at a monetary estimate of the loss to households

from an increase in collection time. They found (in Nepal) that a one-hour or 20% increase in collection time at a wage of 6.37 rupees per hour, resulted in a 1.6% drop in consumption for the median household with this being more like 2% for the poorest households (those in the tenth decile of consumption). While not wholly insignificant, this is not a large impact. I suspect, though, that this method of valuing the impact will underestimate the impact because firewood collection is probably one of the more strenuous activities engaged in by households. (One might ask, if the value of time in firewood collection is higher than estimated, why then is there such a low elasticity of firewood collection with respect to collection time per head-load? The answer may be, as the authors acknowledge, that the elasticity is underestimated because head-loads get smaller when collection times are greater.) Even so, if the value of time in firewood collection is double that of the average activity, it would still be a loss of only 4% of consumption for a 20% increase in collection time.

However, I am not convinced that this is the only impact at the local level. One finding that does not quite gel with this is that decentralised forest management is associated with 20% less degradation due to lopping and to lower firewood collection. In other words, once residents are empowered to act collectively at the local level, they seem to reduce firewood collection. Now this would not be remarkable if the reduced firewood collection were a temporary phenomenon, lasting a few years until the forest recovered enough for people to sustainably harvest firewood at a higher level. This is what I thought when I first read Eric Edmonds' (2002) study describing the 14% fall in firewood collection within three years of devolution of forest management to local communties. But Jean-Marie and his collaborators, using the data from Uttarakhand in India, where there are Van Panchayats, find that this is not the case. The negative effect of local management on firewood collection is greater, the longer local management has been in place. This, to me, is one of the more surprising findings of the research.

Now one has to ask the question: why villagers would reduce firewood collection, if the local externality from it is as low as the authors seem to suggest? I think the answer is that there are other perceived benefits from reducing degradation and this is what motivates villagers to reduce firewood collection by self-regulation. One of the benefits that I frequently heard about from villagers during the course of my own fieldwork in the region was the relationship that they perceived between the forest being in good condition and the water supply in springs. Since water supply is a critical issue, this could

be a strong enough motivator for them to reduce firewood collection. Other factors like increased leaf litter for manure may also be part of it.

The global benefit from increased carbon sequestration and the local benefits from reduced collection time and improved water supplies are both reasons to try to reduce firewood collection. However, I believe there are even more compelling reasons. One of them is the health costs of indoor air pollution from using firewood for cooking and heating. These health costs are mentioned by the authors, and in the last decade or so, they have become known in policy circles. They are dire. It is estimated that about half a million female and child lives are lost in India every year owing to indoor air pollution from the use of solid fuels for cooking (Smith, 2000).

Even in well-informed policy circles, however, there is much less awareness of another very great danger arising from the use of solid fuels for cooking. This is the regional climatic effect of these fuels. South Asia in the off-monsoon season from November to May has a huge aerosol haze hanging over it. It has been estimated that about 40% of the black carbon in the haze originates from cooking fires (Venkataraman, Habib, *et al.,* 2005).

This haze has at least two possible adverse consequences that are very serious. The first is a reduction in summer monsoon rainfall. While the science behind this is not settled, there is considerable evidence to suggest that the haze is implicated in droughts over the last four decades (Ramanathan, Chung, *et al.,* 2005). If this is in fact the case, then the haze has resulted in an annual fall in rice harvests of more than 10% over the last two decades or so (Auffhammer, Ramanathan, *et al.,* 2006).

The second likely adverse consequence of the haze is an acceleration of the melting of the Himalayan snowpack and glaciers that feed off-monsoon flows into the rivers of Pakistan, northern India and Bangladesh. A disappearance of the glaciers could have catastrophic effects on crop output in this part of the world. The haze could contribute to glacier melting (greenhouse warming is the other major culprit) by deposition of soot in the snow and ice, thus reducing their reflection of solar radiation. Although not studied in the Himalayas, this effect has been found to be significant in Greenland (Hansen and Nazarenko, 2004) despite much lower levels of particulate pollution in that part of the world. The haze also contributes to heating the upper

atmosphere (Ramanathan, Ramana, *et al.,* 2007) and may thus directly heat the snowpack. Recent measurements in Nepal show episodes of fine particulate matter reaching a monitoring station at an altitude of over 5000 meters (Venzac, Sellegri, *et al.,* 2008).

What might the appropriate policy be to deal with this problem? Jean-Marie Batard's research suggests a strong enough response to a hundred or two-hundred-rupee subsidy on the price of a cylinder of gas to have a large impact on fuelwood demand. While this is useful information, it should not be taken to mean that this is necessarily the best policy option. It is cheaper by far to transport electricity over a transmission line than it is to transport gas by truck and pack animal. In a context of low population density, gas pipelines will be uneconomical. At Rs 4/KWh, the price charged to urban consumers in Delhi, and assuming consumption of 90 KWh/month (Gupta and Ravindranath, 1997), the monthly cost of electricity supply will be about Rs 360. This could be much lower than that of unsubsidised gas, which in May this year, cost about Rs 600 for a 14.2 kg cylinder that is about one month's consumption (Katakey, 2008). So electricity is probably a superior option, especially because electrification has other benefits that the provision of gas does not (ESMAP, 2004).

The problem, of course, is that electricity supply in India is controlled by politicised and inefficient State Electricity Boards. As a result, cooking on electricity is not a realistic option for most households because of the unreliability of the supply. Nevertheless, there are instances of reform in some states, such as Rajasthan and Maharashtra. In the last two or three years, there have been experiments in which the State Electricity Boards have metered domestic connections and charged higher rates in return for an assurance of 24-hour supply. Anecdotal evidence and a reduction in losses suggest that these have worked well in Rajasthan, and on quite a large scale.

Himachal Pradesh and Uttarakhand are both well-endowed with fast-flowing rivers from which run-of-the-river projects could generate considerable power locally. So this is a policy option that should be analysed seriously. The fact that electricity generation is not currently considered a power-supply option should not cause it to be ignored.

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Comment

by
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Introduction

Jean-Marie Baland's article is highly topical. He talks about a region in the foothills of the Himalayas where the number of households has doubled in the past twenty-five years, which is twice the rate of the rest of the world. The subject he has chosen for his analysis of the linkage between demography and environment is forest degradation, an issue that has been taken up by the recent international initiative REDD (Reducing Emissions from Deforestation and Forest Degradation). This initiative is supported by the results of the Millennium Ecosystems Assessment (MEA) as well as by the search for possible ways of reducing greenhouse gas emissions with the framework of the fight against climate change.

Part 1

The area studied is situated between 1,800 m and 3,000 m in Uttarankhand province in the foothills of the Indian Himalayas and in Nepal. The first part of the paper describes forest degradation in the region and its causes. Forest cover in Nepal was halved between 1947 and 1980 dropping to 23% of national territory. Yet the situation has changed, as there is currently little or no disappearance of forest but rather

the degradation of trees primarily due to lopping for firewood and animal fodder. In two districts of Uttarankhand, 61% of the forests are severely degraded and, in Nepal, the survey carried out by J-M. Baland shows the same percentage of lopping. Trees are still standing but their poor state **-** branches torn off and sparse foliage **-** is endangering the region's forests. As a result, the average time spent on firewood collection has risen by 30% in the past 25 years. Forest degradation is to some extent the poor relation in the global debate on forests, which for the most part tends to focus on deforestation. Yet the methods used to monitor the degradation of the Nepalese forest will certainly be of interest to forest experts in the Congo Basin even though the context is very different.

The observations carried out on the Himalayan forests exemplify the degradation taking place in developing countries. The 2008 Living Planet report, published in October 2008 by WWF, characterises this phenomenon with respect to forests and, more broadly, to the planet's ecological footprint, which is estimated to be 30% above what the planet can sustain. Similarly, the Stern report indicated that the destruction of forests accounted for 20% of the world's greenhouse gas emissions, which is higher than the overall emissions of the transport sector. In the Uttarankhand region studied, firewood is the main source of energy for cooking and heating, with gas being used as an alternative energy source by only 9% of households for cooking during the summer. In Nepal, firewood use represents 75% of the energy that households consume for cooking and heating. Consequently, although this article talks about forests, it is in fact first and foremost about the issue of access to energy.

Part 2

The second part analyses the relations between income, forest degradation, and the use of an alternative source of energy. On the basis of field surveys, J-M. Baland shows that increased firewood collection time, which is also a good indicator of forest degradation and includes the impact of a growing population, has little impact on the amount of wood consumed. He reports that the opportunity cost of a 26% increase in collection time remains marginal for households (1% to 2% of their income), which suggests that if forest degradation continues, this will not result in a decrease in consumption.

The author then shows that there is a strong relation in both regions between household income and firewood consumption: a 10% rise in income being linked to a 4% increase in firewood consumption. His study examined this linkage in Nepal and shows that this is true for farming and livestock-owner households (elasticity of 0.37), whereas for educated households or those with diversified activities (trades people, for example) the firewood consumption decreases as their income increases (elasticity of -006). This result suggests that in the future, the kind of economic growth and household occupation (whether it is diversified or chiefly agricultural) will have an impact on the degree of pressure that is put on forests.

In Nepal, however, a drop in firewood consumption is observed for the upper band of the wealthiest households, and income-firewood consumption elasticities seem to decrease over the years for these households. J-M. Baland relates this to the high increase in the use of gas for summertime cooking. The author has in fact studied the effect of substituting fossil-fuel energy in India and points out that subsidising gas by 33% would induce a 22% reduction in firewood consumption, even in poor households. Calculated as the equivalent of household consumption expenditures, this subsidy is similar to an opportunity cost of a 26% increase in collection time and is more effective in reducing forest degradation.

I would like to make two remarks on this part and raise a few questions.

The first concerns using gas as a substitute for a renewable energy, firewood, which is sometimes seen as a debatable option, for three reasons:

- Generally, gas is not readily available to the poorest populations. For example, in a project studied by AFD in urban Madagascar, it is primarily high and middle income households that can afford to buy a full gas refill cylinder, which is too expensive for poorer households. My question to J-M. Baland is: what is the distribution of households with access to gas in the two regions that he has studied? Is there a phenomenon of exclusion of the poorest and how can this be remedied?
- Gas is a fossil energy that certainly produces fewer greenhouse gas emissions for an equivalent cooking output, but it is nonetheless non-renewable. Experts say that its price will increase as oil resources become increasingly scarce: the

equilibrium price for oil is likely to rise from 30 USD to around 100 USD per bbl. How will this expected trend impact the solution involving gas cylinders as substitutes? Is it a temporary solution, whilst waiting for other possibilities to emerge?

- Projects to promote improved ovens or biodigestors seem to be having considerable impacts, at least of the same magnitude as that obtained by subsidising the price of gas, and have the advantage of developing renewable energy. In China, for example, in regions with warmer climates but which are very poor, or in Cambodia, French NGOs[1] are taking part in large-scale programmes to distribute biodigestors and improved ovens. The former enable a 40 to 90% saving of firewood and the latter 20%. My question to J-M. Baland is: what role do these technological innovations play in the two situations he has studied in India and Nepal? Does a forestry policy in these regions not also involve an energy policy that offers different options in terms of energy efficiency and development of renewable energies for the poor?

My second remark concerns the relationship between per capita income and the environment, with reference to the literature on the environmental Kuznets curve. The article quite rightly underlines the debate surrounding this approach. My question to J-M. Baland is: ultimately, what might the fate of the environmental Kuznets curve be in the light of the two examples of India and Nepal? Are not the solutions suggested for national policy level - diversification of growth, substitution, and decentralised forest management - a means of shortcutting the Kuznets curve by flattening the inverted-U curve so as to avoid reaching the critical zone; which is what some would refer to as designing policies that allow a "policy tunnel" scenario?

Part 3

The third part deals with community-managed forests and raises the following question: is forestry management by local villages more effective than State management? On the basis of a survey of the literature, J-M. Baland shows that the

1 GERES (Groupe Energies Renouvelables, Environnement et Solidarités) in Cambodia, Initiative Développement in the Chinese province of Guizhou, with support from Yann Arthus-Bertrand's voluntary Action Carbone programme.

growing trend for forest management by village organisations goes hand in hand with signs of improved management of these forests:

- in Nepal, the setting up of a community-based forest management structure led to a 10 to 15% reduction in firewood collection, three years after its creation.
- in India, the crown cover of community-managed forest is 12% more than that of State forests, which are thirteen times more costly to manage than community-managed forests.
- J-M. Baland's surveys in Nepal show that firewood and fodder collection in community forests is lower compared to State forests.

These positive findings are, however, tempered by the author, who points out the risk of income from community-managed forests being captured by local elites, or of women being excluded from the forest management councils. Certainly, the lessons to be learnt from the experiences of community-managed forests are mitigated by examples such as that reported in Cameroon, where an independent observer was able to show that a large part of illegal logging activities came from community-managed forests. The examples of Sichuan and Yunnan in China show that highly centralised management and a policy of subsidising replanting and biodigestors have managed to reverse the trend of forest cover destruction. My question to J-M. Baland is: what essential principles need to be recommended for a policy of decentralised forestry management to succeed?

Investing in the global REDD+ initiative

Forest degradation is now on the global agenda and a top item in the negotiations on climate change. The next climate change conference in Poznań will be held in two weeks' time and REDD will be one of the key topics. The evolving scope of this subject shows that it has gradually broadened out to now include all the components of national forestry policy, ranging from deforestation (decline in forest cover with changing land use), forest degradation (with no change in land use), reforestation and forest plantation, conservation of forests (protected areas) and augmenting stocks through the sustainably managed forestry activities. One reason why the scope has widened, and which was not foreseen at the Bali Conference, is the fact that these issues, and

the solutions they require, are complementary. Certainly, the causes of reduced forest cover are extremely diverse and it is often necessary to act on different but complementary aspects: for example, it may be effective to reduce pressure on a forest and in parallel develop nearby plantations to maintain the production of firewood, or reinforce management of a conservation area to avoid deforestation pressures shifting to another zone. This is the approach used for instance in the Mantadia region of Madagascar where financing is mobilised on the voluntary carbon market. My question to J-M. Baland is: in both the Indian and Nepalese examples, what complementary forestry actions (reforestation, protected areas, State-managed forests, training) have been initiated by the two States and what are the results?

Conclusion:

The article concludes with a call for more public intervention in order to curb the degradation of forests and manage them more sustainably. The author has shown that this will not come about spontaneously, at least for the majority of households whose main activity is crop and livestock farming. This reminder of the utility of public policy is very timely: could the return of a stronger State or one that plays a more effective role in regulating national policy - a question raised by the current financial crisis - also be part of the solution to the ecological crisis? Yet will these institutional and technological solutions be able to address the expected population growth and pressure on natural resources?

My concluding remark is intended to highlight the importance of considering natural resources as a capital in its own right that cannot be totally substituted by other components of a country's national wealth. Many examples evidence that natural resources are characterised by irreversible or threshold effects that can result in a sharp decline of natural capital and thus of the goods and services produced, for instance, by ecosystems. This point is in fact suggested by the author at the beginning of the article when he refers to the increasing damage that the deforestation of the Himalaya foothills causes downstream. Just how severe the impact of forest degradation is can be evaluated by analysing the stock of existing forests, or those that still exist, or by studying the minimum stock that needs to be conserved in order to preserve soils and water resources and to avoid an even more dramatic reduction of forest cover.

Substituting for the loss or degradation of forests is possible, but what is important are the limits of this substitution because the closer we come to the point where the situation proves irreversible (e.g. a minimum 25% remaining forest cover compared to initial cover), the stronger the environmental constraint will have to be for those households whose number and firewood needs are growing.

The demand for the reinforced monitoring of the state of natural resource reserves indicates that we are approaching the limits of human pressure on the environment. Some will say that this limit has already been exceeded for certain resources and the WWF'S work on our ecological footprint, for example, has stylised this by announcing that our consumption has already surpassed the planet's biocapacity by 30%.

The example of Haiti, whose forest cover has almost entirely disappeared, and a comparison with neighbouring Santo Domingo, illustrates to what extent the degradation of natural capital can impact the poorest populations: extremely difficult access to energy, soil degradation that is endangering farmers' productivity, growing water insecurity… In developing countries, the amount of natural capital is thus closely linked to human capital, which means that national policy, as well as Official Development Assistance, must give it greater attention.

Sustainable Strategies for Managing the Natural Capital

Confronting the Oil Curse

by

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Introduction

Does a strong natural resource endowment tend to promote growth and development or to retard it? In particular, is oil a blessing or a curse? This old question, which has been debated for many years, is again topical. Following a twenty-year interlude of low commodity prices, the world is now seeing its third post-war resource boom. The first was in the 1950s, the second in the 1970s; this time round, prices began to increase in the early 2000s. By 2008, many commodity prices had reached all-time highs before retreating.

The boom has not been confined to one commodity or to a single group. Crop prices have soared, including for maize, wheat and rice; metals prices have also risen, including for copper and steel. The most noteworthy increases have been for oil. Prices tripled from $20 to $60 per bbl between early 2003 and mid-2005; a second phase gathered steam after early 2007, and saw prices rocket to over $140 per barrel in 2008 before falling back to half their peak later in the year.

Part of the price increases can be attributed to the weakness of the dollar. But in real terms, the changes in terms of trade between commodity producers and consumers

1 We are grateful to Stephen Knack and Alice Kugler for contributions to this paper, and to Luis Serven and Santiago Herrera for advice on the model framework. Shortcomings are the responsibilities of the authors alone. The views expressed in this paper are those of the authors alone and should not be attributed to the World Bank, its Executive Directors or the countries they represent.

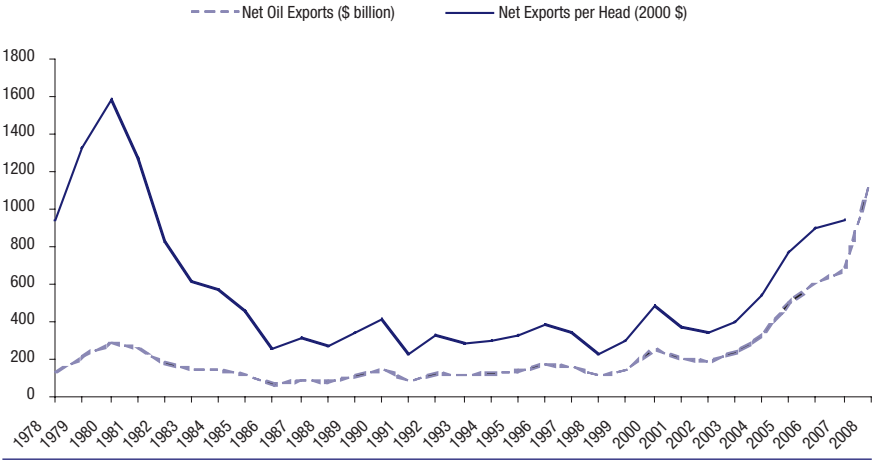
have been impressive, especially for oil (Table 1). For oil alone, resource transfers have been on the order of 2 % of global GDP. OPEC revenues have soared, exploding from little over $100 billion in the early-mid 1990s to an historic high of about $1.2 trillion in

Table 1.
Resource price trends since 1970

	1970	1980	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007
World Bank commodity price index (1990 = 100)												
Agriculture	163	175	100	112	90	84	93	95	98	106	116	131
Metals and minerals	144	120	100	87	85	80	78	82	105	133	198	220
Petroleum	19	204	100	64	127	113	117	126	154	218	258	279
Relative to MUV-Index (1990 = 100)												
Agriculture	*	2.22	1.00	0.96	0.93	0.89	1.00	0.95	0.92	0.99	1.06	1.18
Metals and minerals	*	1.52	1.00	0.74	0.88	0.85	0.84	0.82	0.98	1.24	1.82	1.98
Petroleum	*	2.58	1.00	0.55	1.31	1.20	1.26	1.26	1.44	2.04	2.37	2.51
Memo: MUV G-5 index	*	79	100	117	97	94	93	100	107	107	109	111

* MUV G-5 index for 1970 is being reviewed.
Source: World Development Indicators, World Bank.

Figure 1.
OPEC: net oil exports and constant-dollar exports (per head)



Source: US government.

2008. This figure needs to be seen in the context of inflation and high population growth, however. Expressed in constant-price dollars per capita, net OPEC exports in 2008 may be slightly lower than the peak reached at the height of the previous boom (Figure 1).

After a two-decade hiatus with stagnant investment in resource sectors, many developing countries have also been seeing a surge in resource development, including investments from new Southern players, such as India, China and Brazil. While oil output is stagnating or declining in many mature fields, Angola, Sudan, Brazil and other countries are expanding capacity. Ghana, Uganda and others will soon become producers.[2]

These events have naturally renewed interest in the potential of resource-based development. Will windfalls be used to support long-term growth and poverty reduction, or will the "resource curse" prevail? And are gains permanent or temporary – are we at last in a Club of Rome scarcity scenario, or will substitution, new discoveries, and improvements in yields and recovery rates once again depress commodity prices back towards their long-term trends? The picture is perhaps least clear for hydrocarbons because of the increasing concentration of reserves in a few countries, mostly in OPEC.[3] National oil companies now control 90% of global oil reserves and 75% of production, and the numbers are similar for natural gas.

Traditional development economics emphasizes three important constraints to accelerated growth and improved living standards: domestic savings; exports; and fiscal revenues. A strong resource base can relax all three simultaneously; linkages to resource-based sectors can also spur upstream and downstream industries. There are certainly successes, including Australia, Canada, some of the Scandinavian countries,

2 The scramble has been particularly acute in Africa as exemplified by the 2004 visit of China's Premier Hu Jin-Tao to Gabon, and the recent announcement of a major agreement between the Democratic Republic of the Congo and China to exchange mineral exports for $5 billion in development assistance. Oil is one of the few commodities for which Africa's share in global trade has increased in the last decades. The region has accounted for a quarter of all recent oil discoveries — by 2008, ExxonMobil is expected to produce more oil in Angola than in the US. Even now, Africa supplies over a quarter of China's imports and will soon provide more than a quarter of US crude imports. The resource investment surge is not confined to oil or even to minerals: for example, Mozambique has recently received over 100 applications for large-scale sugar-based ethanol investments in the North, while Tanzania is fielding a similar number for investments in the South.

3 Since 1980, global oil reserves have increased by 81%. OPEC's reserves have more than doubled, while reserves of OECD countries and EU countries have declined, by 27% and 39%, respectively.

as well as a few developing countries, like Botswana. But poor outcomes in many resource-rich countries show that the outcome varies widely.

With so many cross-country studies available on the impact of resources on development, it seems more useful to overview the debate and selectively interpret the empirical results than to provide another one. This is done in Section 1. Cross-country studies confirm the importance of path dependence; that the resource curse is conditional rather than absolute, and they raise some questions on the direction of causality between resource dependence, governance, economic diversification and development progress. But this does not negate the point that resource wealth creates difficult problems for many exporters, and that what should be a blessing often turns out to be a curse, especially for countries starting out with poor initial conditions.

Section 2 focuses on oil, an extreme in the "resource spectrum". Even relative to other commodities, direct linkages are few, prices are volatile, and massive point-source rents provide a prize for rent-seeking activities and corruption. Comparative data indicate that the oil exporters have underperformed relative to other countries, and certainly relative to potential. The section then focuses on two particular factors that shape performance. The first is a "governance deficit" that extends across all dimensions of governance and seems to be similar for oil exporters in different regions. Recognizing that the relationship between governance and growth is a very contentious one, we find that a simple regression using governance ratings made around 1982 can predict most of their growth shortfall thereafter.

The second main factor is extreme macroeconomic instability. While oil reserves represent wealth, they also expose countries to increased uncertainty and instability. Under plausible conditions, losses from the latter can offset gains from the former. Using a very simple stylized model, we consider the choices faced by oil producers uncertain of whether the current boom is temporary or long-lasting. Simulations suggest a high payoff to prudent spending over the first several years of the current boom, even if there is a substantial probability that prices will stay high for an extended period. We also consider the implications of having short-horizon governments with a high rate of time preference, and of failure to recognize macroeconomic adjustment costs and absorption constraints when making spending plans. The last feature, in particular, can severely reduce the "value" of a windfall, or even turn it negative.

Section 3 revisits five debated issues in managing oil-rich countries:

- What factors encourage windows of opportunity to strengthen governance and institutions?
- Can natural-resource funds play a constructive role?
- Can transferring oil wealth to citizens help strengthen domestic accountability and also build human capital to complement resource wealth?
- Can external pressure to strengthen governance be useful?
- Can oil wealth be used to support economic diversification?

There are no formulaic answers to these questions, but country cases suggest the possibilities. Section 4 concludes.

1. Resources and Development: A Brief Overview

The extensive literature on resources and development proposes several dimensions of a "resource curse" or "generalized Dutch Disease" syndrome. Appreciation of the real exchange rate by resource exports may suppress other exporting sectors that offer increasing returns, or more potential for learning by doing, than resource extraction; over the long run, this suppression slows growth.[4] Terms-of-trade volatility may cause risk-averse investors to specialize prematurely in non-traded sectors; this further increases export concentration, volatility and specialization, reducing growth (Hausmann and Rigobón, 2003). A high proportion of natural rent in the economy may also encourage rent-seeking, reducing transparency and deteriorating governance. In modest cases, rent-seeking could simply sustain poor policies that delay the maturation of infant industries (Auty, 2001); in extreme cases, it may combine with other grievances to fan and sustain civil conflict (Collier, 2007).

Three main complications arise in assessing how general the "resource curse" might be. Measures can differ, both for resources and outcomes. Should resources be measured as dependence — the resource-intensity of exports, GDP, or employment in resource-related sectors, or as abundance — levels of reserves or exports per

4 Real exchange rates do appear to be quite responsive to resource exports; for oil exporters, Korhonen and Juurikkala (2007) find a consistent relationship between the real exchange rate and oil prices, with an elasticity of about 0.4.

head? Should the impact be measured on incomes, on GDP growth, or on broader developmental outcomes? Second, country heterogeneity: performance may be conditional, for example, on institutional quality or human capital. In this case, are resources the problem, or is the problem the lack of complementary factors? Third, causality: if natural resource dependence is statistically associated with low human capital investments and bad institutions, which way might the causality run? These three problems are discussed in turn.

1.1 Measurement issues

Part of the controversy concerning the existence (or not) of a resource curse appears to relate to the measurement of resources. Many studies using dependence measures, such as resource shares in exports or GDP, have found a negative resource-growth relationship. Sachs and Warner (1997), for example, found that developing countries with a high ratio of natural-resource exports to GDP in 1970 tended to grow more slowly than other developing countries during the subsequent 20-year period.

Using cross-section and panel regressions, Gylfason, Herbertsson and Zoega (1999) also find an inverse relationship between the size of the natural resource sector and economic growth. Gylfason (2001) finds significant negative correlations between the share of the primary sector in the labor force (between 1965 and 1990) and several variables, including: GNP per capita growth between 1965 and 1998; secondary school enrolment; and Transparency International's corruption-perceptions index for the year 2000.

On the other hand, studies that have used abundance measures, such as net resource exports per head, have found positive associations between natural resources and growth. Lederman and Maloney (2007) suggest that Sachs and Warner's finding is not robust to when resources are measured in terms of abundance. Using net exports of natural resource-intensive commodities per worker, they fail to find a negative impact of resource abundance on growth.[5]

5 While stressing the abundance measure, Lederman and Maloney (2008) also note that between 1980 and 2005, GDP per capita grew far more slowly in net natural resource exporters (0.6%) than in net natural resource importers (2.2%), suggesting a negative effect of natural resource dependence on growth.

Indeed, "wealth of nations" approaches that distinguish natural capital, produced capital and other capital (the last estimated as a residual) find that all types of capital, including natural capital (cropland, forests and sub-soil mineral assets), are larger, relative to population, for countries with higher PPP income per head (Table 2). Natural capital increases from $3,588 in low-income countries to $20,227 in high-income countries. These data hardly suggest that low-income countries are locked into their status by an excess of natural capital. However, other categories of capital increase far more rapidly across the income progression, suggesting complementarities and indicating the tendency for countries to diversify away from reliance on natural capital as they grow richer.

Table 2.
Capital per head: intangible, produced and natural

	Capital per head (2005 US dollars)			
	Total	Intangible	Produced	Natural
Low-income	9,007	3,849	1,571	3,588
Lower-middle income	22,082	9,444	5,885	6,754
Upper-middle income	87,64	54,097	15,802	17,741
High-income	563,907	446,637	97,043	20,227
Major oil producers	45,413	3,363	11,217	30,833
World (non oil)	119,834	91,488	21,223	7,123
World	113,325	83,78	20,348	9,197

Source: World Bank estimates (2008).

Considering growth-based studies, Maloney (2001) criticizes cross-section analyses, such as those by Sachs and Werner (1997), on the ground that "growth processes take place across the very long run and probably cannot be convincingly summarized by cross section regressions of one highly turbulent 20-year period at the end of the 20th century". Using Sachs and Warner's dataset and measure of natural resource abundance (natural resources as a share of GDP), Manzano and Rigobón (2007) investigate whether cross-section results are robust to a panel regression approach, which allows the possibility of controlling for such country characteristics as large debt overhangs. They find that these, rather than natural resource abundance, are at the source of low-growth performance, and suggest that the resource curse is primarily related to imperfect credit markets.

Similarly, Lederman and Maloney (2007) suggest that Sachs and Vial's (2001) finding that the share of natural resource exports in total exports has a negative impact on growth arises because they do not control for export diversification. The latter is suggested to be the main structural feature of international trade associated with economic development. When diversification is controlled for (by including the Herfindahl Index of Export Concentration in Sachs and Vial's regression), the negative effect of natural-resource abundance on growth disappears.

Finally, it has often been suggested that natural-resource exporters are "rich countries with poor people" (Stiglitz, 2007), with wealth concentrated in the hands of a small elite. It may therefore be better to use developmental outcomes and poverty reduction as measures of success, rather than growth-based measures. And, as Gylfason (2001) notes, there may also be trade-offs between short-term and long-term outcomes. In the short run, natural resources can provide nations with substantial wealth; however, in the long term, they may slow development and lower incomes below those of resource-poor countries. Whether the overall effect is positive or negative would depend on, among other things, the rate of time preference.

1.2 Country heterogeneity

What explains why resources seem to be a blessing in some countries but a curse in others? Two main factors emerge from the literature: (1) human capital; and (2) "governance capital", or the quality of governance and institutions available to complement natural resources.

Bravo-Ortega and de Gregorio (2007) argue that it is not resource abundance *per se* that determines a country's growth opportunities but the human-capital stock present in a resource-abundant country. The larger a resource-abundant country's human-capital stock, the more positive is the marginal effect of natural-resource abundance on growth. Lederman and Maloney (2007) echo this message, noting that rich countries that have successfully used their natural resources to further developmental outcomes, such as Australia and Norway, have done so on the basis of an expansion in their levels of human capital. This suggests strong complementarities between natural resources and human capital, and potentially diverging outcomes across natural-resource exporters.

Similarly, a substantial body of literature suggests that differences in the quality of institutions between successful and less-successful resource rich countries are at the root of their diverging growth paths. Mehlum *et al.* (2006) find, for example, that the quality of institutions is critical in determining whether countries avoid the resource curse or not: natural resources are found to have a negative impact on growth performance only among countries with inferior institutions.

What kinds of institutions are important? Collier (2007) suggests that the issue is not simply whether countries are democratic. Without effective checks and balances on power, competition for natural-resource rents can make democracies malfunction. Unlike normal taxation, they do not invite public scrutiny and political accountability, and therefore encourage the emergence of patronage politics. Eifert, Gelb and Tallroth (2003) distinguish "factional" democracies from "mature" democracies, and argue that highly personalized politics and rent-seeking in the former result in short-horizon, patronage-driven electoral competition and the non-transparent allocation of rents.

Human capital and governance capital would of course be expected to impact on performance, including through affecting the potential for export diversification. While it is sometimes argued that Africa's continued concentration on natural-resource exports partly explains the large shortfall in economic performance relative to Asia, and that active support should be given to enable diversification towards manufacturing, studies also suggest that Africa's low ratio of human capital to natural resources is a major determinant of export structure (Wood and Mayer, 1998).

Even if African countries improve their levels of education substantially, other countries will do the same, and it will take a long time until Africa's comparative advantage changes. Moreover, to the extent that the argument is based on the proposition that real resource prices decline over time, Cuddington, Ludema and Jayasuriya (2007) find no evidence of a downward trend in natural resource prices, contrary to Prebisch (1950). While there is evidence for a downward price shift in 1921, commodity prices are found to follow a random walk. Although export diversification may be good for growth, African countries may not need to shift their exports towards manufacturing in order to escape a "resource course".[6]

6 Auty (2001) offers seven reasons explaining why natural-resource abundance will negatively impact economic development in the presence of an intellectual climate that favors forced industrialization policies.

1.3 Causality

Let us finally consider the causality between resource dependence and the two complementary factors discussed above: human capital and governance capital. Which way might the relationships run? Does low human capital lead to specialization in natural resource exports, or does specialization in natural resources lead to reduced investments in human capital? Causality can run both ways, and if low initial levels of human capital discourage the effective use of resource rents, country paths could diverge ever-further. However, this is not inevitable; Stijns (2006) finds that, on average, per capita rents from natural resources are positively related with human-capital accumulation.

Similarly, two-way causality between resources and political institutions may also cause countries with modest initial differences to diverge further. Botswana (discussed below) had developed good institutions before developing minerals and has used mineral wealth to further strengthen capacity. On the other hand, highly corrupt countries with weak institutions and poor infrastructure may have little alternative to specializing in enclave natural-resource exports, and they experience further institutional deterioration.

1.4 A bottom line?

Whether studies find a generalized "natural-resource curse" depends, to some extent, on the measures they use, and how they account for factors such as human capital and "institutional capital", which appear to be an important complement to natural capital in determining development outcomes. The influence of these factors can be felt through a number of channels, including whether the country can diversify away from resource-based sectors. Initial conditions are important, and causality can run both ways: just as resource wealth may lead to weaker governance, some countries are probably specialized in resources because of low levels of human capital and poor governance.

Resource rents themselves may therefore not be the problem: the question is whether a country has the complementary human and institutional capital to manage them. But this qualification makes the resource curse no less real for many countries.

2. The Case of Oil-Exporting Countries

Oil exporters constitute a particularly important segment of developing countries. Almost 30 developing countries are now heavily dependent on oil exports. In Sub-Saharan Africa, oil exporters account for about a third of total population and land area.

2.1 How well have oil exporters performed?

Hydrocarbons might be expected to create an extreme case of "resource curse syndrome". Many exporters are highly specialized; fuels constitute over three-quarters of exports in 16 of the 28 exporters listed in Table 3. Linkages are small. Production is often an enclave, and although costs can be as low as a few dollars per bbl, high-cost extraction usually involves levels of technical sophistication far above the capabilities of poor countries. Offshore production can spur the growth of an associated industry in countries like Norway or Brazil, but few developing countries will be able to take full advantage of linkage potential.[7] Oil exporters also look quite distinctive on measures of national wealth. The estimates in Table 2 indicate that, relative to other countries, they have not complemented their hydrocarbon reserves with other forms of capital.

Even by the standards of commodity prices, real oil prices are exceptionally volatile. Considering real oil prices back to the 1860s (Figure 2), there has been little long-run trend, but the coefficient of variation is 0.7. Prices have also been very difficult to forecast; since the start of the 1970s, none of the major turning points in the market has been widely predicted. Since the start of the current oil boom, futures prices have been flat, extending the current price out to as long as 10 years. While real prices cannot strictly conform to such a random-walk process because of some lower and upper boundaries, estimated prediction models do little (if no) better than a random walk. In a careful study of the statistical properties of oil price series, Hamilton (2008) finds that the random walk hypothesis cannot be rejected.

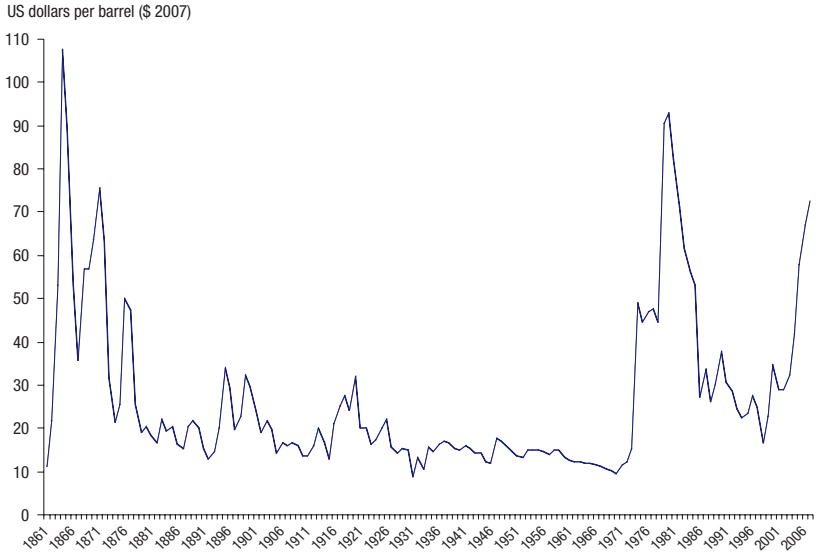
7 There will, of course, still be some direct linkages in any producing country. One common linkage involves the real estate market, where demand emanating in part from the oil industry can drive up rents and prices for certain segments to extreme levels, as is now the case in Angola. Hard-mineral extraction usually has a richer set of linkages, including, in many countries, the employment impact of artisanal mining.

Table 3.
Fuels as a percentage of exports

Country	Fuels (as % of total exports) 1995	2006
Algeria	95%	98%
Azerbaijan	66	85
Bolivia	15	52
Cameroon	29	62
Colombia	28	40
Congo, Dem. Rep.	..	35*
Congo, Rep	88	..
Ecuador	36	59
Egypt, Arab Rep.	37	56
Equatorial Guinea	..	95*
Gabon	83	86
Indonesia	25	27
Iran, Islamic Rep.	86	83
Kazakhstan	25	69
Kuwait	95	..
Libya	95	..
Nigeria	96	..
Norway	46	68
Oman	79	95
Papua New Guinea	38	..
Russian Federation	43	63
Saudi Arabia	88	91
Sudan	0	87
Syrian Arab Republic	63	40
Trinidad and Tobago	48	76
Turkmenistan	77	..
Venezuela, RB	77	93
Yemen, Rep	95	94
Regional Aggregates		
Europe and Central Asia	22%	32%
Middle East and N. Africa	73	76
Sub-Saharan Africa	37	..

*Estimates.
Source: World Development Indicators, World Bank.

Figure 2.
Long-term oil prices (1981-2007)



Source: BP Statistical Review.

The range of uncertainty reflected in the spread of futures prices is enormous. For an exporter like Nigeria, with oil valued at $100 per bbl and futures prices ranging from $50 to over $150 per bbl, the difference between prices at the high-end and the low-end of the spectrum would be equivalent to a difference of 50% of GDP. Starting from a price of $115 per bbl, Hamilton (2008) concludes that four years into the future we should not be all that surprised to find the price of oil as low as $34, or as high as $391, per bbl.

Table 4 shows the growth of oil-exporting countries for which consistent data are available over the period 1965-2007, breaking out the period into booms and busts which coincide with spells of high and low oil prices. Over the 32-year period, the oil exporters grew more slowly than either middle-income countries or low-income countries, even though the definition of the latter group involves a degree of self-selection bias towards slow growth. Norway, a high-income exporter, escaped this fate; among the countries selected, Indonesia also did better than average.[8]

8 Elbadawi and Kaltani (2007) find that during the period 1971-2005, GDP per head in oil-exporting countries grew at about half the rate as in non-oil-exporters.

Table 4.
Growth in GDP and absorption per head Oil-exporters and other countries

Time period	1965-72	72-81	81-90	90-02	2-juil	1972-07
	Growth rates GDP/head (annual average, percent)					
Selected oil exporters*	4.1%	2.6%	-1.5%	0.7%	3.9%	1.4%
MICs (middle-income countries)	3.5	3.0	1.7	2.6	6.1	2.8
LICs (low-income countries)	1.9	0.5	0.7	1.0	4.0	1.6
Memo: Norway	3.2	4.0	2.6	3.1	2.1	2.9
	Growth rates, real absorption/head (annual average, percent)					
Selected oil exporters**	5.2%	5.4%	-3.4%	0.6%	5.8%	1.6%
MICs	2.8	4.0	0.9	2.5	5.9	2.8
LICs	--	0.5***	0.9	2.5	6.9	2.0
Memo: Norway	4.5	4.4	1.4	3.0	4.4	3.0

*Algeria, Cameroon, Ecuador, Gabon, Indonesia, Iran, Nigeria, Saudi Arabia, Syria, Trinidad and Tobago, Venezuela.
**Algeria,Cameroon, Gabon, Indonesia, Iran, Syria,Trinidad and Tobago,Venezuela.
***Set equal to GDP growth of 0.53%.
Source: World Development Indicators, World Bank.

Table 4 also confirms the tendency for oil exporters to alternate periods of shorter booms (high, but not spectacular, growth rates in GDP) with prolonged slumps, marked by stagnant, or declining, GDP per head. This supply-side pattern mirrors the even larger swings in the rhythm of real absorption, usually led by swings in public spending. For exporters with consistent data, the average annual growth of real absorption per head swung from 5.4% in 1972-81, to -3.4% in 1981-90. For many countries, real absorption per head halved over this decade. Real absorption per head was static over the subsequent decade and then boomed again at 5.8%, as prices soared after 2002. Overall, as with GDP/head, absorption per head grew more slowly for the oil exporters than for other countries.

Development indicators, in areas such as education and health, tend to be lower for oil exporters than for other countries (Ross 2003; Gylfason 2004), providing further support to the proposition that poor-growth performance is partly due to lack of investment in complementary forms of capital. To assess the magnitude of such

differences, Table 5 summarizes regressions for infant mortality (in deaths per thousand), expressing this as a function of 2005 GDP per head in Purchasing Power Parity dollars, for an oil exporter dummy and regional dummies. Mortality is about 20 per thousand higher for oil exporters than for non-exporters at comparable levels of income. This is a very large difference; the infant mortality rate of a typical oil exporter corresponds to that of a non-oil-exporting country with only about 40% of the GDP/head in PPP terms. Including regional dummies shows up a large and significant coefficient for Sub-Saharan Africa, but only slightly softens the oil effect, even though many exporters are in that region.

Table 5.
Growth in GDP and absorption per head Oil-exporters and other countries

	Dependent variable: Infant mortality	
	Full country sample	**Developing countries only**
Log of GDP	-22.17***	-16.02***
	(1.351)	(2.156)
Oil dummy	19.11***	17.23***
	(4.601)	(4.819)
Africa		42.47***
		(5.742)
East Asia and Pacific		0.132
		(6.356)
South Asia		13.81
		(8.944)
Europe and Central Asia		1.056
		(5.488)
Middle East and North Africa		2.657
		(7.229)
Constant	224.9***	159.0***
	(11.61)	(18.79)
Observations	180	143
R-squared	0.606	0.717

***Significant at 0.01 level; **significant at 0.05 level; *significant at 0.1 level.
Standard errors in parentheses; GDP refers to 2005 PPP GDP per capita.
Source: World Development Indicators, World Bank.

This does not, of course, provide a picture of a counterfactual. Some oil-exporting countries with a very limited basis of other resources, including several in the Middle East and North Africa, are surely many times better off in material and social dimensions with oil than they would have been in the absence of oil. However, it further confirms the observation that many oil-exporting countries have done poorly on development indicators — certainly less well than might have been expected given their resource endowments.

2.2 Is the growth of oil-exporting countries reduced by a "governance deficit?"

Many commentaries, in particular Karl (1997, 2003, 2007, 2007a) have drawn attention to the low quality of governance in oil-exporting countries and the implications for development. Such an outcome might not be surprising, because of the magnitude of the common-property problem posed by "point-source" rents. Expressed well by George Soros in Humphreys *et al.* (2007), poor governance can be seen as a two-level principal-agent problem: (1) between the ultimate principal (the citizen-owners of the resource) and their agent (the host government); and (2) between the host government (acting as principal on behalf of the citizens, to manage and spend oil income on their behalf) and the national and foreign oil-producing companies (the ultimate agent). Whether governments can successfully play this double role depends on whether they have the *capacity and knowledge* to act as effective principals, and also be *accountable* to the citizenry.

Although the question is not directly discussed in this paper, it is useful to ask: Who actually is the 'principal' that the government is serving? What does citizen ownership of national resources really mean? Are reserves owned on a uniform per head basis? Should they mainly be owned by the citizens in resource-rich regions of a country? Do only current citizens own the resources, or are they partly owned by unborn generations of citizens? Is it realistic to expect the ownership concessions given to foreign oil companies to remain unchanged when market conditions change dramatically in an unexpected way?

The answers to these questions should shape critical elements of policy, such as the balance between spending oil revenues and saving them, and the degree to which revenue allocation follows the principle of derivation, providing more to producing

regions. But there is often a lack of consensus on such questions, and often the questions are not posed clearly at all. Lack of clarity on what resource ownership really means can paralyze policy and lead to costly gaming, whether between central and provincial governments (as in the current struggles between central and local governments in Bolivia and Ecuador) or between governments and oil companies (Venezuela, Russia). It can also encourage non-transparent systems of allocating rents that avoid posing the questions too starkly.

Capacity and knowledge. There has been a sea-change in the oil industry since the early 1970s. Growth in the number of oil companies and the breakout into oil service companies have created more sources of expertise and advice than before. Except perhaps for the most technically demanding fields, the sector has therefore become more contestable. This can help reduce information asymmetry; it enables the ministry responsible for oversight of the oil sector to have better access to the information and expertise needed to negotiate and monitor contracts that are fair and that do not lock in conditions when changed circumstances call for fundamental revisions.[9] Though still an issue especially for very new small producers, the capacity problem should have become less serious over time.

Accountability. The more serious problem is the weakness of the mechanisms that constrain governments to be accountable to their citizens. Governments can collude with the oil companies against their citizens to conceal oil income; budget management and spending priorities might not be in the best interests of a broad spectrum of citizens. The larger the natural rents, the greater will be the pressures underlying these principal agent problems. Incentives will be stronger to obscure information, to design more complex contracts and budgetary arrangements to limit transparency, and to steer oil revenues towards special groups. Ross (2001), Sala-i-Martin and Artadi (2002) and World Bank (2003) find that, controlling for incomes and population size, oil rents have strong explanatory power in accounting for weaker governance in the Middle East. They

9 Norway initially offered generous terms on North Sea contracts, but as experience was gained with extraction, the terms of contracts were tightened. Zambia provides a contrasting example; agreements negotiated during a period of low prices resulted in little revenue increase after 2004, despite soaring prices, because of caps on the levels of prices that could be used to escalate taxes. Poorly designed agreements have an additional cost; they hinder efforts at transparency because governments are reluctant to disclose agreements that in hindsight appear overgenerous.

find that there is little difference in the quality of administration between oil- and non-oil countries, but that public accountability in oil-reliant countries is systematically lower than in non-oil countries.

It is often argued that oil revenue in the budget lessens the need to tax, further weakening checks and balances and reducing the pressures for good policies and responsiveness to citizen needs (Collier, 2007). Resource revenue also enables critics to be bought off, further muting demands for accountability.[10] From this perspective, optimal policy would be to distribute all rents to citizens and rely on a normal tax system for public revenues, even if taxation involves deadweight costs.

2.3 Is there evidence for a governance deficit?

To assess how serious an oil-rich country governance deficit might be, we regressed each of the six clusters of one composite set of governance indicators, the 2008 Worldwide Governance Indicators (WGI), on a common set of explanatory variables: the level of PPP income/head in 2005 dollars, and an oil export dummy.

Table 6 summarizes the results, which show a common pattern across the indicators. Higher ratings are associated with higher income and also with non-oil-exporting country status. The magnitudes of the negative oil dummies are comparable across the governance dimensions: about 0.8 – 1.0 units on the scale [-2.5 – 2.5].[11] These coefficients are large; around three times the typical standard error for an individual country estimate following the WGI methodology.[12] A typical oil exporter has a governance score corresponding to that of a far poorer non-exporter, with barely 25% of the level of GDP/head. This ratio is low for all dimensions, and lowest for voice and

10 Schubert (2006) cites the interesting example of Kuwait. Before the discovery of oil, its economy - and the maintenance of the ruling Al Sabagh family - was reliant on taxes from the merchants of the pearl trade. After the discovery of oil, the Sheikh disbanded the previously influential merchant's assembly and eliminated taxes. To consolidate his power, he arranged jobs for the pearl merchants, provided free health care and education – essentially buying the opposition and making compliance more cost-effective than dissent.

11 Langbein and Knack (2008) critique the concept validity of the WGI, and argue that its indicators do not in fact correspond to six distinct dimensions of governance. This is of less concern in the present context, where the WGI indicators are taken as a broad overall composite of views on governance.

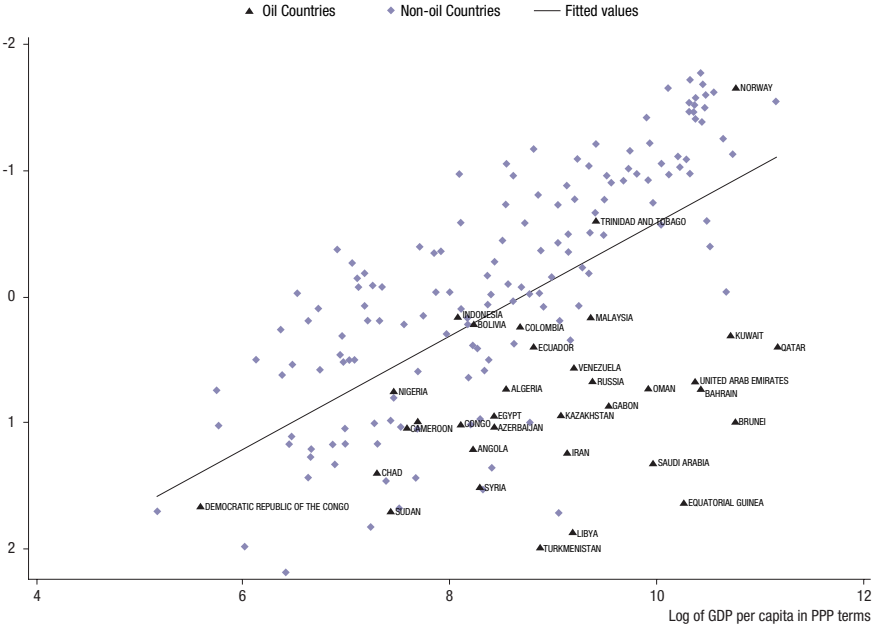
12 Country standard errors as estimated by the WGI methodology are usually in the range of 0.25 – 0.35, depending on the number of sources available for the specific governance indicator and country.

Table 6.
Worldwide Governance Indicators (WGI) Fuel exporters and other countries

	Worldwide Governance Indicators					
	-1 Voice	-2 Stability	-3 Effectiveness	-4 Regulations	-5 Law	-6 Corruption
			All Countries			
Log GDP	0.494***	0.463***	0.615***	0.607***	0.586***	0.594***
	(0.0344)	(0.0383)	(0.0283)	(0.0273)	(0.0307)	(0.0321)
Oil dummy	-1.170***	-0.868***	-0.826***	-0.824***	-0.834***	-0.805***
	(0.119)	(0.132)	(0.0980)	(0.0940)	(0.106)	(0.110)
Constant	-4.074***	-3.868***	-5.141***	-5.068***	-4.927***	-4.982***
	(0.296)	(0.329)	(0.244)	(0.235)	(0.265)	(0.276)
Observations	182	182	182	181	182	181
R-squared	0.601	0.488	0.737	0.747	0.686	0.672
			Developing countries only			
Log GDP	0.457***	0.618***	0.542***	0.552***	0.521***	0.446***
	(0.0609)	(0.0684)	(0.0469)	(0.0526)	(0.0513)	(0.0486)
Oil dummy	-0.914***	-1.031***	-0.725***	-0.745***	-0.829***	-0.738***
	(0.137)	(0.154)	(0.105)	(0.118)	(0.115)	(0.109)
Africa	-0.200	0.483***	0.109	0.0324	0.289**	0.123
	(0.163)	(0.183)	(0.125)	(0.141)	(0.137)	(0.130)
East Asia and	-0.237	0.639***	0.122	-0.118	0.448***	-0.0748
Pacific	(0.180)	(0.203)	(0.139)	(0.156)	(0.152)	(0.144)
South Asia	-0.623**	-0.422	0.0919	-0.0597	0.274	-0.0517
	(0.243)	(0.273)	(0.187)	(0.210)	(0.205)	(0.194)
Europe and	-0.499***	-0.303*	-0.195	-0.232*	-0.196	-0.290**
Central Asia	(0.157)	(0.176)	(0.121)	(0.136)	(0.132)	(0.125)
Middle East and North	-0.851***	-0.0968	-0.0266	-0.205	0.357**	0.138
Africa	(0.205)	(0.230)	(0.158)	(0.177)	(0.173)	(0.164)
Constant	-3.554***	-5.256***	-4.649***	-4.613***	-4.646***	-3.879***
	(0.531)	(0.596)	(0.409)	(0.459)	(0.447)	(0.424)
Observations	143	143	143	143	143	143
R-squared	0.513	0.488	0.599	0.569	0.531	0.493
			Sub-Saharan Africa only			
Log GDP	0.331***	0.532***	0.384***	0.368***	0.374***	0.316***
	(0.0819)	(0.0914)	(0.0643)	(0.0627)	(0.0592)	(0.0548)
Oil dummy	-1.073***	-1.248***	-0.852***	-0.761***	-1.031***	-0.951***
	(0.224)	(0.250)	(0.176)	(0.172)	(0.162)	(0.150)
Constant	-2.805***	-4.101***	-3.368***	-3.248***	-3.253***	-2.771***
	(0.588)	(0.656)	(0.462)	(0.451)	(0.425)	(0.394)
Observations	46	46	46	46	46	46
R-squared	0.412	0.512	0.514	0.494	0.588	0.566

*** Significant at 0.01 level; **significant at 0.05 level; *significant at 0.1 level.
Standard errors in parentheses; GDP refers to 2005 PPP GDP per capita.
Source: Worldwide Governance Indicators, World Bank.

Figure 3.
Voice and accountability results: Fuel exporters and other countries



Source: Worldwide Governance Indicators, International Comparison Project, 2008 round.

accountability; Figure 3 shows the results for this indicator, distinguishing oil exporters from other countries.

These results are reasonably robust when regional dummies are included and not dependent on any particular region. As shown in Table 5, confining the sample within Sub-Saharan Africa, oil exporters also score low on governance indicators. The nine African oil exporters with an average GDP/head of $979 (at market exchange rates) score on average around the lowest decile on governance indicators. In contrast, a set of 11 low-income, non-oil African countries, with an average GDP/head of only $300, that have grown relatively rapidly over the last decade, score around three deciles higher. To cite Karl (2003), the oil exporters are truly “the bottom of the barrel”.

Oil, it could be argued, is not integrated into the rest of the economy in the first place, so that it is unreasonable to benchmark governance estimates to the level of income

per head that includes oil. Some governance discount might therefore have been expected, but its estimated magnitude is far larger than what would be found if governance levels corresponded to the size of the "non-oil" economy. This becomes less surprising when it is recalled that most of the "non-oil" economy in oil exporters is dependent on oil revenues and oil-led spending, so that any true non-oil economic base that might depend on the quality of governance is far smaller.

What might such weak governance mean for growth performance? This question raises a contentious issue: the nature of the causal relationship, if any, between governance (as measured by various indicators) and growth. One approach to the problem of identification, which attempts to reduce the problem of a possible "virtuous feedback loop", running from income levels to governance, is to consider the relationship between governance measured at a point in time and subsequent growth. Table 6 summarizes the results of a simple growth regression covering 108 countries for the period 1982-2006. The explanatory variables are country ICRG ratings made around 1982 and the level of GDP/head in 1982.[13] The sample of 108 countries includes 22 oil exporters.

As expected, growth is negatively associated with GDP/head in 1982, and positively associated with the 1982 ICRG ratings. Dividing the countries into two groups, oil exporters and others, and then averaging, shows that the oil exporters started out with initial incomes a little higher than the non-oil countries, and with initial ICRG ratings a lot lower. They then grew considerably more slowly than the non-oil countries. As shown in Table 7, the growth differential between these two groups is well-predicted by the estimating equation, mainly through the effect of the different ICRG ratings at the start of the period. Conditional on constant ICRG scores, in a long-run equilibrium where oil and non-oil countries grow at the same rate, GDP/head would be about $10,000 lower in the oil-exporting countries.

The individual data provide a picture reasonably consistent with this result. There are few oil exporters with growth rates predicted to be high, relative to the average growth rate of about 1.5% for non-oil-exporters: Malaysia (commonly recognized as

13 We are grateful to Stephen Knack for these results.

Table 7.
Actual and predicted growth rates (1982-2006) Oil exporters and other countries

Countries	GDP'82	ICRG'82	Growth averages Predicted growth 1982-06 (%)	Actual growth 1982-06 (%)
All	7.78	27.7	1.46%	1.41%
Oil	7.87	21.6	0.97	0.72
Non-Oil	7.76	29.3	1.59	1.58
Note: Predicted growth rates for 1982-06 are based on the following regression: (The dependent variable is Growth in GDP/head,1982-2006)				
Constant	-0.285	(-0.83)		
GDP/head 1982	-0.060	(-2.09)		
ICRG 1982	0.080	(4.82)		
R-squared	0.184			

Robust t-statistics are in brackets.
Source: World Development Indicators, calculations by Stephen Knack.

a success among oil exporters) and Norway (commonly taken as the "model" oil country) are two of these.

These conclusions do not, of course, mean that any governance discount can automatically be imputed to the impact of oil. As noted previously, export structure and resource dependence are partly endogenous: some countries with low governance indicators may emerge as specialized oil exporters because other industries cannot survive. Global energy concerns have also been pushing hydrocarbon development towards "frontier" countries with low governance scores, providing an additional impetus for them to become exporters. However, the results do provide support to the proposition that oil exporting tends to be associated with poor governance, and that this may explain part of the disappointing growth performance of these countries.

2.4 Coping with extreme volatility

Compounding the governance problem is the tendency towards extreme boom-bust cycles caused by wide oil-price swings and exacerbated by pro-cyclical access to capital markets. The destructiveness of these cycles is clear in many cases. Mexico borrowed against expectations of increasing real oil prices after 1981 and suffered badly

when these expectations turned out to be far off-track. Hausmann (2001) notes that between 1920 and 1980, Venezuela was one of the fastest-growing Latin American economies, with growth averaging 6.4%. But following several euphoric years after 1974, Venezuela experienced a sharp decline, with output per head halving over the next two decades. Nigeria offers a third example, with "voracious" spending increases outpacing revenue increases up to 1984, followed by sharply lower debt-constrained spending thereafter (Budina and van Wijnbergen, 2008). Simulations with a multi-sector computable general equilibrium model indicate that optimal savings for a capital-importing oil exporter during the 1973-81 boom would have been about 80% of incremental revenues (Gelb and associates, 1988). However, while some countries saved part of their windfall abroad (Indonesia) and some dis-saved (Algeria, Nigeria), on average, the exporters saved little. Simulations also showed that the cost of over-optimistic spending during the boom years could be enormous for an oil exporter, easily turning the value of a windfall into a net loss.

How have oil exporters been responding to the current boom? Recent data compiled by the IMF (IMF, 2007)[14] paint a picture up to the end of 2006, finding that a typical exporter had spent about 60% of the estimated increase in permanent income, valuing reserves at the current price. This indicates a more cautious approach to spending than in the past oil boom. However, they also show wide variation in spending patterns between countries, and suggest that those with poorer governance were spending more aggressively, relative to their wealth windfall, than those with stronger institutions.

Moreover, as in the 1973-81 boom, there may be a lag between incomes and spending. By the end of 2006, capital spending was growing, on average, at an annual rate of 30% and was on a strongly accelerating trend. Applying reasonable ratios between capital and current spending, such an increase in capital spending, if maintained for five years, would lock in recurrent budget obligations of 5% to 10% of GDP. It would therefore be interesting to revisit spending levels in relation to income (especially considering the second price hike after 2007 and the subsequent decline) when more data are available.

14 This summary also draws on more recent information from Rolando Ossowsky (Presentation to PREM Week, World Bank, April 2008).

How much should exporters be saving, considering the great uncertainty over whether high prices are temporary or longer-term? Spending decisions by oil-producing countries are increasingly benchmarked on the permanent income approach, which relates the targeted primary non-oil deficit to the permanent income expected from oil (the sum of returns on savings out of past oil income and the future income expected from reserves still in the ground). These benchmarks, together with associated "stress testing" of spending policies against varying revenue projections, can provide a useful guide to prudent spending decisions. They do not, however, provide guidance on how cautious spending patterns should be in the face of uncertain future revenues.

In determining the right degree of caution, it is important to factor in absorption constraints and macroeconomic adjustment to positive and negative demand shocks. There is considerable support for an asymmetric response, suggesting a supply curve that kinks in response to large booms and busts. For the US economy, Cover (1992) finds that positive money-supply shocks have no effect on output, whereas negative shocks do have an impact. For the Middle East, Kandil (1999) finds a similar result, with demand fluctuations leading to greater average inflation and lower average growth.[15]

Collier and Venables (2008) summarize research on the impact of large terms-of-trade gains and losses on developing countries. They abstract from the income-effect accruing directly from changes in the terms of trade, and they find asymmetric adjustment: favorable shocks do not have significant effects on growth, but adverse shocks reduce output. For a typical African country, a terms-of-trade loss of 10% of GDP reduces growth in the following year by 3.6 percentage points. The implications of asymmetry are clear: under-spending when prices are high can incur a small loss of welfare, but over-spending during a boom can be costly, especially if financed by borrowing.

A full analysis of spending decisions would need to take many country-specific issues into account. These include: the options for spending (including investments, subsidies and direct transfers to the population); the effectiveness of spending, which is likely to fall as levels rise; the costs imposed by sharp reductions in over-extended spending

15 Reflecting macro-level behavior at the micro-level, Kandil (2006) also finds asymmetric responses for 28 two-digit Standard Industrial Classification (SIC) industries in the US.

levels (investment wasted because of shortages of complementary recurrent resources); and the macroeconomic cost of adjustment to sharp declines in demand, as well as the opportunity cost in terms of additional reserve accumulation and investment income foregone.[16] Here, we consider a very simple stylized model that focuses on two effects: efficiency losses when public spending levels are very high, and macroeconomic losses due to sharp cutbacks in the level of spending.

The model involves three periods: period 0 is pre-boom, and sets the historical base for public spending; period 1 is the boom, lasting N1 years; and period 2 is the uncertain post-boom future, lasting N2 years. The country faces an inter-temporal budget constraint: total spending over all years cannot exceed total revenue received. We assume a non-oil economy of 100 in each year and express oil income relative to this level. This therefore abstracts from population and non-oil GDP growth, and there is no second-period payoff for possible first-period investment. However, to partly compensate for this, savings abroad yield no return either.

In a fully-specified model, the utility function would value a (possibly discounted) sum of annual utilities of consumption, but this would require setting out in detail how oil-led spending affects the entire macro-economy. In the simple reduced-form model here, valuation is focused directly on "net" public spending, with utility represented by the log of net spending, to allow for diminishing marginal utility. Spending in each year is weighted by the number of years, to form the aggregate utility in each period.

Net spending allows for two types of efficiency losses. First, beyond a moderate level of spending, the efficiency of spending begins to decline according to a quadratic function. We do not have good estimates of the parameters of such a cost function, which will depend on, among other things, the quality of public management. But at some level of very high spending (here set at 40% of non-oil GDP) the marginal value of spending can reasonably be assumed to approach zero. Second, asymmetric adjustment is assumed, with losses that are due to sharp declines in spending. The estimates provided in Collier and Venables (2008) are used to calibrate the macro-adjustment cost in the reduced-form model.

16 Many of these issues are considered by Engel and Valdés (2000). The model used by Gelb (1988) also incorporates some of these options, including the domestic pricing of energy over the boom-bust cycle.

What does such a model suggest about spending decisions during a boom, when the post-boom outlook is very uncertain? We take N1 as 5 years and N2 as 20 years, and start from a baseline where revenues are steady at 10% of non-oil GDP. Spending is optimized for two revenue profiles: (1) a short boom, with oil revenues at 10%, 30% and 10% of non-oil GDP, for the pre-boom, boom and post-boom periods, respectively; and (2) a long boom, with a revenue profile 10%, 30% and 25%, respectively. Total spending is constrained to equal total income over the period. This implies a downward bias for the estimate of optimal savings, if absorptive capacity is a severe constraint over the period as a whole, or if the horizon of 25 years is too short.

In the case of the short boom, the optimum is to spend 20% of incremental oil revenues (or just under 50% of total oil income) during the boom years and save the rest. For the long boom, it is optimal to spend 80% of incremental oil revenues, or about 85% of total income (Figure 4). The losses due to misjudging the nature of the boom are asymmetric.

Slow initial spending results in only a small loss of the potential value of the long boom; in the opposite case, over-optimistic initial spending results in the loss of most of the potential value of the short boom. If each scenario is expected with a probability of 0.5, the expected welfare-maximizing spending level, at about 22% of incremental boom income, is not much higher than the optimal spending level for the short boom. As in Gelb and associates (1988), the value of a short boom is severely negative at very high levels of spending, and even more so if spending is further boosted by borrowing. For the stylized exporter, after several years of high prices, optimal savings abroad would cumulate to some 80% of GDP.

Table 8.
Payoff matrix for percentage of maximum windfall gain
Based on expected vs. actual oil-boom duration

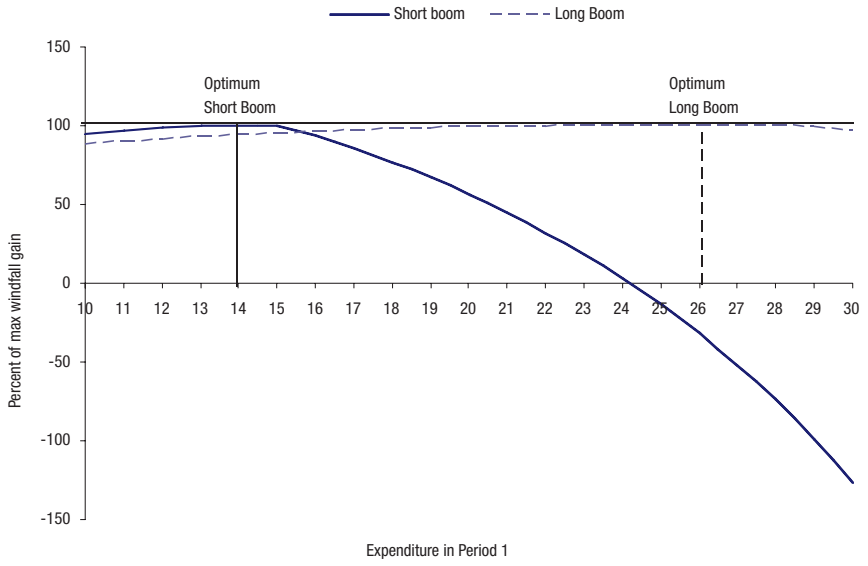
		Reality (actual duration)	
		Short boom	Long boom
Expected duration of oil boom	Short boom	100%	94%
	Long boom	-32%	100%

Source: Model simulations.

Spending decisions are inherently political, however. Governments may have a short horizon, and discount future welfare. Using a discount rate of 10% somewhat increases Period 1 spending, but the heavy weight of the long, post-boom period in total welfare means that moderate levels of discounting are not likely in themselves to lead the economy into a serious problem (Figure 5). Only when the political horizon is very short (discount rates of 30% and above) does Period 1 spending rise towards the level of revenues.

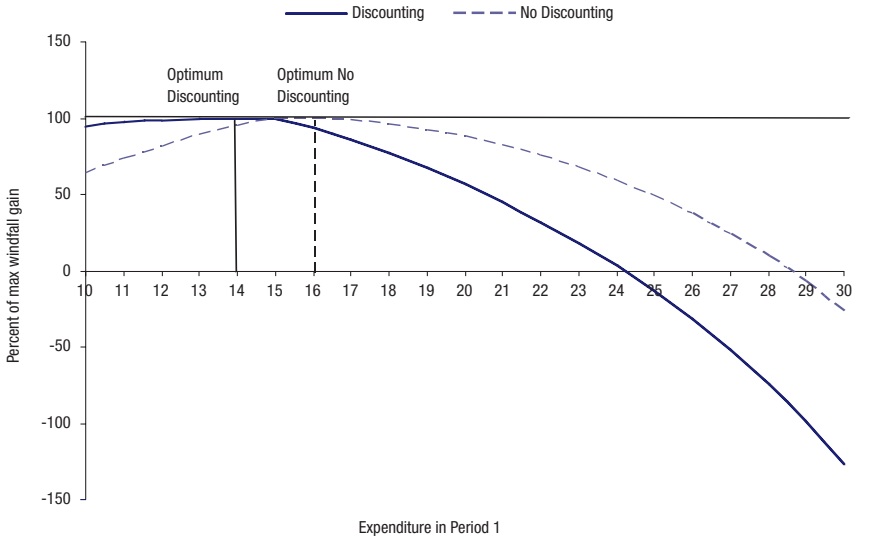
More problematic is the possibility that policymakers might not factor in adjustment costs, and macroeconomic-adjustment costs, when making their spending decisions. When budget discipline is weak, congestion costs will be seen as external to any individual decision-maker. Corrupt officials may also be more interested in spending for its potential to generate lucrative contracts than its effectiveness. They may not believe that macro-adjustment costs will bind if spending declines sharply, perhaps because (against the evidence) they expect high investments in the boom period to pull the economy through any post-boom demand slump.

Figure 4.
Percentage of maximum windfall gain: Short oil boom vs. long oil boom



Source: Model simulations.

Figure 5.
Percentage of maximum windfall gain
Based on 10% discounting of social welfare vs. no discounting

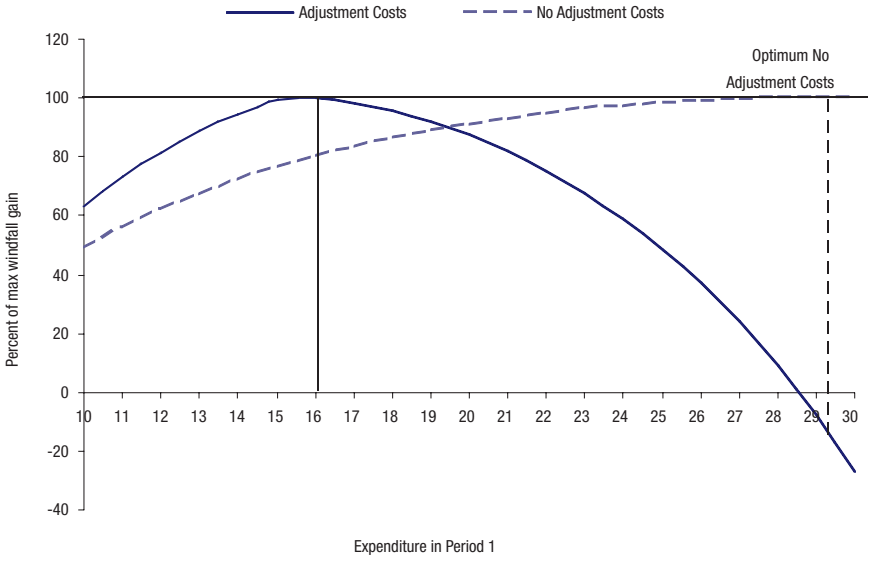


Source: Model simulations.

The combination of such factors with political discounting, or overly optimistic projections of oil incomes, is disastrous: in Period 1, the government spends heavily, resulting in a catastrophic contraction during Period 2 that turns the potential windfall into a sizeable loss (Figure 6). Disseminating the experience of other countries, and strengthening constituencies and institutional arrangements to sustain cautious spending, is therefore key to realizing the potential value of oil windfalls.

Only a few countries, notably Mexico, have tried to hedge oil-price risk through futures contracts, forward markets, commodity swaps and bonds or other instruments. Several factors constrain this option, in particular the asymmetric nature of the political payoff. Profits realized have little visibility and political benefit, but losses open up officials to charges of misusing public money, allegations of corruption and investigations by special committees (Daniel 2003). Addressing this problem requires educating lawmakers on hedging, including presenting strategies as an integral part of the budget process.

Figure 6.
Percentage of maximum windfall gain
Given political discounting and ignoring of adjustment costs



Source: Model simulations.

3. How Can Natural Resources Be Used More Effectively?

This section considers a number of questions that many policy advisors have asked and that (most) resource rich governments should ask themselves sooner, rather than later. What is the starting-point for good policies? Can this only come from a legacy of strong institutions, or is it possible for countries to break free of the path of dependence associated with poor initial institutions? Will oil funds support the strengthening of checks and balances? Can the transfer of rents to citizens both improve accountability and help to build human capital that complements natural-resource wealth? Can external pressure encourage reform? And, can resources be used to support economic diversification? In all of these areas, there are no formulae for success, but specific country cases suggest approaches.

3.1 Windows of opportunity

Countries starting off from strong institutional conditions can clearly expect to have a more positive range of alternatives for using oil rent than extremely institutionally challenged countries, such as Chad or Equatorial Guinea.[17] However, windows of reform arise in weaker settings, and the question is whether these windows can be sustained to create a virtuous cycle.

The institutional heritage

Botswana is perhaps the most striking case of an initially poor mineral exporter with strong initial institutions. Acemoglu, Johnson and Robinson (2003) suggest that the foundation was laid before the discovery of diamonds. Inclusive traditional institutions placed constraints on political elites, and there was minimal disruption to these traditions by colonial rule: powerful cattle-based rural constituencies had an interest in protecting property rights; post-independence political leaders were also willing to place national interest above tribal interests.

Particularly noteworthy was Seretse Khama's initiative in assigning sub-soil mining rights away from the tribes and towards the State, and in this way heading off tribal contestation for revenue and cementing a common national interest. Botswana then used its diamond income well, to further strengthen institutions and capacity. It remunerated civil servants adequately and employed a corps of foreign advisors to work alongside domestic officials, rather than rapidly indigenizing the civil service and lowering its quality. More recently, the government sought and obtained a sovereign-debt rating even though Botswana had no immediate need to borrow. The rating was seen as a commitment device, to alert citizens by signaling policy slippage by future governments.

Anticipating oil rents: the first window of opportunity

Following the adoption of its Oil Revenue Law in 2004, Sao Tome has been at the forefront of efforts to anticipate oil rents, and to lock in the strong institutions needed

17 Equatorial Guinea has been cited as an extreme case of oil rents sustaining a pathology of authoritarian rule, instability and underdevelopment, from which it is difficult to exit. McSharry (2006) analyses the political economy of oil in Equatorial Guinea, suggesting that the extraordinary weakness of government institutions and the dearth of social programs make it less likely that the government will be able to buy the acquiescence of the population in the same way as, for example, in Kuwait or Saudi Arabia.

to manage them.[18] In addition to setting out arrangements for saving and spending, the Law requires full transparency. The responsibility is on firms to disclose all relevant material to a public information office; if they fail to do so, they risk losing their contracts. The Law also mandates powerful oversight mechanisms that include a broad base of constituencies, which are seen as helping to make up for the deficit in government institutions.

The National Assembly is required to hold yearly public sessions to discuss oil and gas policy. Ministers, investment committee members, the Auditor General and the Oversight Commission, which consists of 11 members (including three from civil society), are required to be present to answer questions. The Commission members are selected or elected by a diverse range of constituencies, including trade unions, business associations, local governments, the National Assembly (including opposition groups) and the judiciary. Only one member is directly appointed by the President.[19] The Commission has wide powers, including investigating complaints and judging and enforcing proceedings relating to violations of the Law.

After the rents: other windows of opportunity

Even mineral countries with a history of instability and fractious politics can experience windows of opportunity for good management. The experiences of Chile, Malaysia and Indonesia (at least during the first decade of the Suharto government) suggest a number of common elements that can support good management: (1) having twin goals — accelerating development and sustaining economic/social stability; (2) a fairly broad basis of support for such goals; and (3) close relationships between politicians and technocrats equipped to deal with the complex problems of resource management.

Chile. Technical capacity has traditionally been strong in Chile. In the early 1970s, the country suffered both serious macroeconomic instability and social polarization. The period after the 1970 election of the Allende government and the September 1973 Pinochet coup was particularly traumatic: in 1973-75, the consumer price index rose

18 This commentary draws on the extensive discussion of the Oil Revenue Law, as well as related laws in other countries, such as East Timor and Chad (see Bell and Faria, 2007).

19 Proposals to include international participants in the Commission were debated but in the end rejected.

by 3000%, and this was followed by a deep debt crisis and economic contraction in the early 1980s; unemployment levels reached 33% by 1982.

Following the return of civilian rule in 1990, the traumatic experiences of the two previous decades underpinned widespread consensus around preventing further disruptive boom-bust crises and avoiding conditions that might precipitate the political instability that could lead to a return to military government. The result was a broad constituency in favor of both economic stability and public debt reduction. The strength of this consensus is demonstrated by Chile's current response to spiraling copper prices and the exceptional accumulation of surpluses in its copper stabilization fund after 2005. Net public debt fell to minus 14% of GDP by 2008. Nevertheless, sustaining these policies has required continuous efforts by the technocracy to reach out to elected officials and explain the implications of overspending.

Indonesia. At least during the first part of the Suharto period — a phase classified as "reforming autocracy" by Eifert, *et al.* (2003), Indonesia offers another interesting example of cautious and flexible macroeconomic management-implemented without a dedicated fund, without transparency, and even in violation of fiscal rules. As in post-Pinochet Chile, the Suharto government came into power with a huge stake in stability. The last years of the "Guided Democracy" of the Sukarno period had been increasingly chaotic, including rice riots and ethnic rioting. The 1975 crisis of Pertamina, the national oil company, reinforced the caution of the government, and added to the credibility of the technocrats – a very stable team of economic advisers widely known as the "Berkeley Mafia".[20] This team proved to have both great permanence and leeway to shape policies.

Through the oil booms of 1974-81, the government formally adhered to a balanced budget law. However, without disclosure to the public or the parliament, bureaucratic controls were applied to slow actual spending, creating a *de facto* surplus and doubling reserves. Indonesia also managed its spending programs with great flexibility. As oil prices fell after 1981, the government moved aggressively with a drastic re-programming of its development spending, cancelling projects, cutting subsidies and spending, as well as stabilizing the real exchange rate through progressive devaluation.

20 Pertamina had been under the management of a military associate of the President, its crisis required a $1 billion bailout.

Malaysia. Another success case, Malaysia has faced a threat to social stability from either one of these two paths: economic growth, but with Malays politically dominant yet economically disempowered; or economic collapse caused by excessively redistributive policies. Neither of these options was attractive, leaving effective economic management and reinvestment of rents to encourage growth, especially employment for Malays, as the only option (Abidin, 2001; Rasiah, 2006).

Chile, Indonesia and Malaysia are clearly very different cases, yet they have some common features, including a strong urge to maintain stability and a good appreciation of the risks in managing resources. Another common feature of success has been the power of constituencies rooted in non-oil tradeable sectors. In Botswana, these were the traditional chiefs and cattle owners; in Chile they included a range of other resource-based commodity exporters developed over the years of low copper prices (see below); in Malaysia tin and rubber producers were influential. Agriculture played a similar strategic role in Indonesia, because of its importance in sustaining rural incomes and social stability. Similarly, in Norway, fishing and other decentralized industries supported cautious spending policies; these interests have been important forces for stability; they have helped to restrain sharp exchange-rate appreciations that would damage the sectors concerned.

Nigeria. This country's recent economic reforms offer further insights into the factors that can stimulate reforms. Contrasting Nigeria and Indonesia, Lewis (2007) notes the importance of social divisions, distinct institutional interests and competitive patronage in preventing successive Nigerian regimes from providing consistent, credible signals to private investors. This also resulted in the creation of a diffuse, rent-seeking business class. But dismal economic performance had instigated mounting popular criticism.

During the first democratic government of President Obasanjo, initial intentions of economic reform withered in a political quagmire, and the political goodwill gained by the democratic government had not proven sufficient to secure debt relief from Nigeria's creditors, which was an important objective. There was a growing concern that two democratic terms might conclude without leaving behind a significant positive legacy. A small team of able technocrats was installed after Obasanjo's re-election, and given strong backing for an unprecedented program (Okonjo-Iweala and Osafo-Kwaako,

2007). Macroeconomic, budgetary and fiscal management were rapidly strengthened and due-process mechanisms were instituted to increase the value of money for public procurement. Fiscal transparency and accountability was also promoted, including the publication of accounts and the disclosure of fiscal transfers made to sub-national governments. Reform momentum was sustained in various ways, including the development of national and State-level development plans (NEEDS and SEEDS). It is too early to forecast the eventual result of the reforms, but fully reversing them will not be easy. [21]

The Bretton Woods institutions were conspicuously absent from these home-grown processes, which were designed to emphasize domestic ownership and help develop a national consensus. To sustain domestic support for reforms, Nigeria resisted creditors' desires for a formal IMF program. The outcome was the development and first application of the Policy Support Instrument (PSI), geared to support low-income countries that did not want IMF financial assistance but rather the Fund's seal of endorsement for good management (to be provided to creditors and donors, multilateral development banks and financial markets).

3.2 Are resource funds the answer?

Faced with the need to avoid boom-bust cycles and save for the future, many countries have instituted resource funds. Rietveld and Pringle (2007) identify 23 major funds for managing sovereign wealth; 14 are owned by oil exporters. These funds can vary widely across many dimensions, including around their objective (stabilization or long-term savings), the rules governing deposits, withdrawals and investments, and their degree of transparency. Funds are neither necessary, nor sufficient, to improve fiscal discipline; however, they can provide several potential benefits, especially in difficult conditions consisting of low levels of transparency, weak governance and ineffectual parliamentary constraints on the executive.

Funds can increase transparency. Benchmark yields can be presented alongside the returns from fund investments, to help convey the effectiveness of investment

21 The benchmark oil price, above which tax revenues must be saved rather than spent, was recently raised from $40 to $53, and then to $59. While this opens the way for spending increases, it is still below most medium-term price projections and less disruptive than shelving the fiscal rule altogether, or drawing down reserves.

management. Most funds provide public accounts, and some post full information on the internet. This can help underpin a wider understanding of the spending, savings and investment decisions of the government.[22]

Funds can also widen accountability mechanisms. All funds embody "vertical accountability", embedded in the reporting arrangements to the responsible government minister; some also mandate "horizontal accountability" to a wider audience through two mechanisms: (1) elected officials independent of the government may receive regular reports, and information on balances, earnings, deposits and withdrawals may be made generally available; and (2) funds can be designed to share decision-making power among a range of interest groups independent of the government. In Norway, for example, although the administration of the fund is under the Central Bank, decisions on transfers must be approved by parliament, raising the prospect of scrutiny by (usually strong) opposition parties; in Sao Tome, civil society representatives sit on the Petroleum Oversight Committee. In contrast, spending decisions in Kazakhstan and Azerbaijan are essentially those of the President.[23] Those funds, therefore, do not impose major additional spending constraints in these two countries, which are known for their strong executive branches.

Funds can engage citizens directly, as the ultimate agents of restraint: Alaska's Permanent Fund was designed "to be saved from the ravages of mendacious politicians" (Cowper, 2007). In this respect, the fund has been very successful: politicians have vied with each other to protect its integrity. Despite a severe fiscal squeeze on State finances caused by the imprudent abolition of the State income tax, the popularity of the direct dividends paid by the Fund to State residents, up to $2,000 per head, has discouraged proposals for raiding the savings.

Finally, funds can be identified with particular objectives in order to create support for saving. Because of the length of the oil price cycle, even funds set aside to smooth booms and busts will need to cumulate to substantial levels, sometimes to levels

22 Lacking such transparency, in Indonesia, checks and balances proved insufficient to prevent the reforming autocracy from degenerating into a kleptocracy as the interest groups surrounding the presidency narrowed.

23 In Kazakhstan, for example, the management of the oil fund is conducted by the National Bank. The President decides the composition of the Management Council that oversees the operation of the Bank, approves all reports, and also chairs the Council. Since the President has the powers to dismiss other members, his decision is binding.

greater than GDP. Sovereign-wealth and asset/liability-management services are increasingly used by resource exporting countries. As in Botswana, the prospect of higher returns on a transparently managed reserve fund can help justify saving and insulate wealth management from politics, even if the fund is not a "lock box" with formal withdrawal rules.

Funds can also be linked to more tangible objectives to increase public understanding of the need to save. In Chile, the objective of paying down public debt was important in sustaining adherence to the fiscal rule. In Norway, the prospect of escalating pension and health payments to an ageing population was cited to justify the creation of a petroleum fund in 1990.[24] In countries with youthful populations, funds could be set up to guarantee the future education of all citizens (see below).

Nevertheless, resource funds are neither necessary, nor sufficient, to sustain good macroeconomic management in volatile mineral economies (Davis, *et al.,* 2003). When the institutional environment is weak, funds can be subverted, through rule changes, expropriation, or borrowing against the savings of the fund, as for example in Venezuela (Eifert, *et al.*, 2003). In particular, as depicted most recently by the case of Chad (discussed below), the formal mechanisms of a fund cannot substitute for the absence of effective checks and balances in society.

3.3 Can distribution of oil rents improve accountability and build human capital?

Since citizens own the oil resources,[25] why not distribute the benefits directly back to them? In addition to improving accountability (through encouraging citizens to monitor oil income and forcing government to rely on normal taxation for revenues), this might widen the opportunity for citizens to invest in human capital to complement resource wealth, rather than concentrating access to capital within a small elite. But few, if any, developing exporters copy the Alaska model of making payments to individual citizens on the transparent basis of oil income, or create and manage an oil-income investment fund.

24 In 2006, the Government Petroleum Fund changed its name; it is now called the Government Pension Fund.

25 At least that part of the resources that are not owned by foreign companies. For further discussion, see Stiglitz (2006).

Many exporters do distribute oil rents to their citizens, but in indirect ways. The most prevalent method is to hold down domestic prices of petroleum derivatives and natural gas to well-below world market levels. The fiscal costs can be substantial, on the order of several percentage points of GDP. Cheap energy policies tend to be regressive, inefficient and difficult to reverse, at least until spiraling domestic demand (including demand inflated by smuggling) makes them unsustainable. [26]

Another indirect way to pass on rent income to firms and citizens is to lower the burden of non-oil taxes. This, too, does not provide for a transparent linkage between tax relief and size of rents, but a low-tax environment could be a useful part of a strategy for improving the business climate and encouraging diversification. Sooner or later, however, most oil-exporting countries will need to turn to their non-oil tax systems to finance spending programs, so that a low-tax period should be used as a chance to improve administration, encourage compliance and broaden the tax base. Few countries follow this path. Least prudent is perhaps Alaska's approach of eliminating taxes, rather than just lowering tax rates.

Direct transfers to citizens can be provided through different mechanisms. Some Middle East producers, for example, may offer grants to newlyweds towards the purchase of housing. Community-based programs may provide another way to distribute oil rents effectively and create a constituency with an interest in their effective management (Moreen, 2007). Community-based programs have been used effectively on a large scale in Indonesia, where INPRES programs absorbed almost one-fifth of domestically funded development spending, providing low-wage rural employment in construction projects. Similar projects at the village-level provided only materials, requiring the communities to contribute unpaid labor. Together, these projects created some 1.5 million person-years of employment in the early 1980s, equivalent to almost 3% of the labor force.

Recent evidence of the positive impact of direct-transfer programs suggest that more attention should be given to this approach. From their start in Mexico's *Progresa* program and Brazil's *Bolsa Familiar*, conditional cash-transfer schemes have increased

26 In March 2005, Indonesia instituted the first fuel increase in 14 months for gasoline and diesel, though the cost of kerosene, a socially sensitive commodity, was kept at only one-third of the cost of production. In the previous year, fuel subsidies had mounted to almost $7 billion and were clearly unsustainable. Demand growth was 15% per year, even as total fuel production slowed to 1 million barrels per day.

their prominence; they are now being implemented in at least 14 developing countries and, most recently, in New York City. Cash-transfer programs provide payments to poor families, conditional on specified child behavior, such as attending school or receiving essential health services, including vaccinations. While the outcomes of these transfer systems can vary, depending on their design and country conditions, ongoing impact evaluations suggest that they can be an effective way to widen access to a range of services, especially for countries with limited capacity to deliver such services in traditional "top-down" ways. In addition, careful evaluation of some unconditional programs, such as South Africa's Child Support Grant (CSG), suggests that, if appropriately targeted, they too can have a positive impact.[27]

Whether such programs are effective, however, and at what level of decentralization, will depend on institutional conditions. Since transfers tend to shade into entitlements over time, and household and sub-national budgets face great difficulties in adjusting to very large income shocks, stabilizing public spending seems essential. Programs need to embody design elements that reduce the prospect of capture by local elites (Platteau, 2004). These elements can include transparent reporting on allocations made and received, monitoring the use of funds, or allocating some resources to traditionally less powerful groups, such as women.[28]

New technology, including biometric information systems, could also be used by some exporting countries to implement transfer programs more efficiently, in order to distribute part of the oil rents to citizens. Many countries are currently implementing, or planning to adopt, biometric documentation, including identity cards and passports, for security and other reasons. South Africa has implemented the world's largest biometric identification system, the Home Affairs National Identity System (HANIS), covering some 43 million citizens. In addition to aiding the fight against crime, systems of this type can be used to target transfer programs more effectively. Biometric

27 The CSG is targeted to "follow the child" and is received almost exclusively by women, as the primary caregivers. The projected gain in lifetime earnings of the children receiving the grant significantly exceed the costs (Aguero, Carter and Woolard, 2007). Such programs could be carefully considered by cash-rich, oil-exporting countries with widespread poverty and modest capacity to implement conventional programs.

28 Transparent transfer programs can also be a cost-efficient way of overcoming systemic leakage of funds in service delivery. For example, in Uganda, tracking surveys made in 1996 showed that local bureaucrats were capturing 80% of non-wage education spending. After an information campaign, both nationally and at the district and school level, a repeat survey showed that schools now received over 90% of their allocations. This remarkable improvement was achieved through the government's efforts to disseminate information, both through the media and systematically by posting public-spending information at schools (Reinikka, 2003).

identification raises a number of problematic issues, including privacy and the intrusiveness and accuracy of the systems used to record biometric information. Corporate Watch (2006), notes that the most reliable finger-print systems currently in use have an accuracy of "only" 96.8%. While this may not be sufficient for certain applications, it would seem to be adequate to determine eligibility for a range of transfer programs and superior to other systems available. The distribution of oil rents to citizens and communities will not provide a panacea to all the problems plaguing oil countries. However, direct or community-level distribution could be useful in reducing the buildup of large, ineffective central programs, thus widening access to resources and building human capital. If transparency is linked to the distributed revenues, this may also help build a constituency for good management.

3.4 Can external constraints be effective?

While leadership must come from within, the external global framework for good governance can make the task easier, or more difficult. This framework, still embryonic in many areas, includes programs to develop norms for revenue transparency, such as the Extractive Industries Transparency Initiative (EITI) and the Publish What You Pay (PWYP), anti-money laundering legislation, as well as anti-corruption conventions (including the African Union convention) and approaches to combat high-level corruption, such as the Stolen Assets Recovery Initiative (StAR). At least 51 countries are using an EITI template for increasing transparency within their extractive sectors.

"Soft pressure" from such a framework can be useful. In Nigeria, for example, international benchmarks were invoked to motivate reforms. Comparisons showed just how far Nigeria — proud to be Africa's most populous country — was lagging behind; for example, even combined, its many small banks were smaller than the fourth-largest bank in South Africa. International initiatives, notably the EITI, in which Nigeria became the leading country, also played a reinforcing role, by providing standards to endorse governance reforms, and a forum for the recognition of Nigeria's progress in improving transparency. Karl (2007) notes some other partial successes, including encouraging greater transparency in Angola.[29]

29 For further discussion, and an overview of the evolving framework of global checks and balances, including anti-corruption conventions, the Extractive Industries Transparency Initiative and efforts to recover stolen assets, see World Bank (2006); Karl (2007). Benchmarking approaches, in general, are becoming more widespread — for example, the use of *Doing Business* ratings to spur reforms.

"Hard pressure", or direct conditionality, may be more difficult to sustain. Chad's Petroleum Revenue Management Program, an agreement with the World Bank, stipulated that 76.5% of direct petroleum revenues (royalties and dividends) would be earmarked for priority sectors and for community programs in the oil-producing region. Ten percent would be set aside in a reserve fund, and the rest would be available for the general budget. The program also created a civil society oversight body, the *College de Control* (CCRSP). The agreement was interrupted in January 2006, following the passage of legislation that departed from the agreement. This breach of contract triggered a freeze on the movement of certain of Chad's oil revenues in its Citibank escrow account.

In July 2006, a memorandum of understanding between the World Bank and Chad opened the way to a modified program. While increasing the proportion of revenues for the general budget to 30% and widening the range of eligible sectors for the remaining spending, the scope of the agreement was extended to include indirect oil revenues (taxes), and it also provided for the strengthening of the College de Control oversight mechanism. This proposal failed, too. In September 2008, the Bank withdrew from the pipeline agreement and Chad fully pre-paid the loan, from revenues swollen by high oil prices.

The experience of Chad, and also that of East Timor, where an outwardly tranquil period was shattered by violence after April 2006, indicates how difficult it is to foresee conditions when negotiating such agreements, and also to sustain agreements when domestic checks and balances are very weak in the producing country. Gould and Winters (2007) argue that once oil begins to flow, bargaining power shifts to the host government and that, in the case of Chad, several other developments further strengthened the government's hand. These included unexpected security concerns associated with Darfur, growing interest in African oil by other countries, including China, and the desire of all parties not to see Chad become another failed State in a precarious region. The structuring of any further "pre-oil" agreements, if producing countries show willingness to consider them, will therefore need to strike a balance between commitment and flexibility, to take into account the possibility of turbulent political conditions and likely changes in oil markets and some government priorities, as well as the changing power balance after oil begins to flow. The combination of these requirements creates a tall order.

3.5 Can countries diversify despite resource wealth?

"Sowing the oil" has been an objective for many resource-rich mineral countries, but only some have succeeded in diversifying their economies. Even in well-managed countries, appreciating real exchange rates can pull factors of production away from other export sectors; closing off the flow of imports will only result in higher prices for all domestic goods and services and less competitive conditions. Boom-bust cycles compound the problem by increasing price risk and further discouraging investments in other export sectors.[30] Diversification, therefore, requires a combination of three policies: (1) a reasonable level of macroeconomic stability; (2) a reasonably open trade policy; and (3) the active use of resource rents to increase the productivity of other exportable sectors and reduce their production costs, whether by funding infrastructure, temporary subsidies or other methods.

Only a few developing resource exporters have been successful in diversifying their economies. Coxhead (2007) reviews the performance of developing countries with a primary-exports share that was at least 60% of merchandise exports in 1971. Five of the countries that were more resource-dependent than the mean — Malaysia, Thailand, Chile, Indonesia and Sri Lanka — sustained high growth rates, at around 3.5% per head over 1975-2001; all these have diversified towards manufacturing or, as in Chile, have widened their range of resource-based exports to include new and more sophisticated products. In other cases, resource-rich countries seem to have been slower to diversify. Auty (1990) found that industries tended to be more heavily protected in resource rich countries, and that they take longer to mature and "grow up".[31]

Malaysia was fortunate in its rather diversified resource endowment, with rubber and tin as well as forest products, which preceded oil as export staples. It sustained a high and relatively stable savings rate, and implemented land development and replanting schemes to expand and modernize the production of rubber and palm oil, as well as heavy investment in technology and infrastructure, especially energy, communications

30 Hausmann and Rigobón (2003).

31 A particular risk for large "mega-project" investments is the conflict of interest that can arise when a private partner with a small equity stake in a largely public project is also a major contractor or supplier. Profits from cost overruns can then more than compensate for equity losses. This creates incentives for overoptimistic feasibility studies and for downplaying the risks, with potentially huge losses for the government (Gelb, 1988).

and transport. Although Malaysia did start out on a protectionist path in the 1960s, it maintained a relatively open trade regime, with domestic investments aimed at reducing production costs and increasing competitiveness.

Chile offers several other examples of successful active public roles in helping to develop the salmon and wine industries, including encouraging technical development and adaptation, disseminating information on standards, providing infrastructure and information and coordinating numerous small producers (Benavente, 2006; Katz, 2006). Both the Chilean and Malaysian cases involved developing long-term public-private partnerships, such as those involving CORFO and Fundación Chile, to help producers achieve critical mass and capabilities.

Indonesia offers an interesting example of a low-income country's efforts to use its hydrocarbon resources to support agriculture. Good luck played a part in this success, which would not have been possible without the development of disease-resistant and high-yield rice varieties. But their diffusion would not have been possible without the unusually broad-based development policies followed by the government, including the use of oil income to develop natural gas resources, both for export to Japan and as an input to fertilizer production. Fertilizer was then distributed at subsidized prices, greatly boosting yields. In addition, measures were taken to prevent the real exchange rate from moving too far out of line, thus limiting the adverse impact on agriculture and other non-oil traded sectors, and encouraging diverse exports.

Do such examples provide lessons for other resource-rich countries? Clearly, the potential for diversification is affected by many factors, including the resource base, the capacities of the population and the quality of governance. Some countries, such as Botswana, score highly in many dimensions, but face particular geographical, ecological and skill constraints that make competitive diversification difficult to achieve.[32] Yet many countries do have diverse resource bases and a range of potential alternatives. The examples above suggest that diversification is not impossible.

32 Despite a generally good investment climate, Botswana's industrial sector appears to be less competitive than those of other middle-income countries (World Bank, 2007).

4. Conclusion and Policy Lessons

Poppies cannot be blamed for heroin addiction. Neither can natural resources be blamed for the resource curse; the question is whether resource-exporting countries have the capabilities and institutions to effectively manage high levels of resource wealth or resource dependence. While some countries may have these attributes, many others do not, and these are typically the poorer ones. The observation that rich countries tend to have more absolute resource wealth per head than poor countries may be true, but it does not solve the problem.

Country heterogeneity is key to understanding the resource curse. Studies suggest that it is more likely to be felt by countries with low levels of human capital and institutional capital, two factors that complement natural-resource capital in determining development outcomes. Country trajectories are probably path-dependent: those starting out from a strong foundation will be more likely to benefit from resource wealth than those with weak initial conditions.

But in looking across countries, it is also necessary to allow for two-way causality, from high resource dependence to weak institutions, and vice versa: some countries are specialized in resource-intensive sectors because low levels of human capital and poor governance make other activities unproductive. Either causal chain can lead to associations between resource dependence, lack of diversification, volatility and poor performance.

Turning to the case of oil, exporting countries have grown more slowly than other countries, and their development indicators, such as infant mortality, also lag those of other developing countries at comparable income levels. They have suffered from dramatic "boom-bust" cycles that coincide with conditions in the oil market. This paper focused on two possible channels by which oil wealth can reduce performance: poor governance and extreme macroeconomic volatility.

4.1 The governance deficit

Estimates suggest a massive governance deficit in developing oil exporting countries, one that is not dependent on any one region. The deficit extends across various

dimensions of governance, including those relating to State capability; it is not confined to weak public accountability. The shortfall in the average growth of oil exporters versus that of other countries over the period 1982-2006 is well explained by a simple equation relating growth over this period to governance measures in place around 1982. This does not, of course, imply that oil wealth causes poor governance. However, even though the relationship between governance and growth is contentious, it does suggest that the governance deficit is an important part of the growth story.

Oil dependence exposes exporting economies to enormous levels of uncertainty and potentially to extreme macroeconomic instability. For many producers, the difference between recent high and low oil-price scenarios translates into export revenue differences of 50% of GDP or more. Previous studies have documented the costs, in particular of overoptimistic spending during the boom phase of the cycle, and especially when this is reinforced by pro-cyclical access to credit. The question raised here is how much exporters should save in the current situation, where the length of the price boom is so uncertain. A simple stylized model incorporating absorption constraints and macroeconomic adjustment costs confirms the benefits of caution: even with a 50-50 chance that high prices will continue, the stylized country should save at least half of the revenues it receives over the first several years of the boom.

Spending decisions are political, however. Governments may be myopic, but if political discounting is the only problem, they will need to be very myopic indeed to cause much harm; moderate discounting does not shift the spending decision much because of the very high costs incurred in the post-boom period if boom-time spending is excessive.

Worse is when decision-makers do not factor in absorption constraints (possibly because they value spending for corruption opportunities rather than effectiveness) or macroeconomic adjustment costs. This combination can induce huge macroeconomic cycles and is fatal for welfare. Developing an informed consensus on the opportunities and the risks is therefore essential. Even with an engaged government, the difficulty will be how to do this without creating euphoric expectations of enormous immediate income gains. Transparency will be critical for reaching broad consensus on policies, including the need to assure citizens that savings made when prices and oil rents are high are not going to be stolen.

4.2 Windows of opportunity

Path dependence raises the difficult question of how to address the political and institutional causes of the resource curse in countries starting off with weak institutions. The experience of countries with strong initial bases, such as Norway or Botswana, cannot be replicated by countries with very different institutions. The problem is particularly complex because success requires a combination of accountability to the population at large and strong technical capacity, particularly to manage volatility over long-term cycles. Political competition without strong institutions will tend to be subverted by rent-seeking. But, as in Indonesia, even a reformist autocratic regime with a strong management team is likely to be subverted in the end.

Windows of opportunity to put in place effective mechanisms for managing oil income may exist while oil rents are being anticipated (as in Sao Tome) or after oil begins to flow. Three cases — Chile, Indonesia and Malaysia — suggest some common elements to success: (1) a shared concern to preserve stability and grow rapidly; (2) an effective technocracy that engages closely with leaders and elected officials; and (3) influential non-oil export sectors conscious of the dangers posed by unrestrained boom spending.

These three countries offer lessons in diversifying exports away from a dominant resource. Nigeria offers more recent experience of how a window of opportunity to improve governance and economic management in an oil-dependent country can possibly be locked in for the longer-run, though it is too early to predict the long-run outcome of its reforms.

Resource funds are sometimes suggested as one way to improve accountability and stabilize spending. They can increase transparency and link savings to specified goals in order to increase support for fiscal caution; they can also help to widen checks and balances, whether by requiring parliamentary super-majorities for changes, or by horizontal accountability mechanisms to engage extra-parliamentary constituencies. Although they can offer distinct advantages, funds and formal rules are neither necessary nor sufficient. They can supplement other mechanisms of domestic accountability, but they cannot substitute in cases when accountability is very weak.

Transferring resource rents to citizens has been suggested as another way to create incentives for accountability, including through requiring government to be dependent on non-oil taxes. While many governments do transfer part of the rent to citizens, this is usually through indirect and inefficient mechanisms, especially energy subsidies or inefficient domestic tax systems (an inferior alternative to investing in effective domestic taxation while rates can be held low). Few governments have ventured towards the Alaska model of transparent dividend payments to citizens.

Transfering rents to citizens seems to be an under-exploited opportunity, especially if combined with recent improvements in the structure of transfer systems. Conditional cash-transfer programs, for example, could: reduce pressure for the buildup of huge, ineffective, centralized programs; help build a sense of ownership among the citizenry that would encourage greater public scrutiny of the use of oil funds; and also widen opportunities to create human capital to complement natural resource wealth. New approaches towards transfers, including those based on biometric identification, should have considerable appeal for cash-rich resource exporters. Taking all these considerations into account, a resource fund designed to guarantee transfer payments to young citizens to finance their education might have political appeal in some countries with rapidly growing populations.

4.3 External pressure

Finally, can external pressure force good governance on oil exporters? The evidence suggests that this is unlikely. “Soft pressure” and benchmarking to codes of conduct and transparency may help to create awareness and pressure for better governance. Global and regional frameworks for good governance are still embryonic — for example, despite some successes, it is still very difficult to recover illicit funds deposited abroad by corrupt leaders. Pressure is unlikely to prove decisive in any particular case; yet the campaign for transparency can point to some achievements.

As shown by the case of Chad, “hard pressure” or external conditionality faces severe limits in dealing with oil exporters. Sanctions are weakest just when they are most needed — at the height of the oil price boom. Arrangements need to anticipate shifts in the balance of bargaining power when oil prices increase. Nevertheless, it might be possible to build some strong sanctions into the rules governing withdrawals from an offshore

fund. For example, rules could include provisions to freeze withdrawals in the event of a coup. Oversight bodies could include external members, at least for a fixed term, without compromising long-term sovereignty.

One lesson from Chad is that oversight bodies should not depend on funding from the governments they are charged with monitoring. It may be overambitious to expect such agreements to directly reform governance in a profound way. A more modest goal might be to ensure that at least a part of oil income is used for developmental purposes, in ways that help to create interests that one day will be able to provide stronger domestic checks and balances.

It is important that external efforts are not perceived only as those of NGOs, some rich-country governments and development agencies. Efforts need to be made to gain buy-in from important new players, including India, China, other middle-income countries and regional bodies in which oil-producing countries participate. For African oil producers, the African Union could play an active role, pressuring countries to ratify its Anti-Corruption Convention, creating a supranational dispute-settlement body, and stressing that heads of State are accountable, as well as other public officials.[33]

4.4 Closing thoughts

Where does this leave us? At a technical level, the problems of managing natural resource wealth are better understood than before. We know more about the importance of complementing natural resource capital with human and institutional capital. Country experiences provide useful insights into how the various political and management challenges might be approached within different settings.

Countries with high human capital and strong institutions can expect to benefit from natural resources. It is those exporters that start off with a reasonable baseline of human capital and institutional endowments that can be expected to benefit the most from the cases and lessons described in this paper. But these may be of little help in the most difficult cases: there, we are still woefully short of solutions.

33 Akre (2007).

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Comment

by
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Introduction

The paper neatly summarizes the fundamental results, as well as interesting new research on topics related to the resource curse, such as the overvaluation of the currency. I have some personal experience of this, having lived in Mexico in 1980-81 at the height of the "petrolizacion" of the economy. I would like to emphasize two particular effects I noticed that might escape the cross-country regressions:

- The role of personal development and the allocation of talent in an economy. It is so clear from living in a booming country how all incentives are distorted. The overvaluation of currency and the changes in income distribution affect the relative profitability of a career in manufacturing/agriculture compared to working in the State sector (and particularly at PEMEX). This leads all gifted youngsters to adapt their life and career choices accordingly – it even leads to major changes in values.
- The role of good economists: one of the things that is striking about Norway is the abundance of good economists. I think this was an important factor when it came to formulating rules for the use of oil revenue, such as the fund to neutralize excess liquidity and beat the mechanisms of Dutch Disease.

I very much enjoyed reading this paper and have just a few comments to make under the headings of Monopoly, Asymmetry, Units of measurement, Climate and other environmental resources.

The role of monopoly

A special feature of the really big flows of revenue, such as from oil, is that they are in a sense built on monopoly extraction in some form. Oil money is not made by selling the stuff at "extraction costs + markup". The big money is made by exploiting scarcity rents, and this goes hand-in-hand with an economy that is monopolized or State-monopolized, where key decisions are taken by the government – in fact within OPEC – by a consortium of governments. This leads to a culture pervaded by monopoly practices including secrecy and negotiations rather than transparency – mechanisms that promote certain ways of sharing and using rent also within the economy. There may be a functional link here between the way in which the rents are made (maximized) and the way they are spent.

I think this may feed into the very interesting modeling by Gelb and associates of the mechanisms behind the different types of boom and bust cycle.

Asymmetries

The authors cite a number of studies of the effects of asymmetries in boom and bust cycles. They find asymmetric adjustment: periods of boom do not lead to much growth, but periods of bust lead to falling output. *"For a typical African country, a terms-of-trade loss of 10% of GDP reduces growth in the following year by 3.6 percentage points. The implications of asymmetry are clear: underspending when prices are high can incur a small loss of welfare, but overspending during a boom can be costly, especially if financed by borrowing."*

This is closely connected to the private appropriation of profits and the socialization of costs, something that is being witnessed in the latest financial crisis, for instance.

Towards correct units of measurement

The authors already show that resource abundance does not generally lead to faster growth. I believe the case would be even stronger if we considered better measures

of income and welfare. We all know that GDP can never be even an approximate measure of income. The most elementary insight is that we must take into account depreciation by looking at Net Domestic Product (NDP) – or indeed, at more sophisticated measures of welfare. It is somewhat disputed how big a difference this would make for most countries. There is, however, one category of countries where it makes a big difference: the oil (and some other resource) exporters. The GDP of some oil countries consists almost entirely of petroleum and thus the related corrections for depreciation of the oil stock are very important. The actual growth of these countries is much lower than that reflected in their reported GDP, if one uses any sensible measure of sustainable income (see, for instance, the literature on genuine savings from the World Bank).

Naturally, we should really be discussing genuine welfare, or Net Domestic Product (NDP). However, the reason we do not use NDP is that we have no *exact* data on depreciation, and it seems researchers prefer an implicit zero than a number that is imprecise. For the depreciation of natural resources, and particularly ecosystem resources, our information is even weaker. But the conceptual issues are nonetheless equally important, since the oil economy very often leads to depreciation, not only of the stock of oil, but also of sensitive ecosystems that just happen to be "in the way" of oil development.

Climate and fossil fuels

The size of the oil sector is impressive – during boom years, exports alone amount to 2% of world GDP, according to the authors. Yet, it may well be that climate is more important than oil to long-run welfare.

The authors state rhetorically: *"These events have naturally renewed interest in the potential of resource-based development. Will windfalls be used to support long-term growth and poverty-reduction or will the 'resource curse' prevail? And are gains permanent or temporary – are we at last in a Club of Rome scarcity scenario, or will substitution, new discoveries and improvements in yields and recovery rates once again depress commodity prices back towards their long-term trends?"*

I believe the only way to grapple with these questions fully is to address also the climate and other environmental issues. These issues are completely absent from this paper; the only time climate is mentioned is when it comes to business or investment climate. However, oil is just one resource and "to light a fire" — that is to use oil productively (for anything else than lubrication) you have to use two more resources:

- Oxygen;
- The atmosphere's assimilative capacity for carbon dioxide.

Any of these resources can be scarce, and it now seems that the *critically* scarce resource is the assimilative capacity for carbon dioxide. This happens to be a resource with no owner, perhaps a common-property resource – but it is a real physical resource – and it is scarce! So we need to regulate it.

For this reason, the EU/OECD has proposed (and probably the world will follow) limiting oil sales and extraction indirectly through the regulation of carbon dioxide; the instruments advocated for this (such as taxation) are likely to introduce a new element into the struggle over the oil rent. To date, this type of approach has not played a mayor role, but in the future, it is going to interact decisively with the mechanisms described in this paper.

One could also make a typology of resources depending on their "appropriateness". Oil is high on this scale – which is both good and bad, as we have seen. Biodiversity, genetic information and the climate-regulation functions of an ecosystem are resources that are harder to capture and regulate, sometimes even being hard to define or understand.

In diverse ecosystems, such as rainforests, it is not uncommon to find medically, or biochemically, active components that may hold promise as future ingredients in drugs. To capture this kind of rent is, however, very hard. When there is a big commercial demand for resources that do not themselves have proper ownership (or are subject to weak communal rules), then opening up to trade may be very counterproductive and lead to massive resource degradation, as shown by Chichilnisky and others. This would typically hit hardest at the resources without adequate ownership-protection, such as biodiversity – but also "climate resources".

Final comment

Finally, the authors write: *"Many exporters do distribute oil rents to their citizens, but in indirect ways. The most prevalent method is to hold down domestic prices of petroleum derivatives and natural gas to well below world market levels. The fiscal costs can be substantial, on the order of several percentage points of GDP. Cheap energy policies tend to be regressive, inefficient and difficult to reverse, at least until spiraling domestic demand (including demand inflated by smuggling) makes them unsustainable."*

I have studied this kind of policy extensively (Sterner, 1989 a,b) and can only agree. It is furthermore interesting to think of a situation in which the OECD proposes taxing oil to combat climate change, and OPEC retaliates by increasing domestic subsidies to attract the very same industries the OECD is taxing the most.

We then have full-scale carbon leakage!

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Comment

by
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It is particularly difficult to comment on the paper by Alan Gelb and Sina Grosman as it is an excellent article and there is almost nothing to add to how it has addressed the subject: how to fight the "natural resource curse", especially in the oil-rich countries? It does not of course fall into the trap of proposing a few miracle solutions that could be applied across the board. On the contrary, it highlights the great diversity of cases and the need to design adapted policies.

The first part of the paper surveys the recent research literature on the causes of the resource curse, with a particular focus on the oil-rich countries. The main conclusion is that natural capital is highly complementary to human and social capital. In countries with high human and social capital, the abundance of natural capital is not an obstacle to growth, quite the opposite. The difficulty is that there is very likely an inverse causality: in other words, because of the often observed rent-seeking behaviour and corruption that these windfalls encourage, an over-dependence on oil rents leads to the degradation of human and social capital. This may spawn a vicious circle that locks the country into a kind of spiral where poor governance gives rise to the resource curse that sustains poor governance. The question is how to escape this trap?

The second part presents a simple model for evaluating the macroeconomic consequences of public over-spending during oil booms and even tries to measure the share of oil revenues that needs to be saved in order to maximise inter-temporal consumption. This is an attempt to put into practical application Hartwick's theoretical

rule, which says that the totality of rents should be reinvested in the other three forms of capital. This model clearly points up the danger of periods of windfall years followed by collapse caused by the highly volatile prices of mineral resources and particularly oil. I would, however, like to make two remarks on this very convincing part of the article.

The first remark pertains less to the model *per se* than to an article by Hamilton, which is quoted in the text and concerns oil price volatility. Hamilton says, for example, that if the historic trend and volatility persist, the price of oil in four years' time could stand somewhere between 50 and 350 dollars per bbl. These prices are certainly possible but would, in my opinion, reflect temporary crisis situations. One such situation would be an internal OPEC price war in which there would be an attempt to re-establish discipline in controlling oil output, as in 1986. The second would involve a situation in which political and military unrest in the Middle East either threatens to or begins to limit exports from this zone - a zone on which the world will increasingly depend. Aside from these crisis situations, it can be said with reasonable certainty that the price of oil will indeed fluctuate, but around an average price that has changed, given the widespread conviction not only that we are approaching an oil production peak but also that carbon costs will never be zero, whatever twist and turns are taken by the fight against climate change. In these circumstances, we have reached a new equilibrium price of about $100 per bbl, instead of $30 per bbl, which is the previous equilibrium price accepted by the core members of the oligopoly, or in other words the oil-producing countries of the Middle East.

Fluctuating oil rents are thus to be expected for exporting countries, but also at revenue levels that are much higher than they were over the ten years prior to the last oil price hike. This firmly underlines, first, the importance of policies aimed at encouraging and helping States to put into place anticyclical and not procyclical measures and, second, the urgent need to channel a share of the rents, which are and will continue to be higher, into preparing for the post-oil era.

My second remark about the model involves the difficult task of model calibration. It is, in fact, the way in which the model is calibrated that enables us to say what percentage of additional revenues related to the oil boom should be saved. These calculations are necessarily based on the distinction, in a country's economy, between the oil GDP and the non-oil GDP. Most often, the current non-oil GDP, calculated as

the difference between total GDP and the value-added of the oil industry, is implicitly considered to be the GDP that the country would have marked in the absence of oil. This is certainly a very unsatisfactory couterfactual. The question that should in fact be asked is what the country's economy would be without any oil. As there is little point in asking the question about the past, we need to ask where the GDP will stand when oil rents have ceased. This is a tough if not impossible task. Moreover, the paper recognises this by admitting that it is difficult to foresee the macroeconomic effects induced by a sharp fall in oil rents.

Yet, despite everything, this is precisely the kind of calculation that is being used, especially by IMF teams, to prescribe - or at least strongly recommend given that the IMF no longer prescribes - what share of oil revenues the government can allocate to financing the general budget deficit. My question to Alan Gelb is: on the issue of the share of oil revenue it would *a priori* be preferable to allocate, can he share with us any more precise or more advanced research results?

The final part of the paper pragmatically addresses what can be learnt from various case studies, more specifically the cases of countries that have managed to escape the trap of the mineral resource curse. I should like to return to some of the examples and make several comments that I hope will be forgiven for their occasional impertinence. All of my remarks highlight the importance of what has already been underlined by the overview of the econometric studies: the prior and parallel accumulation of human and social capital.

The example of Botswana is not surprisingly cited in this paper, as it is in most reports on this subject. It is an example of the good student, whose success is attributed to the already existing high-quality institutions that had grown out of the former traditional institutions that organised the lineages of nomadic herdsmen. Sometimes mention is made in measured terms of another favourable factor: the fact that Botswana had agreed to have its senior government officials "accompanied" by foreign experts for quite some time rather than deciding to quickly appoint African nationals to all job positions. It could be said in more frank terms that Botswana successfully pulled through, certainly thanks to its good traditional governance (but were there actually any badly governed traditional African societies?), but also because it was a sort of protectorate of "De Beers", or of South Africa if you prefer, or of both.

I think that one should dare to ask the question of whether one possible national option would not be to accept a lengthy period of "co-piloting" with one or more chosen foreign partners. This would naturally mean giving up some degree of national sovereignty for such periods, providing that it can ensure the possibility of accumulating human capital more quickly and stabilising political institutions capable of driving future growth. This may ultimately be a good investment that is beneficial to the nation as a whole, rather than a form of neo-colonialism. This question may seem politically provocative, but after all, it is the rationale behind European integration of newcomers.

São Tomé is an example of a State that is taking the time to draft particularly well-designed legislation while awaiting its flow of oil revenues. This should make the negotiation process for sharing and using the rents as transparent as possible and provides for their audit not only by parliament but also by independent civil society institutions. This is also the case of Mauritania, which I have studied, as well as Guinea, which is anticipating a substantial mineral boom. Mauritania, having already experienced disappointed first hopes with respect to oil production, is now anticipating the possibility of a real boom and can use this interim period to draft a series of laws and set up oversight institutions that will be ready in good time.

These cases are obviously much like pre-oil Chad. What guarantees that the same scenario will not play out? The reply will be, as Gelb maintains, that Chad's mistake was to design over-restrictive mechanisms, whereas São Tomé is more focused on setting up control mechanisms enforced by its own civil society. Yet, the question inevitably arises as to whether there exists a civil society with interest groups that have enough power to effectively fulfil the role of "Checks and Balances" within the planned system with assistance from top experts and based on feedback from the best learning experiences.

This remark also holds true for the general principle of "Stabilisation Funds". They appear to be useful insofar as they allow for closer oversight for the use of a share of the rents by civil society, providing that the latter is organised and prepared to take risks to do so…

Malaysia, Indonesia and Chile are cited as examples of countries that have successfully diversified production, albeit in different ways, by using part of their resource windfall to finance or even subsidise diversification from the outset. In all

three cases, a positive factor seems to have been the existence of economic interest groups with no linkage to the rent-generating sector, and who have actively campaigned to avoid an excessive and cyclic current spending that produces macroeconomic effects detrimental to their interests. This is yet another example showing the importance of already existing interest groups that support more efficient management of rents given that they stand to benefit from it.

The final example of policy that the authors think is worth rolling out on a broader scale is the direct transfer of part of the rents to the population. Not in monetary form and not for everyone, as is the case of Canada, as this supposes a quality of governance that would make this type of system virtually unnecessary. It would rather take the form of monetary aid conditional, for example, on sending children to school or on behaviour aimed at generally increasing human capital. Here again, one can readily imagine that these systems are only feasible in a context with a minimum level of social capital if they are not to be immediately abused.

In all of these examples of countries that have partly or totally broken out of the vicious circles of the "natural resource curse", it is necessary to have a certain level of initial social and human capital in the form not only of a State that has a minimum degree of efficiency (for example, a dynamic and protected club of reforming bureaucrats) but also, and perhaps above all, a civil society sufficiently well organised to be able to keep a check and put pressure on the State. If these conditions are not united, our authors - in a concluding sentence that is somewhat pessimistic but has the merit of honesty - confess that they are unable see what can be done about it.

To round off, I shall attempt to take up this challenge by drawing on surveys that I carried out on the subject in four French-speaking African countries. The question thus becomes: can Official Development Assistance (ODA) and other incentive policies aimed at the governments of oil-rent countries help to create groups - or rather build them up given that embryonic ones always exist - that have an interest in supporting governance reforms, including of course within public administrations and even among political staff?

To trigger the build-up of initial social and human capital likely to enable an escape from the resource curse trap, the basic idea would be to generalise the notion of

public-private partnership, in which the public partner would contribute part of the funds and the private partner would provide the other part (which means that it would be more than just a service provider and thus have an interest in the operations' success) and, more importantly, its organisational and technical know-how. It would also mean extending this method to partnerships between donors and managers of ODA, on the one hand, and the public administration or directly the economic and social stakeholders of the country concerned, on the other hand, in order to jointly develop projects. The country would contribute a share of the finance, for example, out of a fund collecting part of the rents, while ODA would make up the rest and bring its organisational skills, on the basis of joint piloting with local managers - the last point being an essential one.

This is of course already current practice, but the co-financing and co-piloting of all forms of ODA need to be generalised. Support projects could range from infrastructure projects, should investing part of the rents in infrastructure seem an effective way of preparing for the future, through to projects for training, health care, the transfer of rents to citizens conditioned on improvements in human capital, microcredit, etc. All in all, the project areas matter little, since the primary objective is to build up a technically efficient bureaucracy and independent, mindful interest groups through project management processes. Once these have been formed, whether or not they become organised pressure groups to oversee and debate what the government is doing depends solely on factors within the country itself. Not much can be done from outside at this level.

The outside will nevertheless have helped to improve the conditions necessary for a constructive opposition to emerge in civil society. It gives a glimpse of a possible virtuous circle that could offer a way out of the resource curse trap. In fact, if a group that backs governance reform emerges, it will push for this type of project to be financed by an increasing amount of government funds compared to the share of foreign aid. ODA would then become more focused on knowledge transfer, thus increasing its leverage effect and extending its scope of application to best practices.

If this virtuous dynamic does not manage to get under way, then the only thing to be done is probably twofold. First, support as discreetly as possible and without jeopardising it, the emergence of a civil society capable of making constructive propositions, and secondly discuss with the Chinese government to convince it to

encourage Chinese companies to adopt practices compatible with good governance principles. Even though the Chinese government may first show itself to be primarily concerned with problems of raw materials supply, it may be possible to bring it to understand that better governed, resource-exporting African countries will before long constitute possible territories for the relocation of Chinese industries, when this becomes necessary. This will trigger a process of industrial development if not of all of Africa, at least initially of the coastal areas that will ultimately be beneficial to Chinese exports. It is of no advantage to China, or to Europe, for Africa to fall into the trap of the natural resource curse. The coordination of their public and private sector interventions should thus be integrated into bilateral negotiations between Europe and China and trilateral ones with the Americans.

Question/answer session with Alan Gelb "Confronting the Oil Curse"

Questions:

Pierre Ewenczyk (IMF) asked Alan Gelb about two recent developments. With the rise in oil prices, some African countries have set up reserve funds fed by oil revenues. Is it thus to be expected that these initiatives will mitigate the "curse" that usually results from exploiting natural resources? Due to the financial crisis, the yields from these funds have been severely impacted, so what can be recommended for these countries?

A second participant wondered what to think of the Extractive Industries Transparency Initiative (EITI)? Tony Blair's 2002 initiative is in fact on the verge of breaking down. Should it be revived? What lessons have been learnt from the case of Chad? Was there an error of judgement on the part of the World Bank?

Another possible way of managing oil resources has not been mentioned: non-extraction, as may be the case for the Scandinavian countries. The curse doubtless stems partly from demand-side pressures that push oil-producing countries into marketing their resource, but is this really always in their own interest?

Giovanni Andrea Cornia (Florence University) wondered whether the oil curse might not be attenuated if a country was rich not only in hydrocarbons but also in non-oil resources. In this respect, GDP growth is perhaps a less pertinent indicator than the

extent to which an economy is diversified (measured for instance as the value of oil exports out of a country's total wealth). When applied to Norway, this indicator is, in fact, not very high and may help explain why the country does not suffer from the oil curse.

Responses by Alan Gelb:

For Alan Gelb, although some countries have learnt from past excesses by setting up reserve funds, which shows they are now more prudent, this is not the case for all. Public spending programmes linked to this source of revenue need to be designed for the long-term, if they are to avoid running out of funds fast, as these reserves may well need to be used in the near future. Determining just how risky these funds' investments are and whether yields could become negative is an interesting question in the medium term.

The EITI is an example of a soft pressure initiative that reaches its limits when the price of oil is high. It is far from easy to exert moral pressure in this context given the competition on the international market. Concerning Chad, the agreement was certainly defective from the outset. High oil prices certainly increase the likelihood of armed conflict and the incentives to go back on agreed commitments are stronger. A more limited and flexible agreement would have doubtless been more effective.

Refraining from extracting oil resources is not a very popular solution. It may be a sound one at a global level from an environmental point of view, but not at the level of the individual interests of oil-producing countries.

The problems linked to oil resources emerge when there is no check or balance on the oil sector's economic powers within national political spheres. The example of Botswana is interesting in this respect: De Beers is not a "co-pilot" and has no power over the budget in Botswana. The real question is knowing to what extent stable political coalitions can be brought into being.

Relations do exist between oil companies and governments, but countries do not always manage to capture additional rents when prices rise. The main danger may stem

from a collusion between the government and the oil companies that is detrimental to the interests of citizens. It is in the light of this eventuality that the EITI takes on its full significance for example. Moreover, what must be emphasised is how diverse situations really are, as the companies concerned have a large variety of statuses (for instance, companies are sometimes State-owned).

As for the question of intergenerational equity, the concept of citizen ownership of rents does not seem to be clearly defined. Does this involve rents per capita of the country or of the producing regions? Who are the current generations and the future generations? There is no political process that enables these questions to be answered.

On the same theme, Pierre Noël Giraud recalled that small pro-reform groups are to be found in all the African countries at the level of both the State and civil society, and that it was up to the countries themselves to decide on how rents were to be used and shared between generations - with no need for prescriptions from the outside. As for the issues regarding global public goods, a discussion on financial incentives needs to be held with other countries, particularly those in the North. Concerning the question of China and African industrialisation, it seems clear that the next large industrialising wave of foreign direct investment will come from the emerging countries, including China and India, as they share a common interest with the Africans. The dynamism generated by this FDI is already fully operative in Vietnam and Cambodia. This does not mean that this FDI will suffice to trigger a fast pace of development, but it could be one of the driving forces.

Promoting Innovations

Inducing Innovation: Risk Instruments for Solving the Conundrum of Rural Finance

by
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Introduction

In the pastoral regions of northern Kenya, risk and missing rural financial markets conspire to create a poverty trap. As Lybbert, *et al.* (2004) show, households whose livestock holdings fall below a critical threshold level are unable to recover and rebuild their livelihoods, sinking into abject poverty. This poverty-trap dynamic creates a world in which shocks can have irreversible consequences and create an ever-growing number of indigent, food aid-dependent people.

Peru's north coast is a high-potential agricultural area, where the small farm beneficiaries of an earlier agrarian reform are the dominate feature of the rural landscape. And yet, a recent study of this region estimates that financial-market constraints may reduce small-farm productivity and agricultural GDP by as much as 25% (Boucher and Guirkinger, forthcoming).

While far apart from each other geographically, these two regions are linked by faulty or missing financial markets that compromise the ability of rural households to

productively use and accumulate assets. These distortions are costly to individuals and their economies, literally leaving potential and money on the table.

These observations of persistent, and costly, distortions contradict the claim of conventional economics that decentralized, private action coordinated by markets attains a social optimality in which economic potential is fully realized. Equally, these observations seemingly contradict the theory of induced innovation, which posits that economies autonomously adapt to increasing land (or other factor) scarcity through the creation of technologies that best use scarce factors and the innovation of institutions that provide the incentives needed to employ those technologies.[1]

Sub-Saharan Africa is the world region where induced innovation is most conspicuous by its absence. Despite growing land scarcity in many parts of the African continent, yields of cereal have been stagnant for nearly half a century (World Bank, 2007). Understanding the reasons behind this stagnation is obviously important. In the late 1980s (when the international development community was last paying careful attention to African agriculture) the so-called "Berg Report" (World Bank, 1981) largely placed the blame for this stagnation on destructive government policies that got prices wrong and destroyed incentives for innovation.

Since the Berg Report, Sub-Saharan Africa has seen significant economic liberalization and dismantling of the State marketing boards that were much criticized by Berg. In addition, there have been continuing efforts to hasten the development of the individualized property rights systems hypothesized by many to be a necessary condition for sustained agricultural investment and growth.[2] While it might be unfair to declare these measures a failure (the 2007 World Development cautiously opines that "stagnation in Sub-Saharan Africa may be over"), it is also clear that Africa is a long way

1 Hyami and Ruttan (1985) provide the classic statement of the induced innovation perspective. While they posit that innovation occurs in response to factor scarcity signals, they allow a role for public action in helping bring induced innovations to life, giving particular attention to public funding for research and development.

2 See, for instance, the many studies contained in Bruce and Migot-Adholla (1994), as well as the more recent World Bank policy research report on land policy (World Bank, 2003).

from the type of sustained agricultural technological change that ushered in sustained economic growth and poverty reduction in South and East Asia.[3]

This paper begins with the perspective that innovations in technologies and institutions are far from automatic responses to land scarcity and need. Less clear, however, is the appropriate public response to this failure of decentralized induced innovation. In other words, what needs to be done to induce innovation?

In crafting an answer to this question, this paper identifies risk as a fundamental culprit blocking innovation in many environments. Inducing innovation in these environments will require mechanisms to manage risk and crowd-in financial market development. Past experience makes clear that the public sector cannot simply fill the void left by missing and incomplete financial markets. Instead, this paper argues that the public sector and development assistance underwrite the fixed costs of innovation and provide the public goods needed to get novel, index insurance mechanisms designed, implemented and adopted.

The remainder of this paper is organized as follows: Section 1 explores how risk can knot up the development of rural financial markets, from both the supply and demand sides. Section 2 then explores the potential for index insurance, which removes systemic risk to untie this knot and crowd-in the deeper financial markets needed for sustained innovation and adoption of new technologies. Section 3 confronts a set of design and implementation issues that confront any effort to employ index insurance in a way that will solve the supply and demand side of the rural-finance problem. Finally, Section 4 concludes the paper with thoughts on the appropriate role for public action in this realm.

1. Risk, Displaced Distortions and Missing Financial Markets

The theory of induced innovation hyper-extends the standard neoclassical economic claim that the invisible hand of price-making markets will see to it that, in Adam Smith's language, the "private interests and passions of men (sic)" are led in the direction

3 The adequacy of liberalization and property rights reform has been explicitly questioned by Barrett and Carter (1999) and Platteau (1996).

"which is most agreeable to the interests of the whole society". However, just as we have learned that information costs can derail the efficacy of free markets and laissez faire policy,[4] so too they can disrupt the logic of induced innovation.

1.1 Missing insurance markets and displaced distortions

In a thought-provoking paper published some 20 years ago, Binswanger and Rosenzweig (1986) list the structural characteristics of low-income agriculture that make likely the failure of markets and lack of induced institutional innovation. Among these characteristics, two are especially important for our discussion:

- Costs of information acquisition and transmission are especially high in rural areas because of the spatial dispersion of the production process;
- Agricultural processes are subject to multiple sources of risk, and much of that risk (*e.g.*, yield risk) is covariate across individuals within a given geographic area because of common exposure to weather and disease shocks.

One consequence of these characteristics is that agricultural insurance markets will fail to develop, despite individuals' intense demand for insurance.

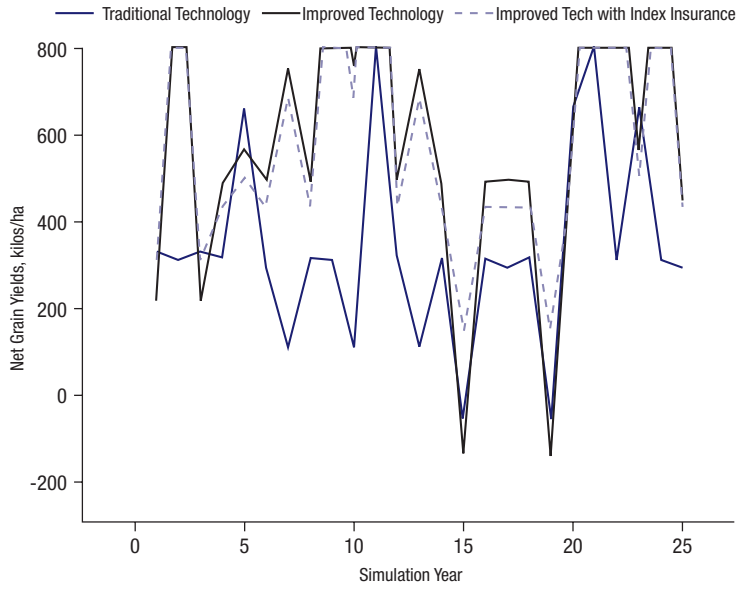
The absence of insurance can be very costly to rural households, leading them to forego economic opportunities that offer the prospect of significant income improvement. For example, a study of smallholder participants in an agro-export boom sector in Guatemala found that smallholders who failed to fully adopt highly profitable opportunities due to financial market constraints were paying implicit insurance premiums equivalent to 50% of their income (von Braun, Hotchkiss and Immink, 1989). This kind of behavior is called income smoothing as farmers forego technologies that would increase expected or average income in favor of safer technologies that offer lower average

4 As Carter (1997) discusses, a series of contributions launched in the 1950s scrutinized in detail the conditions under which the Smithian bundle of individual self-interest and social optimality holds together. The work of Arrow and Debreu (1954) was particularly important in this respect, establishing that the competitive market economy achieves Smithian social optimality (only) if there are full and complete price-rationed markets for all commodities, including markets for future, and possibly contingent, commodity transactions. While often seen as the paradigmatic embodiment of the liberal faith in the social efficacy of unencumbered markets, the Arrow-Debreu results can be viewed as a glass half-full, or half-empty — that is, the apotheosis of Smithian liberalism, or its unraveling. What Carter calls post-Arrow-Debreu economics (for example the work of Joseph Stiglitz) has analyzed the ways in which information costs lead to intrinsic market failures and a world in which there is an important space for public intervention in the market economy.

returns but also avoid the sharp declines in bad years that would threaten household subsistence needs. Over time, the safer technology would generate a smoother income profile (with lower peaks and shallower valleys).

The simulation results reported in Figure 1 illustrate the basic problem that generates income smoothing behavior. The figure was generated using data from field trials of a new technological package developed by the Collaborative Crop Research Program (2008) for millet producers in West Africa. Compared to the traditional technology, the new CCRP technology offers higher yields (629 net kilos of grain per hectare versus 350 for the traditional activity) and indeed offers more millet most (but not all) of the time. To illustrate the farmer's dilemma in choosing whether to adopt a new technology in the absence of insurance, we created two 25-year histories for a farmer by randomly sampling from the net returns generated by the CCRP field trails. One history (the solid line in Figure 1) shows the sequence of net grain yields under the traditional technology. The dashed line shows the sequence under the improved technology.

Figure 1.
Index Insurance & Technology Adoption



Source: CCRP Report, (2008).

Two observations follow from the inspection of Figure 1. First, it is not obvious that a farmer vulnerable to a subsistence crisis would necessarily choose the improved over the traditional technologies. In 7 of the 25 years, the farmer would be significantly better off with the traditional technologies (by approximately 100 kg of grain per hectare). While farmers of course deal with the vagaries of nature through grain storage, livestock accumulation and mutual informal insurance, these mechanisms can be costly, imperfect and liable to breakdown in the face of repeated poor years (or when bad outcomes are highly correlated across households, as they would be in a drought year). It is thus an open question as to which of the two income streams the farmer might prefer. Using the language of Barrett (2006), the behavior of a farmer who chose the safer technology might be described as a "displaced distortion" in the sense that the underlying problem is the missing insurance market that spills over and misshapes behavior in other realms.

In addition to its effects on how individuals use the productive assets that they have, uninsured risk can also distort the savings and accumulation behavior. If the first type of distortion makes people poor, this second type keeps them poor over time. Carter, Barrett and Ikegami (2008) analyze in detail the impact of risk on accumulation incentives in a poverty trap model. They show that exposure to risk and shocks plays especially pernicious roles when poverty traps exist. *Ex post*, realized shocks can have irreversible consequences for agents who are pushed below the critical asset threshold from which recovery is not possible. In addition, the *ex ante* anticipation of shocks shifts out the endogenous threshold, making escape from poverty less likely as agents become less willing to sacrifice current consumption to accumulate risky assets. In this environment, policies that compensate individuals for the effects of realized shocks or insure them against future losses can crowd-in investment and have a major effect on the incidence of chronic poverty. The challenge is how to deliver such insurance and make it credible.

1.2 Tying the Gordian Knot: uninsured risk and rural credit markets

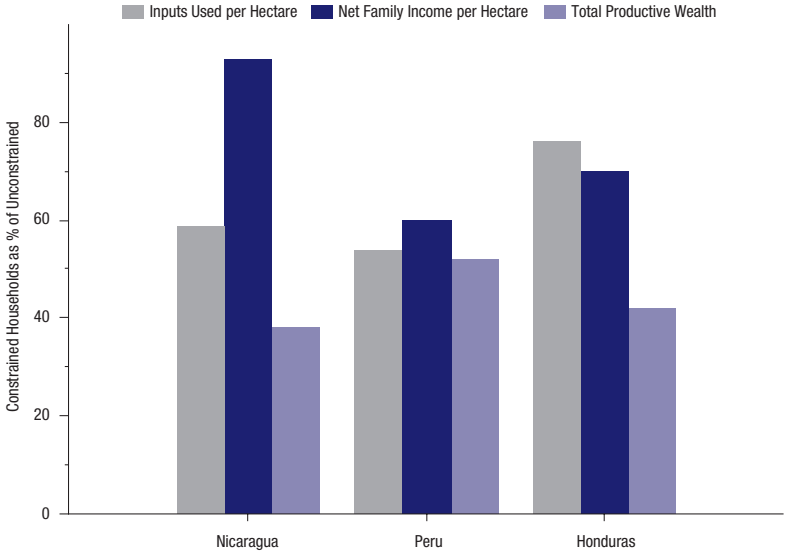
As discussed in the prior section, uninsured risk can directly distort economic decisions on the use and accumulation of assets. In addition, risk can undercut the development of rural financial intermediation and credit institutions, creating a second round of indirect effects of risk on innovation. This section explores how risk and

information costs knot up the development of rural credit markets from both the demand and supply sides.

Going back at least to the seminal contribution of Stiglitz and Weiss (1986), the credit market has been one venue in which the impact of asymmetric information has been extensively studied. A key insight from this literature is that asymmetric information can result in quantity rationing in loan markets, meaning that some individuals are unable to secure desired loans at the market rate of interest. In conventional, price-rationed markets, such excess demand would provoke an increase in price (the interest rate) until supply and demand ere equated. Stiglitz and Weiss show that lenders may find it profit-maximizing to keep the price of their product low even in the face of excess demand. The economic impact is that some farms and businesses will face credit constraints and become unable to adopt profitable, income improving technologies.

Figure 2, taken from material prepared for the recent *World Development Report on Agriculture*, illustrates the ubiquity of constrained access to capital in three recent

Figure 2.
Incidence & Cost of Credit Constraints



Source: Boucher, Carter and Guirkinger, (2008).

surveys of agricultural producers in Latin America. The constrained constitute some 40% of all producers. Constrained producers on average use only 50% to 75% of the purchased inputs of unconstrained producers and enjoy net incomes (returns to land and family labor) that are between 60% and 90% of the level of unconstrained farm households. As mentioned in the introduction to this paper, a recent econometric analysis of the data from Peru estimates that total agricultural output would be 25% higher in the region studied if all these credit constraints were eliminated (Boucher and Guirkinger, 2006).

Financial constraints are not only costly; they tend to be biased against lower wealth households. Figure 2 shows that the constrained farm households have wealth levels that average 50% or less of the wealth levels of unconstrained households. This pattern not only means that benefits from agricultural growth are less equally distributed then they might be, it also means that smallholders are less able to compete for access to land, through either rental or purchase markets.

The root of the problem here is that especially formal lenders will tend to offer only a limited menu of contracts, restricted to those who have met heavy collateral requirements.[5] In the first instance, this truncation of the contract menu may result in wealth-biased quantity rationing, seen in Figure 1. Second, the truncation of the contractual menu results in what recent theoretical work calls risk rationing, meaning that individuals turn down available contracts for which they qualify because they are unwilling to bear the risk of a collateral loss (Boucher, Carter and Guirkinger, 2008).

In the Nicaraguan and Honduran studies illustrated in Figure 2, 20% and 40% of credit-constrained borrowers are risk-rationed.[6] In the case of Peru, where panel data are available, the fraction of constrained borrowers who were risk-rationed rose from

5 Note that for a given default risk, a lender should be willing to tradeoff between the interest rate on a loan and the collateral required. In the presence of asymmetric information, lenders will prefer relatively low interest rate contracts with high collateral requirements, as the collateral serves to reduce moral hazard and the probability of default.

6 Eliciting information on credit constraints is difficult (see Boucher, *et al.*, forthcoming). In the course of carrying out the research on the prevalence of quantity rationing, we discovered a not insignificant number of small farmers who report having access to a loan contract, but who choose not to accept the loan contract for fear of losing the collateral assets required by the contract. Typically, such farmers reported an unwillingness to risk land loss that would threaten their future livelihood and that of their children, who would also depend on that land.

20% to 50% between 1998 and 2003 (with the overall fraction of constrained households dropping form 56% to 43%). In all three countries, risk-rationed producers behave almost identically to quantity-rationed households, using fewer inputs and pursuing less remunerative income generating strategies.

Risk rationing thus illustrates the way in which uninsured risk spills over from the demand side and hampers the development of effective financial intermediation. Risk can also thwart the development of credit markets from the supply side. From a lender's perspective, agricultural loans are problematic because an important component of the risk faced by farmers is correlated, meaning that if one farmer is having trouble repaying a loan because of drought or other climatic reasons, it is highly likely that other farmers will be facing the same problem.

A loan portfolio with too many agricultural loans will thus be unstable in the face of correlated risk.[7] A sufficiently large financial institution can potential diversify its loan portfolio against correlated agricultural risk. Such risk is more problematic for many microfinance lenders that are smaller scale and locally based institutions. This observation is especially true for microfinance lenders that utilize borrower groups whose members are jointly liable for each others' loan repayment. Uninsured, correlated risk would thus seem to explain the limited impact of the microfinance revolution on small-scale agriculture.

In addition to its direct effect on lender willingness to carry a portfolio of agricultural loans, uninsured correlated risk also has an indirect, political-economy effect on rural financial markets. In the wake of the 1998 El Nino climate shock, indebted farmers in Peru pressed the government for relief, arguing that their inability to repay was obviously not their fault. The resulting *Rescate Financiera* (Financial Rescue) mandated lenders to forgive agricultural loans.

Not surprisingly, lenders were not too happy with this rescue plan and reacted to it by further restricting the amount of their loan portfolio that they would place in agricultural projects. In a recent study, Tarazona and Trivelli (2005) interviewed all

7 Binswanger and Rosenzweig (1987) make a similar argument, noting that financial intermediaries that both drew deposits from, and made loans to, agricultural households would have severe stability in drought and other years of covariate shocks.

institutional agricultural lenders in Peru's north-coast department of Piura. All reported severe portfolio restrictions on agricultural lending of because of fears of climatic and political risk. The largest regional financial institution indicated that they would put no more than 3% of their loan portfolio in agriculture. To put this figure in perspective, Piura has an agriculturally dependent economy, with close to 50% of its regional GDP coming from agriculture.

In summary, the particular features of the agricultural economy — information costs and correlated risk — militate against the development of deep and effective financial markets. This failure of induced innovation is especially costly for smallholder farmers who are likely most averse to risk and least able to exploit outside financial options. It is little wonder that technological change has been hard to sustain in rain-fed areas of Africa, where smallholders predominate. In this context, it may seem that direct public provision of credit may be the best solution. Unfortunately, the prior dismal record of public agricultural banks suggest otherwise. What then is the best way to untie the Gordian Knot that holds down the development of rural, and especially agricultural financial markets?

2. Inducing Innovation and Crowding-in Market Development: The Index Insurance Hypothesis

There is a long history of direct government intervention in rural financial markets, and an equally long history of problematic and unsustainable programs. The basic reason for these policy failures is the simple one that the same constraints of risk and asymmetric information that inhibit the development of private financial markets also confront public efforts to substitute for private action.

While recognition of the endogeneity of market failure warns against facile intervention, it also suggests a possible solution. In particular, were it possible to design a mechanism to independently insure and remove significant correlated risk from the agricultural economy, then we could expect to be able to untie the Gordian Knot of agricultural financial markets:

1. Relax the direct supply-side constraints;

2. Undercut the rationale for the destructive political economic cycle of disasters and financial rescues, further enhancing credit supply from the supply side;

3. Eliminate risk-rationing and crowd-in credit demand, if the insured covariant layer of risk were sufficiently important to small holders; and

4. Induce technology adoption and more effective portfolio and savings strategies by individuals.

Unfortunately, conventional insurance contracts, in which indemnity payments are based on the losses experienced by an individual, are unlikely to be sustainable nor can they be provided by the market in smallholder agricultural sectors. Besides the simple transaction-costs issue, moral hazard problems are severe with conventional agricultural insurance, since impossible-to-monitor actions by the insured can increase the probability of crop failure and insurance payouts.

2.1 Index insurance basics

In contrast to conventional insurance contracts with individual loss and indemnities, index or parametric insurance contracts stand out as an innovative financial instrument that can potentially be sustainably offered for smallholder agriculture. The idea of index insurance is straightforward. Payouts are based not on individual outcomes, but on an aggregate index that is correlated with those outcomes. Because this correlation is likely to be imperfect, index insurance will cover only a fraction of the risk that the producer faces.

The uncovered risk is referred to as basis risk. Using a data source that is promptly, reliably and inexpensively available (and not able to be manipulated by either the insurer or the insured), the program makes the agreed indemnity compensation payment to insured beneficiaries whenever the data source indicates that the variable level reaches the strike point, or insurance activation level. For agricultural contracts, indexes can be based on measures of average-area yields (*e.g.*, yields for a valley or other region), rainfall or other climatic information and satellite information on ground cover. For livestock, possible indices include those based on average mortality measures, forage availability measures, and again, satellite measures of vegetative cover.

An advantage of index insurance is that it preserves effort incentives for producers, as no individual farmer can influence the probability of an insurance payoff (*i.e.*, no problems with moral hazard). Index insurance is also unaffected by the fact that only the most risky clients will seek out the product, because payouts do not depend on the personal characteristics of those who actually purchase the insurance (*i.e.*, no problems of adverse selection).

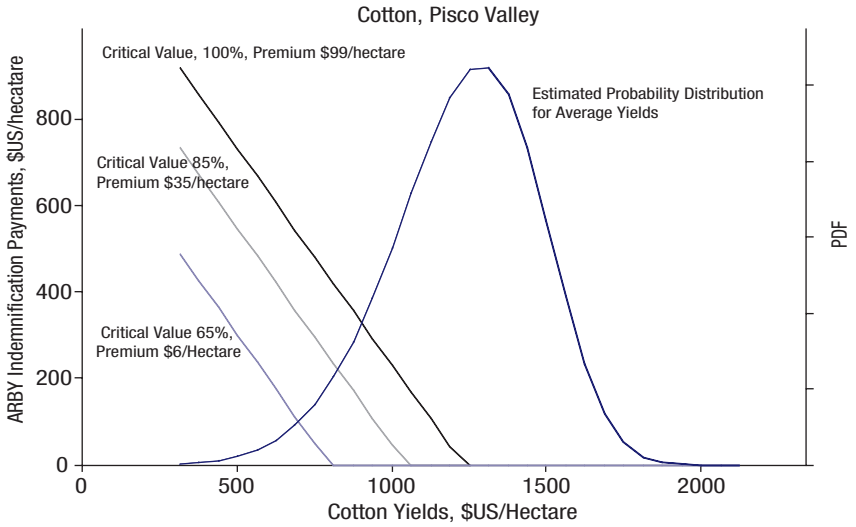
Figure 3 illustrates an index insurance contract for a recently implemented pilot project for cotton farmers in the Pisco Valley in Peru (see Carter, Boucher and Trivelli, 2007). The solid orange curve shows the estimated probability function for average cotton yields in Pisco. Under this distribution, long-term expected yields are $1230/hectare (or 1968 kilos/hectare). Indemnity payments to farmers are triggered when average valley yields fall below a critical value (or strike point). Figure 3 graphs indemnity payments as a function of realized average yields for a three alternative index insurance contracts: one with a strike point at 100% of long-term yields; a second with a strike point at 85% of long-term average yields; and a third contract with the strike point set at 65% of long-term yields. Note that lower strike points make indemnity payouts less likely. They also make the amount of the payout lower for any realized yield level.

Included in Figure 3 are the actuarially fair premiums that would be required for each variant of the index insurance contract. The actuarially fair premium is simply the premium that equals the expected indemnity payment. Note that this premium does not cover the administrative, marketing or other costs of providing the insurance. As can be seen, with the insurance strike point set at 100% of long-term average yields, the ARBY insurance would cost $99/hectare. The 85% strike point insurance would cost $35/hectare and the 65% insurance would cost only $6/hectare. While these latter two forms of insurance are less expensive, they of course also protect the farmer against fewer risks.

As can be seen from Figure 3, there is almost no probability that average yields in Pisco will fall below about $300/hectare (which corresponds to a physical yield of 500 kilos/hectare). At this extremely low and unlikely outcome, payments under the 100% strike point would be $918/hectare. Under the 85% and 65% strike points, these maximum conceivable payments would respectively be $733 and $487 per-hectare.

To put these numbers in context, the lowest registered average yields in Pisco since 1986 were 950 kilos/hectare (or $620/hectare) in 1992. Similar, but slightly higher yields were recorded following the most recent El Nino year (1998).

Figure 3.
Alternative Area Based Yield Insurance Contracts



Source: Carter, Boucher and Trivelli, (2007).

2.2 The supply- and demand-side effects of index insurance

The appeal of an index insurance contract should be substantial for existing (and potential) rural lenders, as such insurance removes most of the covariant risk that makes agricultural lending problematic for financial intermediaries. For the Lambeyeque Valley in Peru, a simulation analysis of weather and area-yield contracts by Carter, Galarza and Boucher (2007) shows that a lender's default risk for an insured loan portfolio should drop to negligible levels. Consistent with this analytical result, the rural lender affiliated with the Pisco Valley cotton project offers 10% interest-rate discounts for borrowers who purchase the index insurance contract.[8] It remains to be seen if the existing

8 The lender typically charges clients 3.25% interest per month and will reduce that charge to 3% per month when insurance is purchased.

lenders will expand their agricultural portfolio as insurance uptake increases and/or if new lenders will enter the market.

From the borrower or individual-farmer perspective, much depends on the degree to which the index insurance contract is able to cover the farmer's risks. The green dot-dash line in Figure 1 above shows the results from a rough simulation of an area-yield contract for West African millet producers, assuming an 80% strike point and that producers pay an actuarially fair premium for the insurance.[9]

As can be seen, while the improved technology developed by the CCRP failed to outperform the traditional technology in 7 out of the 25 years of the simulation, the improved technology with an index insurance contract outperforms the traditional technology in all but one year. Under modest assumptions about the nature of farmers' risk aversion, it can be shown that the improved technology with index insurance is strongly preferable to either the traditional or improved technologies by themselves.

These results open up the exciting prospect that matching innovations of agricultural technologies with financial innovations will open the door to the kind of sustained adoption needed to boost agricultural productivity growth in Africa. Our research group is currently at work on a plan to implement and monitor the impact of technology-matching activity (see Carter and Laaja, 2008). Similar efforts are underway to see if the provision of index-based livestock insurance to Kenyan pastoralists will crowd-in more effective accumulation strategies and help to break down the destructive poverty trap dynamics described earlier (see Barrett, Carter and Mude, 2008).

3. Challenges to Workable and Effective Index Insurance

While index insurance has tremendous potential to untie the knot of risk and rural financial markets, it must surmount two key challenges if it is to realize these hypothesized benefits. The first is the challenge of designing a product that minimizes the basis risk faced by those who might purchase the insurance. The second is finding

9 The simulation is based on results in Carter (1996) on the relative magnitudes of covariant and idiosyncratic risks.

a way to make index insurance comprehensible for individuals who have never had any type of insurance, much less a complex, index insurance contract.

3.1 Designing index insurance to minimize "basis risk"

Data concerns are often central in efforts to create index insurance plans. Quality historical data are needed to price the insurance contract, and future collection of the data need to be beyond manipulation by any of the interested parties. For these reasons, weather-based indexes are prime candidates for insurance contracts of this sort.

While these data issues are important, the hypothesis that index insurance will induce innovation requires that both the supply and demand sides of the market find the insurance valuable. Weather indexes, for example, may leave farmers with significantly larger basis risk than area-yield indexes.[10] Area-yield indexes are in turn more complicated to measure and more subject to manipulation.

Relying on micro farm-level data, Carter, Galarza and Boucher (2007) were able to estimate the severity of basis risk under both weather index insurance and area-yield insurance. In the particular case they analyze, they find that basis risk under the weather index is so large that a typically risk-averse farmer would be unwilling to buy the insurance if it were marked up by 30% or more to cover costs of delivery, administration, etc. Put differently, an area-yield index insurance offers a better match to farmer goals and livelihood needs. Insurance that fails to meet those needs is unlikely to be purchased, much less be able to reduce risk rationing and crowd-in new investment.

3.2 Making index insurance comprehensible to the never-before-insured

Insurance is an unusual commodity; we buy it and hope to get nothing in return. Index insurance, with its problem of basis risk, is even more complicated than standard insurance. Unless households really understand index insurance, demand for it will be

10 Note that weather is only an imperfect predictor of average yields which are in turn only an imperfect predictor of individual yield outcomes.

low and the expected behavioral responses (by households and financial markets) will not take place. The mixed success of recent efforts to implement index insurance products in low-income agricultural settings makes clear that we need to devise methods to ensure an informed clientele for the product.

One approach to solving this problem of understanding is to employ simulation games that mimic index insurance contracts. In the case of the Peruvian cotton-insurance project described above, a game was devised in which a poker chip drawn randomly from a bag represented average yields for a group of players, and different color balls drawn from a different sack created idiosyncratic variation around that average mean (each player independently drew their own ball). The probability of drawing different outcomes was carefully calibrated on the actual data. Payoffs (in game currency) were in turn set to match actual prices, costs and returns for a typical small farmer. Players played long sequences of game years to learn about the probability structure and how insurance works.[11]

After learning the game mechanics, farmers played a sequence of years in which they had to choose between an uninsured, loan-financed, high-return activity and a traditional, low-risk fallback activity. Farmers were then allowed to replay their lives, but in the replay they could choose to purchase an insurance contract to insure the high-return activity. Duplicating the actual contract currently available for purchase, insurance in the game was priced at approximately 30% above the actuarially fair price.

While analysis of the game data and information on the effectiveness of the game as a learning device is still underway, several results stand out. First, approximately 60% of farmers purchased the insurance (and chose the high-return activity). In addition, roughly 25% of participants revealed themselves to be risk-rationed, turning down the loan contract and the high-return activity when insurance was not available. When

11 A second critical design issue with insurance contracts concerns how to capture inter-temporal incentives for insurance. Peruvian cotton farmers risk losing their land and future credit-market access if they are unable to repay loans in any given year. A potentially important advantage of insurance is not only that it insulates current income from shocks, but also that it protects individuals against these inter-temporal, or future-period, penalties. In the Peru game, if a farmer in any year was unable to repay a loan, then in all future game years he/she would be excluded from the credit market and could only employ the low-return strategy. In addition, farmers were paid the value of their land at the end of the game. Farmers who had defaulted during the game were given a lower per hectare payment for their land.

insurance was made available in subsequent rounds of the game, roughly half of the risk-rationed farmers took the loan and the insurance, and they began to undertake the high-return activity.

While these results are provocative, the real test will occur over the next few months as the research explores whether those who played the game are more likely to actually purchase the insurance. Should the game prove effective in establishing knowledge and confidence in insurance, then the next challenge will be to learn how to spread learning from game participants to non-participants.

4. Inducing Innovation: What are the Next Steps?

While increasing resource scarcity provides powerful incentives to economize and use resources more productively, actually existing market economies are filled with examples of intrinsic market failures that lead to outcomes that are "not always most agreeable to the interests of the whole society" (to misquote Adam Smith). This paper has argued that risk and information costs have knotted up the development of the rural financial markets needed to assure effective resource use, productivity growth and poverty reduction in rain-fed, smallholder agricultural economies.

As is always the case with intrinsic market failures, the question is what, if anything, can be done to improve the situation. This paper has argued that a new class of index insurance mechanisms holds the promise of removing sufficient risk from the rural economy so that it will induce the innovation of deeper rural financial markets, from both the demand and the supply sides. While such insurance can, in principal, be sold and reinsured by private actors, there are several barriers that stand in the way and merit redress by governments and the development assistance community. The first is the reliable information needed to establish and implement index insurance programs. Information on regional crop yields that would allow the creation of area-yield insurance is in principal a public good, and yet it is one in very scarce supply.

A second problem is that many of the potential beneficiaries of index insurance find themselves in precarious circumstances that make it unlikely that they can afford market-based premiums. If the theoretically grounded hypothesis is correct that reliable

insurance will crowd-in accumulation and growth, then a serious public policy case can be made for smart insurance subsidies, especially in comparison to the cost of letting poverty-trap dynamics drive an ever-larger number of vulnerable people into a condition of food-aid dependence.[12]

In the end, there is much still to learn about the feasibility, intelligibility and impact of index insurance. But perhaps the biggest challenge is to find out if new financial instruments can indeed induce innovation and solve the conundrum of rural finance.

12 A new cash transfer program in northern Kenya plans to transfer roughly $15 per month to indigent families. Insurance subsidies for the livestock of their slightly-better-off but vulnerable neighbors is estimated to cost $15 per-year (see Carter, Barrett and Mude, 2008).

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Comment

by
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Many rural areas with low per capita income and scarce resources are now facing a classic Malthusian problem characterised by population growth and rising food requirements, especially the demand from the middle classes for meat products. In this context, local food supply is not increasing fast enough to meet these needs, and part of the farming population does not even produce enough food to ensure its own subsistence.

The result is a growing risk of food scarcity. While a Malthusian analytical perspective is well fitted to the situation in Sub-Saharan Africa, a "Ricardian" analysis would seem to have greater pertinence: the most accessible resources have already been depleted by local populations and access to new resources is growing more and more costly. Moreover, new spaces and resources are less "hospitable", offering lower productive capacity.

Africa as a whole is thus experiencing a unique situation: for the last thirty years, food production and population have been growing at about the same rate. Food insecurity is consequently a persistent phenomenon and there is constant tension between supply and demand. This has several root causes. First, available agricultural land is scarce due to demographic pressure, even if the problem is somewhat attenuated by migration to less populated areas. Water resources in the region are also insufficient and soils have poor fertility. In addition, technological progress is moving forward at a slow pace, which hampers improvements in productivity.

Similar situations have frequently occurred during our planet's history, and the way-out of such Malthusian dead-ends has been through either migration or the introduction of new technology to increase per hectare yields. Technological innovation has thus helped prove that the Malthusian or Ricardian vision of agricultural and food history is unsound.

So, given that pathways out of the "Malthusian trap" exist, why has Africa not taken them? Farming technologies that increase productivity per hectare have long been available. For several decades now, since the 1960s, development projects have provided funding and helped bring into being institutions that offer a way-out via productivity gains. Why, then, is the supply side of agriculture in a state of stagnation?

The regions in which this situation persists are often suffering from structural problems, such as a frequent disconnect between urban demand and rural supply. This stems from the persistence of farming for self-sufficiency in the hinterland areas, whereas what is needed is a rural surplus to provide as much food as possible for the urban zones (unless local ecology does not permit this). As a result, elasticity of the rural supply with respect to agricultural prices in the hinterlands remains low. The markets are also highly imperfect, with trades oligopolies, limited bargaining power for producers, little transparency regarding food prices, and no real credit or insurance mechanisms. The insufficient levels of local supply mean that food has to be imported to meet urban food requirements. Import of food products has gradually become a systematic practice and is partly responsible for keeping domestic prices down to a level that provides little incentive for local producers. A vicious circle thus sets in, creating what could be termed "a technical stagnation trap" that is likely to fuel Malthusian-like situations.

On top of this, for some twenty years, there have been no agricultural policies designed to kick-start productivity, and continue on from the structural adjustment policies. At the same time, African governments do not as a rule consider their traditional agricultural sectors as a source of productivity, but rather as a technologically backward sector. For all these reasons, therefore, the advent of deep technological change is unlikely to happen soon.

Yet within the African countries concerned, one finds a great diversity of situations. In the poor zones of North Arica and the Middle East, family farms are characterised

by modest areas of farmland per smallholding, a relatively large work force to hand, which is sometimes in line for emigration, and a relatively low level of technology. This type of farm cannot spontaneously generate a dynamic leading to higher productivity and thus remains locked in the trap of technical stagnation. In regions where family farms are more developed, the situation is somewhat better. These farms generally use more conventional technology, which nonetheless relies on sizeable quantities of energy and inputs (mainly fertilisers) and thus incurs production costs that increase with energy prices. However, production methods are such that if fertiliser use is reduced, soil fertility is not naturally renewed, which then results in the gradual depletion of natural capital. Moreover, in many regions in Africa, climatic variations more or less directly engender high risks with extreme price fluctuations. High prices, due to scarcity, should in theory benefit the agricultural producers, but this is not the case, as the producers themselves are affected by low productivity and obliged to purchase extra food supplies. Conversely, during periods of plenty, prices are low and the producers then have to sell much of what they produce in order to meet their monetised obligations (taxes, etc.). Given the lack of rural financial markets, climatic shocks can only be absorbed by farm income. Michael Carter's proposal in this respect is very salient.

The overall challenge is thus how to initiate a process that can both increase productivity with regard to food and labour, and encourage the towns to procure a greater share of their food supplies from their hinterlands. Clearly, improvements are required in two areas: access to technology and the functioning of markets.

On the technological side, a possible line of action would be to promote a form of "ecology-intensive" agriculture that is affordable both in terms of investment and operation. This type of farming necessarily implies unconventional technology that uses little or no fossil energy (preferably biofuels) or animal traction power, no-till (or light surface tilling) techniques, with soil fertility being ensured primarily though biomass recycling to improve the conservation of rainwater in the soil, and the use of an integrated crop-protection strategy. In many cases, there is also a need to rehabilitate "ecological infrastructure", as for example undertaking structural work on catchment areas in order to conserve water and limit erosion or preventing the degradation of ecosystems. This recapitalisation will become increasingly indispensible and implies changing our perspective: degradation must be turned into "aggradation".

Regarding conditions related to markets, it is vital to do away with policies that are detrimental to agricultural development. If world prices remain low, it would be necessary to bring into play the leeway of protection provided for by the Marrakech Agreements. To be effective, this protection would need to be accompanied by measures for stimulating production. On the other hand, if world prices remain higher than over the last ten years, there would be a need to design policies to support agricultural prices so as to promote risk-taking and investment. Such policies could incorporate measures to avoid imports that would adversely impact the economic take-off of the agricultural sector, accompany eventual food price increases with aid programmes for the poorest populations, take advantage of higher prices to develop credit and insurance mechanisms, and consolidate market infrastructure. On this point, I entirely agree with Michael Carter.

There will most likely be no agricultural development in these regions without voluntarist and sustainable public policies. My comments, as you have doubtless gathered, are designed to advocate the creation of normal market mechanisms, favourable to poor farmers - who are in the vast majority - the objective being to break out of a Malthusian dead-end, which is a legacy of history that must be fought against.

Comment

by
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Introduction

The paper seeks to explain why poorly developed rural financial markets tend to constrain the accumulation and investment needed for agricultural productivity growth in small economies dominated by smallholder agriculture. The study on which the paper is based evaluates what needs to be done in order to induce innovation in the presence of market failures, and then it explores how risk can hinder the development of rural financial markets from both the supply and demand sides.

The author believes strongly that inducing innovation in agricultural economies requires mechanisms to manage risk as a way of stimulating financial-market development. While indicating a significant role for the State in addressing the problem caused by missing and incomplete financial markets, the author acknowledges that the problem cannot be addressed by the public sector alone. His proposal is that the public sector, supported by development assistance, should underwrite the fixed costs of innovation and provide the public goods needed for innovation to take place. The paper essentially introduces the design of index insurance to solve the rural-finance problem.

The role of risk

The paper starts from the position that "innovation of technologies and institutions are far from automatic responses to land scarcity and need". Granted that the responses may not be automatic or immediate, but is not innovation, by definition, societies' response to problems or crisis?

The paper identifies risk as “a fundamental culprit blocking innovation in many environments”. Is the real question then why societies facing all the risks that are very well-known and mentioned in the paper are not able to respond appropriately by developing the technologies and institutions for mitigating those risks? So, for example, if drought is, and has always been, a major risk, why have societies not developed sustainable appropriate irrigation technologies or other water harnessing techniques? It is in knowing what stops/prevents societies from innovative responses to risk that one can begin to address the issues.

Indeed, while risk is at the centre of the poor development of agriculture, and therefore has to be minimized by all means, it is difficult to argue that it “blocks” innovation in agriculture. Agriculture is without doubt central to rural development and rural poverty reduction. Farming has a high potential to create jobs, to increase returns to the assets that the poor possess - their labor, and in some cases their land. The factors that account for low agricultural productivity center around risk. But societies and States have not developed the structures, including technology and institutions, for reducing the different types of risk that farmers face.

There is a danger that if one separates the development of technology from the actual production processes one might be tempted to see the actors as unrelated; but that relationship has always been crucial to the development of technology and the introduction of innovation. So, inducing innovation requires much more than managing risks and crowding-in financial market development. It calls for the availability of an incentive structure that rewards risk-taking and innovativeness in the face of risks. The different types of risk remain pervasive in poor societies because they have not developed the institutions that create the incentive structures.

Institutions

If the financial structures in poor countries are not appropriate for dealing with the systemic and idiosyncratic risks of smallholder farmers, it is simply a result of the fact that those communities have not been involved in the process of developing the institutions that manage the risks associated with borrowing and lending.

In early post-independence Africa, governments set up their own commercial and development banks to grapple with the problem of agricultural and rural finance. As clearly indicated in this paper, this has turned out to be very problematic in many areas. This was so because the banks simply used financial instruments and management practices that were not adequately embedded in local cultures and practices. Traditional attitudes to borrowing and saving, as often reflected by what we generally know as the informal financial sector, were often ignored. It was clearly unthinkable that in communities where all other economic transactions were informally done, they could subject only their financial transactions to formal rules and regulations. Could a mixture of formality and informality have eased these communities more easily into a new relationship with finance and financial institutions?

In the last two decades, with financial sector reforms and the introduction of liberal market principles into banking all over Africa, the engagement with agricultural finance has been unstructured and sporadic in many places. Even though the author of this paper mentions the difficult role that microfinance institutions (MFIs) have sought to play in this regard, there is very little evidence of widespread involvement of MFIs in agricultural and rural finance.

There is indeed clear evidence of considerable risk rationing as the author points out, which effectively hits all participants in the market from both the demand and supply sides. The State's reduced involvement in the delivery of financial services effectively means that there are no institutions for mitigating risk in the rural economy. In this new environment, one often hears such refrains as "the poor can pay", with obvious reference to rapidly rising interest rates charged by both banks and MFIs. Unfortunately, there are hardly any studies that show that the poor can indeed pay high interest rates without any effects on their production.

Economic environment

The absence of innovation in smallholder agriculture is reflected in several dimensions. Until the recent food price rises, the prices of most agricultural commodities had been falling on the world markets. While better opportunities for green revolution packages of improved seeds and fertilizer appear to have been taken up, there have

been doubts about the extent to which new research has led to significant technology adoption by smallholder farmers in poor communities.

Soil fertility has been lost in many places; water tables have been falling very fast; and adverse weather conditions, usually associated with climate change, now pose a growing threat to agriculture for development. Moreover, many parts of Africa face significant effects from the growing HIV/AIDS menace with implications for agricultural development in these countries. How far these developments hinder innovation and agricultural development varies by context. A contemporary agenda to deal with the problem of lack of innovation and low productivity would need to have the following as central elements:

Getting the basics in place - these include ensuring that the macro economy is stable, and that public goods - rural roads, rural education and health care, agricultural research and extension - are provided by the State.

The basics also include good governance for agricultural and rural development, ensuring the rule of law and protection of property rights in the countryside; providing opportunities for resolving disputes, especially over land; and making any public interventions in food and credit markets as transparent and predictable as possible.

It is my view that pursuing this broader agenda will have to take into account the broader socio-cultural context. Which local institutions can best be integrated into modern institution-building in order to be accommodated easily within local communities?

Index insurance

The main message from the analysis in this paper is that insurance is very crucial for rural households, particularly the poor, but farm communities in many developing countries face enormous difficulty when trying to insure income against price and weather fluctuations. Risk and limited, or high, information costs combine to derail the development of rural credit markets from both the demand and supply sides.

Consequently, poor farm households often find themselves trapped in poverty, unable to take advantage of imminent profitable opportunities. This is indeed true.

Section 2 of the paper introduces the idea that in the presence of market failure one can make a case for public involvement in the provision of credit. The author, however, quickly points out that there are several examples of government failures as well. In the author's analysis, index insurance products, as opposed to conventional contracts in which indemnity payments are based on individual losses, hold a lot of promise in addressing the problems of asymmetric information and correlated risk.

In principle, farm communities can choose between mutual insurance and market insurance. The latter is only recently beginning to gain prominence in most developing countries. Mutual insurance involves risk-sharing among farm households and comprises both physical activities, such as helping out at harvest time or in case of a shock, and income transfers in cash and in kind. While this type of insurance has been the main risk-coping mechanism for farmers throughout Africa, it has proven to offer insufficient coverage against aggregate or systemic risks, such as those emanating from droughts, floods and price shocks that threaten all members of the local community at the same time.

What is missing from the analysis is an adequate explanation of why mutual insurance suffers the several limitations expressed in the paper. Is it because many societies in Africa have not invested in developing institutions for scaling-up such insurance by introducing third parties to take up the actual organization of the insurance activity and thereby free up time for farmers to produce on their farms?

The paper suggests that while the alternative of market insurance of crops may be a better solution, this type of insurance is also plagued by excessive monitoring costs in avoiding the two classical problems of adverse selection and moral hazard. The author clearly makes a case for index insurance as a new product that seeks to address the problems of insurance by conditioning the indemnity payments on a set of agreed upon conditions that are independent from both farmers' and insurers' actions and inactions. Such index-based insurance pays out when a pre-agreed upon indicator falls below a pre-agreed upon threshold. Typical examples are payments triggered by the recorded rainfall at a particular weather station or, by the average yield of a particular village.

By construction, it is possible for a farm to experience a yield shortfall and yet receive no indemnity. This would occur if an accident reduced the yield on a farm but was not sufficiently systemic to reduce yield measured at the village level. For sure, the inverse is also conceivable. It is possible for a farm to experience no yield shortfall and yet receive an index insurance indemnity. As a result, some have questioned whether index insurance should even be considered insurance in the right sense of the term.

What is the possibility of designing index insurance contracts with a basis-risk rider that would provide additional protection? This extra protection would be needed against the possibility of an idiosyncratic event causing a farm to suffer a significant yield loss, even though the village yield does not trigger an index insurance indemnity payment.

The author rightly notes that basis risk is inherent with index insurance, but since it is an important factor affecting the efficacy of index insurance, it would have been helpful to see a more detailed discussion of the issue, and how it may affect the indemnity function. One question that keeps popping up ever since the concept of area-yield insurance was first introduced is why such indexed approaches have not been more widely applied in the developing world, especially in Africa.

A number of experiences suggest that it is not easy to design an index-based insurance function that has a low basis risk. We also know that many poor farm households tend to be reluctant to buy index-based insurance, despite significant subsidies often offered on the premiums. How is this explained? Could it still be due to the absence of appropriate institutions? Will governments not be better advised to build those institutions that will make different types of insurance emerge as innovative responses to the pervasive risk present in many poor environments? And these responses might very well include index insurance adequately structured to be very attractive for poor farmers.

Indeed, I agree with the author that governments have to be more directly involved. But such an engagement should be more mindful of local experiences with a view to making them evolve into more modern arrangements that do not leave large populations behind.

Summary of round table discussion

In his presentation, Michael Carter developed the idea that pervasive risks in agriculture and the lack of proper insurance institutions contribute to the under-development of formal financial institutions for agriculture, thereby constraining the development and adoption of agricultural innovations. Insurance institutions themselves do not exist because of the high costs of collecting information and enforcing contracts in rural areas with scattered habitations, providing scope for moral hazard and adverse selection issues. Weather index-based insurance mechanisms may provide new avenues for dealing with these issues, and hence contribute toward crowding-in credit institutions to finance the adoption of agricultural innovations.

For Michel Griffon (first discussant), if such innovations did exist, and if financial support were available, adoption by farmers would still be constrained by the disconnection in developing countries between rural supply and urban demand. Such disconnection stems from poorly integrated markets, oligopolistic situations among traders and the lack of price and harvest information. The disconnection, Griffon added, also stems from the necessary (cheaper) imports of agricultural products to feed urban development, which have contributed to lower prices and limit incentives to invest in agriculture. This reliance on imports was itself reinforced by the lack of proactive public policies towards agriculture in developing countries over the past 20 years, Griffon pointed out.

In addition, Griffon argued towards enhanced focus on ecosystem recapitalization (via no-till farming systems and ecological infrastructure, for instance), and better use

of market regulations to limit the negative effects of the world price on local agriculture development. Sylviane Guillaumont later questioned Griffon about the reasons for the low adoption of such techniques in the Sahel, to which Griffon responded that the Sahel was particularly challenging, and that no such techniques could be adopted without important support from the public sector.

Ernest Aryeetey (second discussant) supported Carter's view that risk is a stumbling block on the path to technological adoption. He, however, suggested that an opposite relationship may also be at play: one in which the lack of agricultural innovation can enhance exposure to agricultural risks. In some Sahelian countries for instance, water-harvesting schemes were successfully developed towards limiting the effects of irregular rainfall.

Aryeetey also pointed that attempts to create new financial institutions for rural development have been tried and abandoned several times in Africa since the 1960s. Instead, there may be better chances for success when building on existing institutions, such as mutual insurance organizations that readily exist in these countries. While inefficient by themselves at dealing with covariate risks, these existing institutions may nevertheless be blended with new instruments to enhance the latter's impact and sustainability.

Several other points were raised by the audience. For instance, Jean-Claude Berthélémy suggested that other market failures be taken into account. If not, providing insurance can have adverse effects (such as local inflation in poorly integrated markets). François Bourguignon called attention to the fact that the discussion essentially focused on smallholders. Although this makes sense from a poverty targeting perspective, the important role of larger producers in supporting the commercialization of export and domestic markets should not be forgotten. In terms of innovations, Bourguignon also noted that less than 5% of all agricultural research worldwide is focused on Africa.

In another intervention, a member of the audience noted that the presenters did not seem to consider farmers as human beings, that a real problem for development (in the Congo, for instance) was civil war, in which foreigners had vested interests, and that potential solutions for African agriculture, such as genetically modified foods (GMOs), were blocked in Africa due to European considerations.

In a second round of interventions, Ibrahim Abouleish (Sekem group) insisted on the necessary partnership between Europe and Africa for market development and agricultural research. Michel Griffon suggested that South-South partnerships in research also be promoted, such as ones between North African universities and research centers. Mr. Cornia from the University of Florence asked who would pay for the insurance premiums given that many farmers are too poor for that. To this, Michael Carter answered that given positive externalities and lower adoption rates among the poor, there was clearly a case for public subsidies. These should, however, be well-targeted, and the amount carefully evaluated, which requires further work.

Finally, a representative of a network of microfinance institutions (MFIs) in Senegal argued that links between microfinance and microinsurance could be enhanced. Michael Carter confirmed that such collaboration is vital: for MFIs to stabilize their portfolio; and for microinsurers to enhance their investment results.

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