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FINANCE and DEVELOPMENT
December 2015

Nick Stern on climate change

Richard Layard and happiness

Paul Collier: Financing HIV/AIDS



Powering^{the} Planet

The Quest for Sustainable Energy



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A Glimpse of the Future

ONE of my favorite car trips in the United States heads east out of Los Angeles and runs through the windswept San Gorgonio Pass, gateway to the Mojave and Sonoran deserts. I'm a fan of the drive on Interstate 10 not only because it affords access to a dramatic desert landscape but also because the funnel-like pass at San Gorgonio prompts thoughts about the planet's energy future.

The pass—one of the windiest places in the United States—is home to the San Gorgonio Pass Wind Farm, an array of more than 4,000 turbines that harness wind to produce “clean”—non-fossil-fuel-based—energy. It's a stunning sight, and I always wonder, is this what a sustainable energy future looks like? Can thousands of turbines sprawled over the landscape be part of society's answer to a most pressing question: how to balance the massive need for energy to power economic growth and development while addressing our urgent need to sharply reduce carbon emissions, a chief contributor to climate change.

The question fuels intense debate—one that has become increasingly polarized and that frequently puts growth and sustainable energy in opposition. But are the two—growth and a more sustainable mix of energy sources—really enemies? Can a more benign mix of energy sources and technology bring power to the 1.3 billion people who don't have it?

These questions, along with December's UN climate summit in Paris, provided the inspiration for this issue of *F&D*.

The answers are complex but reassuring. Nicholas Stern of the London School of Economics argues that the twin challenges of fighting poverty and climate change are not mutually exclusive. And the International Labour Organization's Peter Poschen says we need not choose between green and jobs.

Continuing with the energy theme, IMF economist Ian Parry looks at the practical problems of setting a price for carbon that reflects its true costs. And *F&D* analyzes the four major declines in oil prices in the past 30 years and finds an eerie similarity today to the prolonged slump that began in 1986.

On other topics, Paul Collier and coauthors look at the costs of treating and preventing HIV/AIDS in Africa. This issue of *F&D* also examines the high penalty countries pay when they default on sovereign debt, skewering the conventional wisdom that the costs of default are minimal, and includes articles on the bad effect elections have on intelligent decision making about public investment, the increasingly common practice of offering citizenship “for sale,” and China's investment in Africa. And we profile economist Richard Layard, who says economics has strayed too far from its original purpose of promoting happiness and maximizing well-being.

Jeffrey Hayden
Editor-in-Chief

Alan Wheatley profiles **Richard Layard**, who believes the basic purpose of economics is the maximization of happiness and well-being

A Generous-Hearted Life

After sharing a stage with the Dalai Lama, London School of Economics (LSE) professor Richard Layard is still buzzing. As director of the Wellbeing Programme at the LSE's Centre for Economic Performance, Layard focuses on the study of happiness. So it's fitting that he is visibly, well, happy with the previous afternoon's event. The two had spoken at a meeting of Action for Happiness, a grassroots movement Layard cofounded in 2010 to promote practical action for a happier, more caring society. The Tibetan spiritual leader is the group's patron. "I asked the Dalai Lama at the end what is the one thing that we should cultivate more than anything else and he said, 'Warm heart, warm heart,'" Layard recalls with a smile.

Layard was a distinguished labor economist long before he turned his attention to happiness. He is best known for his

research in the 1980s on unemployment and for his advocacy of policies to support unemployed people on the condition that they try to find work. This "welfare to work" approach became popular in parts of continental Europe and was a mainstay of British Prime Minister Tony Blair's economic program.

People first

"It's interesting to see how throughout his career he's moved from one area to another, but always centered on the well-being of people," says Martine Durand, chief statistician of the Organisation for Economic Co-operation and Development (OECD) in Paris. "At the heart of all his work is this desire to improve policies and people's lives: putting people at the center."

A cynic might say that the Dalai Lama's wish for a warm heart cannot disguise the cold fact of below-par global growth

and persistent poverty in many countries. Isn't happiness economics, which is still viewed skeptically by many in the profession, a self-indulgent distraction from more urgent tasks? On the contrary, Layard argues: to study what makes people happy is to revive the idea of Jeremy Bentham, Adam Smith, and other founders of economics that public policy should aim to secure the greatest happiness for the population. "It has been, since the 18th century Enlightenment, the central idea in Western civilization that the measure of a good society is how happy the people are. So it's not a novel idea," Layard, 81, says in an interview with *Fe&D* in his office at the LSE.

Unfortunately, as Layard sees it, along the way economics partly lost sight of this original purpose. The maximization of utility, or happiness, became conflated with the maximization of consumption and then with income and GDP. Layard's contribution, along with that of other economists, including Andrew Oswald of Warwick University, is to have helped reassert the importance of factors other than income in determining happiness.

"To understand how the economy actually affects our well-being, we have to use psychology as well as economics," was how Layard put it in one of a trio of lectures he gave on the topic at the LSE in 2003. GDP, he added, was a "hopeless measure of welfare." Those lectures were the germ of a best-selling book published in 2005, *Happiness: Lessons from a New Science*, in which he argued that seven major factors affect how happy we are, defined as enjoying life and feeling wonderful: our family relationships, financial situation, work, community and friends, health, personal freedom, and personal values.

If most of these criteria sound suspiciously subjective, Layard says they are not. They are measurable. He became convinced he could write the book after a neuroscientist, Richard Davidson, showed that measurements of brain activity correspond consistently over time with how people say they feel. "That made me confident that we should take very seriously what people tell us when they self-report about their feelings," Layard says.

A winding path

Layard came to economics in a roundabout way. His parents were Jungian psychologists and, after school at Eton, where he was head boy, Layard studied history at Cambridge. His ambition was to be a social reformer. He seriously considered training as a psychiatrist but went instead into school-teaching with the goal of becoming an educator. A job as senior researcher for the Robbins Committee, whose 1963 report ushered in a vast expansion of higher education in Britain, led to an invitation to help set up a research center on education policy at the LSE. To do that, Layard says, he earned an MSc in economics—at the LSE of course. So he did not become an economist until he was in his thirties.

But he says it would not be quite right to describe him as an accidental economist. For one thing, he had considered studying the subject at university. "I was attracted to economics for the reasons that I've developed later in my life, by the belief that it was the only social science that was interested in

the rational selection of priorities on the basis of their impact on human happiness," he recalls.

Happiness economists' contention that poor people benefit far more than the rich from an added dollar of income implies that public policy should aim to reduce inequality—one of the goals of Layard's lifework. Layard favors quite high marginal tax rates and sides with Paul Krugman in opposing

There is public disillusionment that long-term growth has not led to happier, less stressful lives.

the view that austerity policies are necessary to restore economies like Britain's to health after the recent global financial crisis. But Layard is at pains to underline that he is not opposed to growth. Growth reflects human creativity and a continuous quest to find ways of doing things better. "This is certainly not a recipe for a society of lotus eaters," he says. But, he adds, evidence from the United States and western Germany stretching back to the 1950s shows that increased wealth does not make for greater contentment. There is public disillusionment, he reckons, that long-term growth has not led to happier, less stressful lives. "It's not a guarantee of happiness, and we have to be very careful not to sacrifice too much in the name of economic growth," Layard warns. He offers a specific example: banks won the argument that deregulation was good for jobs and long-term growth, but their reckless lending contributed to the 2008–09 financial crisis. Unemployment and uncertainty, a recipe for unhappiness, were the result. "We should never sacrifice economic stability," Layard says. "Security is a hugely important human need."

Disenchantment with growth as a measure of welfare was once largely confined to the Himalayan kingdom of Bhutan and its pursuit of gross national happiness. No longer. In the wake of Layard's book on happiness, the Stiglitz-Sen-Fitoussi commission, set up by French President Nicolas Sarkozy after the 2008–09 crisis, came out in favor of broader measures of well-being. The United Nations now sponsors an annual *World Happiness Report*, and the OECD attempts through its Better Lives initiative to measure life satisfaction. Even the former chairman of the U.S. Federal Reserve, Ben Bernanke, got in on the act. "The ultimate purpose of economics, of course, is to understand and promote the enhancement of well-being," he said in 2012.

Layard was elevated to the House of Lords, the upper house of the British parliament, by Blair after advising him on the labor market. But the Labour Party peer is quick to give particular credit to Conservative Prime Minister David Cameron for directing Britain's statistics office to measure happiness alongside GDP. "It's time we admitted there's more to life than money, and it's time we focused not just

on GDP but on GWB—general well-being,” Cameron said as far back as May 2006. A number of other countries have since followed suit.

Fringe discipline

Despite the momentum behind the topic, Gus O’Donnell, an economist who used to head Britain’s civil service, says economists who study happiness still struggle to get their work published in academic journals. He draws a parallel with behavioral economics, which was also a fringe discipline 30 to 40 years ago. Today it is in the mainstream, and one of its leading exponents, psychologist Daniel Kahneman, was a Nobel economics prize winner in 2002. “The well-being and happiness literature is still slightly behind. I expect in 10 to 20 years’ time it’ll be a fundamental part of the curriculum,” says O’Donnell, who now chairs Frontier Economics, a London consultancy.

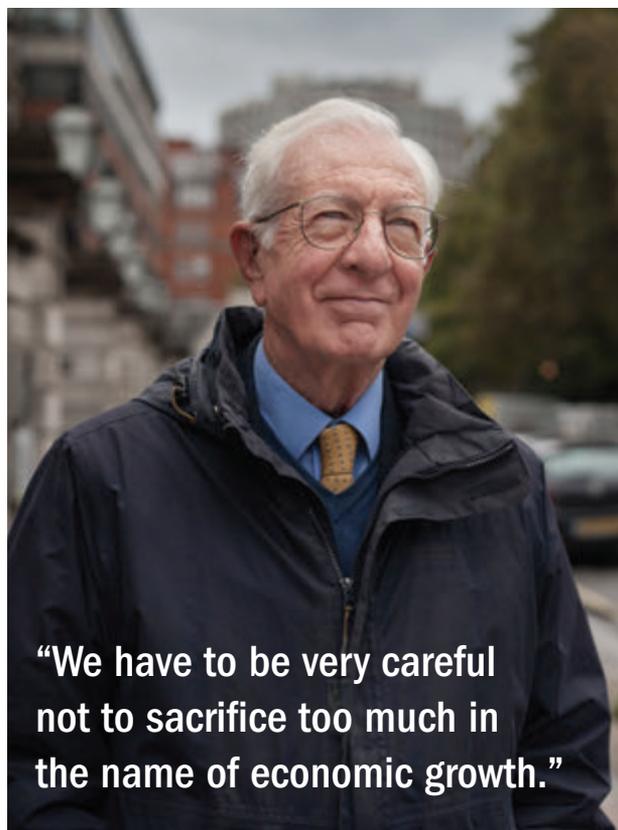
O’Donnell has himself written extensively on happiness economics. He and Layard were coauthors of a 2014 report on well-being and policy commissioned by the Legatum Institute. (Angus Deaton, winner of this year’s Nobel Prize in economics, was another.) O’Donnell sees a link between dissatisfaction with GDP as a gauge of how well we are doing and increasing frustration with established political parties, especially in Europe. “The political discourse misses out a lot of things that matter hugely in people’s lives, and hence they feel disengaged,” he says.

The wellspring of happiness economics is the “Easterlin paradox.” A seminal article in 1974 by Richard Easterlin of the University of Southern California posited that rich people are on average happier than poor people but, paradoxically, a society on average does not become happier as a country grows wealthier. One reason for this, Layard and other happiness economists say, is that individuals compare their incomes with those of people around them. “They are happier when they are higher on the social (or income) ladder. Yet when everybody rises together, relative status remains unchanged,” wrote Jeffrey Sachs, director of the Earth Institute at New York’s Columbia University, in the 2012 World Happiness Report.

Sachs also notes that the concept of diminishing marginal utility means that gains in income must be larger as income rises to produce the same benefit. This explains why the well-being literature points to a clear relationship between income and happiness for low to medium earners, which flattens out thereafter, like a log curve.

More compassion, less competition

Looking at life as a zero-sum game is anathema to Layard. He is all for the spice of a challenge, especially between organizations or in sports. He wants the LSE to outshine rival universities, and he still plays tennis twice a week. But he recoils at the memory of a motto of Britain’s education ministry, “Staying Ahead,” and says that individualism is the foe of happiness. “It’s really important that people don’t think that their job in life is to prove that they are better than others,” Layard says. More compassion and less com-



petition is the answer: “We have to get into a much more generous-hearted approach to life.”

Not everyone analyzes happiness the same way. In an influential 2008 paper, University of Pennsylvania economists Betsey Stevenson and Justin Wolfers reassessed the Easterlin paradox using new time-series data. They did not rule out a role for relative income comparisons, but concluded: “Taken as a whole, the time-series evidence is difficult to reconcile with earlier claims that economic growth yields no boost to happiness.”

Layard acknowledges the careful work of Stevenson and Wolfers but says they fail to take account of variables that change along with income. Factors such as health, personal freedom, and the strength of people’s social support drive much of the association of GDP per capita with well-being, Layard argues. Indeed, within countries incomes explain no more than 2 percent of the variance in happiness, even in the poorest countries, he says.

British economist Diane Coyle rebuts happiness aficionados’ argument that life satisfaction and GDP growth are not positively correlated. “There are some things some people so fervently want to believe that no amount of evidence or logic will persuade them otherwise, no matter how brilliant they are,” she has written. Suffice it to say that the controversy shows the need for more research into measurement techniques and the reasons for personal and national variations in happiness.

Layard regards the work he did on unemployment—with Stephen Nickell and Richard Jackman—modeling the

so-called nonaccelerating inflation rate of unemployment (NAIRU) as his foremost original contribution to economics (Layard, Nickell, and Jackman, 1991). Their explanation of unemployment departs from assumptions of a perfectly competitive labor market and proposes a model based on wage determination by means of bargaining or efficiency wages. Layard says the model has stood up well to the test of time. It explains, for instance, why Germany, which has embraced labor market reform, enjoys much lower joblessness than some of its neighbors. “Countries like France that have simply refused to take this issue seriously have had absolutely no change in their underlying unemployment rate,” Layard says.

Layard, who spent time advising institutions in Russia in the 1990s after the breakup of the Soviet Union, strongly advocates a carrot-and-stick approach to tackling unemployment: active labor market policies to help people find a job, coupled with welfare payments at a level that encourages people to get back to work. This tough-love conditionality appealed to Labour moderates like Blair, but it alienated the party’s core trade union supporters. Layard has also come under fire from right-wing commentators. A *Daily Telegraph* reviewer of *Happiness* denounced Layard’s proposals to redistribute income through the tax system and to reduce performance-related pay as the “foppish utilitarian suggestions” of an “Old Etonian socialist.” Another critic attacked his “reactionary romanticism.”

“Richard’s taken on people across the political spectrum in the interest of enhancing everyone’s welfare,” says O’Donnell. “He’s incredibly persistent.”

Mental health

In the same vein, Layard has become a champion of better treatment of mental illness despite the stigma still attached to the issue in some quarters. “What is shocking is that people still think that to treat people who are mentally ill requires an economic justification, and to treat people who are physically ill doesn’t,” Layard says. His motivation is simple: mental illness does more to explain unhappiness in rich countries than either poverty or unemployment does. In Britain, it accounts for more than half of all illnesses in people younger than 45. Yet less than a third receive treatment. The cost—in terms of both personal misery and the public purse—is immense. Layard is proud that he was instrumental in persuading the U.K. government to train thousands of therapists to provide psychological treatment for people suffering from depression and chronic anxiety disorders. “This has been a really fruitful combination of economics and clinical psychology,” he says.

The Improving Access to Psychological Therapies program, launched in 2008 and described as world-beating by the journal *Nature*, came about after Layard serendipitously met the eminent clinical psychologist David Clark at a tea party. Layard has described Clark as a visionary. The two went on to author the book *Thrive: The Power of Evidence-Based Psychological Therapies* in 2014. Layard also pays tribute to the “incredibly helpful” support of

his wife, Molly Meacher, who was chair of mental health services in East London. While Layard is pleased with the government’s response, a lot more needs to be done, and money is tight. Before the *F&D* interview, he had been on the phone fighting with government officials for a bigger budget to treat mental illness. Psychological therapies are Layard’s obsession, according to O’Donnell. “It’s probably a good word to use with Richard because he does have obsessions,” he chuckles.

Climate change

Layard’s other current preoccupation is climate change. He is one of the drivers of the Global Apollo Program, a project to make renewable energy cheaper than fossil fuels within 10 years through publicly funded, internationally coordinated research and innovation.

Layard says he was alerted to the dangers of climate change by the 1989 book *Turning Up the Heat: Our Perilous Future in the Global Greenhouse*, by the British science writer Fred Pearce. Later, as a member of a House of Lords committee, he pressed for a publicly funded research program to combat the problem—anchored, of course in economic principles. “It seemed to me then, as now, that the surest way to solve the problem is to make sure clean energy is cheap enough that it will outcompete fossil fuels,” he says.

The danger that climate change poses to the planet can be seen as one more threat—an extreme threat—to the pursuit of human welfare and happiness that has been the thread running through Layard’s career.

Geoff Mulgan, a cofounder with Layard of Action for Happiness, says that the right policies for well-being still have a long way to go. “But Richard has shown late in his career a remarkable hunger to return to the heart of economics, which was always meant to be about well-being but often ended up confusing the ends and the means,” says Mulgan, who was director of Blair’s strategy unit and is chief executive of the National Endowment for Science Technology and the Arts, a British nonprofit that fosters innovation.

Layard is confident that the well-being movement is here to stay: more and more people want to understand what is standing in the way of a satisfying, fulfilled life.

Which raises the obligatory question of whether Layard is himself happy. “In general, yes, absolutely. I really enjoy life. But, of course, we all go up and down. It comes back to the point about challenge, doesn’t it? If you try to make certain things happen, you can’t expect to be happy all the time, can you? Because they don’t always happen.” ■

Alan Wheatley is an economics writer and editor, formerly with Reuters, and editor and coauthor of The Power of Currencies and Currencies of Power.

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The Low-Carbon Road

Man walks between solar panels powering ice machines, Sustainable Development Reserve, Amazonas, Brazil.

The twin challenges of poverty and climate change are tightly interwoven

Nicholas Stern

TWO defining challenges of this century are overcoming poverty and managing climate change: if we fail on one, we will fail on the other. Success in rising to both challenges depends on shared recognition of how they are profoundly interwoven, and of the complementarity between sustainable development, economic growth, and climate responsibility. Thus the global agenda on sustainable development, adopted at the United Nations in New York in September 2015 (the Sustainable Development Goals, or SDGs) is critically linked to international action on climate change, including what will be agreed at the United Nations climate change summit in Paris (COP21) in December 2015.

New insights

Three critical insights on economic development and climate responsibility emerged after the previous attempt at an international climate agreement, in Copenhagen in 2009. These insights strengthened the prospects for success at Paris and beyond by demonstrating how the twin challenges of poverty and climate change can be overcome together.

First, there is now much greater understanding of *the potential complementarity of economic growth and climate responsibility*, particularly through infrastructure investment (GCEC, 2014). To portray these as in opposition to each other—as is often done—is to misunderstand both economic development and the opportunities created by moving to a low-carbon economy. To pit growth against environmental responsibility is diversionary and can thwart prospects for agreement and sustainable development itself.

Second, there is greater awareness of *the increasing dangers of delay* as the structure of the global economy—particularly in terms of cities, energy systems, and land use—changes over the next two decades. Billions of people are moving into cities, and the number of city dwellers will nearly double in the next three decades or so. Huge and long-lasting investments will pour into the infrastructure of cities—wisely or badly. Energy systems and land use, including the care for and investment in forests and soil, are similarly open to opportunities and risk. High-carbon lock-in of capital and infrastructure is a serious threat: coal and gas power plants,

for instance, often need to operate for many decades to generate a financial return on investment. Another risk is the degradation of carbon sinks—natural systems that absorb and store carbon dioxide. The urgency is intensifying with both the pace of structural change to the global economy and persistently inadequate approaches to the management of cities, energy, and land systems.

Third, we know that *the use of fossil fuels creates a range of severe problems in addition to climate change*. Pollution is destroying lives and livelihoods: many millions a year die globally because of pollution, and many millions more become sick. A recent study by Rohde and Muller (2015) concluded that breathing the air in China is equivalent to smoking 40 cigarettes a day and is responsible for more than 4,000 deaths each day. Air pollution in India is still worse, and Egypt, Germany, Korea, and, indeed, most other countries, rich or poor, have serious problems. Such pollution is mainly domestic, and cutting it sharply is clearly in countries' self-interest. Fossil fuel prices have bounced back and forth over the past few years, and indeed over a very long period without much sign of a trend. But the cost of renewables is still trending downward and will likely continue so for some time. The long-term prospects for renewables are strong, and many are already competing with fossil fuels without correction for the very strong and negative consequences of oil, coal, and gas use, which have been documented by IMF economists (Coady and others, 2015).

These three new or enhanced perspectives can help frame discussions on climate change in two important ways.

First, they help explain the enormous *opportunities* for reducing poverty and raising living standards worldwide in the transition from economies' heavy dependence on expensive fossil fuels and polluting high-carbon technologies to clean and efficient low-carbon alternatives. Plans submitted ahead of the Paris summit show that many countries are already making this transition.

Second, they focus attention on the *urgency* of accelerating the transition to sustainable low-carbon growth and development. Greater international collaboration—built on a strong agreement in Paris—can foster that acceleration.

These new perspectives highlight the crucial importance of effective international coordination, particularly around financing and technology. Some of the architecture for this collaboration between countries was discussed at the Third International Conference on Financing for Development in Addis Ababa and will continue around COP21.

Climate financing

At previous climate change summits, parties to the United Nations convention agreed that by 2020 rich countries should be mobilizing \$100 billion a year, from both public and private sources, to help developing economies make the transition to low-carbon growth and become more resilient to the unavoidable impacts of climate change. (Methods of mobilizing this support were examined, for example, in the 2010 report of the United Nations Secretary-General's High-level Advisory Group on Climate Change Financing.) An analysis

published in October 2015 by the Organisation for Economic Co-operation and Development and the Climate Policy Initiative estimated that developed economies collectively mobilized \$52.2 billion in 2013 and \$61.8 billion in 2014 in climate financing for developing economies.

Reaching the \$100 billion goal is a good test of the sincerity of rich countries' commitment to supporting poorer countries. Assessing this commitment calls for an understanding of how climate financing, and its associated initiatives, is additional to or represents increments beyond the support rich countries would otherwise extend for economic development. I have argued previously that this can be done in four ways (Stern, 2015).

To pit growth against environmental responsibility can thwart prospects for sustainable development.

First, assessment of funded projects—for example, supporting feed-in tariffs for renewables—can look at whether the projects would have come to fruition without this financing. A second test might gauge whether the contribution stimulates action in areas, such as forest protection, that would not otherwise be covered or financed adequately. Third, does the contribution mobilize new sources of financing, such as expansion of multilateral development banks for climate action or carbon pricing revenue that would not otherwise have been forthcoming or available? And fourth, one can measure total official development assistance (including resources designated for climate action) and ask how much it exceeds the amount that would have been committed in a world unaware of the problem of climate change. This last counterfactual is particularly difficult to measure.

Financing for sustainable development

Still more important than the \$100 billion a year commitment from rich countries is strong international collaboration on the infrastructure investments needed over the coming two or three decades to foster poverty reduction and growth in the context of rapid urbanization. It is crucial that these investments in infrastructure promote—rather than derail—sustainable development. Global investment in infrastructure on the order of \$90 trillion over the next 15 years is needed (GCEC, 2014).

How these infrastructure investments are made—including their scale and quality—will have a critical effect on both sustainable development and managing climate change. These investments represent a great collection of opportunities to drive faster and better-quality growth over the coming decades: less polluted, less congested, more creative and innovative, more efficient, and more biodiverse. But many of those opportunities could be lost through hesitation. There is a danger that high-carbon, polluting, wasteful, and long-lasting structures will be locked in—that forests will be

destroyed and soil irretrievably eroded. There is so much that can be done now that it is both in countries' self-interest and in the collective interest of all countries, with coordination and collaboration.

Most of the \$90 trillion investment in infrastructure needed over the next 15 years will be in emerging market and developing economies. Much of it will happen somehow, but it must include both better quality and greater scale than is currently underway and planned.

Investments in infrastructure are a means to an end: sustainable development as summarized, for example, in the SDGs. At the heart of the SDGs lies the elimination of absolute poverty, which means securing a better life for all and, in particular, a world in which every child can survive and thrive. The SDGs also embody a sustainable future for the planet.

Scarcity of infrastructure is one of the most pervasive impediments to growth and sustainable development. Good infrastructure removes constraints to growth and inclusion while fostering education and health. It can empower children and women by giving them access to education, reduce the burdens of obtaining water and fuel, and provide decentralized electricity. Bad infrastructure kills people and leaves unsustainable economic burdens for future generations. Furthermore, at a time of low world demand, a concerted focus on infrastructure can boost global demand in the short run while raising productivity and long-term growth.

Transformation of the global economy

This is a critical moment in the transformation of the global economy, which requires large investments in sustainable cities, energy systems, and other infrastructure. The world's urban population will increase from about 3.5 billion today to about 6.5 billion by 2050, and forests, agricultural lands, and water systems will come under tremendous pressure. Inadequate infrastructure will cause lasting damage; poorly structured cities and polluting energy infrastructure can impose burdens and inflict damage for decades or centuries to come.

This is a defining moment. Fundamental impediments to the quantity—and quality—of investment, including the risks associated with government action and the availability of appropriate financing, cannot be ignored.

Government-induced policy risk—for example, through inconsistent support for low-carbon technologies or the lack of credible systems for contract enforcement—is the greatest impediment to investment. This is particularly true for infrastructure investment because of the longevity of such investments and their inevitable and intimate links to government policy. As a result, capital for infrastructure financing tends to be priced far too high, often 500 to 700 basis points above the benchmark, when long-term interest rates are close to zero. And the huge pool of private savings—probably \$100 trillion or more—held by long-term institutional investors, little of which is currently invested in infrastructure, cannot be mobilized.

The failures around infrastructure in government policy and institutions and the failures of the financial system must both be fixed. Moving on one front alone will not produce

the scale of investment needed. The only way to build a better and more productive infrastructure on the scale necessary for climate responsibility and sustainable development is through a concerted set of actions on both fronts (see Bhattacharya, Oppenheim, and Stern, 2015).

On the policy side, first, national authorities should clearly articulate their development strategies on sustainable infrastructure—not one project at a time, but as a comprehensive direction and as development strategies to support the SDGs. This will offer investors confidence that there is clear demand for the services of the infrastructure investment they are considering.

Second, market distortions and policy failures that undermine the quality of infrastructure investments must be tackled. The biggest distortions affecting the quality of infrastructure investments are pervasive fossil fuel subsidies and a lack of carbon pricing, especially a distorted price for coal.

The IMF recently estimated the total cost of fossil fuel subsidies at more than \$5 trillion a year, including the failure to price in pollution and climate change, which together account for three-quarters of the total (Coady and others, 2015). And when we take into account the impact of coal on pollution and climate, its real price jumps from \$50 to well over \$200 a metric ton. Our calculations assume a carbon price of \$35 a metric ton of carbon dioxide equivalent (the standard assumption by the U.S. government) and that burning a metric ton of coal produces about 1.9 metric tons of carbon dioxide. If we factor in the carbon costs and, following the findings of Coady and others, we figure the cost of local pollution to be twice that from climate change, we get a cost of about \$250 a metric ton for coal. These extra costs are not abstract externalities, but the very real costs of current and future deaths from air pollution and climate change. Without sound policy, these externalities are unpriced, or inadequately priced, so incentives are currently heavily tilted toward bad infrastructure and against sustainability. Wrongly, and perversely, high-carbon is still seen as the low-cost option.

On the financing side, development banks' capacity to invest in sustainable infrastructure and agricultural productivity—that enhances rather than damages lives and livelihoods—should get a substantial boost to allow them to pioneer and support the changes needed. I saw very clearly when I was chief economist of the European Bank for Reconstruction and Development how a development bank's participation in a deal can boost the confidence—and thus the scale of investment—of private participants. And because international development banks, and many national ones, are generally trusted as convenors, their investments can exert much stronger leverage. Governance is as relevant for development banks as for central banks. If such banks are well designed and well run, they can develop strong skills in key areas, such as energy efficiency, and bring a full set of financial instruments to the table, from equity and political risk guarantees to loans.

In addition, central banks and financial regulators could take further steps to promote productive and profitable redeployment of private investment capital from high-carbon to

better low-carbon infrastructure. Over time, the riskiness of and damage from high-carbon infrastructure is becoming ever clearer. But imperfections in the capital markets mean that borrowing can be expensive when real long-run interest rates are very low. This distorts the market against renewables, whose up-front costs are relatively high. These imperfections worry central banks and regulators, as well as others.

The official community, including the Group of 20 industrialized and emerging market economies (G20), Organisation for Economic Co-operation and Development, and other rel-



This is all about development and growth.

evant institutions, working with institutional investors, could lay out the policy, regulatory, and other actions needed to increase their infrastructure asset holdings from \$3–\$4 trillion to \$10–\$15 trillion over the next 15 years. In other words, the share of funds held by institutional investors could rise from a small percentage to just over 10 percent.

Together, such action on policy and financing could foster the private sector investment that is essential for fighting poverty and climate change. It would boost both the scale and quality of infrastructure investment and the rate and quality of economic growth. Such a global strategy could galvanize strong and sustainable growth, and it is natural to look to the G20, as the main global economic forum for heads of government and finance ministers, to take the lead.

Prospects for success

So what are the key factors for success in the months, years, and decades ahead? Four lessons should be kept in mind.

First, much, or even most, of the necessary country-level action in the management of climate change is in the vital interest of every country. Second, the urgency of action is even greater than previously thought. Third, it is possible to see ever more clearly the importance of collaboration: rich countries should be setting strong examples and providing efficient and effective financing, and all countries should be sharing and investing in technology. Fourth, strong and collaborative action will usher in a period of extraordinary creativity, innovation, investment, and growth.

These conclusions are particularly important because the so-called intended Nationally Determined Contributions submitted by countries ahead of the Paris summit point to 2030 global emissions that are much higher than consistent with the goal of limiting global warming to 2 degrees Celsius above the preindustrial, 19th century average temperature. And the dangers of warming greater than 2 degrees Celsius are becoming ever clearer.

The pledged action would result in global annual emissions in 2030 of about 55 (or more) billion metric tons of

carbon dioxide equivalent (Boyd, Cranston Turner, and Ward, 2015). This is a substantial improvement over projected business-as-usual emissions of more than 65 billion metric tons, but it still far exceeds the 40 billion target most predictions propose to avoid global warming of more than 2 degrees Celsius. The December conference in Paris must not be regarded as a one-off opportunity to set targets, but the first of many steps, followed by regular progress reviews and a focus on learning lessons and accelerating action. In light of the implications of the Paris agreement, it is essential to recognize that the likely high annual emissions over the next 20 years dictate zero carbon dioxide emissions in the second half of this century.

Finally, it is important to understand that climate change is not just an issue for environment ministers and foreign ministers. Implementation of the actions agreed to in Paris must have the support and involvement of presidents, prime ministers, and economy and finance ministries as well. This is about economic development, investment in the future, resource allocation, and priorities: that is the work of government as a whole and economic ministers in particular.

We must remember that this is all about development and growth. This is about the two defining challenges of our century: overcoming poverty and managing climate change. If we fail on one, we will fail on the other. ■

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The RIGHT PRICE

Ian Parry

Raising the cost of fossil fuels to reduce greenhouse gas emissions presents policymakers with practical, but manageable, issues

UNLESS steps are taken to reduce greenhouse gas emissions, global temperatures are projected to rise by about 3 to 4 degrees Celsius above preindustrial levels by 2100, with risks of more severe warming and climate instability. Both advanced and developing countries are pledging to reduce emissions in what are called Intended Nationally Determined Contributions, at the December 2015 United Nations climate conference in Paris (see table). If fulfilled, these pledges would significantly slow global warming, though probably not by enough to contain projected warming to 2 degrees Celsius, which is the official target of the international community.

The key practical challenge facing policymakers is how to fulfill these pledges, preferably with policies that do not overburden the economy and that deal with such sensitive issues as the strain higher energy prices place on vulnerable households and firms. Carbon dioxide is by far the most important source of atmospheric greenhouse gases, which essentially trap the earth's heat and cause warming

of the planet. Putting a price on emitting carbon dioxide from burning fossil fuels should be at the center of any policies and, because of domestic environmental benefits, may actually be in a country's national interest regardless of what other countries do.

Global carbon dioxide emissions from fuel combustion are slightly more than 30 billion metric tons a year, and without mitigating measures are projected to roughly triple by 2100 due to expanding energy use, especially in the developing world. In fact, developing economies, including emerging markets, already account for nearly three-fifths of global emissions, roughly half of which go into the atmosphere and remain for about a century.

Although mitigation is needed everywhere, 20 advanced and emerging market economies accounted for nearly 80 percent of global emissions in 2012 (see Chart 1). The success of the Paris effort will hinge critically on the collective actions of those countries.

Coal produces the most carbon emissions per unit of energy, followed by diesel, gasoline, and natural gas. Broken down by fuel type, 44

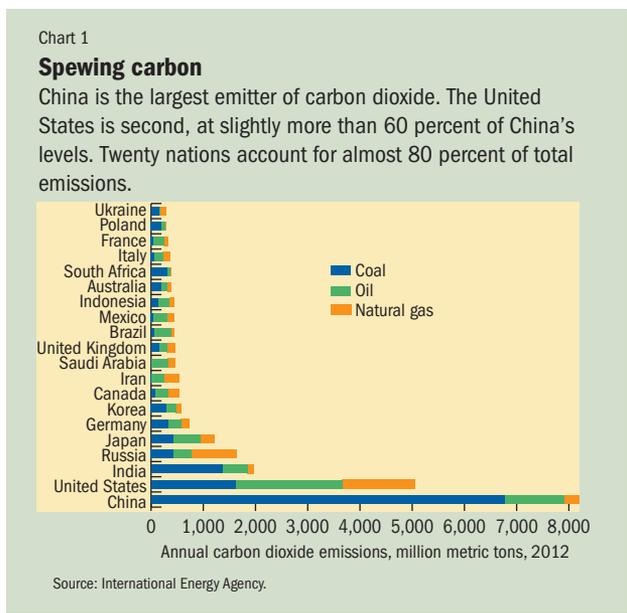


percent of global carbon dioxide emissions come from coal, 35 percent from oil products, and 20 percent from natural gas.

Reducing carbon dioxide emissions requires reducing the demand for fossil fuels, especially high-carbon fuels such as coal. Basic economics tells us the best way to do that is to raise the price of fuels. A higher price causes a wide range of behavioral changes that result in fewer emissions. For example, energy demand will decline as firms and households switch to more energy-efficient products and capital (including lighting, air-conditioning, cars, and industrial machinery) and conserve on the use of these products. Users will also switch to cleaner fuels—for example, from coal to natural gas in power generation and from these fuels to wind, solar, hydro, and nuclear, all of which produce no carbon. Ultimately it may be possible for some large industrial sources to capture the carbon dioxide emissions from fuel combustion and store them underground.

The beauty of carbon pricing—imposing charges on the carbon content of fossil fuels or their emissions—is that a single instrument can encourage the entire range of these behavioral responses across an economy, as carbon charges are reflected in higher prices for fuels, electricity, and so on. It also strikes a cost-effective balance among those responses, by providing the same reward for reducing emissions by an extra metric ton across different sectors. Moreover, a clear and predictable carbon dioxide price is the most important element in the promotion of longer-term development and deployment of emission-saving technologies—many of which, such as more efficient homes and more cost-competitive renewable technologies, have high up-front costs and emission reductions that continue over decades. Carbon pricing also raises revenue, which is especially important in these times of historically high fiscal stress.

By contrast, a patchwork of regulations—such as efficiency requirements for cars, buildings, and appliances and standards for using renewable sources of energy in power gen-



eration—is less efficient. Among other things, it is impossible to regulate every type of activity (such as how much people drive), and the reward for reducing emissions by an extra metric ton may vary considerably across programs and sectors. Regulatory approaches are also administratively more complex, do not provide the clear price signals needed to redirect technological change, and do not raise revenue. But because they have a weaker impact on energy prices, they may face less political resistance.

Carbon pricing can be implemented either by an emission tax or an emission trading system. In a trading arrangement, firms need a permit for each metric ton of their emissions, and the government caps emissions at a target level by restricting the number of permits. If the permits (generally called allowances) are given away for free, recipients gain a windfall profit, and allowances can then be traded, which sets a market price on allowances and emissions. Emission trading systems also need price stability mechanisms, most obviously price floors and ceilings, to establish the predictable prices needed to encourage emission-saving investments. But if, as generally recommended, carbon pricing is to be part of broader fiscal reform, the allowances must be auctioned and revenues remitted to the finance ministry. In an auction system there is less need for permit trading.

Getting it right

In implementing carbon pricing, there are three basic, and commonsense, design features to get right.

First, policymakers must *choose an approach that maximizes emission coverage*. This can be achieved by imposing carbon charges on fossil fuel products equal to a fuel's emission factor (metric tons of carbon dioxide emitted per unit of fuel combustion) times a carbon dioxide price. Using that formula, for example, a \$30 a metric ton charge on carbon dioxide would increase the price of a barrel of oil by roughly \$10. These charges can be a practical extension of gaso-

Cutting back
Major nations and regions promised significant reductions in carbon dioxide and other greenhouse gas emissions at the United Nations climate conference in December 2015.

Country/Region	Pledge
China	Lower emissions by 60–65 percent per unit of GDP from 2005 levels by 2030 and achieve emission peak
United States	Reduce emissions 26–28 percent below 2005 levels by 2025
European Union	Reduce emissions 40 percent below 1990 levels by 2030
Russia	Reduce emissions 25–30 percent below 1990 levels by 2030
Japan	Reduce emissions 26 percent below 2013 levels by 2030
Korea	Reduce emissions 37 percent below business-as-usual levels in 2030
Canada	Reduce emissions 30 percent below 2005 levels by 2030
Mexico	Reduce emissions 22 percent below business-as-usual levels in 2030
Australia	Reduce emissions 26–28 percent below 2005 levels by 2030

Source: World Bank (2015).
Note: The pledges refer to all greenhouse gases, except for China, for which the pledge covers only carbon dioxide. Carbon dioxide is by far the most important of the greenhouse gases, which reflect back to the earth heat that radiates from the surface. Other such gases include methane, nitrous oxide, and fluorinated gases. Almost 150 countries met the October 1, 2015, deadline for filing emission pledges. Countries and regions are listed in descending order of their contribution to global greenhouse gas emissions.

line and diesel fuel excise taxes, which are well established in most countries and among the easiest taxes to collect. Carbon charges can be built into these excise taxes and similar charges applied to the supply of other petroleum products, coal, and natural gas—either at the point of extraction, such as the wellhead or mine mouth, and point of import if purchased from abroad or after fuel processing, for example, at the refinery gate (Calder, 2015).

Alternatively, carbon charges could be imposed downstream, that is, on emissions from power plants and other large industrial sources. However, this approach would miss small-scale emission sources, such as homes and vehicles, which typically account for about half of carbon dioxide emissions. To capture emissions from smaller sources, downstream carbon pricing must be combined with other instruments, such as taxes on roads and heating fuels.

The second design feature to get right is the *price*. Although the Intended Nationally Determined Contributions typically are emission-reduction targets, what matters for climate change are global emissions over decades, if not centuries, rather than one country's emissions in one year. Ideally, coun-

Carbon pricing can be about smarter, more efficient tax systems, rather than higher taxes.

tries would meet their emission targets on average (with stable prices), rather than rigidly sticking to annual emission caps (with unstable prices). Rough predictions of prices needed to meet emission targets on average could be derived using predictions of future carbon dioxide emissions from fuel use, the impact of carbon pricing on fuel prices, and how responsive a fuel's use is to a change in its price. The predictions could be adjusted if future emissions are not on track to meet the target.

Alternatively, prices could be based on estimates of how much worldwide damage each extra metric ton of carbon dioxide causes through such things as agricultural losses, rising sea levels, health costs, and output losses from extreme weather. A U.S. government study (Interagency Working Group, 2013), for example, estimates these damages at about \$50 a metric ton for emissions in 2020 in current dollars.

The third key design feature is *efficient use of revenues*. Chart 2 shows simple calculations of the revenue that would have been raised in large-emission countries had there been a \$30 a metric ton carbon dioxide tax in 2012. Revenue would have been substantial, exceeding 1 percent of GDP in many cases. Although tax bases are progressively eroded as carbon prices rise over time—because users switch from the most highly taxed fuels—revenues are nonetheless unlikely to peak until the distant future.

The revenue raised could be used, for example, to lower the taxes on labor and capital that distort economic activity and harm growth. Carbon pricing can therefore be about *smarter, more efficient* tax systems, rather than *higher* taxes and need not impose large burdens on the economy. Revenues could

be used for other purposes, but to contain the overall cost of carbon pricing on the economy they should generate economic benefits comparable to those from cutting taxes that distort economic choices. Using revenue for low-value spending is always a bad use of taxpayers' money.

The fiscal and administrative case for carbon taxes over other mitigation policies may be especially strong in developing economies, where large informal sectors may extend beyond the reach of broader tax instruments such as those on income or profits. In these situations, carbon pricing revenues could be used, for example, for productive investments in health, education, and infrastructure that would otherwise go unfunded.

Making the right choices

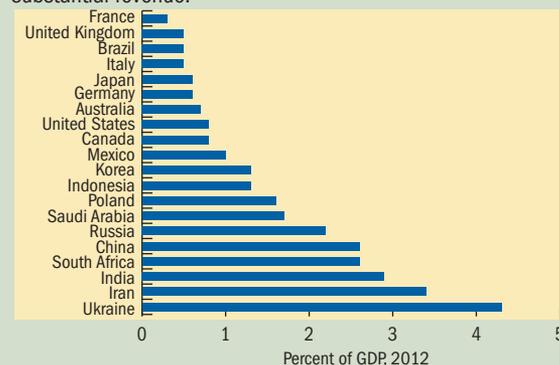
Recently, there has been a proliferation of carbon pricing systems. There is some form of carbon pricing at the national level in almost 40 countries (including 28 in the European Union's emission trading system), and there are more than 20 pricing arrangements at the regional or local level (World Bank, 2015). But these formal pricing arrangements cover only about 12 percent of global emissions and, from an environmental perspective, with prices that are too low—typically below \$10 a metric ton. A transition to greater coverage of emissions will be needed, and at higher prices.

At the domestic level, a key challenge is the burden higher energy prices place on low-income households. However holding prices below levels needed to cover the supply and environmental costs of energy, which many countries do, is an inefficient way to help poor people. Most of the benefits, typically more than 90 percent according to IMF estimates (Arze del Granado, Coady, and Gillingham, 2012), go to higher-income people, who use more energy on a per capita basis than poor people do. More effective in helping the poor are targeted measures such as adjustments to the tax and benefit system, which may require only a small fraction of the carbon pricing revenues (Dinan, 2015). In countries where the poor are not registered, targeted investments in health, education, and work programs may be needed, but such programs leak revenues because they

Chart 2

Substantial payoff

A \$30 a metric ton tax on carbon emissions could raise substantial revenue.

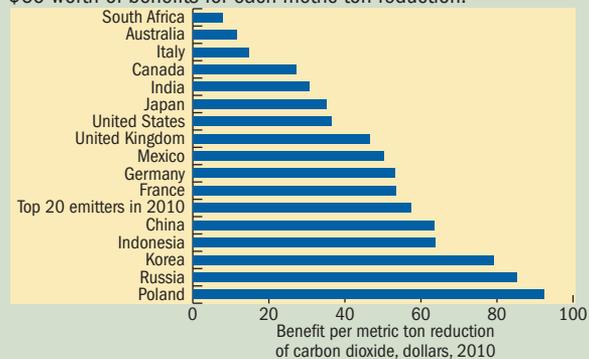


Source: Author's calculations based on emission data from the International Energy Agency and an assumption that a \$30 a metric ton tax reduces emissions by 10 percent.

Chart 3

More than climate

A country that reduces carbon emissions realizes domestic environmental benefits such as lives saved from less air pollution. The top 20 emitters on average would receive nearly \$60 worth of benefits for each metric ton reduction.



Source: Parry, Veung, and Heine (2014).

also often benefit those who are not poor. Nevertheless, the focus should be on the whole policy package (which can include numerous, simultaneous adjustments to other tax and spending policies) not just the component that raises energy prices.

Higher energy prices also harm energy-intensive industries, especially those such as steel, aluminum, and glass manufacturing, which are heavily exposed to international trade and therefore unable to raise prices much in response to higher input costs. However, efficient allocation of an economy's productive resources requires that labor and capital eventually move out of activities that are unprofitable with efficiently priced energy. Temporary assistance such as worker retraining programs and relief for firms may be needed. Many have proposed to level the playing field by imposing charges for the carbon embedded in imported products, but such charges are contentious because of difficulty in measuring such carbon and risks of trade retaliation. If carbon prices were coordinated internationally, such competitiveness issues would be of less concern.

A major obstacle to coordination over emission reduction has been countries' reluctance to incur emission-mitigation costs when the global climate benefits accrue largely to other countries—so-called free riders. But for many countries, carbon pricing can actually be in their own interest, due to environmental benefits that accompany carbon pricing—most important, the lives saved from less local air pollution as carbon pricing reduces the use of coal, diesel, and other dirty fuels (see Chart 3). The IMF (Parry, Veung, and Heine, 2014) estimates that, on average, these accompanying benefits would have warranted carbon dioxide prices of \$57 a metric ton among large emitters in 2010, and these prices would have reduced global emissions by about 10 percent.

That means many countries would make themselves better off by moving ahead unilaterally with carbon pricing that at a minimum addresses local problems and raises revenue. In the process they would also contribute to relieving a global problem. It is not necessary to wait for other countries to make progress

on their Intended Nationally Determined Contributions. But once countries have carbon pricing systems in place, their efforts can be strengthened by international coordination.

Within this context, there could be a role for a carbon price floor agreement, which would set a minimum price for carbon. The agreement could initially be negotiated among a limited number of willing countries as a complement to the Intended Nationally Determined Contributions process. Price floors provide some degree of protection for industries competing with imports from other countries that are party to the agreement, while allowing individual countries to set higher carbon prices if they wish to do so for domestic fiscal, environmental, or other reasons. Moreover, a single floor price should be easier for countries to negotiate than numerous country-level emission targets. In fact, minimum taxes have been established in other arenas, such as the European Union, for value-added taxes and excise taxes on alcohol, tobacco, and energy products. A challenge to reaching a carbon price floor agreement is how to account for changes in existing energy taxes or subsidies that can enhance, or offset, the emission impact of a formal carbon price. But the practicalities of monitoring these changes should be manageable. More substantively, incentives eventually will be needed to encourage, and enforce, broader country participation in the agreement.

Bring on finance ministries

Falling energy prices, the momentum for mitigation action following the Paris conference, and the long-term need for revenues to enable broader fiscal reform open a unique window of opportunity to phase in carbon taxes—or instruments that resemble taxes. Finance ministries are becoming more engaged in the policy dialogue and can play a central role in integrating carbon pricing into the wider fiscal system to support a transition to low-carbon economies. ■

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Green Jobs



Protecting the environment can go hand in hand with economic prosperity and job opportunities

Peter Poschen and Michael Renner

U.S. President Barack Obama's 2013 climate action plan and 2015 clean power plan triggered fierce debate. Senate Republican Leader Mitch McConnell denounced the proposals. "Declaring a 'War on Coal' is tantamount to declaring a 'War on Jobs,'" McConnell told the Senate. "It's tantamount to kicking the ladder out from beneath the feet of any Americans struggling in today's economy."

The perception that there is a trade-off—an intrinsic contradiction between protecting the climate and the environment on one hand and economic prosperity and job opportunities on the other—is common among government decision makers north and south, as well as among business leaders.

Doubt also lingers among voters. An annual poll of U.S. voters' top concerns conducted by the Pew Research Center showed a clear pattern over the past decade. During years of high growth with ample employment opportunities, environmental sustainability and jobs and family incomes were tied as the two top concerns of the American public, at 57 percent each. But when the Great Recession started to sting in 2009, fear of job losses became a top concern of 82 percent of the U.S. public; the environment worried only 41 percent, and climate change was all but eclipsed at 30 percent (Pew Research Center, 2009).

When jobs are the priority and environmental protection is perceived as causing job losses, political will is hard to muster.

But do we really have to choose between protecting the environment and generating enough good jobs?

The answer has profound implications in a world where more than 200 million people are unemployed and almost half of those who are working have unstable and often low-paying jobs (ILO, 2015). An additional 400 million jobs will be needed to counter the unemployment that surged in the wake of the Great Recession and to offer opportunity for the young job seekers who will enter the labor market over the next decade, mostly in developing economies (ILO, 2014).

Is there a dilemma?

On the face of it, those who worry seem to have a point. The sectors that most directly contribute to climate change and other environmental degradation are agriculture, the fishing industry, forestry, energy, resource-intensive manufacturing, waste management, construction, and transportation. These sectors are the targets of policies designed to mitigate climate change, and together they employ more than 1.5 billion people, or about half the global workforce (see ILO, 2012).

But evidence accumulated over the past decade suggests that combating climate change does not preclude the growth of a healthy job market.

Green jobs—those that reduce the environmental impact of economic activity—are critical to shifting to a more environmentally sustainable economy. They fall into two broad

categories: production of environmental goods such as wind-mills and energy-efficient buildings, and services such as recycling and work related to reducing emissions and energy and resource consumption, such as environmental and work safety and facilities and logistics management.

Two key measures for reducing greenhouse gas emissions are implementation of low-carbon energy production and lowering emissions from land use as a result of deforestation.

Combating climate change does not preclude the growth of a healthy job market.

Cleaner energy production requires cutting back on fossil fuels, which release carbon dioxide when used to generate electricity or for heating and transportation. Substituting less-polluting fossil fuels such as natural gas for big polluters like coal and heavy oil offers temporary help. But ultimately, renewable energy such as power from water, wind, and sun and from sustainable biomass are what it will take to keep emissions from exceeding the ability of carbon sinks in the atmosphere and oceans to absorb them.

Industries producing renewable energy have started to generate a significant number of jobs. One of the first global assessments estimated direct and indirect employment in the renewable industry at 2.3 million as of 2006 (UNEP and others, 2008). Comparable assessments subsequently raised that figure to 7.7 million in 2014 (IRENA, 2015). (See Chart 1.) Well over half of these jobs are in emerging market economies such as Brazil, China, and India, which play a major role in the move toward renewable energy sources such as solar heat and power, biogas, and biofuels.

Investment in renewable energy has grown fast (though it slowed somewhat after 2011) and installed capacity has soared (UNEP, 2015; REN21, 2015). So far, however, renewables have not expanded at the expense of fossil fuels. Will there be job losses when that happens? Aren't renewables costing jobs because they are often more expensive than the fossil alternative? And does it make a difference if the equipment for renewable energy needs to be imported? These questions flag an important point: the full economic and employment impact of a switch to low-carbon energy must be assessed for the economy as a whole.

Millions of jobs have been lost in the fossil fuel industry over recent decades, in particular in coal, where only 9.8 million jobs remained in 2014 (Greenpeace International and others, 2015). These losses are not the result of climate policies, however, but of productivity gains in coal mines and international trade. When renewables start to displace fossil fuels, the direct comparison suggests a net gain, which is confirmed by a look at the broader economy. Filling up a car's gas tank and use of electricity in a fossil-fuel- or nuclear-based power grid do not generate many jobs, either in the energy sector or among its suppliers. These sectors generate far

fewer jobs than average consumption spending does. By contrast, renewables and investment in energy efficiency generate more jobs than demand for other goods and services (see Chart 2, which illustrates the point for France).

How do the cost of renewables and the prospect of equipment imports affect net jobs? The cost of renewable energy has dropped unexpectedly quickly over the past decade. The International Renewable Energy Agency reckons renewables are already the cheapest way to provide electricity to the 1.3 billion people who lack access to clean energy, mostly in Africa and south Asia (IRENA, 2013). And power from wind is commercially viable in a growing number of countries—such as Brazil and the United States and in Europe—with extensive and diversified power grids.

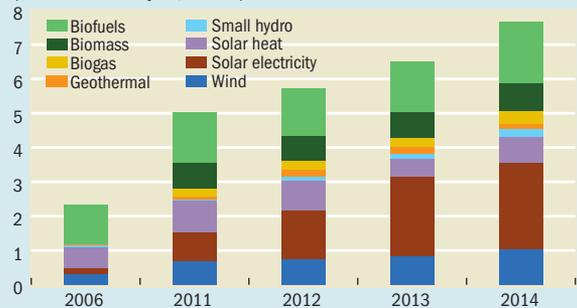
While much of the debate on climate change and employment has focused on renewables, another and more significant source of jobs from decarbonization has received much

Chart 1

Renewable jobs

Solar energy has become a key driver of green jobs, which are growing in number globally each year.

(direct and indirect jobs, millions)

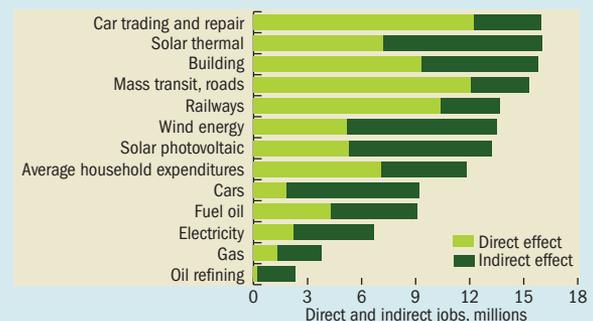


Sources: UNEP and others (2008) for 2006 data; ILO (2012) for 2011 data; and IRENA (2013, 2015) for 2012–14 data.

Chart 2

Job generators

Renewables and energy efficiency generate more jobs in France than fossil fuels do.



Source: Quiron and Demailly (2008). Note: Chart shows jobs generated in France in 2005 per million euros of final demand in selected sectors.

less attention. Substantial efficiency gains are technically feasible and economically viable in industry, housing, transportation, and services. Businesses can make a profit and households can enjoy real savings. And spending the surplus on things other than fossil energy will boost an economy's employment.

For example, the United States is a diversified economy that imports substantial amounts of equipment for renewables. A recent study carefully considered economy-wide effects of reducing emissions by 40 percent by 2030 through a mix of clean energy and energy efficiency (Pollin and others, 2014). It concluded that \$200 billion a year in investment would generate a net gain of about 2.7 million jobs: 4.2 million in environmental goods and service sectors and their supply chains but 1.5 million lost in the shrinking fossil- and energy-intensive sectors. The net gain of 2.7 million jobs would reduce the unemployment rate in the 2030 U.S. labor market by about 1.5 percentage points—for example, from 6.5 percent to 5 percent. The authors consider this a conservative estimate; for example, it does not take into account the 1.2 to 1.8 million jobs likely gained from reinvested savings.

Other studies show similar results. A review of 30 studies covering 15 countries and the European Union as a whole found appreciable actual or potential net gains in employment (Poschen, 2015). Most studies considering emission targets in line with the ambitions announced for a Paris agreement in December find net gains on the order of 0.5 to 2.0 percent of total employment, or 15 million to 60 million additional jobs. In emerging market economies such as Brazil, China, Mauritius, and South Africa, green investment was found to accelerate economic growth and employment generation when compared with business as usual. Several studies suggest that more ambitious climate targets would generate greater gains in employment (for a discussion of particular countries, see Poschen, 2015).

In addition to new jobs, active climate policies offer other potential employment and social gains. Increasing productivity and sustainability in sectors that are critical for the climate, such as agriculture, construction, and waste management, could, for example, lift hundreds of millions of small-scale farmers out of poverty (ILO, 2012).

Policies matter

There is an important caveat, however. In addition to the emission-reduction targets themselves and the technology deployed to meet them, policy plays a crucial role in determining economic and employment outcomes. Price has long dominated economists' debate on the right instruments for effective climate and other environmental policies. Getting the prices to speak the truth—that is, to communicate the full economic cost of consuming a good or service, including the negative impact on climate—has long been seen as the key to changing economies without destabilizing the planet's climate system in unmanageable ways.

While few would question that correct pricing is a necessary component of an effective climate policy, it may

not be sufficient. In terms of employment outcomes, *how* the right prices are achieved also matters. Studies consistently show that environmental tax reform (“eco-tax”) that shifts the burden away from labor and income—by reducing payroll and income levies—and toward emissions and resource consumption, through instruments such as carbon taxes, can both reduce emissions and create jobs (see ILO, 2011).

The proceeds from an eco-tax can also help defuse three negative effects of the transition to a climate-friendly economy.

The *first* blow is the loss of jobs in some sectors—such as coal mining, coal-fired power generation, heavy industry, and transportation—as a result of restructuring of

Environmental tax reform can both reduce emissions and create jobs.

the economy. Thanks to the lower cost of labor achieved through the reduction of payroll taxes and social protection charges, even sectors that are resource intensive can maintain employment when energy and raw material costs increase. While the limited available evidence suggests only moderate job losses from restructuring, losses do tend to occur in areas already damaged by globalization and where there are few alternatives to the mining or energy sector. In such cases, investment in social security, worker retraining, and diversification of the local economy are needed to discourage workers and politicians from the affected regions from blocking decarbonization.

A *second* worry concerns income rather than jobs. Increases in energy prices—whether from eco-taxes or the elimination of energy subsidies—are socially regressive. Wealthier households benefit the most from subsidies because they consume more energy, while poorer households spend a disproportionate share of their income on energy and on goods and services that are energy hogs, such as food and transportation. Efforts to end subsidies that encourage consumption and waste have been successful only when a portion of the savings has compensated those excessively affected.

The *third* downside is the need to adapt to climate change itself. International Labour Organization research estimates the cost of unmitigated climate change will be 7 percent of world output in 2050 (ILO, 2011); the Organisation for Economic Co-operation and Development and the World Bank expect it to be even higher. Even if there is agreement in Paris and ambitious reductions of emissions are achieved in coming decades, the greenhouse gases already in the atmosphere will do increasing damage. Even with the current less than 1 degree Celsius increase over pre-industrial temperatures, erratic weather patterns and extreme weather have begun to alter ecosystems, erode infrastructure, disrupt business activity, destroy jobs and livelihoods, and kill people on

an unprecedented scale (Poschen, 2015). Climate change has also become a main driver of forced migration.

To cope with these climate stresses, investment is urgently needed to fortify affected sectors, communities, and businesses. Social protection is vital to help the poor weather the storms and droughts brought on by climate change. Employment-intensive investment can build infrastructure for adaptation and bring jobs to deprived communities in the process. Watersheds can be rehabilitated by planting trees and conserving soil to prevent floods downstream, and small dams and reservoirs can harvest water for the dry season. South Africa's Expanded Public Works Programme pursues a mix of poverty reduction and community-led development through investment in economic, social, and environmental infrastructure, including water management, wetlands protection, and forest rehabilitation. It generates several hundred thousand jobs for local communities and vulnerable groups. India's Rural Employment Guarantee Act provides at least 100 days of wage employment a fiscal year to every rural household whose adult members volunteer for unskilled manual work in projects such as soil and water conservation, reforestation, and flood protection. In fiscal year 2012/13, this program put 50 million rural households to work (Poschen, 2015).

Managing change

Some of the greatest opportunities to reduce emissions come from improvements in production processes and operations. Unlike changes in hardware, which take time, substantial reductions in emissions and resource consumption can be achieved in the short and medium term. The Pollution Prevention Pays program run by manufacturing conglomerate 3M since the 1970s shows what is possible. The company asks workers to identify opportunities to save resources and reduce emissions and implements those deemed viable. Between 1990 and 2011, 3M reduced its greenhouse gas emissions by 72 percent: it reduced its emission of pollutants by 1.4 million tons and saved \$1.4 billion in the process (3M, 2011).

This is just one example of the many ways businesses and employer organizations, workers, and trade unions—the so-called world of work—can help achieve the transition to a low-carbon, sustainable economy. Green businesses can save through more energy- and resource-efficient processes. Managers and workers can deploy energy- and resource-efficient technology. When businesses and workers are not prepared and lack the skills to install and use new technology, the economic and environmental gains are diminished or lost altogether. Skills shortages have been a bottleneck for green growth in almost all economic sectors and virtually all countries around the world.

Ministries of labor, employer organizations, and trade unions have also made major contributions to climate change adaptation. In Germany, these three actors launched the largest program to improve energy efficiency in the world, with more than €120 billion invested to date. In Brazil, these key players have integrated renewable energy into large-scale

social housing programs. In India and South Africa, they pioneered the use of social protection systems—ensuring social security and adequate working conditions—for the purpose of rehabilitation work and increased resilience to climate change. And in Bangladesh, the Ministry of Labour and Employment scaled up training for renewable energy installers, which brought solar home systems to more than 4 million rural homes.

The environmental and social challenges the world is now facing are closely linked. We have neither the time nor the money to deal with them separately or consecutively. Mobilizing employers, workers, and trade unions will be critical to putting a climate agreement into practice and garnering the needed political support. And that's one ladder that can mean a step up for rich and poor alike. ■

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Nuclear power has grown from a lab experiment to a mature technology but now faces serious headwinds

Nuclear power plant under construction, Kudankulam, India.

Power of the Atom

Lucas Davis and Catherine Hausman

LONG before the current enthusiasm about solar photovoltaics and other renewables, a seemingly magical technology turned yellow dust into electricity. In 1942, on an abandoned squash court at the University of Chicago, the Italian physicist Enrico Fermi demonstrated that electricity could be generated using a self-sustaining nuclear reaction. In the early decades, it was expected that nuclear power would be “too cheap to meter”—a cleaner, modern alternative to the fossil fuels of the day.

Fast-forward 75 years, and nuclear power has indeed grown to play a central role in global electricity supply. Last year nuclear power provided a whopping 2.4 petawatt hours of electricity, enough to meet 10 percent of total worldwide demand. And unlike fossil fuel plants, nuclear power plants emit no carbon dioxide, the primary driver of climate change.

Worldwide, over 400 reactors are operating on five continents. The regions with the largest nuclear fleets are western Europe (led by France) and North America (led by the United States), but Asia also has a significant number of plants—largely in China, Japan, and Korea. Overall, 31 countries are home to an operating reactor.

At the same time, nuclear power has not been everything it was expected to be. Fermi’s original nuclear experiments were financed on a shoestring budget, but it has proved remarkably difficult to scale up this technology cheaply enough to compete with fossil fuels. And, today, there is great uncertainty about the future prospects for nuclear power. While some countries, notably China, are expanding their fleet, public pressure has led Germany to phase out its reactors.

Understanding the economic and regulatory forces at work in this evolving outlook has never been more important. The nuclear disaster in Fukushima, Japan, highlighted the inherent risks of nuclear power. Still, with the approaching climate negotiations in Paris, it is particularly timely to consider the future role of nuclear energy.

It makes sense that many nuclear supporters see a key role for nuclear power in addressing climate change. A single pound of uranium produces as much electricity as 16,000 pounds of coal. And while nuclear power is virtually emission free, burning coal and other fossil fuels generates carbon dioxide, sulfur dioxide, nitrogen oxides, and mercury.

How much carbon dioxide are we talking about? Consider the following. If all currently operating nuclear plants were replaced with fossil fuels, carbon dioxide emissions would increase by 2 billion metric tons a year. This is slightly less than the total carbon dioxide emissions of Germany, France, Italy, and the United Kingdom *combined*. While wind and solar energy are increasing around the world, they do not provide the reliable capacity required to fill this gap.

Boom and bust

Despite increased attention to climate change, relatively few new nuclear plants have been built during the past three decades. Construction boomed first in western Europe and in North America back in the 1960s and 1970s (see chart). Many of these projects took well into the 1980s to finish, but since 1990 there has been relatively little new construction.

Nuclear construction surged again in 2008 and 2009, and has continued despite the Fukushima accident in 2011. Currently, 70 nuclear reactors are under construction worldwide, about one-third of the construction volume at the peak in the late 1970s. Of these, 46 are in Asia, 15 in eastern Europe and Russia, and 5 in the United States. The biggest driver is China, with 26 reactors under construction and plans to begin construction on dozens of additional projects over the next decade.

Why are we not building more plants? Probably the most important explanation is construction costs. Building a nuclear power plant requires highly skilled, highly specialized architects and engineers to manage all stages of design, construction, assembly, and testing. And the sheer size of nuclear power plants means that most components must be specially designed and built, often with few suppliers worldwide. Moreover, the long time required for construction means that financing costs are substantial.

Nuclear plants have always been expensive to build. But recent experience suggests that construction costs may have actually increased. As part of the recent surge in building, construction was started on two “next generation” reactors to be built by the French company Areva in Olkiluoto, Finland, and Flamanville, France. These new plants were expected by many nuclear proponents to usher in a new era of European nuclear reactor construction. Instead, both projects have been plagued with problems and delays. Construction costs at both sites are now expected to be more than triple the

Building many, smaller, identical reactors could lower up-front costs and make siting easier.

original estimates. Similarly, a new plant at Hinkley Point in southwest England is just beginning construction, but is already years behind schedule and expected to cost at least \$25 billion.

These cost overruns provide a vivid reminder of some of the challenges that can occur during construction. Most recently, Areva discovered problems with the quality of the steel used in the French plant’s reactor vessel. Nuclear power plants must meet such strict safety requirements that it is almost inevitable that there will be some delays and cost overruns.

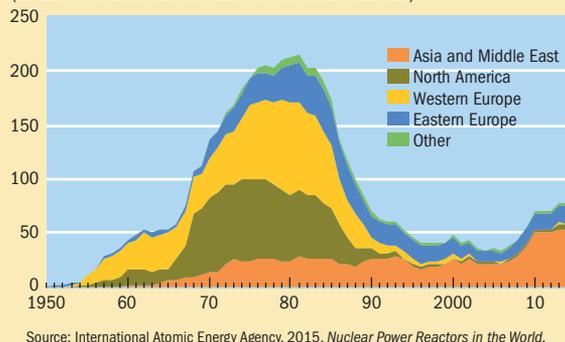
The hope has always been that learning-by-doing would bring down nuclear construction costs. The idea is that the more you build, the cheaper it becomes. The empirical evidence for this is mixed, but it is probably not a coincidence that the lowest reported construction costs in the world today are in China, where nuclear capacity is growing the fastest. An important priority for the nuclear industry is to study these new Chinese builds closely to understand how they have been able to reduce costs.

Another potential cause for optimism is small modular reactors. Building many, smaller, identical reactors could

Going nuclear

Construction of nuclear reactors peaked in the late 1970s.

(number of nuclear reactors under construction worldwide)



Source: International Atomic Energy Agency, 2015, *Nuclear Power Reactors in the World*.

lower up-front costs and make siting easier. Several intriguing nuclear start-up companies are pursuing this option, and industry insiders are following this technology extremely closely, looking forward to demonstration projects soon.

Other challenges

But it still won’t be easy for nuclear power. In addition to high construction costs, nuclear power faces other significant challenges. In North America, for example, natural gas is so cheap it makes it hard to justify any other type of power plant. You can build a nuclear plant and sell electricity around the clock, but still not make enough profit to pay for the plant.

In North America, even *existing* nuclear plants are struggling financially. Since 2010, five U.S. reactors have closed. Two additional plants have announced early closure, with one announcement as recently as October 2015. For the latter two cases, the operators cited a poor economic outlook as a driving factor in the decision to close early. Analysts have projected potential closures at other plants, with cheap natural gas the real stumbling block.

And of course, for any existing or new nuclear plant, much hinges on public opinion and the social license to operate. Declining public support since Fukushima, continued concerns about storage of spent fuel, declining costs of renewable generation, and the lack of a global price on carbon emissions have all contributed to a substantial headwind for nuclear power.

Is the world headed for a nuclear renaissance, with China leading the way? The turning point many have hoped for is not yet here. Construction costs are still too high and alternative technologies too cheap, and there is insufficient global commitment to reducing carbon dioxide emissions. A confluence of factors could make nuclear power a viable economic option. Otherwise, nuclear power will fall over time as a fraction of electricity generation. ■

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Down the Slide

John Baffes, M. Ayhan Kose, Franziska Ohnsorge, and Marc Stocker

The collapse in oil prices since 2014 is the most recent of several in the past three decades and may portend a long period of low prices

AFTER four years of relative stability at about \$100 a barrel, oil prices began a more than 50 percent slide in June 2014. The dramatic drop in oil prices joins the decline in the price of other commodities in marking what appears to be the end of a boom, or supercycle, that began in the early 2000s. But the oil price decline is not an unprecedented event. Before the current collapse there were three large declines in oil prices (see Chart 1).

Each of those earlier declines coincided with major changes in oil markets and the global economy. The recent collapse in prices has triggered not only intense debate about its causes and consequences, but has also raised questions about how it compares with those previous episodes.

We analyzed the main features of each episode and found that although each of the collapses had its own narrative, the first and the most recent have eerier similarities, which include a rapid expansion in unconventional supplies and a shift in policy by the Organization of the Petroleum Exporting Countries (OPEC) after a period of high prices. These similarities suggest that oil prices will remain relatively low for some time.

Underlying demand and supply conditions for oil determine long-run price trends as do

expectations about future developments. But expectations can also play a role in short-run movements in market sentiment. During the current oil price plunge, revisions of supply and demand expectations were noticeable, but neither exceptional nor unusually large—and by themselves unlikely to cause such a massive price disruption.

Behind the recent collapse

But these changes in expectations coincided with four other major developments: a rapid increase in U.S. oil output, a significant shift in the objectives of OPEC, receding geopolitical risks, and significant dollar appreciation. These factors, coupled with longer-term shifts in supply and demand dynamics, formed a perfect storm that sent prices plummeting:

- **Supply and demand:** Global oil markets have been affected by a long-term trend of greater-than-anticipated supply, especially from unconventional sources of oil production in the United States and, to a lesser degree, from Canadian oil sands and the production of biofuels (produced from plants such as corn or sugarcane). An increase in oil prices after 2009 and exceptionally favorable financing conditions made extracting oil from tight rock formations (shale sources) in the United States profitable and led to a significant increase in U.S. oil production (see Chart 2). These unconventional oil projects differ from standard drilling operations in that they have relatively low capital costs and a much shorter life cycle—2.5 to 3 years from the start of development to full extraction compared with decades for conventional

Rows of oil derricks in oil field, Daqing, China.



drilling. At the same time that oil supplies were predicted to rise, oil demand forecasts were downgraded as global growth repeatedly disappointed since 2011 (see Chart 3). While both supply- and demand-related factors played a role in driv-

Unconventional oil suppliers are likely to continue to be significant players.

ing down oil prices, empirical estimates indicate that supply (much more than demand) factors have accounted for most of the latest plunge.

- OPEC objectives:** The roughly 36 million barrels a day that OPEC countries produce account for 40 percent of global oil supply, and although its share of global production is less than it was a decade ago, OPEC still has the potential to be the swing producer in global oil markets if it chooses (see box). That is, OPEC has enough spare production capacity to easily increase or decrease the supply of oil to affect its price. Through the early 2010s, OPEC's desired price range for crude oil increased gradually from \$25 to \$35 a barrel in the early 2000s to \$100 to \$110 a barrel. However, because of the high price target and rising unconventional oil production, OPEC's share of global oil supply was at risk of steadily eroding. To stem further losses of market share, several OPEC members in the third quarter of 2014 began to offer discounts to Asian oil importers, signaling OPEC's intentions to abandon price targeting. At its meeting in November 2014, OPEC left unchanged the production quotas that were agreed to in December 2011, implying that it would no longer act as the swing oil producer.

- Geopolitical developments:** Oil prices have long been influenced by political tensions in oil-producing regions. Although unconventional oil supplies were adding more than 1 million barrels a day to global production as early as 2010, at first this extra supply merely made up for losses from various producers in the Middle East and North Africa. But by the second half of 2014, it became apparent that conflicts in the Middle East and eastern Europe were not having as severe an impact on oil supply as expected. Libya, despite internal conflict, added 500,000 barrels a day of production in the third quarter of 2014. In Iraq, as the advance of the Islamic State stalled, it became apparent that oil output would not be disrupted. Finally, the sanctions and countersanctions imposed after June 2014 as a result of the Russia-Ukraine conflict have had little effect on European energy markets.

- Appreciation of the dollar:** Since June 2014, the dollar has appreciated by more than 15 percent against major currencies in trade-weighted terms (see Chart 4). Typically, a broad-based appreciation of the dollar tends to raise the local currency cost of oil in countries using currencies not linked to the dollar, making for weaker demand in those countries. It also prompts an increase in supply from non-dollar producers, such as Russia, whose input costs are mostly denominated in local currencies.

Chart 1

Four on the floor

Three oil price collapses preceded the current decline—in 1985–86, 1990–91, and 2008–09.



Source: Authors' calculations.
 Note: The last price observation is for September 2015. OPEC = The Organization of the Petroleum Exporting Countries.

Chart 2

Upside surprises

As unconventional extraction techniques gained hold, starting in 2011, U.S. oil production consistently exceeded forecasts.



Source: Authors' calculations.
 Note: U.S. oil output includes biofuels, which are produced from plants such as corn and sugarcane. The dotted lines are month-by-month forecasts of annual output. The solid line represents the actual output for the year. The solid line for 2015 corresponds to forecasts for the year as a whole made in September 2015.

Past as prologue

There were three large oil price declines before the current one—in 1985–86, in 1990–91 during the first Gulf War, and in 2008–09 during the global financial crisis (see table).

The collapse of oil prices in 1986 was preceded by several years of high oil prices precipitated by the 1979 revolution in Iran. OPEC's practice was to set official prices for the various types of crude oil produced by its members, with highly prized light oil from Saudi Arabia the benchmark. The price of Saudi light was set at \$34 a barrel in 1981. High prices and a global recession in the early 1980s led to a large decline in oil consumption, mainly in advanced economies. High prices also encouraged fuel conservation, substitution of other fuels for oil—especially in electricity generation, including from nuclear power—and efficiency gains, particularly higher minimum fuel efficiency standards for automobiles.

The high prices also sparked non-OPEC production, notably in the U.S. state of Alaska, in Mexico, and in the North Sea. Weak demand and rising non-OPEC output forced OPEC to cut its production nearly by half, most of which was absorbed by Saudi Arabia. Nevertheless, Saudi light prices declined to \$28 a barrel in 1985, because of both sluggish global economic activity and the decision of several members to discount official prices to increase exports. By 1985, Saudi Arabia had seen its oil production drop to 2.3 million barrels a day from 10 million a few years earlier. To regain market share, it raised production, abandoned official pricing, and adopted a spot pricing mechanism.

The 1990–91 crash was the indirect result of Iraq’s August 1990 invasion of Kuwait. For a number of years before the invasion oil prices were low. North Sea (Brent) oil averaged less than \$17 a barrel over the previous five years. Iraq’s invasion of Kuwait and the subsequent Iraq war to restore Kuwait’s independence removed more than 4 million barrels a day of combined Iraqi and Kuwaiti crude oil from the market. Other OPEC members had more than enough untapped capacity to cover this shortfall, but it took time for them to ramp up output, so prices rose sharply. Brent prices briefly rose above \$40 a barrel in September 1990 before slowly retreating to \$28 in December as additional supplies reached the market. The ensuing price crash in mid-January 1991 was sharp and sudden. Prior to the war the International Energy Agency (IEA) agreed that if there were war, its largely advanced economy members would release 2.5 million barrels a day from the emergency crude oil stocks they held in reserve. The IEA action and the apparent early success of coalition forces in ending Iraqi control of Kuwait prompted an immediate decline in prices to under \$20 a barrel. The 1990–91 crash then was a reversion of prices to their low prespike levels following an external shock. It differed from the other three, in which the crash followed a prolonged period of high prices.

The 2008–09 price decline was the biggest since World War II and was a response to the global financial crisis that began in 2008. During the second half of 2008, oil prices fell more than 70 percent. The price collapse, which reflected

Chart 3

Repeated disappointments

For the past four years global growth projections have proved too optimistic.

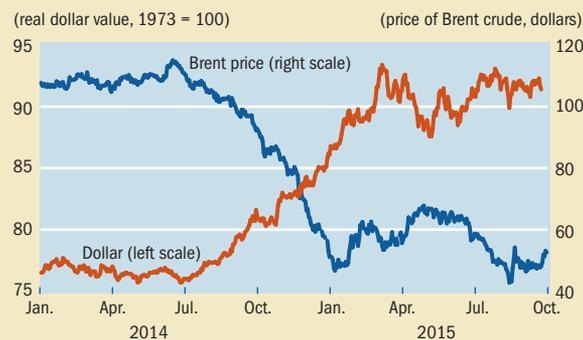


Source: Authors’ calculations.
Note: Projections are forecasts made a year earlier. The actual growth for 2015 is the September 2015 projection for the year as a whole.

Chart 4

Singing a different tune

Oil prices have steadily fallen since July 2014, while the dollar has steadily gained value.



Source: Authors’ calculations.
Note: The dollar value is its effective exchange rate against a trade-weighted basket of major currencies. The latest observations are for October 9, 2015. Brent crude is oil produced from the North Sea.

global uncertainty and a drastic reduction in demand, was not unique to oil. Most equity markets experienced similar declines, as did other commodity prices, including for

The last cartel standing

The largest player in the global crude oil market is the Organization of the Petroleum Exporting Countries (OPEC), which was founded in 1960 to “coordinate and unify petroleum policies among member states.” OPEC has 12 active members—Algeria, Angola, Ecuador, the Islamic Republic of Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, the United Arab Emirates, and Venezuela.

OPEC began to play an important role in global oil markets after it decided to impose an embargo on oil exports in 1973, which resulted in a quadrupling of oil prices—from \$2.70 a barrel in September 1973 to \$13 a barrel in January 1974. OPEC actions were also instrumental in the tripling of oil prices from \$12.85 in October 1978 to \$40.75 in November of 1979. Efficiency gains and new oil suppliers, along with disagreements among various OPEC members (especially during the Iran-Iraq and first Gulf wars), reduced the cartel’s role for

the next two decades. OPEC countries again acted in concert to raise prices following the Asian financial crisis in 1997, when oil prices dropped to less than \$10 a barrel.

Efforts to manage world commodity markets to achieve price objectives are not unique to the oil market. A number of commodity agreements, often negotiated among producing and consuming nations to stabilize prices at levels deemed fair to both, were put in place following World War II and included cocoa, coffee, natural rubber, olive oil, sugar, tin, and wheat. However, the price and trade restrictions imposed by some of the agreements either encouraged the emergence of competing products or new producers. As a result, all of these non-oil agreements collapsed. A key difference between OPEC and the earlier commodity agreements is that OPEC does not have a legal clause on how to intervene when market conditions warrant, which allows it flexibility in responding to changing circumstances.

other energy products, such as coal; metals; food commodities; and agricultural raw materials, such as natural rubber. The 2008 oil price crash was also accompanied by a spike in volatility, and most commodity prices, including oil, fell at about the same rate. The severity of the 2008 oil price collapse had its roots in OPEC's decision in the early 2000s to return to restricting oil supplies. It briefly targeted a crude oil price range of \$22 to \$28 a barrel. However, when prices exceeded that range in 2004, OPEC gradually raised its "preferred target" to eventually reach \$100 to \$110 a barrel. As the financial crisis unfolded and recession gripped the advanced economies in 2008–09, prices dropped to less than \$40 a barrel. Within two years, though, prices surged back to the \$100 mark, helped by stronger demand as the global economy rebounded and supported by OPEC's decision to take 4 million barrels a day off the market.

The slides side by side

The four oil price collapses since 1985 have similarities and differences.

	1985–86	1990–91	2008–09	2014–15
Key Statistics				
Period	Nov. 1985–Mar. 1986	Nov. 1990–Feb. 1991	Jul. 2008–Feb. 2009	Oct. 2014–Jan. 2015
Duration (days)	82	71	113	83
Price drop (percent)	66	48	77	51
Volatility (percent)	4.69	5.18	4.62	2.58
Market and Policy Environment				
Fundamental drivers	Increasing non-OPEC oil supplies, especially from Alaska, Mexico, and the North Sea	Operation "Desert Storm" and IEA emergency stock drawdown calmed oil markets	Sell-off of assets (including commodities) due to the 2008 financial crisis	Increasing non-OPEC oil supplies, especially shale oil from the U.S.
OPEC's policy objective	Protect market share rather than target prices	Keep oil market well supplied	Target a price range	Protect market share rather than target prices
OPEC's action	Raise production	Raise production	Cut production	Raise production
Pre-crash oil prices	Gradual decline of official OPEC prices	Sharp increase	Large increase prior to the crash	Relatively stable prices above \$100 a barrel
Post-crash oil prices	Remained low for almost two decades	Returned to prespike levels	Reached pre-crash levels within two years	Projected to remain lower
Source: Authors' compilation. Note: IEA = International Energy Agency; OPEC = Organization of the Petroleum Exporting Countries.				

Comparisons

There are some critical similarities and differences among the four oil price collapses.

Most striking are the similarities between the 1985–86 crash and the current one. Both occurred after a period of high prices and increased production from non-OPEC countries—in 1985–86 from Alaska, the North Sea, and Mexico and in the current collapse from oil shale in the United States, oil sands in Canada, and biofuels. In both crashes, OPEC changed its policy objective from varying output to maintain a targeted price to selling flat out to maintain its market share. There are similarities between the 1990–91 and 2008–09 crashes as well. Both were precipitated by global events: the first Gulf War and the 2008 global financial crisis.

The most recent oil price collapse is similar in many ways to those in the 1980s and during the global financial crisis. However, there are also marked differences between the two most recent oil price declines. The fall in the price of oil that began in 2014 was considerably sharper than the decline in the prices of other commodities. In 2008–09 virtually all commodity prices declined by similar magnitudes as a result of a severe global recession, and most commodity prices, including the price of oil, recovered just as quickly after the recession bottomed out. Other price and market developments also suggest that the recent episode was driven by a range of mostly oil-industry-specific factors, whereas the 2008–09 episode was due to broad factors—a severe collapse in demand following the global financial crisis, global uncertainty, and liquidity constraints. For example, oil prices have been less correlated with prices of other commodities since late 2014 than they were in 2008–09. Moreover, oil prices were less correlated with prices in equity markets during the latest episode than they were during the global financial crisis.

Prospects for oil markets

Recent developments that led to the plunge in prices appear to have affected oil markets in a lasting way that will probably result in lower oil prices for some time. As costs of unconventional production continue to decline sharply, unconventional oil suppliers are likely to continue to be significant players. They could take over OPEC's role as a swing producer because unconventional output can adjust reasonably quickly to changes in demand. The new swing role could be cemented if OPEC continues its current policy stance over the near term, aiming less at keeping prices high and more at maintaining its share of the oil market—as it did following the 1985–86 plunge. Moreover, a long-standing global trend toward production technologies that use less oil will continue to tamp down increases in demand for oil and thus put pressure on oil prices.

Over time, however, a slow pickup in global economic growth should gradually lift global oil prices. Oil prices could also increase rapidly if unconventional suppliers cut their production significantly. As has happened in the past, an escalation of geopolitical tensions could drive prices up. Nonetheless, the sharp drop in prices since mid-2014 has been one for the record books as a major episode with likely lasting effects on the global oil markets. ■

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Taking the **Power** Back

U.S. consumers will play an active role in shaping the energy system of the future

Power lines and wind turbines in the Morongo Basin near Palm Springs, California, United States.

Mustafa Jamal

THE U.S. electrical grid is the largest machine in the world. In 2014, over 3.8 trillion kilowatt hours of electricity (nearly a fifth of the world total) flowed through its 4.3 million kilometers of power lines to reach over 315 million consumers, who paid \$400 billion for it.

But this behemoth of a system has changed little except in size in the 133 years since Thomas Edison launched its earliest iteration, The Pearl Street Station in lower Manhattan. Electrical grids in most countries remain quite primitive.

Given the risks of fuel price volatility and potentially catastrophic climate change, and the availability of new technologies for mitigating these risks, consumers and regulators are demanding a greener and more efficient U.S. electrical system. Just as the telecommunications landscape was rocked when landlines gave way to cell phones, the grid infrastructure is being forced to undergo a sea change: become smarter or fade into irrelevance.

This is not the best news for U.S. utilities. In the face of pressure from their regulators to modernize, these monopolies have hesitated to assume the risk and cost of implementing changes that could cut revenue. But it's great news for consumers. Until now relatively powerless over their energy use or carbon footprint, consumers will have new tools to help them better understand and control their energy use, carbon footprint, and electricity costs.

Controlling demand

The most promising and established of these new tools is demand-side management (DSM).

DSM helps address the problem of peak load. Utilities must have sufficient generation on hand to provide the electricity needed to meet demand at its highest point—the peak of the demand curve (see chart). Otherwise, the system will

crash, resulting in blackouts that incur significant economic and social losses, especially since peak load often coincides with the busiest hours for business and industry. DSM uses financial incentives to modify the demand curve by encouraging industrial, commercial, and residential consumers to use less electricity and shift discretionary use to off-peak times, such as nights and weekends.

If the peak of the demand curve is flattened or shaved, fewer new power plants will be needed, requiring less additional infrastructure investment, reducing the environmental harm associated with construction of new power facilities, and the emissions that would come from them. The emission savings are especially significant because “peaker” power plants—used to meet additional demand during peak periods—are more expensive and less efficient than baseload plants, which run constantly to meet continuous base demand. Peaker plants are also almost always powered by carbon-emitting fossil fuels, whereas baseload plants often run on nuclear or hydroelectric power.

DSM's financial incentives are time-of-use tariffs that charge more for energy during peak hours and less during off-peak hours, prompting consumers to shift their use to off-peak hours, when baseload plants can meet demand. This requires a new class of meters called smart meters, which measure not only how much electricity is used, but also when, and then communicate this information to the utility at regular intervals. Customers can log in to a secure website to view their energy use in close to real time and analyze their consumption patterns. Understanding these patterns helps consumers decide how to modify their behavior to cut their bills and help reduce peak load for the system overall.

Environmentally conscious customers can use this information to understand and reduce their carbon footprint.

In addition to encouraging energy efficiency and conservation, smart meters promote growth in distributed renewable generation—solar panels and wind turbines on top of factories, offices, and homes. Many smart meters are net energy meters, measuring electricity flow in both directions, so utility customers with solar panels installed on their roofs can sell power back to the grid, reducing their electricity bill and even earning money from the utility if they produce more than they use. About a third of all meters in the United States today are smart meters, up from fewer than 5 percent in 2008.

In the United States, DSM reduced peak loads by over 28.8 gigawatts in 2013, a 7.2 percent increase over 2012 and enough to power Austria. The latest reductions came increasingly from residential customers.

Storing it up

While still at a nascent stage, new and advanced electricity storage solutions hold great promise. At their core, these new energy storage solutions are simply large rechargeable batteries, able to store and discharge electricity. And while rechargeable batteries are nothing new, they've never been cheaper, safer, longer lasting, or more capacious.

A key limitation of energy systems has been that electricity had to be consumed when it was generated. There was no effective way to store it, which has been a major stumbling block for renewable energy technologies in particular. No matter how much sunshine there is and how efficient solar cells are at converting it to electricity, it will not contribute to meeting nighttime peak demand. Likewise, efficient wind turbines can be deployed in an area with strong wind, but that won't help meet daytime peak demand if the wind blows mostly at night. By balancing the intermittent generation from wind and solar plants, where the timing and magnitude of electricity generation supplied often don't coincide with peak demand periods, new energy storage technologies will help facilitate adoption of renewable energy.

A home battery like the Tesla Powerwall can capture solar power during the day for homes equipped with solar panels and power the home in the evening. It can also store electricity from the utility during off-peak hours, when it's cheap,

and discharge it to the home or business during peak hours, when it's expensive. Given their high cost, home batteries today appeal primarily to affluent early adopters, but with rapid advances in battery technology, they could become as ubiquitous as refrigerators in a decade.

Since plug-in hybrid and electric vehicles already contain large batteries and are parked 95 percent of the time, in the

New and advanced electricity storage solutions hold great promise.

future they could become significant providers of demand response when tied to the grid. A car in a vehicle-to-grid (V2G) system would help meet peak demand through its batteries, recharging them during off-peak hours. For now, though, V2G remains experimental.

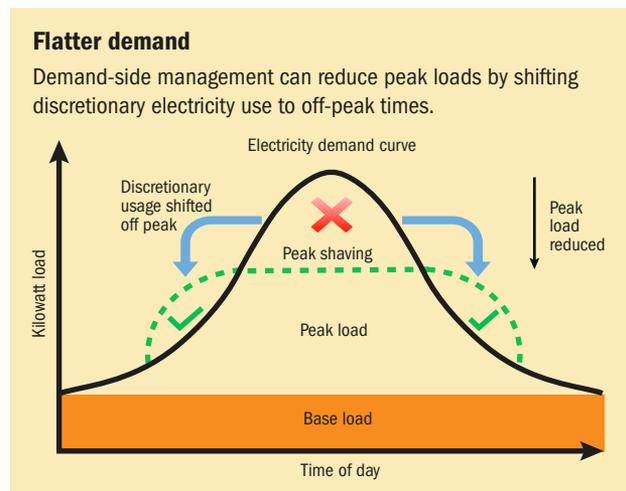
Energy storage systems don't have to be based on traditional battery designs. Several newer buildings in New York City, including the headquarters of U.S. investment firm Goldman Sachs at 200 West Street (constructed in 2009), are cooled by what are essentially giant ice makers in their basements. In Goldman's case, 770,000 kilograms of ice are frozen during the night, when electricity from baseload power plants is cheaper and 35 percent less carbon intensive. In the daytime, instead of energy-intensive air-conditioning, fans circulate air over the ice to cool the building, saving Goldman \$50,000 a month during the summer. Commercial air-conditioning is responsible for over 5 percent of U.S. electricity demand. Although not much on an absolute basis, it represents a major component of peak demand, especially on hot summer days when the electrical grid is most stretched. Buildings incorporating peak-flattening technologies like those of 200 West Street help New York City avoid building additional peaker power plants, whose environmental footprint surpasses their carbon emissions alone.

More problems to solve

There remain a few unanswered questions. For instance, who will pay for the future grid? Utilities already complain that increased adoption of homegrown green energy such as solar is draining their revenue without helping pay for maintenance and the infrastructure upgrades used to sell that power back to them. As meters and grids become "smart," they also become vulnerable to cyberattacks. How will the security of something as important as the electrical grid be ensured? And do large-scale grids make sense in a future of decentralized microgrids that offer more ownership and control to communities and corporations and greater resilience to severe weather?

In any case, in the near to medium term, end users of electricity stand to gain significantly more knowledge and choice than at any other point in the history of electricity. ■

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MORE THAN SYMBOLIC VALUE

Gita Bhatt

When India chose a symbol for its rupee, it joined a select club of countries

LIZA Minnelli and Joel Grey may have to add another currency to the famous quartet that makes the world go round. “A mark, a yen, a buck, or a pound . . . Is all that makes the world go around,” they sing in *Cabaret* in their famous duet at Berlin’s decadent Kit Kat Klub.

Now India has a symbol for its rupee to make the currency as easily recognizable as the yen or the dollar.

Distinctive identity

Besides representing monetary value, for many countries a symbol can be a source of national pride and identity, evoke a country’s hopes and aspirations, and occupy a coveted place on computer keyboards.

This was the thinking behind the Indian government’s search for a rupee symbol to replace the “Rs” abbreviation. In February

2009, a nationwide contest invited entries for a symbol that “reflects and captures the Indian ethos and culture.” With a formal symbol, then Finance Minister Pranab Mukherjee (now president of India) declared, “the rupee will join the select club of currencies such as the U.S. dollar, British pound sterling, euro, and Japanese yen that have a clear distinguishing identity.” In addition, a symbol would help separate India’s currency from others with similar or identical names, like Nepali, Pakistani, and Sri Lankan rupees and the Indonesian rupiah.

The new rupee symbol was unveiled July 15, 2010; officially approved by the government of India on August 26, 2010; and went into circulation about a year later.

Designed by academic and designer Udaya Kumar—the symbol was selected from over 3,000 submissions and a short list

of five finalists. Today Kumar's winning design is found on all Indian currency notes and coins (not to mention stamps, checkbooks, and keyboards), marking India's as only the second currency in the world—the first being the U.K. pound (£)—whose distinctive symbol is printed on its notes.

Once in a lifetime

Launching a currency symbol is a rare event. The euro's (€) was one of the most recently introduced, in 1999. Russia's search in 1999 for a symbol to represent the ruble proved fruitless. Many other countries rely on simple abbreviations of their currency's name, while others combine a letter abbreviation with the dollar sign.

Some monetary symbols have literal origins. The British pound sign, £, evolved from the Latin word *libra*, meaning scales, since the pound was originally worth exactly one pound of pure silver.

For India, the process was more complicated. India sought a currency symbol that would capture the culture, ethos, and diversity of India—17 languages are represented on its rupee notes—and have international appeal.

Unique and universal

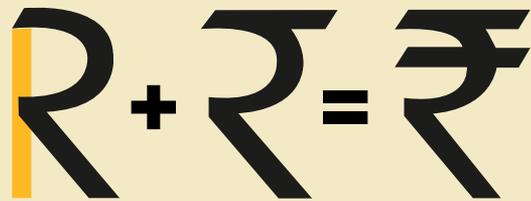
The winning design achieved just that: it is a combination of the letter "Ra" in Devanagari script—used to write Hindi, India's official language, and recognizable by the horizontal top line from which its letters hang—and the Latin "R" without the vertical line. "This amalgamation traverses boundaries across cultures giving it a universal identity, at the same time symbolizing our cultural values and ethos at a global platform," wrote Kumar in his design proposal.

The symbol also distinguishes itself in other ways. The parallel lines at the top (with white space between them) allude to the tricolor Indian flag as well as to the arithmetic equal



"The symbol is designed using the Devanagari 'Ra' and Roman capital letter 'R.'"

— Udaya Kumar, designer



sign—symbolizing the nation's desire for balance, stability, and economic equality within and among other nations.

While much remains to be done to boost growth and equality within India, the symbol serves as a powerful reminder of the country's aspirations to become a global player. ■

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"This symbol now lends a distinctive character and identity to the Indian currency."

— Indian President Pranab Mukherjee, 2012
(then finance minister)



From **Death** Sentence to **Debt** Sentence

Paul Collier, Richard Manning, and Olivier Sterck

Now that AIDS is a controllable disease, countries and donors must focus on financing treatment and investing in prevention

TWENTY years ago, a diagnosis of AIDS meant certain death. Now, thanks to antiretroviral therapies, people living with the HIV virus in low-income countries can enjoy a near-normal life at a cost of a few hundred dollars a year. Initially, it was thought that these therapies might not be viable in Africa given the difficulty of adhering to the demanding routine of treatment (Stevens, Kaye, and Corrah, 2004). But these fears have proved groundless: millions of Africans are alive and healthy today thanks to such therapies.

Reflecting this perception that the medical battle against AIDS is now winnable, an *Economist* cover story marking the 30th anniversary of the disease was titled “The End of AIDS?” But as the end of AIDS as a medical disaster comes within reach, it has become a potential fiscal calamity. Vastly improved survival rates for people who are HIV positive mean that poor countries with high HIV prevalence face a major new fiscal liability (Haacker and Lule, 2011).

Moral dilemma

The HIV virus gradually destroys white blood cells, essential to the operation of a person’s immune system. Without treatment, people whose CD4 count—a measure of these white blood cells—falls below 350 cells/cubic millimeter are likely to die within five years; with treatment they can live nearly normal lives. Despite the availability of generic and discounted drugs in



Girl in AIDS orphanage, Geita Town, Tanzania.

poor countries, the cost of treatment is too high for sufferers who are poor—and too high for poor societies to bear on their behalf. But from the perspective of high-income countries this cost is trivial—a few hundred dollars to save a life. These features give rise to an obligation of rescue: identifiable HIV-positive people cannot be left to die when it is so readily in our power to prevent it. That is why past leaders, such as U.S. President George W. Bush and French President Jacques Chirac, who did not regard development aid as a high priority, nevertheless launched massive and dedicated funding for HIV/AIDS programs.

But the cost of financing antiretroviral treatment poses its own unique moral issues. Once treatment is started, it would be abhorrent to stop it because funds run out. Choosing to discontinue treatment is an “act of commission” that ends the lives of identifiable people rather than the “act of omission” of failing to start treatment. But expenditures on antiretroviral treatment are long lasting precisely because treatment enables normal life spans: currently young sufferers will have to be treated for decades.

Thanks to antiretroviral therapies and prevention, the number of people who are newly infected with HIV is declining in most parts of the world. Between 2001 and 2013, the number of new HIV infections declined by 38 percent, from 3.4 million to 2.1 million (UNAIDS, 2014). AIDS-related deaths have also fallen thanks to treatment, by 35 percent since 2005. However, since the number of new infections in many countries is still well above the number of deaths, the stock of HIV-positive citizens continues to increase, meaning that the costs are likely to escalate for many years. In addition, most of the people already infected with HIV are not yet on antiretroviral therapy, either because their CD4 count has not yet fallen to the point at which treatment is warranted or because they have not yet been diagnosed. So many more people will at some stage need treatment. And worse, many of the people receiving therapy—and those who will need it in the future—will eventually become resistant to the standard treatment. At that point they will need more sophisticated treatment regimens, which are considerably more expensive.

The distinctive features of these costs have two potent implications that justify our focus on HIV/AIDS. However, our framework can be adapted to study the implications of other health conditions with the same features, and our analysis is of course not intended to minimize the requirement for investment in other health needs.

First, because the decision to start treatment locks in the need to finance future provision, that future liability needs to be known in advance. Donors and the governments of affected countries then must agree on clear rules for how that cost will be shared. Otherwise, governments might reasonably be wary of incurring liabilities that would not be viable if donor attention shifts to other priorities.

Second, because the continuing spread of infection creates large future liabilities, there is a new

rationale for prevention policies. While no longer medically essential to prevent death, prevention becomes more financially valuable. It is worth expanding spending on prevention at least until an extra dollar averts a dollar of liability from new infections.

This means that the treatment and prevention of HIV/AIDS shifts from an issue concerning ministers of health to one that also directly affects ministers of finance. New research suggests that committing additional resources to HIV prevention could save a country money overall (see Collier, Sterck, and Manning, 2015, and related papers from the RethinkHIV consortium).

Counting the costs

In our research, we examined the prevalence of HIV and its future fiscal implications for eight African countries. We recognize that there are clear benefits to treating HIV/AIDS in terms of individual well-being and the economy, but our focus here is on the fiscal implications of the moral duty to rescue (see table). We use a standard epidemiological model integrated in the widely used Spectrum software to estimate the likely spread of infections until 2050 (Avenir Health, 2014). Then we calculate the total cost of future treatment. The unit costs come from Schwartländer and others (2011) and are assumed to be constant over time. We reduce future costs by the “discount rate,” which is the rate of interest. The higher the rate of interest, the lower the value of the liability today of costs that occur in the future. Generally, health economists use an interest rate of only 3 percent, which would imply a massive liability. In our work we use the higher (and therefore more conservative) rate of 7 percent—the rate at which African governments can currently borrow in sovereign debt markets—since this is a clearer reflection of opportunity costs. Even with this high discount of future expenditures, the liabilities arising from the treatment of HIV/AIDS are large enough to have an impact on countries’ economies.

Future costs

The potential destabilization from future antiretroviral treatment costs warrants international assistance for some countries.

	Adult HIV Prevalence	GDP per Capita	External Debt Stock, 2012	Domestic Financing for HIV	Fiscal Cost of Antiretroviral Treatment in 2015	Aggregated Fiscal Cost of Future Treatment
	(adults, percent)	(U.S. dollars)	(percent of GNI)	(percent of GNI)	(percent of GDP)	(percent of GDP)
Botswana	21.6	8,332	17.7	2.12	77	24.1
Kenya	3.7	1,588	31.1	0.34	30	9.1
Lesotho	13.9	1,390	31.3	2.08	57	73.6
Malawi	8.0	275	31.7	0.05	2	80.3
Nigeria	6.3	3,677	4.2	0.05	23	6.8
South Africa	17.3	6,477	36.6	0.52	88	21.1
Uganda	4.5	685	22.5	0.19	13	21.3
Zimbabwe	13.4	1,073	75.5	0.28	29	38.7

Sources: IMF; World Bank; Spectrum, AIDS Info Online database; and authors’ calculations.
 Note: Data are for 2015 unless noted otherwise. Fiscal cost of future treatment is measured as the net present value of cost for 2015–50, with a terminal value calculation (for an explanation of this term, see Collier, Sterck, and Manning, 2015). GNI = gross national income.

More than 10 percent of the population in four of the eight countries we studied—Botswana, South Africa, Zimbabwe and Lesotho—has the disease.

Taking into account the continuing spread of HIV, both Botswana and South Africa face a liability of over 20 percent of GDP arising from the need for treatment. Because both



Donors and governments should not sleepwalk into a future crisis.

are middle-income countries, they cannot count on the international community to shoulder much of this future burden. Fortunately, because both countries have been prudently managed and therefore have low or moderate overall levels of debt to GDP, the treatment liability is substantial but not destabilizing. In fact, the response against HIV is already largely financed domestically in Botswana and South Africa.

Zimbabwe has a somewhat lower prevalence of the disease than Botswana or South Africa, but a much lower income level and a higher recognized debt burden. In this case, it would be desirable to agree in advance on burden sharing with potential donors. Otherwise, there is a danger of a game of chicken between donors and government, each underfunding so as to leave the other with the duty of rescue.

Lesotho is in an altogether different situation. It is much poorer than Botswana or South Africa, but has a similar level of HIV infection. As a result, it faces a dramatically larger liability, analogous to a debt in excess of 70 percent of GDP. Lesotho's external debt is only 31 percent of GDP, but the HIV-related liability would raise the country's overall burden above 100 percent, in effect thrusting it into a debt level defined by the IMF's Heavily Indebted Poor Countries Initiative as unsustainable. For this very reason, donors should not leave Lesotho to face this burden on its own. The international community already recognizes that external unsustainable debt burdens of poor countries should be forgiven. Lesotho has a small population, so the financial burden on the international community of financing the country's HIV/AIDS expenses will be trivial.

In Malawi, despite the lower HIV prevalence, the cost burden of future treatment dwarfs the country's modest external indebtedness. But because Malawi is much larger than Lesotho, the costs to the international community will necessarily be much higher. The Malawian government must therefore have reasonable reassurance of future donor funding if it is to commit to future treatment.

Clearly, given these liabilities for future treatment, ministries of finance must be aware of HIV/AIDS, and consider how to minimize the implied risks. Even for Uganda, which has lower prevalence, the hidden liability of treatment is as large as recognized indebtedness.

For some of the countries we studied, liabilities far exceed the capacity of the government to bear them. Given that there is an obligation of rescue, the excess of liabilities for treatment over what a country can reasonably afford becomes a liability of the donor community, and funding it will stretch for decades into the future. Ministries of finance must pressure donors to clarify their future commitments. Although donors face constraints on their ability to make long-term commitments legally binding, an agreed burden-sharing framework would make it less likely that donors will divert funds in the future to newly fashionable priorities.

The special funds that the international community has built to tackle HIV/AIDS have been crisis responses to the new duty of rescue, with short-term funding horizons rather than long-term strategies of partnership with African governments. But the likely evolution of each country's funding requirements can be projected through analysis of historical government and donor spending on HIV/AIDS. For a given HIV prevalence, as per capita income rises, government spending increases too. But donor spending declines almost dollar for dollar with higher government spending, so that total spending on HIV/AIDS stays roughly constant. Unless ministers of finance can successfully renegotiate this pattern of burden sharing, they will have to accept that as their economies grow, escalating treatment costs will increasingly fall on their own budgets.

Countries that decide on renegotiation can draw on some existing benchmarks that could trigger relief—for example, the point at which a country's total burden of future liability of antiretroviral treatment plus recognized external indebtedness exceeds the agreed debt sustainability threshold. Building an international consensus for such renegotiation would of course be no light task.

Whatever is done, donors and governments should not sleepwalk into a future crisis in which millions of people face the imminent prospect of avoidable death while each party tries to pin responsibility on the other. That said, spending money and providing drugs alone are not likely sufficient to defeat HIV; continuous investments to increase testing rates, diffuse knowledge, and promote prevention are essential.

An ounce of prevention

Our estimates of the cost of the duty of rescue underscore the need for effective policies to prevent the spread of infection. For Lesotho and Uganda, about half the future fiscal liability comes from new infections. And for Malawi, new infections increase the liability from 50 percent to 80 percent of GDP. On medical grounds, since the discovery of antiretroviral therapy, expanding treatment has taken precedence over prevention, but now there is a powerful *fiscal* rationale for greater attention to curtailing the spread of infection.

The initial policy response by the international community has been to promote treatment as the key to prevention. Once people are on antiretroviral therapy, they are far less infectious. The World Health Organization (WHO, 2015) is currently using this as one argument for treating people long before it is necessary to avoid death. However, this extension



A handful of AIDS pills, Pepo La Tumaini Jangwani HIV/AIDS Community Rehabilitation Program, Orphanage & Clinic, Isiolo, Kenya.

to treatment-as-prevention would be a further massive fiscal commitment, and in terms of the prevention objective other means of reducing the spread may be more cost-effective.

For example, in simulations for Malawi, we find that while the expansion of an adult circumcision program would more than pay for itself in reduced fiscal liabilities, an expansion of treatment-as-prevention would not. Good progress has been made by African countries in some areas, such as prevention of mother-to-child transmission. Encouraging adolescent girls to stay in school has also shown promising results (Santelli and others, 2015), but currently there are not enough proven prevention programs. Rather than pouring huge sums into the further expansion of treatment-as-prevention, it may be better to pilot a range of other prevention strategies, including those designed to achieve changes in sexual behavior, to see which work best.

The fear of inadvertently stigmatizing those who are HIV positive has often inhibited nonmedical approaches to policy. An early straightforward campaign of Ugandan President Yoweri Museveni, which warned people of the risks of multiple partners, proved to be highly effective. Ugandan infection rates subsequently rose again when the first campaign was replaced by a less realistic one advocating sexual abstinence. Similarly, there is a good case for intensively targeting sex workers and truck drivers—key groups spreading infection—for preemptive treatment. More precise geographic targeting would also make sense: for example, in Kenya risks of infection can vary tenfold between one county and the next.

A final important implication of our results is that donors and governments should closely align the share that each takes of the costs of treating future infections and of the costs of prevention. Any significant departure from this principle would expose the parties to moral hazard. For example, if donors paid for most of the treatment of future infections but governments paid for most of the prevention (or vice versa), neither party would have a financial incentive to increase

spending on prevention to its cost-effective level. Despite the many billions of dollars spent to date on HIV/AIDS, this basic principle of incentive-compatible financing has not been recognized, let alone implemented. The principle will become much more important as effective prevention strategies are discovered and need to be scaled up.

To date, governments have left HIV/AIDS issues largely to ministries of health, and the international community has created large financial silos through which interventions have been funded. Creative work has been done by both sides. But with the expansion of antiretroviral therapy, the fiscal implications of HIV/AIDS are now too large to ignore. It is time for ministries of finance to be more directly involved in decisions on managing the liabilities to which countries are exposed, for the IMF to underscore the fiscal implications in all relevant cases, and for donor agencies to integrate HIV/AIDS funding needs into the general framework of development finance at the country level. ■

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This article is based on a paper (Collier, Sterck, and Manning, 2015) published as part of the work of RethinkHIV, a consortium of senior researchers, funded by the RUSH Foundation, who evaluate new evidence related to the costs, benefits, fiscal implications, and developmental impacts of HIV interventions in sub-Saharan Africa. The costing methodology in this article—and the conclusions drawn from applying it, about the relative cost-effectiveness of different policies—were originally developed by Markus Haacker.

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Workers on assembly line at Huajian shoe factory in Dukem, Ethiopia.

Investment Renaissance

Wenjie Chen, David Dollar, and Heiwai Tang

China is important to the increasing foreign investment in Africa, but its role is far from dominant

AFRICA'S economic growth has accelerated over the past 15 years and the continent has been receiving significantly more foreign direct investment than in the past. Each development almost certainly plays a role in causing the other.

African economies on average have improved their institutions and policies—changes that not only make for productive and enhanced growth, but also attract more domestic and foreign investment. At the same time there is evidence that foreign direct investment, which involves an ownership stake in an enterprise, has spillover benefits on the recipient economy providing technology, management, and connection to global value chains that should speed economic growth in Africa.

The acceleration of African growth is important because increased growth in the past decade has led to the best progress on poverty reduction on the continent since before 1990. Between 1990 and 2002 the poverty rate in sub-Saharan Africa was flat at 57 percent of the population (living below

the World Bank's \$1.25 a day poverty line). But between 2002 and 2011 poverty dropped 10 percentage points. Continued sustained growth is needed to bring poverty down further, and a steady flow of foreign direct investment can help meet that objective.

Recently much attention has been paid to one part of this investment renaissance: Chinese direct investment in Africa. China has become Africa's main trading partner and Chinese demand has increased Africa's export volume and earnings. Many observers assume that China has also become the dominant investor in Africa. Indeed, there have been some high-profile, large natural resource investments, including some in countries that have a poor track record of governance—such as Sinopec's oil and gas acquisition in Angola, the Sicomines iron mine in the Democratic Republic of the Congo, and Chinalco's mining investment in Guinea. But in fact, although China is an important investor in Africa, and is likely to remain so, it is far from dominant—whether in the resource or other sectors. Moreover, exactly what the recent slowdown in Chinese growth portends for Africa is unclear.

Our research looks beyond the big state-enterprise deals, like the splashy ones mentioned above, to understand the reality of Chinese investment, especially private investment, in Africa. Chinese investment has the potential to become very significant in Africa, partly because the demographics of China and Africa are going in different directions.

Labor force growth

China has been through a period of rapid labor force growth in which it needed to generate 20 million jobs a year. However, that phase is over. The Chinese working-age (15–64) population has started to decline, as it has in most advanced economies. In sub-Saharan Africa, on the other hand, by 2035 the number of people reaching working age will exceed that of the rest of the world combined (IMF, 2015; see Chart 1). Africa and south Asia will be the main sources of labor force growth in the global economy, as workforces elsewhere shrink. That means there is great potential for mutual benefit from foreign investment that flows from the aging economies such as China to younger and more dynamic ones in Africa.

In investigating China's foreign direct investment (called overseas direct investment by the Chinese), we used firm-level data compiled by China's Ministry of Commerce. Chinese enterprises that make direct investments abroad are supposed to register with the Ministry of Commerce. The resulting database provides the investing company's location in China and its line of business. It also includes the country to which the investment is flowing and a description in Chinese of the investment project. However, *it does not include the amount of investment*. During 1998–2012 about 2,000 Chinese firms invested in 49 African countries. There are about 4,000 investments in the database because firms often have more than one project. The typical investing firm is private and much smaller than the big state-owned enterprises involved in the megadeals that have captured so much

attention. Based on the descriptions of the overseas investment, we categorized the projects into 25 industries covering all sectors of the economy—primary, or raw materials operations; secondary, or materials processing; and tertiary, or services. The allocation of the projects across countries and across sectors provides a snapshot of Chinese private investment in Africa.

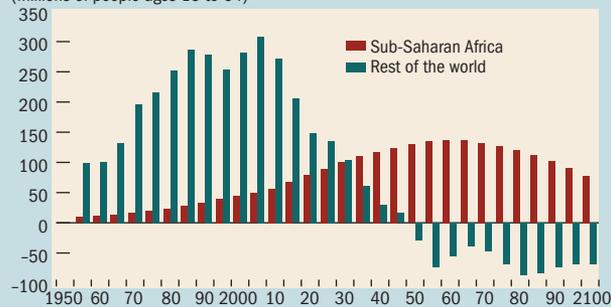
Some things immediately jump out from the data on the number of investments. The investments are not concentrated in natural resources. The service sector received the most number of investments—such as sales affiliates or operations that provide assistance to construction and transportation. There were also significant investments in manufacturing. Most foreign direct investment is in the service sector both globally and in Africa, so in this sense Chinese investment is typical. Chinese investment is well dispersed in Africa: in resource-rich countries like Nigeria and South

Chart 1

Faster growth

As the working-age population shrinks in most of the world, it will grow sharply in Africa in coming decades.

(millions of people ages 15 to 64)



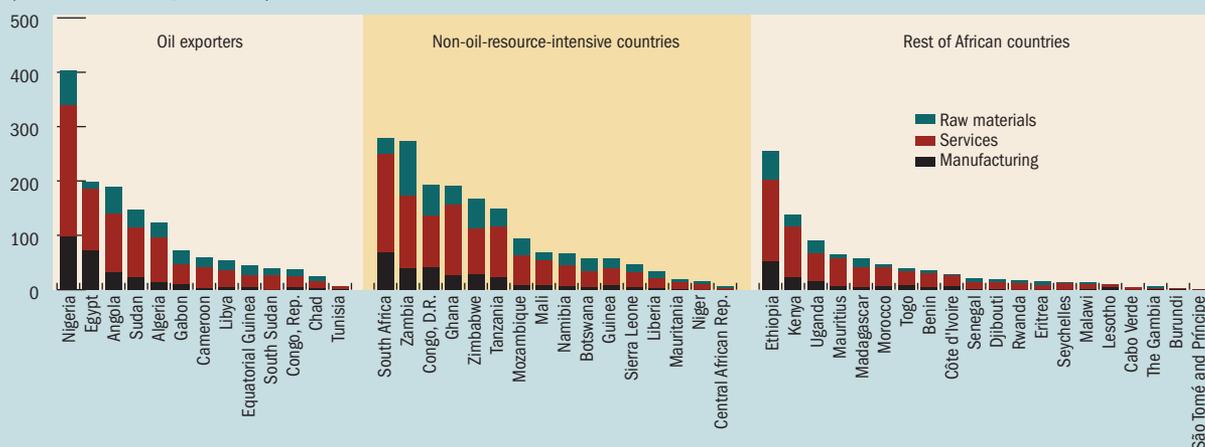
Source: IMF (2015).

Chart 2

Investment spread

Chinese foreign direct investment is dispersed among many African countries and sectors.

(number of investments, 1998–2012)



Sources: China, Ministry of Commerce; and authors' calculations.

Africa, but also in non-resource-rich countries like Ethiopia, Kenya, and Uganda (see Chart 2). Even in resource-rich countries, natural resource projects make up a small portion of individual investments.

We also asked whether factor endowments—such as land, labor, and capital—and other country characteristics influence the number and types of investment projects from Chinese investors. If Chinese investment is similar to profit-oriented investment from other countries, then the number and nature of projects should be related to the factor endowments as well as to other characteristics of the recipient countries. We found that although Chinese foreign direct investment in Africa is less prevalent in sectors that require high-skilled labor, it does tend to gravitate toward those countries with a better-trained workforce, suggesting that Chinese investors aim to exploit the edge these countries have over other countries in the region whose workforces lack the same level of training. We also found that Chinese foreign direct investment is more concentrated in capital-intensive sectors in the more capital-scarce countries, suggesting its importance as a source of external financing for the continent.

Our initial assessment of Chinese investment in Africa looked at the number of investment projects without refer-

The slowdown in investment is bound to have some spillover effect on employment, income, and consumption.

ence to the size of the investment—which may explain why our findings about the nature of China’s investments did not support the common belief that China is an outsized investor in Africa. But when we looked at investments by size, we also found that China does not dominate foreign direct investment in Africa. Using the Ministry of Commerce’s aggregate data on the stock of Chinese foreign direct investment (that is, the value of the investment in place) in different African countries, we found that at the end of 2011 it was only 3 percent of total foreign direct investment on the continent. Most of the investment came from Western sources. Although that figure may seem small to many people, it is confirmed by other sources. According to the United Nations Conference on Trade and Development (2015) new Chinese foreign direct investment in Africa during 2013–14 was 4.4 percent of the total investment flow—only slightly more than the Chinese share of investment in place. EU countries, led by France and the United Kingdom, are overwhelmingly the largest investors in Africa. The United States is also significant, and even South Africa invests more on the continent than China does.

Moreover, when it comes to the value of investments, China allocates its direct investment in Africa much as other countries do. Chinese and non-Chinese investors are both attracted to larger markets and both are attracted to natural-resource-rich countries. So although most Chinese investments are in services

and manufacturing, those tend to be smaller than the typically large-value investments in energy and minerals. Western investment favors these expensive natural resource projects too.

One important difference between expensive investments by China and by Western firms involves governance: Western investment is concentrated in African countries with better property rights and rule of law. Chinese foreign direct investment is indifferent to the property rights/rule of law environment, and its expensive investments tend to favor politically stable countries. This difference makes sense because a significant portion of Chinese investment is tied up in state-to-state resource deals.

China’s slowdown

Analysts have asked whether the recent slowdown in China’s economy, the stock market turbulence in the second quarter of 2015, and the renminbi depreciation in August 2015 may augur a slowdown in Chinese foreign investments.

The underlying issue in China’s economy is that it has relied on exports and investment for too long and is making a difficult transition to a different growth model. Because China is the largest exporter in the world, it is not realistic for its exports to grow much faster than world trade. The recent growth in China’s export volume has been in the low single digits, similar to the growth rate of world trade. There is nothing wrong with China’s competitiveness; it is just facing a slow-growing world market. Depreciation likely would not change the picture much because other developing economies may follow suit.

China’s stimulus package following the global financial crisis of 2008–09 was heavily oriented toward boosting investment and took its investment rate to 50 percent of GDP. That maintained growth for a while, but it has resulted in excess capacity throughout the economy. There are many empty apartments, the capacity utilization rate in heavy industry is low, and there is much underused infrastructure, such as highways in smaller cities and convention centers in cities where there is no demand for them. Because of the excess capacity it is natural for investment to slow and affect the overall growth of the economy. The slowdown in China has had an immediate effect on Africa because it has contributed to declining prices for primary products and declining volumes of exports for African economies.

But the weaker news for the old industrial Chinese economy during the first half of 2015 was matched by some positive news from the new economy. In contrast to industry, the services sectors grew rapidly. Most of the service output is consumed by households, and household income has been rising steadily for the past three decades. Still, the slowdown in investment is bound to have some spillover effect on employment, income, and consumption.

Even though the economic slowdown in China has hurt African exports and export prices, it carries some potential positive news. The deceleration in domestic investment in China means that for the moment China has even more capital to send abroad. Although its consumption rate should gradually rise, for the foreseeable future China is likely to have an excess of savings over investment, which

means that it will continue to provide capital to the rest of the world. This can happen in a fairly orderly fashion. The authorities have laid out an ambitious set of reforms that should facilitate the shift from investment-led growth to a model based more on productivity growth and consumption growth. The plans include a number of steps to foster the new model. For example, to allow more labor flexibility, authorities plan to relax rules that tie a household's government benefits to the region in which the household is registered. They also intend to introduce financial reform to price capital better and allocate it to the most efficient use, and to open up the service sector, which is still largely closed to foreign trade and investment.

A smooth transition should enable China to continue to grow in the 6 to 7 percent range for the next decade. It will not provide increases in demand for energy and minerals on the scale of the past, but it should be a stable source of direct investment for other countries. Africa will have to compete for its share through infrastructure investment, improvements in the investment climate, and strengthening of human capital because, as we found, countries with more human capital attract the more skill-intensive investment from China.

There is, however, a possibility of a more negative outcome. For the first time, Chinese outward investment is exceeding inward investment by a large amount; the slowdown in the domestic economy is part of the reason, as domestic Chinese firms are looking elsewhere for profits. In fact, the net capital

outflow from China in 2015 is extraordinary. The IMF's 2015 Article IV staff report projects a current account surplus of \$337 billion. Through September the central bank's reserves declined by \$329 billion. The two numbers together provide a rough estimate of \$666 billion in net capital outflows.

If China does not make a smooth transition to a new growth model, it will remain a major source of capital in the short run but it will not grow as well over the medium to long term and thus will not be as important a source of capital. China's successful rebalancing will be a better outcome for both China and for the rest of the developing world. ■

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To Pay the Piper

Luis A.V. Catão and Rui C. Mano

Countries face a far higher interest rate premium for defaulting on their sovereign debts than previous wisdom suggested

THINK of a government that defaults on its debt to foreign investors and, a few years later, negotiates a reduction of the original debt and is about to resume borrowing from capital markets. It faces a number of questions. Should it expect to be penalized for the default and pay an interest rate on new borrowing that is higher than justified by the fundamental state of its economy? If so, how large will such a “default premium” be? And how long will it take for that country to reestablish its creditworthiness and eliminate this default premium?

These are important questions for several reasons. The size and persistence of any default premium determines the debt service burden the country will carry into the future. The premium may also affect any adjustment programs a defaulting country might undertake with multilateral institutions like the IMF to enable it to stay afloat after losing market access. If the default premium is high and persistent, it may take time for the country to reduce reliance on multilateral loans. And if the default premium lasts a long time, it suggests that investors do not easily forget the debt they forgave.

However, whether defaulting sovereigns actually pay a nontrivial interest rate premium has been long debated. With the greater availability of historical data starting in the 1980s a few researchers tried to answer the question empirically. Much of that research suggests that countries either pay a relatively trivial premium for defaulting on their debts or one that is short-lived. For instance, papers by Eichengreen and Portes (1986), Lindert and Morton (1989), and Ozler (1993), among others, found only tiny differences in the interest rate paid by countries that defaulted in the 1930s and those that did not—no more than 25 to 30 basis points (one basis point is 1/100th of 1 percent). In contrast, studies that relied entirely on emerging market data from the 1990s and 2000s (such as Borensztein and Panizza, 2009) found large interest rate premiums of up to 400 basis points on average when countries started to borrow again in private markets, but also found that the premiums virtually disappeared within two years. Only in a few cases in which losses imposed on creditors (so-called haircuts) were exceptionally large did premiums persist (Cruces and Trebesch, 2013).

Still, most governments seem to go out of their way to avoid defaults, which seems incongruous if the penalty is relatively trivial for failing to repay borrowing on the original terms. Clearly, there are other potential risks to defaulting besides interest rate premiums—such as international sanctions, disruptions to trade financing, and loss of reputation—but many studies contend that these other penalties seldom bite hard. Our findings indicate that the general desire to avoid default can be attributed to larger and longer interest rate premiums than previously thought (see Catão and Mano, 2015). So government behavior should not be considered puzzling.

New evidence

Interest rates can be higher than expected based on a country's fundamentals for many reasons—such as political instability in a borrowing country or bouts of risk aversion in financial markets. But when the premium is solely the result of default history, there are three major factors that should be taken into account to measure correctly the magnitude of such a premium: how to produce a score of a country's credit history; how to obtain representative data; and how to pick all relevant economic fundamentals—such as the ratio of debt to GDP and economic growth—that could explain a country's interest rate.

Other researchers have chosen varied measures of credit history, studied disparate time periods, and used different sets of economic fundamentals in their analyses. Estimates of default premiums can be extremely sensitive to these

Most governments seem to go out of their way to avoid defaults.

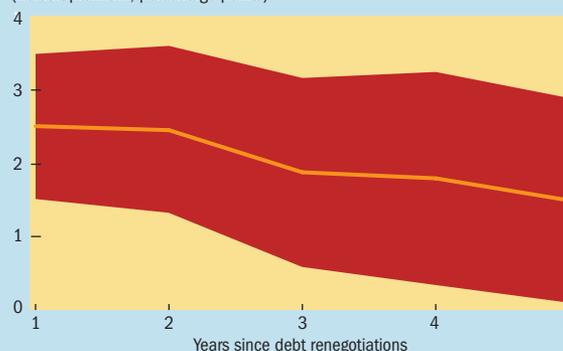
choices. For instance, default premiums may vary across time because of temporary external factors—for example, during 2002–07, when commodity prices were high and risk aversion was low. Likewise, focusing on the less globalized and less liquid world of the 1960s and 1970s—as some earlier studies did—may lead to unrealistically low default premiums. That means that any estimate of the average default premium in a short time period may be biased. Indeed, it is tempting to assume that default premiums simply vanished when sovereign spreads were compressed, even for countries with repeated defaults. But narrow sovereign spreads can be explained by temporary factors (including low risk aversion) and should not be taken as a proxy for the underlying default premium. A proper measure of the default premium requires netting out from the spread the effects of the current country's fundamentals and of global capital markets; it is very important to control for those factors in any analysis. Finally, a researcher can underestimate the correct size of the default premium by using measures of how investors remember the past that are ad hoc narrow, and do not allow the data to speak more broadly by itself.

Chart 1

High price to pay

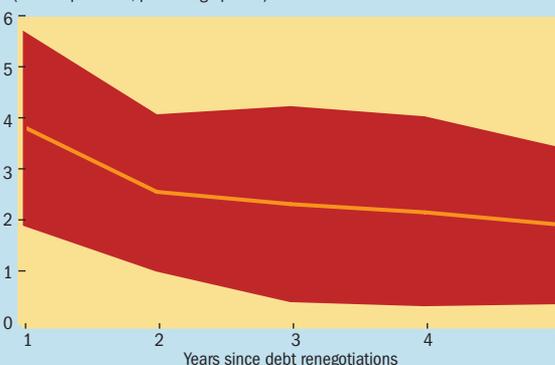
Countries that defaulted between 1870 and 1938 on average paid a default premium on new debt of 2.5 percentage points that tailed off to 1.5 percentage points after five years . . .

(default premium, percentage points)



. . . while those that defaulted between 1970 and 2011 paid a premium of 4 percentage points that tapered to about 2 percentage points.

(default premium, percentage points)



Source: Catão and Mano (2015).

Note: The shaded area represents the range of most default premiums paid by defaulting countries. Those that defaulted more than once generally paid much more than average, while one-time defaulters paid less. The chart begins at one year after conclusion of debt renegotiations.

We looked at each of these three key ingredients and applied a common methodology across samples. We found more significant default premiums than other researchers because:

- We used a more general measure of credit history that shapes investors' perception of creditworthiness. We measured the default premium as the sum of three credit history indicators: the total amount of time a country was in default, the years since its last default, and whether the year after debt renegotiation corresponds to the first, second, third, fourth, or fifth year after default. This allows for the possibility that investors' memories decay quickly in the first years after default and more gradually thereafter.

- We constructed a much broader data set that spans advanced and emerging market countries for two active periods of international bond markets: 1870–1938 and 1970–2011. Our data set expands the historical coverage of existing

series on sovereign spreads through research with primary and secondary sources. The new data set comprises 68 countries and has about 3,000 annual observations excluding default years, far more than previous studies.



The typical interest rate premium for past defaults has been underestimated.

- We included factors other than credit history that might have affected default premiums. These factors include many macroeconomic fundamentals such as public debt-to-GDP ratio, the share of debt in foreign currency, and GDP growth (amplifying, for example, the historical data in Reinhart and Rogoff, 2009), as well as conditions in global financial markets, such as the volatility of stock prices and benchmark interest rates, that affect investors' risk appetite and hence leniency toward less creditworthy borrowers. Finally, we included the size of past defaults.

Chart 1 shows default premiums when countries return to private borrowing for 1870–1938 and 1970–2011. For the pre-World War II period, the average initial premium was 250 basis points, much higher than earlier estimates, and it lasted much longer—after five years it still averaged 150 basis points. For the later period the premiums were higher—400 basis points at first and 200 basis points even after five years. The persistence of the premiums is the result of both the years in default and the number of years since default.

Overall, the default premium accounted for up to 60 percent of the spread between the rate paid by defaulters and the

benchmark rate (see Chart 2). That is, much of the overall interest rate paid by a sovereign when it returns to private capital markets is not due to the state of its economy but to its substandard credit history. So the default premium can be of striking importance in gauging the interest charges countries may pay once they fully return to private capital markets.

Serial defaults

Chart 1 indicates that there was a large range of default premiums both above and below the average. That is chiefly due to differences between one-time and serial defaulters. Serial defaulters typically pay a higher-than-average default premium because they stay out of the market accumulating arrears for longer stretches—an effect captured by our credit history indicator measuring time in default. Investors tend to take these “out-of-market” spells—especially if recent—as suggestive of lower creditworthiness, even if standard fundamentals such as debt-to-GDP ratio and economic growth are good. Moreover, the more uncertain lenders are about the accuracy of statistics reported by a defaulting country, the more the lenders tend to focus on government actions such as failure to repay and renegotiation delays, which generally results in a higher expected default premium.

Our credit history indicators do not distinguish between large and small defaults. It might seem logical that because investors suffer bigger losses in some defaults than in others, they would punish larger defaults with larger default premiums.

But establishing the effects of past haircuts on default premiums is difficult. First, all defaults are major events, usually involving a sizable haircut. Second, investors in competitive markets base the price of bonds and loans on future default risk. Past haircuts would matter if lenders consistently decided to recoup their losses by charging an extra premium. But in competitive markets—like the typical sovereign bond market—any attempt to recoup losses is likely to be undercut by new lenders. Moreover, nearly 90 percent of the broad differences in haircuts is explained by variables already included in our model of the default premium—like debt-to-GDP ratio and length of default.

A clear rationale

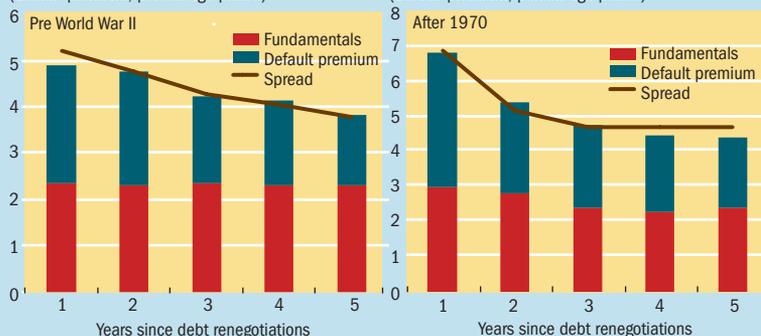
The bottom line is that the typical interest rate premium for past defaults has been underestimated. This is partly because earlier studies did not take into account sufficient indicators of credit history, and—crucially—their data sets were not comprehensive enough. Looking at a larger number of episodes and longer historical periods than previous researchers did, we found that the sovereign default premium was usually sizable in the first few years after debt renegotiation and that it declined only gradually—certainly more slowly than previous researchers had found.

Chart 2

Credit history trumps

Overall, the default premium accounted for about 60 percent of the spread between the rate paid by defaulters and the benchmark rate in the first five years after debt renegotiations. The rest was due to a country's economic fundamentals.

(default premium, percentage points)



Source: Catão and Mano (2015).

Note: The benchmark for pre-World War II yields was long-term U.K. government bonds (consols) and for after 1970, with a few exceptions, the yield on 10-year U.S. government securities. The spread and the top of the components bar are sometimes slightly different because of estimation errors.

As a practical spinoff, consider a country with a moderate ratio of debt to GDP of, say, 50 percent, with all of its debt in private hands. At the post-1970 default premium average of 400 basis points, its excess annual payments in interest would amount to 2 percent of GDP after debt renegotiation, tapering to 1 percent of GDP several years later. Even for moderate debt ratios, the interest cost is not trivial—given that interest payments on external debt often range between 1 percent and 3 percent of a country's GDP. This cost would be higher for more-indebted countries that stayed out of private financial markets for many years. The short of it is that avoiding defaults can be very valuable, even leaving aside other costly risks such as loss of reputation, international sanctions, and disruptions in trade and financial intermediation.

Clearly, the absolute size of a default premium for a country depends on its specific conditions and estimates of how national and global economic factors might evolve. But our analysis demonstrates that a default premium that is close to historical averages would likely be costly enough to justify attempts to avoid default—including the use of austerity measures to get the economy back on track. This is all the more true for governments that are highly indebted and have a history of default and long spells away from private capital markets. ■

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Strategic Thinking

Game theory analyzes behavior when decisions must take into account the potential actions of opponents

Sarwat Jahan and Ahmed Saber Mahmud

ANYONE who has had to make a strategic decision taking into account what others will do has used game theory. Think of a game of chess. The outcome of the game depends not only on one participant's move, but also on the actions of the opponent. When choosing a course of action—in other words, a “strategy”—a player must take into account the opponent's choices. But the opponent's choices in turn are based on thinking about the course of action the player might take. Game theory studies this interdependent decision making and identifies the optimal strategy—that is, the best course of action—for each player in response to the actions of others and how this leads to an equilibrium outcome, in which no players have a reason to change their strategy.

Because situations involving interdependent decisions arise frequently, so does the potential application of game theory in strategic thinking. Businesses competing in a market, diplomats negotiating a treaty, gamblers betting in a card game, and even those contemplating proposing marriage can use game theory.

The science of strategy

The earliest example of a formal game-theoretic analysis was by Antoine Cournot in 1838, when he studied the business behavior of two firms (a duopoly in economic parlance) with identical costs producing the same products but vying for maximum profits in a limited market. The mathematician Émile Borel suggested a formal theory of games in 1921, which was furthered by Princeton mathematician John von Neumann later in the decade. But game theory became a field in its own right after the publication of *Theory of Games and Economic Behavior* by von Neumann and economist Oskar Morgenstern in 1944. They studied “zero-sum” games, in which the interests of two players are so strictly opposed that the games are pure conflict—with one person's gain always resulting in the other's loss. A good example is chess, which has a winner and a loser. But games do not have to be zero-sum. Players can engage in positive

sum games—for example, jointly writing this article generated benefits for both authors/players and was a win-win game. Similarly, games can result in mutual harm (negative sum)—for example, the failure to prevent a war. John Nash treated the more general and realistic case in which a game involves a mixture of common interests and rivalries and any number of players. Other theorists—most notably Reinhard Selten and John Harsanyi, who shared the 1994 Nobel Prize in economics with Nash—studied even more complex games with sequences of moves, and games in which one player has more information than the others.

What's in a game?

A game is the strategic interaction between two or more players. Each player has a set of possible strategies. For each strategy players pick, they receive a payoff, which is usually represented by a number. That payoff depends on the strategies of all players in the game. Payoffs can also have different meanings. For example, they can signify an amount of money or the number of years of happiness. Game theory presumes that players act rationally—that is, that they seek to maximize their own payoffs.

The prisoner's dilemma is perhaps the best-known example in game theory. Two bank robbers are arrested and are interviewed separately. The robbers can confess or remain silent. The prosecutor offers each the following scenario. If one confesses and the other stays silent, the one who admits the crime will go free while his accomplice will face 10 years behind bars. If both confess, each will go to prison for five years, while if both remain silent each will go to jail for a year.

If Robber A confesses, then it is better for Robber B to confess and receive 5 years in jail than to remain silent and serve 10 years. On the other hand, if Robber A does not confess, it still is better for Robber B to confess and go free than remain silent and spend a year in jail. In this game it is always better for Robber B to confess no matter what Robber A does. That is, the *dominant strategy* is to confess. Because each player has the same payoff structure, the out-

come of the game is that rational players will confess and both will end up in jail for five years. The dilemma is that if neither confesses, each gets one year in jail—a preferable outcome for both. Can this dilemma be resolved? If the game is repeated without a foreseeable end, then both players can reward or punish the other for their respective actions. This can lead to the mutually beneficial outcome in which neither confesses and each spends a year in prison. A real-life example would be collusion between two competing firms to maximize their combined profit.

Sometimes there is more than one equilibrium in a game. Take the following example: A couple is planning a night out. Above all, they value spending time together, but the husband likes boxing while the wife prefers the ballet. They both must decide independently of the other what they will do, that is they must decide simultaneously. If they choose the same activity, they will be together. If they choose different activities, they will be separate. Spouses get a value of 1 if they get their favorite entertainment; the value 2 is assigned to being together. This leads to a payoff matrix that maximizes satisfaction when both pick the same activity (see chart, left panel).

If players sacrifice for their partners, they obtain the worst outcome: each goes to the undesired event, but alone, and the payoff is zero. If both choose the event they like, the outcome

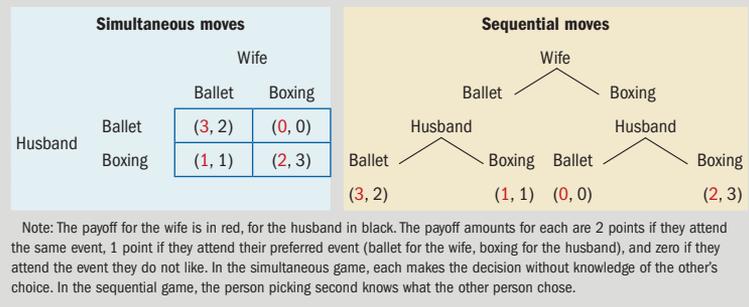
Game theory presumes that players act rationally—that is, that they seek to maximize their own payoffs.

is better, but neither has the pleasure of the other's company, so the payoff is 1 for each. If the wife chooses ballet, the optimal result occurs when the husband also chooses ballet. Hence going to the ballet is an equilibrium with a payoff of 3 for the wife and 2 for the husband. By similar logic, when both attend the boxing match, there is also an equilibrium—in which the husband's payoff is 3 and the wife's 2. Therefore, this game has two equilibria.

Modifying this game by letting the players move sequentially—that is, each player is aware of the other's previous action—will yield a single equilibrium (see chart, right panel). If the wife moves first and decides to go to the ballet, the husband's best option would be to go to the ballet. If the wife chooses boxing, the husband would definitely choose to go to the match. The wife's basic strategy will be to “look ahead and reason backward.” The wife can anticipate where her husband's decision will lead and

The game

Whether the players, in this case, spouses, make entertainment decisions simultaneously or sequentially, they maximize payoff when both attend the same event.



use this information to calculate her best decision: in this case choosing ballet. In this type of game, there is a clear advantage to moving first.

Nuclear deterrence

The prisoner and spousal games involve only two players, and each has complete information about the game. Games become more complicated when more players are involved or if players do not all have access to the same information. It is not surprising that game theory has been applied to analysis of the nuclear arms race. The 2005 Nobel Prize winner in economics, Thomas Schelling, showed that the power to retaliate is a more effective deterrent than the ability to withstand an attack and proved that uncertainty about retaliation—which keeps the enemy guessing—may preserve peace more effectively than the threat of certain retaliation.

Game theory has been used to analyze market power and how to regulate monopolies to protect consumers—an avenue of research that earned Jean Tirole the 2014 Nobel Prize in economics. Game theory has also revolutionized the field of information economics by studying games in which some players have more information than others. Three economists earned the Nobel Prize jointly in 2001 for their seminal work on games with asymmetric information: George Akerlof on the market for used cars, Michael Spence on signaling in labor markets through education, and Joseph Stiglitz on self-screening in insurance markets.

Game theory has even been applied in evolutionary biology, where the players (in this case animals) are not necessarily rational beings. The hawk-dove game developed by John Maynard Smith in 1982 involves aggressive and nonaggressive behavior and provides insight into the survival of species. Game theory is being used by some to forecast the fate of the European Union. As long as there are interactive decisions to be made, game theory will be applied to inform them. ■

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Politics and Public Investment

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Infinity Bridge, Stockton-on-Tees, Teesside, United Kingdom

Catering to voters as elections approach can upend intelligent decisions on infrastructure spending

VIRTUALLY all countries need additional infrastructure such as roads, bridges, airports, telecommunications networks, power plants, and public transportation. With interest rates low—and, as a result, cheap financing for government spending—many analysts and policy advisors advocate increasing public investment in infrastructure to promote growth, which would both lower the debt-to-GDP ratio and expand an economy's long-term productive capacity (IMF, 2014).

However, even if shovel-ready projects have been identified and decision-making processes for public investment are working efficiently, investment still may not happen. Why?

Political considerations get in the way. When elections loom, policymakers choose to provide immediate benefits to the electorate through

lower taxes or increased income transfers—at the expense of public investment, which takes time to come to fruition. Other factors can also play a role in discouraging needed investment. For example, the political orientation of parties that form a government may favor a lower level of public investment.

When there are no political or institutional constraints, public investment should be determined mainly by development needs—to meet the requirements of a growing population and to reduce infrastructure bottlenecks. Occasionally, public investment can be triggered by demand management considerations—for example, when an economy has spare capacity and policymakers believe investment would increase aggregate demand and raise employment in the short term. In reality, however, political considerations often strongly influence public investment decisions.

Bad incentives

William Nordhaus (1975) provided early modeling of how political cycles could affect economic decision making. He argued that incumbents have incentives to stimulate the economy before elections to achieve a temporary reduction in unemployment, an outcome preferred by voters, who in general have a short-term view. Research on the political economy of budget and fiscal policy has burgeoned. Four factors have been cited as possible ways political factors affect public investment:

- **Politicians are opportunistic** and, as a result, launch investment projects only at the beginning of the electoral term to be able to inaugurate them before the next election. As elections near, politicians choose to woo voters with public sector wage increases, tax cuts, and cash transfers, finding the wherewithal to do that by cutting back on investment.

- **Fiscal outcomes reflect the ideology of different political parties.** For instance, a preference of right-wing parties for limited provision of state-owned physical and human capital would imply lower public investment in infrastructure, health, and education. On the other hand, left-wing parties prefer a more activist state, implying higher public investment in these areas.

- **Minority governments, a divided legislature, coalitions, and multiparty cabinets** could result in fiscal profligacy and lower public investment. Large coalition and minority governments may have greater difficulty reaching agreement on balancing the budget. Government investment becomes easier to cut than some other types of spending.

- **Inadequate budgetary institutions**—the rules and regulations by which budgets are drafted, approved, and implemented—are unable to protect public investment during a crisis.

One or more of these four factors are likely to influence the behavior of public investment. We examined all of them to determine which factors dominate and under what circumstances (Gupta, Liu, and Mulas-Granados, 2015). We compiled a unique database from 80 democracies during 1975 to 2012, covering all regions and income levels. This database includes national executive and legislative elections and differs in important ways from those in previous studies: it goes beyond advanced democracies and includes a wide range of emerging market and low-income countries with free and competitive elections and uses more precise electoral cycle measures by identifying the exact day, month, and year in which citizens went to the polls. For example, if an election was held in November 2012, we measure months to the next elections from this

date. Data on election dates by month and year are from the Database of Political Institutions published by the World Bank.

Our data show that public investment has declined over the past three decades across most economies (see Chart 1, left panel). In advanced economies, the ratio of public investment to GDP fell from about 5 percent in the mid-1980s to about 3 percent in 2014. In emerging market and low-income countries, the reduction was broadly similar, falling from close to 10 percent of GDP to about 7 to 8 percent of GDP

Incumbents have incentives to stimulate the economy before elections.

during the same period. At the same time, public consumption increased moderately—especially in advanced economies, where it reached almost 20 percent of GDP, in part reflecting rising health care and pension costs and other transfers associated with an aging population (see Chart 1, right panel). These long-term driving factors are compatible with the evidence that in the short run, investment cycles are also affected by political considerations.

Election effects

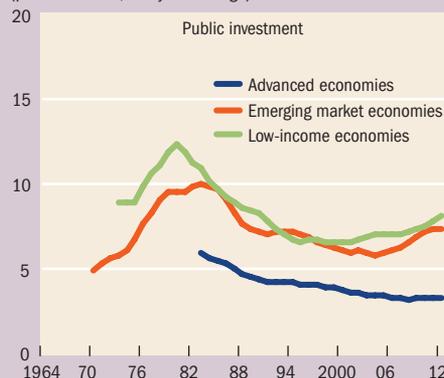
Our analysis, which accounted for the effects of other relevant variables on investment, found that as elections approach there is a deceleration of public investment as a share of GDP, coupled with a slight acceleration in current expenditures (see Chart 2). For example, public investment grows at 2 percent of GDP in the two to three years prior to elections, but when elections are about 12 months away, its growth not only slows, it becomes negative. The opposite is observed with regard to public consumption. This pattern is consistent with work by various scholars (such as Rogoff,

Chart 1

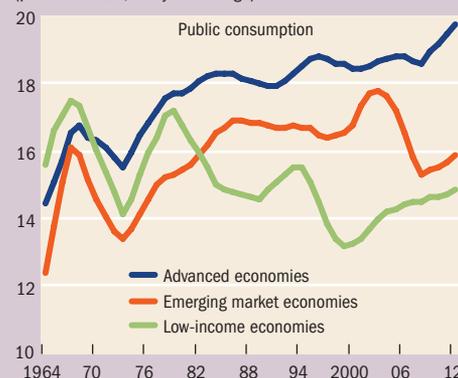
Falloff

Over the past three decades public investment as a percent of GDP has declined. Public consumption has varied.

(percent of GDP, five-year average)



(percent of GDP, five-year average)



Sources: Haver Analytics; IMF (2014); and World Bank, World Development Indicators, 2014.

1990) who have argued that electoral incentives may induce incumbents to shift public spending toward more “visible” government consumption and away from public investment.

Our quantitative analysis confirms that growth in public investment starts to decelerate about two years before elections. In fact, for each year closer to the next election the growth rate of public investment in relation to GDP declines by 0.3 to 0.6

percentage point. Between four and two years before elections, public investment accelerates. It seems that a typical government makes most public investment at the beginning of its term and gradually shifts spending toward other items as the next election approaches (see Chart 3, left panel).

These results hold whether a country is engaged in fiscal consolidation or fiscal expansion. But when considering different country groups, interesting nuances emerge with respect to how the strength of fiscal institutions may help soften the effects of elections on public investment cycles. For example, in advanced economies, which are older democracies and possess relatively stronger institutions to ensure efficient public investment planning, allocation, and execution, public investment growth peaks much later during the electoral cycle (see Chart 3, right panel), and the deceleration of public investment is smaller. This could be explained by three interrelated considerations: because public investment processes are more robust in advanced economies, the potential for manipulating them is limited compared with other country groups; in mature democracies policy-making processes are more transparent, and the electorate tends to punish incumbents for manipulating spending; and incumbent governments do not need to signal their competence by varying public investment spending because they have other means to do so, such as effective communication on fiscal policy, efficient tax policies, and project execution.

Sustained booms

We have focused so far on short-term investment decisions. Are the same political factors behind multiyear episodes of sustained investment booms over a longer time horizon? Typically, multiyear investment spending is the result of long-term strategies to expand the productive capacity of economies: governments invest in public capital for several years—a highway project that takes several years to complete, for example. One would expect multiyear investment booms to be less affected by electoral considerations, because they last longer than the usual four to five years a government

is in office. For example, between 1980 and 2012, the United States had three episodes of sustained increase in public investment (see Chart 4), with a combined duration of 18 years. The first period started at the end of Democrat Jimmy Carter’s administration in the late 1970s and continued for almost eight years through the presidency of Republican Ronald Reagan. The second coincided with the second term of Democrat Bill Clinton. The third episode began after the reelection of Republican President George W. Bush in 2004 and continued until 2009, a year into the first term of President Barack Obama, a Democrat.

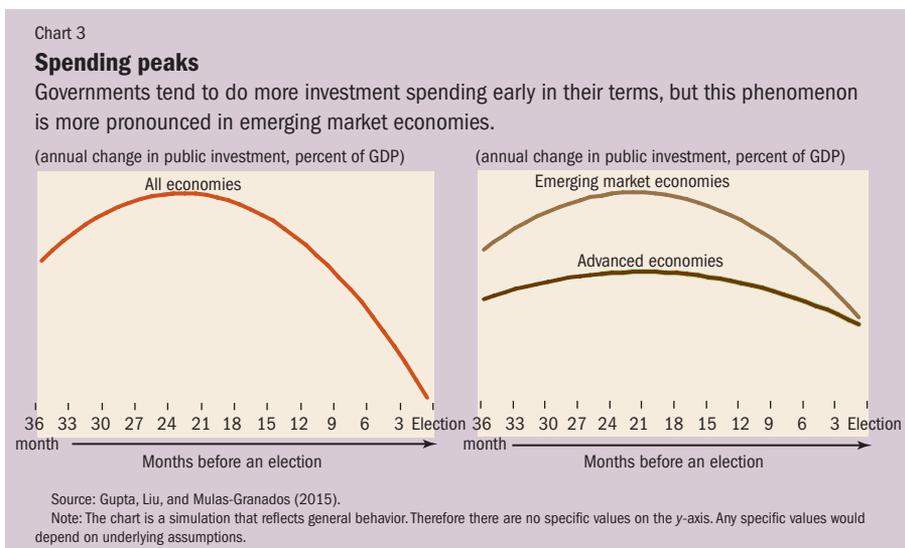
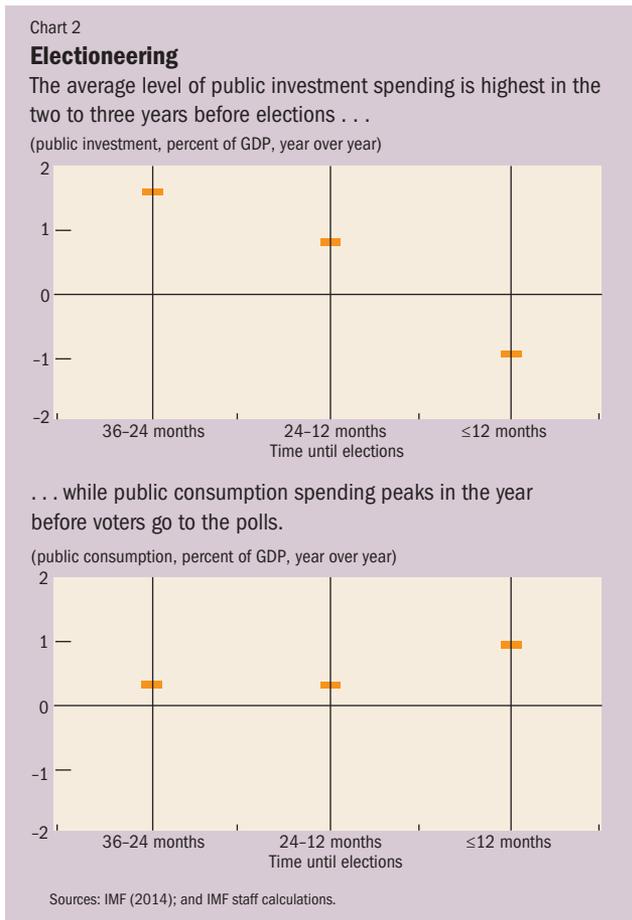


Chart 4

U.S. spending booms

Since 1980 there have been three sustained multiyear increases in public investment spending in the United States.

(public investment spending, percent of GDP)



Source: Gupta, Liu, and Mulas-Granados (2015).

To explore these long-term dynamics, we identify the change in public investment from the lowest level of the investment episode to the highest level of the episode. Between 1975 and 2012, we count 264 episodes of investment booms in the 80 democracies in our database. The average size of an investment boom is 3.8 percent of GDP, with the biggest increase being 26 percent of GDP in Lesotho between 1978 and 1982, and the smallest an increase of 0.3 percent of GDP in the United States between 1998 and 2003.

Our quantitative analysis confirms that in the long run, political characteristics such as cabinet fragmentation and ideology are more important than elections in explaining the size of sustained investment booms. More right-wing governments are associated with smaller increases in public investment, unless they are faced with a divided legislature and pro-investment parliamentary coalitions, as was sometimes the case in the United States during the Reagan and George W. Bush administrations. Fragmented governments are also associated with smaller sustained investment booms.

Policy implications

Three important policy implications can be drawn from our research. First, even when macroeconomic conditions in terms of fiscal space and monetary policy are appropri-

ate and effective shovel-ready investment projects are available, it may not be possible to expand public investment when an election approaches. The incentive for incumbent governments is to increase “visible” current spending on tax cuts, public wages, or public transfer programs to shore up political support. Such spending may be difficult to reverse, which creates a bias toward ongoing deficits. It may also affect the long-term growth potential of the economy, because election pressures may generate suboptimal levels of public investment, thus reducing investment in such things as roads and airports and other areas that would enhance an economy’s ability to deliver goods and services. Second, when countries approach international organizations for advice or financial support, financial assistance programs should explicitly recognize the bias in favor of current spending that occurs about two years prior to elections. Stronger fiscal policy design during this period could help restrain permanent ratcheting up of certain spending items. Finally, the best option to insulate the public investment cycle from electoral pressures is to strengthen budget institutions and improve public investment management systems. ■

Sanjeev Gupta is Deputy Director and Estelle Xue Liu and Carlos Mulas-Granados are Economists, all in the IMF’s Fiscal Affairs Department.

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I certify that the statements made by me above are correct and complete.
Jeremy Clift, Publisher

The Insatiable Demand for SAND

Deceptively abundant, the basic raw material for glass and concrete can't keep up with demand

Bruce Edwards



Burj Khalifa building,
Dubai, United Arab
Emirates.

THE commercial construction industry is booming. Office towers are popping up in Manhattan at their fastest pace in decades. “There are 23 buildings under construction with an average of 32 stories, and construction is projected to pick up dramatically. And on the multifamily side, we are seeing a record volume of new construction,” says Maddie Eldridge, market analyst for real estate research firm CoStar Group.

New York is not alone. Singapore has more than a dozen 40-plus-story buildings under construction. Dubai has started on a shopping mall covering 8 million square feet, after building the world’s tallest tower. At 2,716 feet, the Burj Khalifa is covered in 1.8 million square feet of glass and required 110,000 metric tons of concrete.

The United Nations says cities around the world are growing faster than ever, with 54 percent of the world’s population now living in urban areas, and 66 percent expected to do so by 2050. According to the UN *World Urbanization Prospects* report, urbanization combined with overall world population growth could add another 2.5 billion city dwellers by 2050. The report says that there were 10 megacities with 10 million people or more in 1990 and 28 today; it predicts 41 by 2030.

But as the world’s metropolises get bigger and reach higher into the sky to accommodate more people, the earth’s natural resources supply chain is being pushed to the limit. That strain is not from increasing demand for gold, diamonds, or copper, but for sand, the primary material for construction and hence for economic development.

Concrete and glass are made mostly of sand, a certain type of sand found deep below the earth’s surface, underwater, and on beaches. Sand mining to meet increasing demand over the years has become a thriving multibillion-dollar industry, but research by the United Nations Environment Programme (UNEP) shows that rate to be unsustainable.

“Sand and gravel represent the highest volume of raw material used on earth after water. Their use greatly exceeds their natural renewal rates” (UNEP, 2014).

Dammed particles

Each grain of sand originates from rock on a mountaintop. The grains, formed by erosion over thousands of years, make a long journey through springs, streams, and rivers to the ocean, where the tides and waves distribute them across the ocean floor and eventually carry them onto beaches.

The damming of rivers during the past century has dramatically impeded this natural process, and so roughly half of the estimated 40 billion metric tons of sand and gravel extracted every year for the construction industry, glass manufacturing, and other uses—such as land reclamation and oil exploration—will never be replenished.

The seemingly endless supply of sand in the Mojave and Sahara deserts just won’t cut it. Desert sand granules have been rounded by wind over time and no longer bind together, an essential characteristic of sand used in construction.

The greatest consumer of sand and gravel is the cement industry. The United States Geological Survey (USGS) estimates that almost 26 billion metric tons went into making con-

crete in 2012, up dramatically from 11 billion in 1994. USGS data show that world cement production almost tripled from 1.37 billion metric tons in 1994 to 3.7 billion in 2012, which UNEP attributes to rapid economic growth in Asia. “China alone built 90,000 miles of road in 2013, and its demand for cement has risen by 437.5 percent in 20 years,” the report says.

As the construction industry scrambles to find more high-grade sand to meet the rising demand for glass and concrete, sand suppliers are contending with another force of nature, hydraulic fracturing. This unconventional oil drilling process, commonly known as fracking, shoots a mixture of sand and water into tight oil formations, breaking the shale rock and making the oil in the rock easier to extract.

And though the use of sand in fracking isn't new, oil producers have recently found that they can increase the output of oil wells if they use more of it. As a result, use of total U.S

“Sand and gravel represent the highest volume of raw material used on earth after water.”

industrial sand production by the fracking industry skyrocketed from only 5 percent in 2003 to 72 percent in 2014 (USGS, 2004 and 2015).

Stephen Weidner, vice president at Pilkington Glass, says at the height of the fracking boom, glass manufacturing plants were competing for resources. “This forced us to have to source supply from other suppliers/deposits sometimes at greater distance than before. The cost and particularly the transportation cost of sand subsequently increased,” Weidner says.

So critical is sand to their operations that Houston-based oilfield service company Halliburton last year opened what it calls the sand “war room” to help manage the flow of billions of pounds of sand from mines to well sites across the country. Halliburton's senior director for North American operations, Billy Smith, said that the average well can use about 3,500 metric tons of sand, and some as much as 10,000 (Holeywell, 2014).

Until recently, most sand was extracted from land quarries and riverbeds. But with demand so high and growing, suppliers have started dredging for sand in coastal waters, with a tremendous environmental impact on seabed flora and fauna. “Dredging and extraction of aggregates from the sea bottom destroys organisms, habitats and ecosystems and deeply affects the composition of biodiversity,” the UNEP report says.

The dredging boats make matters worse by rejecting sand particles that are too fine, releasing vast plumes that muddy the waters, disrupting habitats well beyond the actual extraction sites.

Beaches erode faster too, and can disappear altogether, when coastal waters are dredged. But the worst thing that can happen to a beach is for it to be stripped bare, which is precisely what's happening in places where a bag of sand means food on the table.

Mining bans, imposed by some countries and meant to mitigate the environmental impact, have only further decreased

supply of the highly sought-after riverbed and coastal sand, and pushed prices up sharply.

Sand trading is a lucrative business around the world—and not only for the big mining conglomerates. Lack of regulation and weak enforcement of the few rules there are have opened the door to illegal mining. In some developing economies, shovels and pickup trucks take the place of dredging boats and heavy mining machinery. Half the sand used for construction in Morocco comes from illegal coastal sand mining. And in parts of India, where they've seen dramatic price increases for sand since the building boom started about a decade ago, cartels control much of the construction industry's supply. Illegal miners are stealing land for sand, and people are being killed in the process.

“Nowhere is the struggle for sand more ferocious than in India. Battles among and against “sand mafias” there have reportedly killed hundreds of people in recent years—including police officers, government officials, and ordinary people” (Beiser, 2015).

Shifting sands

Some cities use sand to expand their landmass: Singapore holds the world record in that category. The island city-state is 20 percent bigger than it was 40 years ago, thanks to sand imported from Cambodia, Indonesia, Malaysia, and Thailand. Singapore has imported 517 million metric tons of sand in the past 20 years, according to UNEP.

Dubai, on the other hand, exhausted its marine sand resources pouring 385 million metric tons to create an artificial set of islands called the Palm Jumeirah between 2001 and 2006. The city has since been relying on Australia to satisfy its seemingly insatiable demand for sand for other massive construction projects.

As the world's population continues to grow, so will the need for housing, office towers, factories, roads, and shopping malls. And given that most of what we build today is made of glass and concrete, sand is a fundamental resource for our economic development.

But with an exponential increase in the amount of sand mined globally and no international conventions to regulate its extraction, use, or trade, UNEP says, the harm to the environment is unequivocal, and occurring around the world.

In the end, our overdependence on this precious natural resource works against any sustainable development strategy. ■

Bruce Edwards is on the staff of Finance & Development.

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A Passport of CONVENIENCE

Judith Gold and Ahmed El-Ashram

Offering citizenship in return for investment is a win-win for some small states

“**A**RE you a Global Citizen? Let us help you become one.” You may have seen such an advertisement in an in-flight magazine designed to lure some business class passengers, largely from less-developed economies, into acquiring a passport that can smooth their entry at the border of their next destination. A whole new industry of residence and citizenship planning has emerged over the past few years, catering to a small but rapidly growing number of wealthy individuals interested in acquiring the privileges of visa-free travel or the right to reside across much of the developed world, in exchange for a significant financial investment.

A growing phenomenon

The rapid growth of private wealth, especially in emerging market economies, has led to a significant increase in affluent people interested in greater global mobility and fewer travel obstacles posed by visa restrictions, which became increasingly burdensome after the terrorist attacks of September 11, 2001. This prompted a recent proliferation of so-called citizenship-by-investment or economic citizenship programs, which allow high-net-worth people from developing or emerging economy countries to legitimately acquire passports that facilitate international travel. In exchange, countries administering such programs receive a significant financial investment in their domestic economy. Also contributing to the rapid growth of such programs is the pursuit of political and economic safe havens, in a deteriorating geopolitical climate and amid increased security concerns. Other considerations include estate and tax planning.

Economic citizenship programs are administered by a growing number of small states in the Caribbean and Europe. Their primary appeal is that they confer citizenship with minimal to no residency requirements. Dominica, St. Kitts and Nevis, and several Pacific island nations have had such programs for years: the St. Kitts and Nevis program dates back to 1984. More recently, a number of new programs have been introduced or revived, including by Antigua and Barbuda, Grenada, and Malta, with St. Lucia the most recent addition to the list. While some of these programs have been in place for years, they have only recently seen a substantial increase in applicants, with a corresponding surge in capital inflows.

Similarly, economic residency programs were recently launched across a wide range of (generally much larger) European countries, including Bulgaria, France, Hungary, Ireland, the Netherlands, Portugal, and



Spain. Almost half of EU member states now have a dedicated immigrant investor route. Also known as golden visa programs, these arrangements give investors residency rights—and access to all 26 Schengen Area countries, which have agreed to allow free movement of their citizens across their respective borders—while imposing minimal residency requirements (see table). Although these programs differ in that one confers permanent citizenship while the other provides just a residency permit, they both allow access to a large number of countries with minimal residency requirements, in return for a substantial investment in their economies (see Chart 1).

In contrast, some advanced economies, such as Canada, the United Kingdom, and the United States, have had immigrant investor programs since the late 1980s or early 1990s, offering a route to citizenship in exchange for specific investment conditions, with significant residency requirements. In 2014, Canada eliminated its federal immigrant investor program, but the provinces of Quebec and Prince Edward Island continue to run a similar scheme that leads to Canadian citizenship. And the United Kingdom and the United States continue to run and expand their programs.

The cost and design of the programs vary across countries, but most involve an up-front investment, in the public or the private sector, combined with significant application fees and an amount to cover due diligence costs. The programs in the Caribbean allow for either a large nonrefundable contribution to the treasury or to a national development fund, which finances strategic investment in the domestic economy, or an investment in real estate (which can be resold after a specified holding period). Other programs provide the option to invest in a redeemable financial instrument, such as government securities. In Malta, the program requires contributions in all three investment routes.

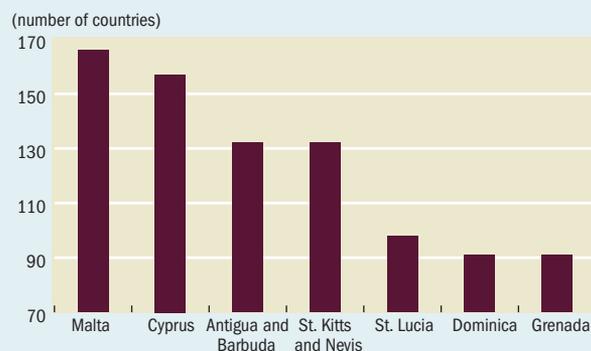
Economics of citizenship

The inflows of funds to countries from these programs can be substantial, with far-reaching macroeconomic implications for nearly every sector, particularly for small countries (see Chart 2). Inflows to the public sector alone in St. Kitts and Nevis, which has the most readily available data, had grown to nearly 25 percent of GDP as of 2013. Antigua and Barbuda and Dominica have also experienced significant inflows. In Portugal, inflows under the country's golden visa program may account for as much as 13 percent of estimated gross foreign direct investment inflows for 2014; in Malta, total expected contributions to the general government (including the National Development and Social Fund) from all potential applicants—which are capped at 1,800—could reach the equivalent of 40 percent of 2014 tax revenues when all allocated passports are issued.

Chart 1

Pick a country, any country

Among the countries offering citizenship programs, Maltese and Cypriot passports offer visa-free access to the most countries.



Source: Henley & Partners Visa Restriction Index 2014.
Note: Ranking reflects the number of countries to which the country's passport offers visa-free access. The program is not yet launched in St. Lucia.

The price of citizenship

The conditions for acquiring a passport via economic citizenship/residency vary by country.

	Country	Inception Year	Minimum Investment ¹	Residency Requirements ²	Citizenship Qualifying Period ³
Citizenship Programs	Antigua and Barbuda	2013	US\$250,000	5 days within a 5-year period	Immediate
	Cyprus	2011	€2.5 million	No (under revision)	Immediate
	Dominica	1993	US\$100,000	No	Immediate
	Grenada	2014	US\$250,000	No	Immediate
	Malta	2014	€1.15 million	6 months	1 year
	St. Kitts and Nevis	1984	US\$250,000	No	Immediate
Residency Programs	Australia	2012	\$A 5 million	40 days/year	5 years
	Bulgaria	2009	€500,000	No	5 years
	Canada ^{4,5}	Mid-1980s	Can\$800,000	730 days within a 5-year period	3 years
	Canada—Prince Edward Island	Mid-1980s	Can\$350,000	730 days within a 5-year period	3 years
	Canada—Quebec ⁵	N.A.	Can\$800,000	730 days within a 5-year period	3 years
	France	2013	€10 million	N.A.	5 years
	Greece	2013	€250,000	No	7 years
	Hungary	2013	€250,000	No	8 years
	Ireland	2012	€500,000	No	N.A.
	Latvia	2010	€35,000	No	10 years
	New Zealand	N.A.	\$NZ 1.5 million	146 days/year	5 years
	Portugal	2012	€500,000	7 days/year	6 years
	Singapore	N.A.	S\$2.5 million	No	2 years
	Spain	2013	€500,000	No	10 years
	Switzerland	N.A.	Sw F 250,000/year	No	12 years
United Kingdom	1994	£1 million	185 days/year	6 years	
United States	1990	US\$500,000	180 days/year	7 years	

Sources: Arton Capital; Henley & Partners; national authorities; UK Migration Advisory Committee; and other immigration services providers.

¹Alternative investment options may be eligible.

²Explicit minimum residency requirements under immigrant investor program; residency criteria to qualify for citizenship may differ.

³Including the qualification period for permanent residency under residency programs.

⁴Program suspended since February 2014.

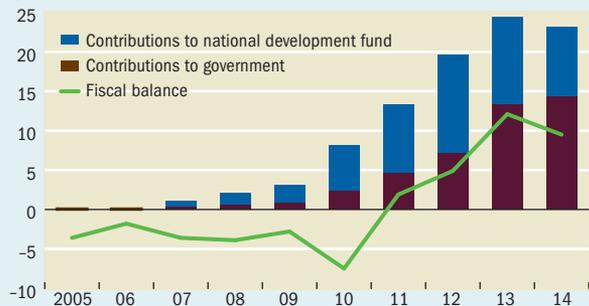
⁵Although not specific to the immigrant investor program, retaining permanent residency requires physical presence of 730 days within a five-year period.

Chart 2

A big boost

St. Kitts and Nevis's economic citizenship program accounts for significant inflows.

(percent of GDP)



Sources: National authorities; and IMF staff estimates.

The macroeconomic impact of economic citizenship programs depends on the design of the program, as well as the magnitude of the inflows and their management. The foremost impact is on the real sector, where inflows can bolster economic momentum. Programs with popular real estate options generate an inflow similar to that of foreign direct investment, boosting employment and growth. In St. Kitts and Nevis, inflows into the real estate sector are fueling a construction boom, which has pulled the economy out of a four-year recession—to a growth rate of 6 percent in 2013 and 2014, one of the highest in the Western Hemisphere. The rapid increase in golden visa residency permits in Portugal, which has issued more than 2,500 visas since the program's inception in October 2012, has reportedly bolstered the property market, leading to a steep rise in the price of luxury real estate.

However, a large and too rapid influx of investment in the real estate sector could lead to rising wages and ballooning asset prices, with negative repercussions on the rest of the economy. And the rapid expansion in construction could erode the quality of new properties and eventually undermine the tourism sector, since most of the developments include (or are repurposed for) tourist accommodations.

Moreover, inflows under these programs are volatile and particularly vulnerable to sudden stops, exacerbating small countries' macroeconomic vulnerabilities. A change in the visa policy of an advanced economy could suddenly diminish the appeal of these programs. It's conceivable that advanced economies could act together to suspend their operations, triggering a sudden stop. Increasing competition from similar programs in other countries or a decline in demand from source countries could also rapidly reduce the number of applicants.

If they are saved rather than spent, inflows from these programs can substantially improve countries' fiscal performance. In St. Kitts and Nevis, budgetary revenues from the program boosted the overall fiscal balance to more than 12 percent of GDP in 2013, one of the highest in the world. But these inflows can also present significant fiscal management challenges,

similar to those caused by windfall revenues from natural resources (see "Sharing the Wealth" in the December 2014 *F&D*). Such revenues can lead to pressure for increased government spending, including higher public sector wages, even though the underlying revenues may be volatile and difficult to forecast. The resulting increase in dependence on these revenues could lead to sharp fiscal adjustments or an acute increase in debt, if or when the inflows diminish.

A country's external accounts are also significantly affected by large program inflows. The budgetary revenues can improve the country's current account deficit, and substantially so if they are saved, and the capital account can be strengthened by transfers to development funds and higher foreign direct investment. But increased domestic spending as a result of higher government expenditures and investment will substantially boost imports, particularly in small open economies, offsetting some of the initial improvement in the balance of payments. Risks to the exchange rate and foreign currency reserves are also magnified as these inflows become a major source of external financing. In addition, rising inflation from economic overheating can cause the real exchange rate to appreciate, lowering the country's external competitiveness over the long run.

Large program inflows can also boost bank liquidity, especially if the bulk of the budgetary receipts are saved in the banking system. At the same time, they can threaten financial stability in small states. While some increase in liquidity may be welcome, large accumulation of program-related deposits presents new financial risks, reflecting small banking systems' limited and undiversified options for credit expansion. Risks to financial stability may be magnified if banks face excessive exposure to construction and real estate sectors already propped up by investments from the economic citizenship program. In that case, a sharp decline in program inflows could prompt a correction in real estate prices, with negative implications for banks' assets, particularly if supervision is weak.

Another challenge is the risk to governance and sustainability. Cross-border security risks associated with the acquisition of a second passport are likely to be the main concern of advanced economies. Reputational risks are also magnified: weak governance in one country could easily spill over to others, since advanced economies are less likely to differentiate between citizenship programs. In addition, poor or opaque administration of programs and their associated inflows—including inadequate disclosure of the number of passports issued, revenues collected, and mechanism governing the use of generated inflows—could prompt strong public and political resistance, complicating, or even terminating, these programs. Programs have indeed been shut down in the past as a result both of security concerns and domestic governance issues.

Weeding out the risks

Country officials can implement policies to reduce and contain the risks small economies face from large economic citizenship program inflows while allowing their economies to capitalize on the possible benefits.

Prudent management of government spending has an important role in containing the impact of these inflows on the real economy, but it should be accompanied by sufficient oversight and regulations to pace inflows, particularly to the private sector. For example, annual caps on the number of applications or the size of investments would limit the influx of investments to a country's construction sector. A regulatory framework for the real estate market would reduce risk

A rigorous due diligence process for citizenship applications is essential.

and limit potentially damaging effects of price distortions and segmentation in the domestic property market as a result of investment minimums imposed by these programs.

Changing key parameters of the program can also be an effective way to redirect investments to the public sector, allowing countries to save the resources for future use and to invest in infrastructure.

Saving is a virtue

Large fiscal revenue windfalls tend to trigger unsustainable expansions in expenditure that leave the economy exposed if the revenue stream dries up. Given the potentially volatile nature of these inflows, program countries—and small economies in particular—need to build buffers by saving the inflows and reducing public debt where it is already high. Prudent management of citizenship inflows would allow for a sustainable increase in public investment and accommodate what economists call countercyclical spending—spending when times are bad—and relief measures in the face of natural disasters. As in resource-rich economies, managing large and persistent inflows is best undertaken via a sovereign wealth fund. This would help deal with fluctuations in program revenues and stabilize the impact on the economy, possibly also providing scope for intergenerational transfers.

In any case, all fiscal revenue from economic citizenship programs, whether application fees or contributions to development funds, should be channeled through the country's budget to allow for proper assessment of the fiscal policy stance and avoid complications in fiscal policy implementation. In particular, development funds financed by economic citizenship programs should have their role properly defined and their operations and investments fully integrated in the budget.

Effective management of inflows, combined with prudent fiscal administration, will also reduce risk to the external sector, by containing the expansion of imports, limiting the rise in wages and the real exchange rate, and accumulating international reserves—to serve as a buffer in case of a sharp slowdown in program receipts. Strengthening banking sector oversight is also needed to moderate risks arising from the rapid influx of resources to the financial system.

Caps on credit growth, restrictions on foreign currency loans, or simply tighter capital requirements may be needed to dampen the procyclical flow of credit.

Managing a reputation

Preserving the credibility of the economic citizenship program is perhaps the most critical challenge. A rigorous due diligence process for citizenship applications is essential to preclude potentially serious integrity and security risks. And a comprehensive framework is needed to curtail the use of investment options as routes for money laundering and financing criminal activity. Such safeguards are integral to the success of economic citizenship programs. A high level of transparency regarding economic citizenship program applicants will further enhance the program's reputation and sustainability. This could include a publicly available list of newly naturalized citizens. Complying with international guidelines on the transparency and exchange of tax information would reduce the incidence of program misuse for purposes of tax evasion or other illicit activities and minimize the risk of adverse international pressure. Countries with similar programs should also collaborate among themselves and with concerned partner countries to improve oversight and ensure that suspicious applicants are identified.

Moreover, to help garner necessary public support for these programs, the economic benefits should accrue to the nation as a whole. They should be viewed as a national resource that may not be renewable if the nation's good name is tarnished by mismanagement. A clear and transparent framework for the management of resources is necessary, including a well-defined accountability framework with oversight and periodic financial audits. Information on the number of people granted citizenship and the amount of revenue earned—including its use and the amount saved, spent, and invested—should be publicly available.

The ever-surprising effects of globalization have given rise to a new dynamic whereby passports can carry a price tag. Economic citizenship programs facilitate travel for citizens of emerging and developing economy countries in the face of growing travel restrictions and are an unconventional way for some countries, particularly small states, to increase revenue, attract foreign investment, and bolster growth. Keeping these programs from being shut down calls for efforts to ensure their integrity, and the security and financial transparency concerns of advanced economies must be duly addressed. Small states offering these programs must develop macroeconomic frameworks to deal with the potential volatility and inflationary impact of the inflows, by saving the bulk of them for priority investment in the future and by pacing and regulating their flow into the private sector. ■

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This article is based on a 2015 IMF Working Paper, "Too Much of a Good Thing? Prudent Management of Inflows under Economic Citizenship Programs," by Xin Xu, Ahmed El-Ashram, and Judith Gold.



Collateral Damage

Combine harvesting wheat.

Pablo Druck, Nicolas E. Magud, and Rodrigo Mariscal

A strong dollar is seldom good news for emerging market economies

WHEN the U.S. economy is growing, other economies should benefit from the strong demand for exports from the world's largest economy—not only directly, but from the rest of the world, which benefits from stronger U.S. demand. But for emerging markets, especially those that are net commodity exporters, a buoyant U.S. economy is often a double-edged sword.

Based on data for 1970–2014 we found that during periods of dollar appreciation—which are about six to eight years long and usually occur when the U.S. economy is growing—real GDP growth in emerging markets slows, even though U.S. growth is driving global demand. By contrast, during periods of a depreciating dollar—which last about nine years—emerging market economies do better.

It may seem counterintuitive when the world's largest economy is growing and pulling in imports, including from emerging markets, that those economies should suffer. But it appears that the effect of an appreciating dollar in depressing global commodity prices outweighs the buoyant effects of a healthy U.S. economy. That is, as the dollar appreciates, dollar-denominated commodity prices tend to fall, and weaker commodity prices result in falling incomes in emerging market economies, slowing

their domestic demand growth. The result is a deceleration in real GDP growth in emerging market economies.

Depressing effect

The depressing effects of a stronger dollar occur even when foreign demand rises for products from emerging market economies whose depreciating currencies make their exports cheaper. In other words, even if net export growth increases, the drop in domestic demand growth is proportionally larger, resulting in slower aggregate domestic production. This is true even when we take into account China's increasing role in commodity prices, which began in earnest in the late 1990s. Moreover, beyond the effects of a stronger dollar and faster U.S. real GDP growth on emerging markets' activity, we found that the increase in U.S. interest rates that eventually accompanies a growing U.S. economy, *further* reduces growth in these economies. These effects are stronger in countries with less flexible exchange rate regimes. Although net commodity exporters are affected the most, countries that rely on importing capital for investment or inputs for domestic production are also affected. That is because most of those imports are priced in dollars. Moreover, borrowing costs rise with interest rate increases, affecting firms that incur debt to finance their investment.

In the past year emerging markets have suffered from a rising dollar and declining commodity prices. The expected persistence of the strong dollar and an anticipated increase in U.S. interest rates will tend to further subdue growth in emerging market economies in the near term.

Why is the protagonist the dollar exchange rate? Part of it is that most international transactions, including those involving commodities, are priced in dollars—the currency that is effectively the global medium of exchange, store of value, and unit of account. And, with the exception perhaps of China (a commodity importer anyway), emerging market economies cannot affect the U.S. multilateral exchange rate much. That means that while developments in the United States affect every emerging market economy, occurrences in those economies have little effect on the United States. Moreover, U.S. macroeconomic policy takes little account of developing economies. That means that the U.S. real exchange rate is likely to be more relevant to an emerging market economy than its terms of trade—that is, the relative price of a country's exports in terms of its imports. In other words, the dollar is the ultimate driver of emerging market dynamics: the terms of trade are only the vehicle.

Real dollar effects

The effect of the real dollar exchange rate on emerging market economies can be shown in a decade-by-decade look at the effects on South America's GDP. The story is similar in other regions.

1970s: This was a period of dollar depreciation. U.S. monetary policy was expansionary, with low real (after-inflation) interest rates that hovered around 2 percent. Economic activity in the United States went through two recessions and a period of high inflation and slow growth, often called stagflation. South America's real GDP growth was strong (averaging over 6 percent), on the back of two oil price surges (in 1973 and 1979) along with higher commodity prices more generally.

1980s: Following high inflation in the United States, the Federal Reserve, the U.S. central bank, tightened monetary policy in the early 1980s. Real interest rates reached 8 percent. As a result, the dollar appreciated and commodity prices dropped. The U.S. economy went into recession but quickly recovered and grew robustly for the rest of the decade. In South America growth was so mediocre that the period became known as Latin America's lost decade. Moreover, higher U.S. interest rates caused a sharp increase in the cost of international financing, which in many cases resulted in a sovereign debt crisis—in Latin America and some other developing economies.

1990s: After a 1993 recession, there was a sustained period of strong growth in the United States, one of the longest in recent history. U.S. real interest rates were higher than in the 1970s, yet lower than in the 1980s. The dollar progressively strengthened. Commodity prices were mostly weak. Real GDP growth in South America was about 3 percent, not good for emerging market economies and lower than expected given the growth-enhancing structural reforms in the region in the early years of the decade.

2000s: The decade started with low real interest rates, a depreciating dollar, and strong commodity prices on the back of strong external demand, particularly from China. South America's growth boomed at about 4½ percent—until the 2008–09 global financial crisis.

2010s: The dollar has been appreciating again, especially since mid-2014. Commodity prices have weakened, and are expected to remain subdued into the medium term. If the events of the past four and a half decades are any indication, emerging market economies face a period of low real GDP growth—at least lower than when the dollar was weak and commodity prices high. Economic activity in emerging markets has in fact been decelerating recently. And the dollar, which appreciated about 15 percent between June 2014 and July 2015, again appears to be one of the factors slowing growth in emerging market economies, whose prospects have been revised downward several times by the IMF (2015) and by the market more broadly in recent months.

Softer growth

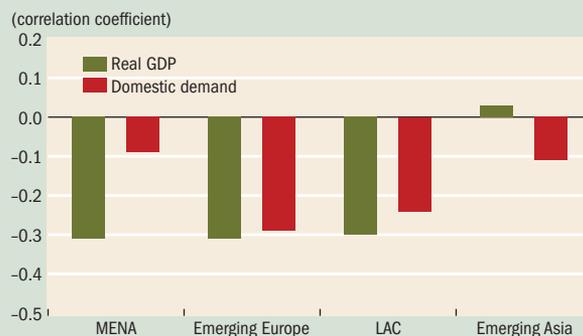
Based on the experiences of emerging market and developing economies, we have documented some broad generalizations about average occurrences using annual data for 63 of those countries during 1970–2014:

- Periods of dollar appreciation coincide with softer real GDP growth throughout emerging market regions (see Chart 1). During periods of dollar depreciation, emerging market economies fare much better. This is especially true for regions that are net commodity exporters. Specifically, we observed a strong comovement in Latin America (particularly among the net commodity exporters of South America), emerging Europe, and the Middle East and North Africa, and to a lesser extent in emerging Asia.

Chart 1

Hand in hand

When the dollar appreciates, the growth rate of both real (after-inflation) GDP and domestic demand slows in emerging market economies in most regions of the world.



Sources: Bank for International Settlements; Federal Reserve Bank of St. Louis, *Real Narrow Effective Exchange Rates for the United States*; and IMF, *World Economic Outlook*.

Note: The correlation coefficient shows the closeness of fit between the dollar appreciation and real GDP and domestic demand in the various regions. Dollar appreciation is measured by the real effective exchange rate with each of the regions. Growth rates are three-year moving averages. Real GDP is calculated as the purchasing-power-parity-weighted average of the pooled countries in each region. Domestic demand is private consumption + government consumption + private investment + net exports. LAC = Latin America and the Caribbean; MENA = Middle East and North Africa. The period covered is 1970–2014.

- The stronger the dollar, the weaker is domestic demand in emerging market economies. Domestic demand is a major driver of economic activity, and domestic demand seems to be affected by the purchasing power of the real effective exchange rate (see box), and it is through domestic demand that the U.S. real effective exchange rate is transmitted into economic activity in emerging market and developing economies. The impact on domestic demand appears to be weaker for countries in the Middle East and North Africa and emerging Asia and stronger for Latin America and emerging Europe.

- Periods of higher interest rates in the United States tend to occur alongside a stronger dollar, and vice versa. Higher interest rates increase capital inflows to the United States as investors seek higher yields, leading to an appreciation of the dollar.

- Higher U.S. interest rates appear to be associated with stronger U.S. growth, though not always. Stronger growth eventually generates demand-induced inflation pressure when domestic demand approaches the economy's ability to produce goods and services efficiently. Rising prices induce the Federal Reserve to tighten monetary policy by raising interest rates, which increases borrowing costs for businesses and individuals. Higher borrowing costs mitigate inflation pressure by slowing credit growth, which tamps down economic activity. However, there have been a few periods during which the relationship between economic activity and interest rates in the United States was not so strong.

- When the dollar is in an appreciating cycle, the price of commodities is weaker, which in turn reduces growth in emerging markets.

The dollar cycle

As we have said, an important channel for the negative income effect of a stronger dollar on emerging markets is the depreciation of commodity prices in dollar terms. When commodity exports have lower purchasing power in dollars, a country's real income is reduced. Domestic demand will fall as will economic

output. The opposite happens during periods of a weak dollar.

For 1970–2014, we found three appreciation cycles and three depreciation cycles (see Chart 2). Real dollar depreciations were, on average, stronger and lasted longer than real appreciation cycles. The real average appreciation is 3.2 percent a year with an average duration of more than six years (eight years if the ongoing dollar appreciation is not included); the real average annual depreciation is 3.8 percent, with an average duration of close to nine years. Moreover, the cycles are persistent. A period of real appreciation is 83 percent more likely to be followed by another period of appreciation than by depreciation. For real depreciation, the probability of continuation is about 88 percent.

To further substantiate our findings we used event analysis, which seeks to relate over time how GDP in emerging market economies behaves, depending on whether the dollar is in an appreciation or depreciation cycle.

That analysis showed that except for Central America and Mexico real GDP is lower in every region during periods of dollar appreciation. This pattern holds for Latin America as an aggregate, despite the effect of Central America and Mexico, and especially for South America, which is a strong net commodity exporter. It also holds for emerging market economies in the Middle East and North Africa as well as for

Chart 2

Ups and downs

The dollar goes through long-term cycles in which its value appreciates and depreciates in terms of most other currencies.



Source: Authors' calculations.

Terms of trade

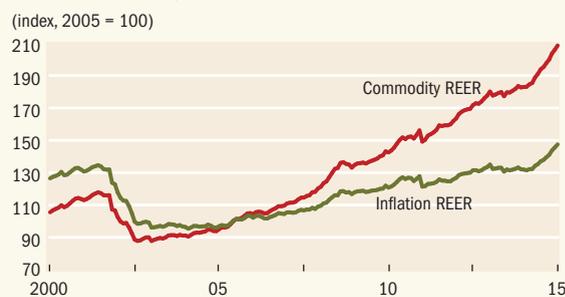
The real effective exchange rate (REER) measures a country's currency value relative to the currencies of the countries with which it trades, adjusted for inflation. It is a measure of purchasing power.

To determine the REER, a country's nominal exchange rate with each trading partner is multiplied by the export-share-weighted consumer price index of the trading partners and then divided by the domestic country's consumer price index.

To construct an index that reflects an economy's purchasing power, its REER can be adjusted to yield the commodity terms of trade real effective exchange rate. The weighted consumer price indices in the REER are replaced by the trade-weighted commodity terms of trade of each country. The terms of trade measure is a country's export prices divided by import prices. When commodity prices increase, the commodity REER increases more than the standard REER, and vice versa. The chart shows how the two measures of purchasing power compare in Mexico and South America from 2000 to 2015.

Commodity power

As commodity prices rose starting in 2007, purchasing power in terms of commodities began to exceed the purchasing power measured by relative inflation in Latin America.



Source: Authors' calculations.

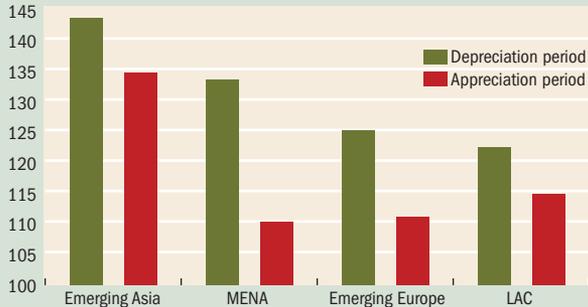
Note: The real effective exchange rate (REER) measures a country's currency value relative to the currencies of countries with which it trades adjusted for consumer price inflation. The commodity REER adjusts the inflation-based measure of REER to reflect purchasing power in terms of commodity prices. The countries measured are Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Mexico, Paraguay, Peru, Uruguay, and Venezuela.

Chart 3

Drag on GDP

In most regions real GDP accumulates less during periods of dollar appreciation than in periods of dollar depreciation.

(GDP index, year before period starts = 100)



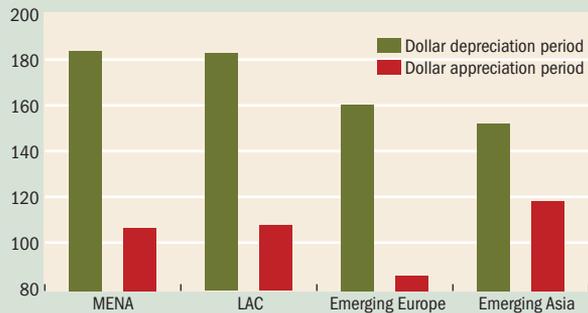
Sources: IMF, *World Economic Outlook*; and authors' calculations.
 Note: Dollar is calculated in terms of real effective exchange rate with each region. Regional real GDP is calculated as the purchasing-power-parity-weighted average of the pooled countries in each region. LAC = Latin America and the Caribbean; MENA = Middle East and North Africa. GDP is calculated as a regional average. The period covered is 1970-2014.

Chart 4

In demand

During periods of dollar depreciation, domestic demand grows robustly in most emerging markets. When the dollar appreciates, domestic demand growth is more subdued.

(domestic demand index, year before period = 100)



Sources: IMF, *World Economic Outlook*; and authors' calculations.
 Note: Dollar is calculated in terms of real effective exchange rate with each region. Domestic demand is private consumption + government consumption + private investment + net exports. LAC = Latin America and the Caribbean; MENA = Middle East and North Africa. Demand is calculated as a regional average. The period covered is 1970-2014.

emerging Europe. To a lesser extent, it is also true for emerging Asia. On average, real GDP in Latin America accumulates about 7 percentage points less during a dollar appreciation cycle than during a dollar depreciation cycle. The differences are even higher in the Middle East and North Africa—about 21 percentage points—and although less dramatic in emerging Asia, comparable to Latin America at 7 percentage points (see Chart 3). The difference is not so marked in Central America and Mexico, however, perhaps because of the strong noncommodity links to the United States, such as trade, tourism, and remittances. The trade link operates through the external demand for goods. Tourism boosts external demand for services. And remittances transfer resources from the United States to Mexico, Central America, and the Caribbean. All help support domestic demand and income in

these emerging market and developing economies, offsetting any negative income effect from a stronger dollar. Countries with currencies pegged to the dollar or that use dollars as their domestic currency tend to be further synchronized with the dollar cycle.

Capital inflows to emerging market economies are likely to moderate.

With the exception of Central America and Mexico, all regions and subregions experience much stronger real domestic demand growth when the dollar is more depreciated. In many of the regions, domestic demand actually falls or remains flat when the dollar is appreciating. This is a powerful indication of the negative impact of a stronger dollar on the purchasing power of domestic demand. In turn, this suggests that the lower dollar income that results from weaker commodity prices (usually referred to as an income effect) is more important than the increase in economic activity that usually accompanies exports when the domestic currency depreciates. This is commonly referred to as an expenditure-switching effect, because it results in stronger external demand as domestic goods become cheaper in dollars (see Chart 4).

Whither the dollar?

The dollar has been appreciating since at least mid-2014, and based on historical data, there is a more than 80 percent probability that it will continue to appreciate in the short and medium term—in line with the six- to eight-year appreciation cycles we have identified. That means commodity prices in dollars are likely to remain weak, and domestic demand and the reduction in dollar purchasing power mean that real GDP growth in emerging market economies will be slower than when the dollar is falling.

If the Federal Reserve begins to raise interest rates and unwinds the extraordinary expansionary monetary policy it began during the global financial crisis, the dollar is even more likely to remain strong. Capital inflows to emerging market economies are likely to moderate at best (and in a worst-case scenario capital could flee), which could exacerbate the effects of weaker commodity prices. Furthermore, international financing costs would increase. That means, on balance, that the external prospects for these economies are not promising. ■

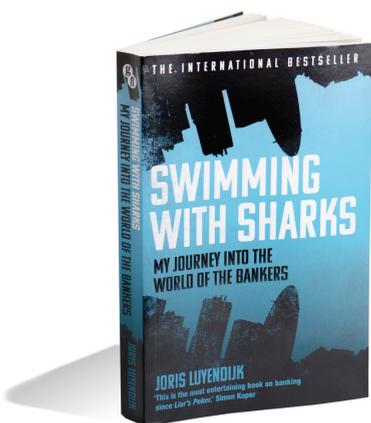
Pablo Druck and Nicolas Magud are Senior Economists and Rodrigo Mariscal is a Research Assistant, all in the IMF's Western Hemisphere Department.

This article is based on a 2015 IMF Working Paper, "Collateral Damage: Dollar Strength and Emerging Markets' Growth," by Pablo Druck, Nicolas Magud, and Rodrigo Mariscal.

Reference:

International Monetary Fund (IMF), 2015, World Economic Outlook (Washington, April and October).

The Jaws of Finance



Joris Luyendijk

Swimming with Sharks

My Journey into the World of the Bankers

Guardian Faber, London, 2015, 288 pp., £12.99 (paper).

Reality is complicated and the human mind can have a hard time grasping it. Events usually need an explanation, a causal source. The origins of earthquakes and other natural catastrophes are on some level easy to grasp: they just happen. No human hands involved. Social and economic events are often harder to understand or accept. They do not just happen. The human mind craves a cause-and-effect paradigm, which can give rise to conspiracy theories: the moon landing was a hoax; global warming is a fabrication of the liberal left; greed and collusion among unscrupulous bankers are behind the 2008–09 financial crisis.

How then does an investigative journalist transcend easy answers? Well, ask the people involved. Be humble, start with the most basic questions, and reach out to the widest sample of players. This is what Joris Luyendijk set out to do when the *Guardian* invited him in 2011 to blog about “understanding the financial sector.” After many postings and interviews with more than 200 staff members from large investment and commercial banks, hedge funds, financial supervisors, and others, *Swimming with Sharks* was born. The

author’s quest: to discover what went wrong in 2008 and figure out whether the same type of crisis could happen again. His investigative work borrows from what anthropologists do, including by creating an analytical taxonomy for his analysis that he uses to divide his interviewees into three groups: front-office, high-profile traders; back-office support staff; and mid-office compliance and risk-management officers. He studied how members of the financial sector think by reading memoirs and exposés.

Then he did field work, trying not to go “native”—meaning without letting his sympathies, biases, and emotions get in the way of analysis. A hard task.

Luyendijk’s answer: the 2008–09 financial crisis was not caused by individual character flaws, such as greed, which pervade human society. The crisis was caused by perverse incentives against a backdrop of a male-dominated, competitive culture that punishes (perceived!) failure swiftly. Scant job security has eroded people’s attachment to the institutions they work for, which may have encouraged excessive risk taking. Changes in the governance of large financial institutions from the investor-owner model (widespread till the 1980s) to the open capital model have limited shareholders’ ability to monitor risk taking and added to incentives to take extreme chances. Very large and complex financial firms created “too-big-to-fail” institutions that do not internalize the social risks of their actions.

The book is full of good anecdotal evidence—including some debunking the illusion that firewalls can prevent conflict of interest within financial sector institutions. Firewalls between investment bankers cooking up new financial products and those trading them and bank analysts advising clients on the quality of those assets were not respected. Rating agencies were soft on the risk associated with complicated derivative products, probably because they were paid by the owners of the underlying assets

being rated. As Luyendijk states, firewalls in most financial sector firms are about as credible as the independence of “the *Guardian* if it were bought by a political party in England.” To close the loop of perverse incentives in the financial

The author’s quest: to discover what went wrong in 2008.

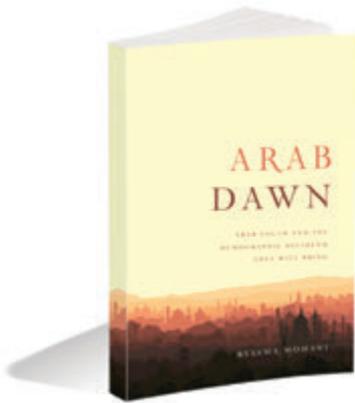
complex, supervisors and banks’ mid-office staff were mere window dressing as financial products became more complicated and the sector’s culture of “eat, drink, be merry, and do not show weakness” inhibited a critical mass of whistle-blowers.

Luyendijk makes a good case against the argument that the great financial crisis of 2008–09 sprang from an organized, well-orchestrated conspiracy among fat cigar-smoking bankers. (He does not, however, spare a subset of calculating financial sector players he dubs “cold fish” in an entertaining story arc that nicknames each type of financial player.) After a thorough anthropological journey through the City of London, the forecast is bleak: nothing has changed. The competitive culture (with its scant respect for risk management, including through the demoralization of mid-office employees and the cult of successful super traders, the “masters of the universe”), too-big-to-fail institutions, and everything that underpinned the great financial crisis are still with us. The author ends the book with an “empty cockpit” as an image of our awareness of the risks of another crisis. *Swimming* leaves the impression that current regulatory and supervisory changes are like bike helmets for passengers on this accelerating plane. The rush for the few available parachutes will be intense when the next crash comes.

Marcello Estevão

Deputy Division Chief, IMF Western Hemisphere Department

Young and Still Restless



Bessma Momani

Arab Dawn

Arab Youth and the Demographic Dividend They Will Bring

University of Toronto Press, 2015, 176 pp., \$21.95 (paper).

For those readers who have consumed little information about the Arab region and its youth between the Arab-Spring-Fires-up-the-Arab-Street news cycle and the ISIS-Brings-back-the-12th-Century news cycle, *Arab Dawn* by Bessma Momani could indeed be the uplifting, hopeful antidote she hopes it will be.

For those with a more nuanced view of the region and its youth demographic, Momani's book is a light addition to the tiny genre of literature on the future prospects of Arab youth, which includes Christopher Schroeder's *Startup Rising* (2013) and Tarik Yousef's *Generation in Waiting* (2009). Schroeder's book offers richer, more inspiring portraits of entrepreneurs grappling with the region's problems to build the change they want to see in their societies (disclaimer: my company is profiled in the book); Yousef's contains deeper, more meaningful policy recommendations for the region's economic development challenges.

What Momani's book lacks in depth, however, it makes up for in new statistics and anecdotes about the region's youth. It may come as a surprise to some readers that despite the negative news cycles, the young people who took to the streets are still agitating for change. Their efforts do

not always make the front pages in the West, but the Saudi women who post YouTube videos of themselves driving their own cars around Riyadh and the Egyptian TV personality who exposes cultural hypocrisy in hidden-camera episodes are continuing the struggle.

These stories are not as dramatic as those of demonstrators toppling dictators, but given the pace of political reform we've seen in most of the postrevolution countries, they could prove to have a greater impact.

On religion, Momani can be praised for not trying to use statistics to tell us that Arab youth are more secular or more moderate than older generations. She tells it as it is: it's complicated. Yes, 35 percent of entrepreneurs are women, and 80 percent of men think that women should be able to work outside the home—but 94 percent of women in Egypt wear a head scarf, twice as many as in their mother's generation.

Some of the surveys and polls Momani cites that were published before Facebook's 2009 "Like" button release should probably be discarded. Joking aside, the average three hours a day Arab young people spend on social networks has profoundly affected how they see the world and their place in it—even if they're sitting in a blighted neighborhood in Cairo or Tripoli or Amman. This may be the first generation to embrace modern ideas and attitudes as a result of interacting with global culture *online*—bottom-up modernization independent of economic progress or government-led reform.

How these globally connected young people will respond to ever-rising unemployment is not addressed by Momani. She tells us the scary truth: 100 million additional jobs are needed by 2030. But her economic policy recommendations seem out of touch with present realities. For governments to provide more finance, infrastructure, and hospitality jobs in the private sector, as Momani writes, is simply not enough.

It's not enough, for two reasons. The economic growth of the region will

not support the job growth required. 100 million jobs by 2030 is just what is required to maintain present employment levels; unemployment is currently at 28 percent among Arab youth and 43 percent among Arab females, double the global average, according to the Arab Monetary Fund. With oil prices having dropped more than 50 percent in the last year and few experts predicting a rise back above \$100 a barrel, it is unlikely that the GCC's economies will

The young people are still agitating for change.

help pick up the slack. The ravages of war on Syria, Libya, and Yemen mean a lost generation in those countries: the IMF's Masood Ahmed has said that it will take 20 years of 3 percent annual growth for Syria to reach prewar income levels.

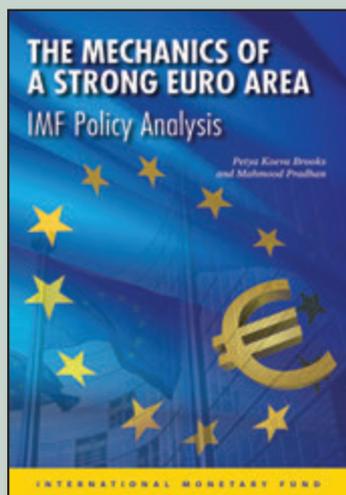
Second, the very nature of work is changing, and the skills economies will value are changing. The coming artificial intelligence revolution will leave many people everywhere behind—not just in the developing world.

The book does contain a seed of optimism, though the author doesn't connect the dots for us. The Arab world is a wellspring of creativity. One in five Arabs can be categorized as a creative professional, and the skills they possess are rising in value. Within the life spans of the youth Momani portrays, machines will best human beings at just about everything—including building new machines, both the hardware and the software.

But where machines will have a harder time catching up with us humans is in our creativity, empathy, and ability to make human connections. This is the wealth of Arab youth, and this is where hope can be found.

May Habib
CEO and cofounder of Qordoba,
an enterprise SaaS platform for
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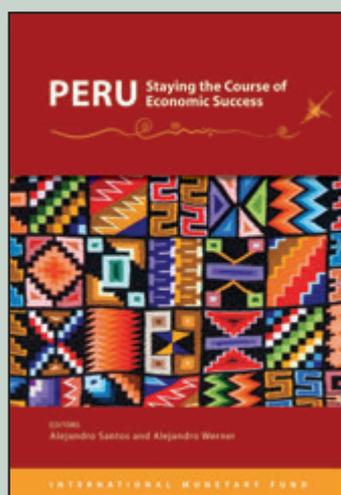
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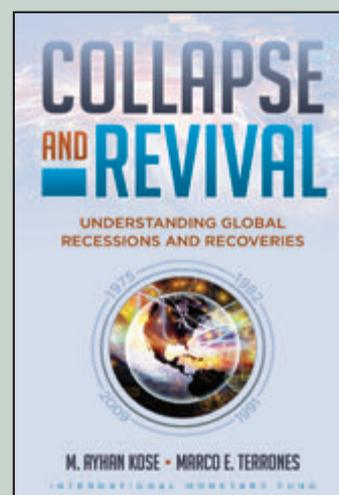
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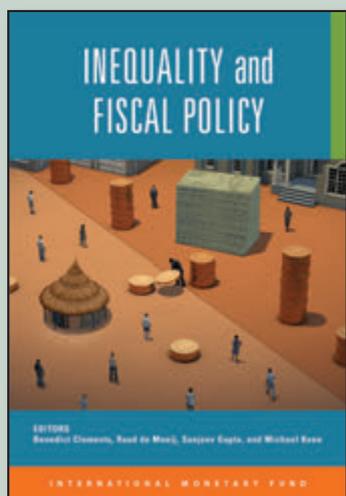
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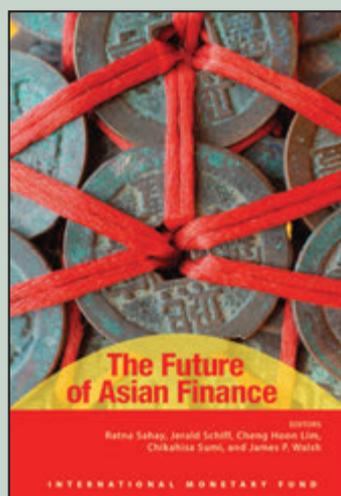
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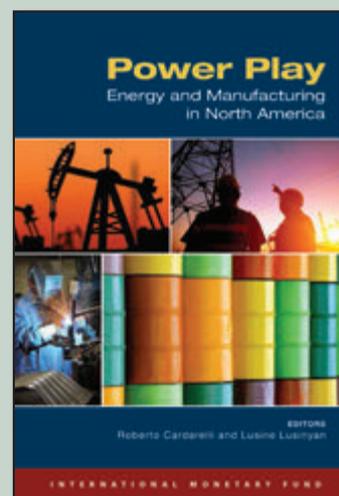
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