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Mashup Indices of Development

Martin Ravallion

Countries are increasingly being ranked by some new “mashup index of development,” defined as a composite index for which existing theory and practice provides little or no guidance for its design. Thus the index has an unusually large number of moving parts, which the producer is essentially free to set. The parsimony of these indices is often appealing—collapsing multiple dimensions into just one, yielding seemingly unambiguous country rankings, and possibly reducing concerns about measurement errors in the component series. But the meaning, interpretation, and robustness of these indices and their implied country rankings are often unclear. If they are to be properly understood and used, more attention needs to be given to their conceptual foundations, the tradeoffs they embody, the contextual factors relevant to country performance, and the sensitivity of the implied rankings to the changing of the data and weights. In short, clearer warning signs are needed for users. But even then, nagging doubts remain about the value-added of mashup indices, and their policy relevance, relative to the “dashboard” alternative of monitoring the components separately. Future progress in devising useful new composite indices of development will require that theory catches up with measurement practice. JEL codes: I00, I32, O57

Various indicators are used to track development, both across countries and over time. The World Bank’s annual World Development Indicators presents literally hundreds of development indicators (World Bank 2009). The UN’s Millennium Development Goals are defined in terms of multiple indicators. Even in assessing specific development goals, such as poverty reduction, mainstream development thinking and practice is premised on a multidimensional view, calling for a range of separate indicators.

Faced with so many indicators—a “large and eclectic dashboard” (Stiglitz, Sen, and Fitoussi 2009, p. 62)—there is an understandable desire to reduce the

dimensionality to form a single composite index. As Samuelson (1983, p. 144) put it (in the context of aggregating commodities): “There is nothing intrinsically reprehensible in working with such aggregate concepts.” However, as Samuelson goes on to note in the same passage: “it is important to realize the limitations of these aggregates and to analyze the nature of their construction.”

Two broad types of composite indices of development can be identified. In the first, the choices of the component series and the aggregation function are informed and constrained by a body of theory and practice from the literature. GDP, for example, is a composite of the market values of all the goods and services produced by an economy in some period. Similarly aggregate consumption is a composite of expenditures on commodities. A standard poverty or inequality measure uses household consumption or income, which are aggregates across many components. In these cases, the composite index is additive and linear in the underlying quantities, with prices (including factor prices) as their weights. A body of economics helps us construct and interpret such indices. With a complete set of undistorted competitive markets, market prices are defensible weights on quantities in measuring national income, though even then we will need to discount this composite index for the extent of income inequality to derive an acceptable money metric of social welfare (under standard assumptions). And market prices will need to be replaced by appropriate shadow prices to reflect any market imperfections such as rationing. There is a continuing debate and reassessment related to these and other aspects of measurement, through which practice gets refined. Decisions about measurement are guided by an evolving body of theory and practice.

This is not the case for the second type of composite index. Here the analyst identifies a set of indicators that are assumed to reflect various dimensions of some unobserved (theoretical) concept. An aggregate index is then constructed at the country level, usually after rescaling or ranking the component series.¹ Neither the menu of the primary series nor the aggregation function is predetermined from theory and practice, but are “moving parts” of the index—key decision variables that the analyst is free to choose, largely unconstrained by economic or other theories intended to inform measurement practice.

Borrowing from web jargon, the data going into this second type of index can be called a “mashup.” In web applications one need not aggregate the data into a composite index; often users look instead for patterns in the data. When a composite index is formed from the mashup, I will call it a “mashup index.” This is defined as a composite index for which the producer is only constrained by the availability of data in choosing what variables to include and their weights.

The country rankings implied by mashup indices often attract media attention. People are naturally keen to see where their country stands. However, the details of how the composite index was formed—the variables and weights—rarely get

the same scrutiny. Typically the (often web-based) publications do not comply with prevailing scholarly standards for documenting and defending a new measure. No doubt many users think the index has some scientific status.

Just as it is recognized that there can be gains from bringing together data and functionality from different sources in creating a web-application hybrid, there can be gains in forming a mashup index. These gains often stem from the inadequacies of prevailing composite indices of the first type as characterizations of important development goals—combined with the desire for a single (scalar) index. No single data series captures the thing one is interested in, so by adding up multiple indices one may hope to get closer to that truth; in principle there can exist an aggregate index that is more informative than any of its components. As data sources become more open and technology develops, creative new mashups can be expected. It is a good time then to take stock of the concerns with existing indices, in the hope of doing better in the future.

In this paper I offer a critical assessment of the strengths and weaknesses of existing mashup indices of development. What goes into the mashup and how useful is what comes out? One theme of the paper is the importance of assessing the (rarely explicit) tradeoffs embodied in these indices—for those tradeoffs have great bearing on both their internal validity and their policy relevance. Another theme is the importance of transparency about the robustness of country rankings. Clearer warnings are needed for users, and technology needs to be better exploited to provide those warnings. As it is, prevailing industry standards in designing and documenting mashup indices leave too many things opaque to users, creating hidden costs and downside risks, including the diversion of data and measurement efforts, and risks of distorting development policymaking.

After describing some examples, I will discuss the generic questions raised by mashup indices. Four main issues are identified: the need for conceptual clarity on what is being measured; the need for transparency about the tradeoffs embedded in the index; the need for robustness tests; and the need for a critical perspective on policy relevance. These are not solely issues for mashup indices; practices for other composite indices are often less than ideal in these respects. However, by their very nature—as composite indices for which virtually everything is up for grabs—these concerns loom especially large for mashup indices.

Examples of Mashup Indices of Development

A prominent set of examples of mashup indices is found in past efforts to combine multiple social indicators. An early contribution was the Physical Quality of Life Index (Morris 1979), which is a weighted average of literacy, infant mortality, and life expectancy. Along similar lines, a now famous example is the Human

Development Index (HDI) that is published each year in the United Nations Development Programme (UNDP)'s Human Development Report (HDR), which started in 1990. The HDI adds up attainments in three dimensions—life expectancy, schooling (literacy and enrollment rates), and log GDP per capita at purchasing power parity—after rescaling each of them.² There have been a number of spinoffs from the HDI, including the “Gender Empowerment Measure,” which is a composite of various measures of gender inequalities in political participation, economic participation and decisionmaking, and power over economic resources.

In a similar spirit to the HDI, the Multidimensional Poverty Index (MPI) was developed by [Alkire and Santos \(2010a\)](#), in work done for the 2010 HDR. The authors choose 10 components for the MPI: two for health (malnutrition and child mortality), two for education (years of schooling and school enrollment), and six aim to capture “living standards” (including both access to services and proxies for household wealth). Poverty is measured separately in each of these 10 dimensions, each with its own weight. In keeping with the HDI, the three main headings—health, education, and living standards—are weighted equally (one-third each) to form the composite index. A household is identified as being poor if it is deprived across at least 30 percent of the weighted indicators. While the HDI uses aggregate country-level data, the MPI uses household-level data, which is then aggregated to the country level. Alkire and Santos construct their MPI for more than 100 countries.³

Mashups have been devised for other dimensions of development. The “Economic Freedom of the World Index” is a composite of indices of the size of government, property rights, monetary measures (including the inflation rate and freedom to hold foreign currency accounts), trade openness, and regulation of finance, labor, and business ([Gwartney and Lawson 2009](#)).

The “Worldwide Governance Indicators” (WGI) ([Kaufmann, Kraay, and Mastruzzi 2009](#)) is a set of mashup indices, one for each of six assumed dimensions of governance: voice and accountability, political stability and lack of violence or terrorism, governmental effectiveness, regulatory quality, rule of law, and corruption. The WGI covers some 200 countries and is now available for multiple years.

Probably the most well-known mashup index produced by the World Bank Group is the “Ease of Doing Business Index”—hereafter the “Doing Business Index” (DBI).⁴ This is a simple average of country rankings for ten indices aiming to measure how easy it is to open and close a business, get construction permits, hire workers, register property, get credit, pay taxes, trade across borders, and enforce contracts. Unlike most of the mashup indices, DBI collects its own data, using 8,000 local (country-level) informants. The composite index is currently produced for 183 countries. The country rankings are newsworthy, with over 7,000 accumulated citations in Google News.

The World Bank's "Country Policy and Institutional Assessments" (CPIA) attempt to assess the quality of a country's policy and institutional environment. The CPIA has 16 components in four clusters: economic management (macro-management, fiscal, and debt policies), structural policies (trade, finance, business, and regulatory environment), policies for social inclusion and equity (gender equality, human resources, social protection, environmental sustainability) and governance (property rights, budgetary management, revenue mobilization, public administration, transparency and accountability in the public sector). These are all based on "expert assessments" made by the Bank's country teams, who prepare their proposed ratings, with written justifications, which are then reviewed.

Two mashup indices are produced from the CPIA. One of them is simply an equally weighted sum of the four cluster-specific indices, with equal weights on their subcomponents. This appears to be only used for presentational purposes. The second index puts a weight of 0.68 on the governance cluster of the CPIA and 0.24 to the mean of the other three components (and the remaining weight goes to the Bank's assessment of the country's "portfolio performance"). This "governance-heavy" mashup index based on the CPIA is used to allocate the World Bank's concessional lending, called "International Development Association" (IDA), across IDA eligible countries. The African Development Bank has undertaken a similar CPIA exercise to guide its aid-allocation decisions.

The Environmental Performance Index (EPI), produced by teams at Columbia and Yale Universities, is probably the most well known mashup index of environmental data. This ranks 163 countries by a composite of 25 component series grouped under 10 headings: climate change, agriculture, fisheries, forestry, biodiversity and habitat, water, air pollution (each of the latter two having two components, one for effects on the ecosystem and one for health effects on humans), and the environmental burden of disease.

Probably the most ambitious example yet of a mashup using development data was released by *Newsweek* magazine in August 2010. This tries to identify the "World's Best Countries" using a composite of many indicators (many of them already mashup indices) assigned to five groupings: education, health, quality of life, economic competitiveness, and political environment. The education component uses test scores. The health component uses life expectancy at birth. "Quality of life" reflects income inequality, a measure of gender inequality, the World Bank's poverty rate for \$2 a day, consumption per capita, homicide rates, the EPI, and the unemployment rate. "Economic dynamism" is measured by the growth rate of GDP per capita, nonprimary share of GDP, the World Economic Forum's Innovation Index, the DBI and stock market capitalization as a share of GDP. The "political environment" is measured by the Freedom House ratings, and measures of political participation and political stability.

While in the bulk of this paper I critically review the main claims made about the *benefits* of these and other mashup indices of development, rather little seems to be known about their *costs*. The teams working on these indices appear to range from just a few people to 30 or more. The website for Doing Business (www.doingbusiness.org/MeetTeam/) lists 33 staff on the team who produced the 2010 edition, on top of the 8,000 “local experts.”⁵ However, it should be recalled that this team is collecting the primary data, so this does not imply a high cost of the mashup index per se. The labor inputs to producing prevailing mashup indices are probably small.

What Is Being Measured and Why?

The fact that the target concept is unobserved does not mean we cannot define it and postulate what properties we would like its measure to have. Understanding the purpose of the index can also inform choices about its calibration.

In practice we are often left wondering what the concept is that the index is trying to measure and why. For example, what exactly does it mean to be the “best country” in *Newsweek*’s rankings (which turns out to be Finland). (I guess I should be pleased to see my country, Australia, coming in at number 4, but I have little idea what that means.) The rationale for the choices made in the *Newsweek* index is far from clear, not least because one is unsure what exactly the index is trying to measure.⁶

Some mashup indices have been motivated by claimed inadequacies in more standard development indices. The construction of a number of the mashup indices of development has been motivated by the argument that GDP is not a sufficient statistic for human welfare—that it does not reflect well the concerns about income distribution, sustainability, and human development that matter to welfare. To my eyes this is a straw man, and it has been so for a long time. Soon after the HDI first appeared, motivated by these inadequacies of GDP, [Srinivasan \(1994, p. 238\)](#) wrote: “In fact, income was never . . . the sole measure of development, not only in the minds of economists but, more importantly, among policy makers.” In poverty measurement, a similar straw man is the view that mainstream development thinking has been concerned solely with “income-poverty,” ignoring other dimensions of welfare. For example, in [Alkire and Santos \(2010b\)](#), the authors of the MPI counterpoint their measure with the World Bank’s “\$1 a day” poverty measures, which use household consumption of commodities per person as the metric for defining poverty.⁷ Yet, while it is true that the World Bank puts considerable emphasis on the need to reduce consumption or income poverty, it is certainly not true that human development is ignored; indeed, this topic has a prominent place in the Bank’s work program, side-by-side with its

focus on income poverty.⁸ A similar comment can be made regarding environmental sustainability, which has a prominent place in the Bank's work.

The fact that a welfare indicator is in monetary units cannot be objectionable per se. One could in principle construct a money-metric of almost any agreed (multidimensional but well-defined) welfare concept. A strand of the economics literature on welfare measurement has taken this route, by deriving money metrics of welfare from an explicit formulation of the individual and social welfare functions.⁹ Conventionally those functions have been seen to depend on command over commodities (allowing for inequality aversion), but the approach can be extended to important "nonincome" dimensions of welfare. For example, [Jones and Klenow \(2010\)](#) introduce life expectancy into a money metric of social welfare (embodying inequality aversion) based on expected utilities, where life expectancy determines the probability of realizing positive welfare (with utility scaled to be zero at death). Arguably the important issue is not the use of a monetary metric, but whether one has used the right components and prices in evaluating that metric.

Some mashup indices have alluded to theoretical roots, to help give credibility. However, there is invariably a large gap between the theoretical ideal and what is implemented. For example, the HDI claims support from Sen's writings, arguing that human capabilities are the relevant concept for defining welfare or well-being (see, for example, [Sen 1985](#)). The authors call it a "capability index" ([Klugman, Rodríguez, and Choi 2011](#)). Yet it is unclear how one goes from Sen's relatively abstract formulations in terms of functionings and capabilities to the specific mashup index that is the HDI. Why, for example, does the HDI include GDP, which Sen explicitly questions as a relevant space for measuring welfare?¹⁰ Sen has also questioned whether life expectancy is a good indicator of the quality of life; [Sen \(1985, p. 30\)](#) notes that "the quality of life has typically been judged by such factors as longevity, which is perhaps best seen as reflecting the quantity (rather than quality) of life." Possibly it is the combination of GDP and life expectancy that somehow captures "capabilities," but then where in Sen's writings do we find guidance on the valuation of life from the point of view of capabilities, as required by any (positively weighted) aggregation function defined on income and life expectancy? (I return to the issue of tradeoffs below.) It is clearly a large step indeed from Sen's (often powerful) theoretical insights to the idea of "human development" found in the HDRs, and an even bigger step to the specific measure that is the HDI.

A similar comment applies to the MPI. In defending their data and methodological choices, the authors of the MPI contrast their index to poverty measures based on consumption or income, arguing that "the MPI captures direct failures in functionings that Amartya Sen argues should form the focal space for describing and reducing poverty" ([Alkire and Santos 2010a, p. 1](#)). However, the various components of the MPI include measures of deprivation in the attainments space as well as functionings. As with the HDI, it is unclear how much this really owes

to Sen. And if one looks at how poverty lines are in fact constructed for most conventional poverty measures found in practice, they too can claim no less credible antecedents in Sen's approach. By this interpretation, the poverty line is the monetary cost of attaining certain basic functionings, as outlined in Ravallion (2008). In practice, the main functioning is adequate nutritional intakes for good health and normal activities, though an allowance for basic nonfood needs is almost always included. More generally one can define a poverty line as a money metric of welfare. By normalizing consumption or income by such a poverty line,¹¹ the resulting poverty measure comes to reflect something closer to the broader concept of welfare than the authors of the MPI appear to have in mind. The key point here is that doing analysis in the income space does not preclude welfare being defined in other spaces, as has long been recognized in economics.

In truth, the concept of "human development" in the HDI has never been crystal clear and nor is it clear how one defines the broader concept of "poverty" that indices such as the MPI are trying to capture, and how this relates to "human development." Development policy dialogues routinely distinguish "poverty" from "human development," where the poverty concept relates to command over commodities. While "poverty" is typically distinguished from "human development," it can be argued that mainstream development thinking and practice is already premised on a multidimensional view of poverty (Ravallion 2010a). The real issues are elsewhere, in the case for and against forming a mashup index.

The frequent lack of conceptual clarity about what exactly one is trying to measure makes it hard to judge the practical choices made about what pre-existing indicators get used in the composite. One can debate the precise indicators chosen, as would probably always be the case. Double counting is common,¹² though unavoidable to some degree. But greater guidance for users on the properties of the ideal measure with perfect data would help to assess the choices made with imperfect data. For example, while we can agree that "income" (as conventionally measured) is an incomplete metric, we would presumably want any measure of "poverty" to reflect well the changes in peoples' real incomes (their command over commodities)—changes that might emanate from shocks. The MPI's six "living standard" indicators are likely to be correlated with consumption or income, but they are unlikely to be very responsive to economic fluctuations. The MPI would probably not capture well the impacts on poor people of the Global Financial Crisis or rapid upswings in macroeconomic performance.

What Tradeoffs Are Embedded in the Index?

We need to know the tradeoffs—defined here as the marginal rates of substitution (MRS)¹³—built into a composite index if it is to be properly assessed and used. If

a policy or economic change entails that one of the positively valued dimensions of the index increases at the expense of another such dimension, then it is the MRS that determines whether overall index has risen or fallen.

We should be clear why we are interested in these tradeoffs. It is not because we interpret the composite index as a welfare function that is to be maximized, or that the tradeoffs are to be compared with prices in some optimizing calculation. For example, one can readily agree with [Klugman, Rodríguez, and Choi \(2011\)](#) (from the team that produced the 2010 HDR) that the HDI is not likely to be the sole maximand of any government, or even a complete index of “human development,” though supporters of the HDI have often argued that it has influenced country governments to take actions that would improve their HDI (see, for example, [UNDP undated](#)). One does not need to assume that a composite index of development is a comprehensive maximand to want to know what weights are attached to its components. The MRS is just the normalized weight on each variable, normalized by the weight on a chosen reference variable. If, as [Klugman, Rodríguez, and Choi \(2011, p. 1\)](#) put it, the HDI is a “well-known yardstick of wellbeing” then we should know what tradeoffs it assumes between its underlying dimensions of wellbeing.¹⁴ On the basis of those tradeoffs we may well decide that it is not in fact a good measure of what it claims to measure.

At one level, the weights in most mashup indices are explicit.¹⁵ Common practice is to identify a set of component variables, group these in some way, and attach equal weight to these groups for all countries.¹⁶ It is hard to believe that weights could be the same for all countries, and (indeed) all people within a country. Unlike market prices, which will come into at least rough parity within specific economies (and between countries for traded goods), the values attached to nonmarket goods will clearly vary with the setting, including country or individual attributes. For example, the weight on access to a school must depend on whether the household has children. The weights attached to the various dimensions of good policies and institutions identified in the CPIA surely cannot be the same in all countries, as critics have noted.¹⁷

There are typically two levels at which weights can be defined in mashup indices. First there are the (typically equal) weights on the components indices, such as “education,” “health,” and “income” in the HDI. However, the component indices are invariably functions of one or more primary variables (such as literacy and school enrollment in the education component of the HDI). This is the second level at which weights can be defined. While the weights attached to the component indices are typically explicit, this is almost never the case for the weights attached to the underlying dimensions. The explicit weights are defined in an intermediate, derived space. Little or no attention is given to whether the implied tradeoffs in the space of the primary dimensions being aggregated are defensible. It does not even appear to be the case that the aggregation functions

in the current mashup indices of development have been chosen with regard to the implied tradeoffs on those dimensions.

For those indices (such as DBI) that are created by taking an average of the rankings of countries by the components, it is quite unclear what the weights are on those components; the mean rank is typically equally weighted, but the weights on any primary variable—the first derivative of the composite index with respect to that variable—are unknown and difficult to determine. There can be no presumption that the MRS would have seemingly desirable properties; using this method of aggregation it is possible that a component that has a low value in some country will not be valued highly relative to another component with a high value. In other words, the MRS need not decline as one increases one component at the expense of the other.¹⁸ These aggregation methods are thus capable of building in perverse valuations.

The MPI and the *Newsweek* index have implicit valuations of life, though it is hard to figure out what they are from the documentation.¹⁹ In some cases one can figure out the implicit tradeoffs, even though they are not explicit in the documentation of the mashup index. The tradeoffs embodied in the HDI have been particularly contentious in the literature.²⁰ By adding up average income per capita with life expectancy (after rescaling and transforming each component) the HDI implicitly attaches a monetary value on an extra year of life, and that value is deemed to be much lower for people in poor countries than rich ones. In [Ravallion \(1997\)](#) I drew attention to this fact and questioned whether it was ethically defensible. In a recent comment on the HDI, [Segura and Moya \(2009\)](#) argue against imposing any tradeoff between its components, so that a country's progress in human development should be judged by the weakest (minimum) of its scaled components.

[Klugman, Rodríguez, and Choi \(2011\)](#) take exception to calling the MRS of the HDI the “value” attached to one variable relative to another. They argue that since the HDI is not a complete metric of welfare its tradeoffs do not reflect “values.” However, here I am only claiming that the MRS is the valuation implicit in the HDI, and no more than that. Quite literally that is what the MRS of any composite index tells us—the value attached by that index to one thing relative to another. One can be legitimately concerned that the HDI attaches too low a value on extra life in poor countries or extra schooling from the point of view of assessing “human development” without implying that the index is a comprehensive welfare metric. “Valuation” is always relative to some metric, whether or not it is a metric one wants to maximize (although if it is then that carries some powerful further implications, as is well-known in economics). And expressing those valuations in monetary units is surely useful to make them understandable to users; an extra \$1 is easier to understand than (say) 0.0005 on the HDI's scale.

The implicit monetary value attached to an extra year of life embodied in the HDI varies from very low levels in poor countries—the lowest value of \$0.50 per year is for Zimbabwe—to almost \$9,000 per year in the richest countries (Ravallion 2010b). Granted Zimbabwe is an outlier, even amongst low-income countries, the next lowest is Liberia, with a value of \$5.51 per year attached to an extra year of life. However, the same point remains: the HDI implicitly puts a much lower value to extra life in poorer countries than rich ones. Klugman, Rodríguez, and Choi (2011) argue that this solely reflects the fact that the HDI imposes diminishing marginal weight on income as income rises. However, the weight on longevity plays an equally important role. The changes introduced in the 2010 HDR entail that the HDI's weight on an extra year of life expectancy rises steeply with GDP per capita.²¹ The multiplicative form of the HDI guarantees that the weight on longevity is very low in low-income countries. Consider, for example, Zimbabwe with the lowest HDI of any country in 2010, namely 0.14 (on a scale 0 to 1). Despite having the fourth lowest life expectancy of any country, Zimbabwe's low income yields a very low marginal weight on life expectancy, given the multiplicative form of the new HDI. The weight is so low that it would require a life expectancy of over 150 years for Zimbabwe to reach the HDI of even the country with the second lowest HDI (the Democratic Republic of Congo).²² The new HDI appears to be (inadvertently it seems) telling very poor countries that there is little point in taking actions to raise life expectancy if they want to improve their HDI.

A rich person will clearly be able to afford to spend more to live longer than a poor person, and will typically do so. But should we build such inequalities into our assessment of a country's progress in "human development"? Does the HDR really want to suggest that, in the interests of promoting "human development," Zimbabwe should not be willing to implement a policy change that increases life expectancy by (say) one year if it lowers national income per capita by more than \$0.51—barely 0.3 percent of the country's income? Most likely not. Rather it was just that the construction of the HDI did not properly consider what tradeoffs were acceptable. Indeed, as noted above, Klugman, Rodríguez, and Choi (2011) question whether it is meaningful to make such calculations. Possibly it is not then surprising that the HDI ended up having such questionable tradeoffs, since its tradeoffs were apparently never questioned by its creators.

Greater clarity about the concept being measured can guide setting weights. For example, the DBI is apparently motivated by the expectation that excessive business regulation impedes investment and (hence) economic growth. Surely then a regression model of how performance in the components of the DBI has influenced these outcomes could help guide the choice of weights? Similarly the CPIA exercise is clearly motivated by the belief that the identified attributes of country policymaking matter to the goals of development aid, notably poverty

reduction. Greater effort at embedding the measurement problem within a model of the relevant outcomes could help in calibrating these indices.

One of the few mashup indices that has taken seriously the problem of setting weights is the WGI. Here the weights are the estimated parameters of a statistical model, in which each of the observed indicators of governance is taken to be a linear function of an unobserved true governance measure with common parameters across countries for each indicator (Kaufmann, Kraay, and Zoido-Lobaton 1999; Kaufmann, Kraay, and Mastruzzi 2009, Appendix D). Under explicit distributional assumptions about this latent variable and the model's error term, the parameters can be estimated. A key identifying assumption is that the errors contained in different data sources are uncorrelated with each other—the noise in one component index is not correlated across countries with that in any other. Then the data sources that produce more highly correlated ratings can be deemed to be more informative about the latent true governance variable than sources that are weakly correlated with each other. This assumption can be questioned, however. Høyland, Moene, and Willumsen (2010) show how the assumption can be partially relaxed by allowing for (nonzero) correlations within certain predefined groups of variables. They argue that this would be important if one was to apply this method to (say) the derivation of the HDI, given that there are likely to be natural groupings of indicators; for example, the current HDI uses four variables, two of which are related to education, and can be expected to be correlated at given values of the latent concept of “human development.”

However, while this approach delivers a composite index without making ad hoc assumptions about the weights, it is still a mashup index. The interpretation of the estimated parameters derived by this method, and (hence) the concept being measured, is far from clear. Nor should one apply such “principal component” methods mechanically, since the method is only relevant if one accepts that the multiple component indices are all proxies for the same (latent) concept. Then it makes sense to attach higher weight to component indices that are more highly correlated with each other. In some applications, however, the components are intended to measure distinct things, and one would not want to choose the weights this way.

Public opinion can be an important clue. A mashup index might be thought of as the first step in a public debate about what the weights should be. Stimulating such a debate would be a valuable contribution, but there is little sign as yet that this has led to new weights. Consider, for example, the oldest of the mashup indices still in use, the HDI. Its weights were set 20 years ago, with equal weight to the (scaled) subindices for health, education, and GDP.²³ Equality of the weights was, of course, an arbitrary judgment, and it might have been hoped that the weights would evolve in the light of the subsequent public debate. But that did not happen. The weights on the three components of the HDI (health,

education, and income) have not changed in 20 years, and it is hard to believe that the HDI got it right first go.²⁴

Setting initial weights and revising them in the light of subsequent debate would point to the need to know the tradeoffs in the most relevant space for understanding what the weights really mean. The fact that the industry of mashup indices has often assigned weights in what can be thought of as “secondary spaces”—such as rankings or poverty measures, rather than the space of the underlying primary dimensions—does not make it easy for the debate to proceed on a well-informed basis. Indeed, given the opaqueness about the tradeoffs in the primary dimensions built into most mashup indices, it can be argued that users (including policymakers) may end up tacitly accepting, and acting upon, implicit tradeoffs that they would find objectionable when revealed.

Subjective questions in surveys can also offer useful clues as to the appropriate weights, although this type of data raises its own problems, such as those stemming from psychological differences between respondents, including latent heterogeneity in the interpretation of the scales used in survey questions.²⁵ Ravallion and Lokshin (2002) discuss how subjective data on perceived economic welfare can be used to calibrate a composite index based on objective variables; the trade-off between income and health (say) is chosen to be consistent with subjective welfare.²⁶ Using survey data for Russia, the authors find that income is a highly significant predictor of subjective welfare, but that this is also influenced by health, education, employment, assets, relative income in the area of residence, and expectations about future welfare.

However, for many mashup indices of development there is likely to be an important normative judgment to be made about these tradeoffs. If the index is to be accepted, then some degree of political consensus will be needed. Without that consensus, there are risks in aggregating prematurely. As Marlier and Atkinson (2010, p. 292) note, “the weights are a matter for value judgments, and the adoption of a specific composite index may conceal the resolution of what is at heart a political problem.”

The reality is that no consensus exists on what dimensions to include and how they should be weighted in any of the mashup indices of development in use today. And these are difficult issues. How can one contend—as the MPI does implicitly—that avoiding the death of a child is equivalent to alleviating the combined deprivations of having a dirt floor, cooking with wood, and not having a radio, TV, telephone, bike, or car? Or that attaining these material conditions is equivalent to an extra year of schooling (such that someone has at least five years) or to not having any malnourished family member? It is very hard to say (as the MPI does implicitly) that a child’s life is worth so much in terms of material goods.

And where do we draw the line in terms of what is included? In a blog comment (www.oxfamblogs.org/fp2p/?cat=31), Duncan Green, Head of Research at Oxfam Great Britain, has criticized the MPI for leaving out “conflict, personal security, domestic and social violence, issues of power/empowerment” and “intra-household dynamics.” Sometimes such judgments are needed in policymaking at the country level. The specific country and policy context will determine what tradeoff is considered appropriate; any given dimension of poverty will have higher priority in some countries and for some policy problems than for others. This will typically be a political decision, though hopefully a well informed one.

But could it be that we are asking too much of a single measure of poverty to have it include things like child mortality, or schooling, or violence, as components, on top of material living standards? It is one thing to agree that consumption of market commodities is an incomplete metric of welfare—and that for the purpose of measuring poverty one needs to account for nonmarket goods and services—and quite another to say that a “poverty” measure should aggregate traditional measures of (say) “human development” with command over commodities. There can be no doubt that reducing child mortality and promoting health more generally are hugely important development goals and that poverty—defined as command over (market and nonmarket) commodities—is an important factor in health outcomes. But does it help to have measurement efforts that risk confounding these factors in a mashup index?

How Robust Are the Rankings Given the Uncertainties about Data and Weights?

Theory never delivers a complete specification for measurement. There is inevitably a judgment required about one or more parameters. There is also statistical imprecision about parameter estimates. Rerankings can be generated by even very small differences in the underlying measure of interest; as Høyland, Moene, and Willumsen (2010, p. 1) note, the country rankings provided by the HDI and DBI “emphasize country differences when similarity is the dominant feature.”

For these reasons it is widely recommended scientific practice to test the robustness of the derived rankings. For example, in the case of poverty measurement, where there is almost always a degree of arbitrariness about the poverty line, best practice tests the robustness of poverty comparisons to the choices made, invoking the theory of stochastic dominance.²⁷

Users of prevailing mashup indices are rarely told much about the uncertainties that exist about the series chosen, the quality of the data, and their weights.²⁸ Few robustness tests are provided. Yet the uncertainty about key

parameters is evidently huge, and greater than other indices found in practice. It can be granted that the market prices (say) that are typically used in aggregating consumptions across commodities need not all accord with the correct shadow prices. But it is hard to accept that adding up expenditures across commodities to measure economic welfare is as problematic as valuing life, as is required by the HDI and MPI.

If one was to take seriously the degree of uncertainty in the data and weights, and (more generally) the functional form for aggregating across the multiple indices, one may well find that the country rankings are far from conclusive—rather dulling public interest in the mashup index. The degree of robustness to weights depends on the intercorrelations among the components. If these are perfectly correlated then nothing is gained by adding them up, and the result is entirely robust to the choice of weights. More generally, however, one expects imperfect correlations.

How robust are the rankings? Some clues can be found in the literature. [Slottje \(1991\)](#) examines the country rankings on his own mashup index of 20 social indicators for a range of weighting methods, including averaging ranks, weights based on principal components analysis, and weights based on regression models in which a subset of the indicators were taken to be the dependent variables. Slottje's results suggest considerable sensitivity to the method used; for example, Luxembourg's rank ranges from 3 to 113 depending on the method. However, it seems that one or two of Slottje's methods might easily be ruled out as implausible.²⁹

The most common method of testing robustness in this literature is to calculate the (Pearson, rank, or both) correlation coefficients between alternative versions of the mashup index, such as obtained by changing the weights. The website (http://siteresources.worldbank.org/EXTAFRSUMAFTPS/Resources/db_indicators.pdf) for Doing Business reports (though with little technical detail) comparisons of the DBI's country rankings (based on the mean rank across the 10 component indicators) with rankings based on both a principal components method and "unobserved components analysis." The reported correlation coefficients with the original DBI rankings are high (0.997 and 0.982 respectively). Similarly, [Kaufman, Kraay, and Mastruzzi \(2007\)](#) report results for an equally weighted WGI (rather than the original index based on weights derived from their latent-variable model), which turns out to be highly correlated ($r = 0.97$ or higher) with the original WGI. And [Alkire and others \(2010\)](#) provide correlation coefficients between various MPIs obtained by varying the weights, with 50 percent weight on one of the deprivations, and 25 percent on each of the other two (instead of one-third on each). The correlation coefficients are all above 0.95, and they conclude that the index is "quite robust to the particular selection of weights" (p. 4).³⁰

However, it is not clear how much comfort one should get about robustness from even such high correlation coefficients, which can still be consistent with some sizeable rerankings. In the case of the DBI (which provides a useful graph of the results for the alternative methods), the largest change appears to be a country (unnamed) whose rank falls from about 50 using the ordinary DBI to 80 using the unobserved components ranking.

In the case of the CPIA, the country rankings do not play any role in the World Bank's aid allocations, which are based on the aforementioned "governance-heavy" index based on the CPIA. This reweighted index turns out to be highly correlated with the original (equally weighted) index; the correlation coefficient is 0.96 using the 2009 CPIA.³¹ This is not surprising given that the components of the CPIA are highly correlated amongst themselves. Across the 77 countries receiving concessional loans under IDA, the correlation coefficients with the CPIA are 0.86 for its "economic management" component, 0.87 for "structural policies," 0.91 for "social inclusion/equity," and 0.90 for "public sector management." Given these high correlations, the index is affected little by changes in its weights.

The fact that the ordinary CPIA and this reweighted index have a correlation coefficient of 0.96 might be taken to suggest that the extra weight on governance is largely irrelevant. However, that reasoning ignores the fact that, in attempting to reward good policies (particularly on governance), the IDA allocation per capita is highly elastic—an elasticity of five—with respect to the index ([International Development Association 2008](#), Annex 1). Then changes in the weights will matter to aid allocations. This is evident if one compares the actual aid allocations under IDA with those implied by the ordinary (equally weighted) index based on the CPIA. To make the comparison (approximately) budget neutral I have rescaled the equally weighted index to have the same mean as the actual index used by IDA. Then I find that the implied proportionate changes in IDA allocation in switching from the equally weighted CPIA-based index to the governance-heavy index range from 0.68 to 2.49. Of the 77 countries receiving concessional loans under IDA, I estimate that 16 would have seen their allocation increase by at least 20 percent with the higher weight on governance, while 15 countries would see it fall by 20 percent or more. Despite the high correlations, it is clear that changing the weights makes a sizable difference to aid allocations.

Data and methodological revisions also provide a clue to the robustness of mashup indices. An independent evaluation of the DBI by the [World Bank \(2008\)](#) pointed to a number of concerns about the robustness of country rankings to data revisions. The evaluation found 2,200 changes to the original data posted in 2007; the data revisions changed the country rankings by 10 or more for 48 countries. [Wolff, Chong, and Auffhammer \(2010\)](#) use data revisions to measure the imprecision in the HDI, and find standard deviations that vary from 0.03 (for

the United States) to 0.11 for Niger (recall that the HDI is scaled to the (0,1) interval). Poorer countries tend to have less accurate HDIs.

In the case of mashup indices that use expert assessments, such as the CPIA, we can learn about robustness by comparing the assessments of different experts. The same CPIA questionnaire administered to the World Bank's country experts was also completed by experts at the African Development Bank (though only for Africa of course). [Kaufmann and Kraay \(2008\)](#) compared the two and found many notable differences in the CPIA ratings for 2005. The overall correlation coefficient in the two institution's scores on governance across the countries of Africa was significantly positive, with a correlation coefficient of 0.67, but still suggesting a good deal less than full agreement. Of course, the source of these differences is unclear. Experts may disagree on the facts about a country, or they may disagree about how those facts are to be weighted in forming the various subindices that go into the CPIA.

I repeated this test for the 2009 CPIA ratings of governance by both institutions and found that the correlation has risen to 0.87. The correlations are similar for other CPIA components: for economic management the coefficient is 0.88, for structural policies it is 0.85, while it is 0.87 for social inclusion or equity.³² The correlation coefficient between the overall CPIA indices is 0.94. While their expert assessments cannot be considered independent, these correlations point to a high level of agreement, with signs that this has risen over time. However, as already noted, the aid allocations based on these indices may well be sensitive to even small differences, depending on the allocation formulae.

In 2010, the Human Development Report introduced a number of changes to the data and methods of the HDI (UNDP 2010). [Ravallion \(2010b\)](#) shows that these changes led to a marked reduction in the implicit monetary valuation of extra longevity, notably in low and middle-income countries; the whole schedule of tradeoffs was noticeably higher using the prior HDI method (though even then some observers felt that the implied valuations of life were too low). The change in aggregation method generated large downward revisions in the HDIs for Sub-Saharan Africa. The reasons for the data and methodological changes are not entirely clear from the report, though the main reason given is the desire to relax the perfect substitution property of the old HDI, whereby the MRS was constant between the subcomponents.

[Ravallion \(2010b\)](#) provides an alternative HDI, based on [Chakravarty's \(2003\)](#) generalization of the HDI. This alternative index also allows imperfect substitution but has advantages over the new HDI proposed by UNDP (2010); in particular, the valuations on longevity appear to be more plausible and show only a mild income gradient. [Ravallion \(2010b, Figure 1\)](#) also gives the valuations of longevity implied by this alternative index. While the two HDIs are highly correlated ($r = 0.980$), there are many large changes. Zimbabwe's index rises by over 300

percent, from the lowest value (by far) of 0.14 based on the UNDP's (2010) index to 0.45 using the alternative HDI; it also rises relatively to be the twelfth lowest—reflecting the fact that the additivity property of the Chakravarty index allows it to give a higher reward for Zimbabwe's relatively good schooling attainment. The largest decrease in the HDI is that for New Zealand, for which the index falls by 0.094 and the ranking falls from third place to eighteenth. The largest increase in ranking when switching to the Chakravarty index is for Qatar, which rises from the 38 highest using the 2010 HDI to third place.

Confidence intervals (CIs) provide a basis for assessing robustness. This is not common practice in this literature, though an exception is the WGI, for which the econometric method used to estimate the weights readily delivers standard errors (Kaufmann, Kraay, and Zoido-Lobaton 1999). Høyland, Moene, and Willumsen (2010) apply a version of the WGI method to both the HDI and DBI to test the robustness of their country rankings.³³ They find wide CIs for both the HDI and DBI (both using data for 2008), indicating that the rankings can be highly sensitive, though less so at the extremes. For example, Singapore, New Zealand, the United States, and Hong Kong are deemed by Høyland, Moene, and Willumsen to be “almost surely” in the top 10 of the DBI, while Congo, Zimbabwe, Chad, and the Central African Republic are almost surely among the 10 countries doing worst. However, most rankings in the middle 80 percent look far more uncertain. Høyland, Moene, and Willumsen (2010, p. 15) conclude: “In contrast to the key message of the precise ranking published in the Doing Business report, it is clear that the index does not do a very good job in distinguishing between most of the regulatory environments in the world. While the rankings, after taking uncertainty into account, clearly distinguish the best economies from the worst, it does not distinguish particularly well between the economies that are somewhere in between.”

Turning to the HDI, Høyland, Moene, and Willumsen find that no country has more than a 75 percent chance of being in the top 10 in terms of this composite index, though we can have more confidence about which countries have very low HDIs. Similarly to the DBI, there is great uncertainty about the middle rankings. For example, Georgia has a DBI rank of 18, but Høyland, Moene, and Willumsen find that the 95 percent CI is that the true ranking lies between 11 and 59. To give two more examples, Saudi Arabia has a DBI rank of 23 but a 95 percent CI of (12, 63), while for Mauritius, with a DBI rank of 27, the CI estimated by Høyland, Moene, and Willumsen is (16, 77).

In the light of their findings, Høyland, Moene, and Willumsen argue that it would be more defensible for these composite indices to try to identify a few reasonably robust country groupings than these seemingly precise but actually rather uncertain country rankings. Of course, there will always be a degree of arbitrariness about such groupings; for example, the 2010 edition of the HDR

uses quartiles. However, Høyland, Moene, and Willumsen provide defensible country groupings for the HDI (and DBI) for various “certainty thresholds,” given by one’s desired confidence that there is a difference between the top and bottom ranked country within a given group.

The EPI has been subjected to numerous sensitivity tests, reported in [Saisana and Saltelli \(2010\)](#). They find that the rankings for 60 of the 163 countries “depend strongly on the original methodological assumptions made in developing the Index and any inference on those countries should be formulated with great caution” (p. 3). For the other 103 countries, the ranking was considered reasonably robust, although this only means that the actual EPI rank lies within a confidence interval that could span up to 20 positions in the country ranking.³⁴

Probing some of the data provided on the websites for recent mashup indices also helps to give us an idea of their sensitivity to different weights. For example, I find that Finland’s ranking as number 1 in *Newsweek*’s index falls to 17 if I put all the weight on health; Australia’s rank at number 4 falls to 13 if one puts all the weight on education. In exploring the website for *Newsweek*’s mashup, the most dramatic impact of reweighting appears to be for China: if one puts all the weight on “economic dynamism” China’s rank rises from 66 to 13.

None of their websites makes it easy for users to assess properly the sensitivity of these mashup indices to changing weights. Yet it would be relatively easy to program the required flexibility into the current websites, so users can customize the index with their preferred weights, to see what difference it makes. The only examples I know of to date are the OECD’s Social Institutions and Gender Index (SIGI) and its Better Life Initiative. The OECD’s interactive website (<http://my.genderindex.org/>) “My Gender Index,” allows users to vary the composition and weights of the SIGI and immediately gives the corresponding country rankings and maps them. Similarly, see the (excellent) website of the Better Life Index.³⁵ There are also some useful graphical tools for assessing robustness from the work of [Foster, McGillivray, and Seth \(2009\)](#). A careful assessment of robustness using such tools would be a more open approach than encouraging users to think that the data have been aggregated in the one uniquely optimal way.

Few of the mashups of development data have said much about *data quality*, including international comparability. Data constraints are often mentioned, but most of the time the mashups take their data as given with little or no critical attention to the problems; the data often come from others who can be blamed for its inadequacies.³⁶ Under certain circumstances, forming a mashup index may actually help to reduce data concerns, notably when averaging across indicators there is a reduction in overall errors. This may have a bearing on the choice of indicators, though one finds little sign in the documentation on past mashup indices that this has been considered.

Possibly more worrying than the lack of attention to data quality in existing mashups is how little is done to expose and address the problems in pre-existing data series. The rapid growth in mashup indices will hopefully come with greater attention to these problems, though that may well be little more than hope unless prevailing practices change on the part of mashup producers; greater critical scrutiny and skepticism from mashup consumers would help.

A cavalier approach to data issues appears at times to come hand-in-hand with immodesty in the claims made about new knowledge generated by simply aggregating pre-existing data. “Important new insights” are claimed about (for example) the causes of poverty and how best to fight it even though there has been no net addition to the stock of data—just a repackaging of what we already had—and no sound basis is evident for attributing causation.³⁷

How Is the Index Useful for Development Policy?

If we agreed that the index provides an adequate characterization of some development goal, and that its embodied tradeoffs are acceptable, what would we do with it? An important role served by mashup indices can be to provide an easily administered antidote to overly narrow conceptualizations of development goals. Putting aside the straw-man argument that GDP is seen as the sole measure of welfare, the HDI has helped to sensitize many people to the importance of aspects of human welfare that are not likely to be captured well by command over market goods. This can provide a useful rebalancing when policy discussions appear to put too little weight on factors such as access to public services in determining undeniably important aspects of human welfare such as health ([Anand and Ravallion 1993](#)).

Does this translate into better development policies? It has been argued that country comparisons of a mashup index can influence public action in those countries that are ranked low. This has been claimed by proponents of both the HDI and DBI. In the context of the HDI, there is an interesting discussion of this point in [Srinivasan \(1994, p. 241\)](#), who argues that “there is no evidence that HDR’s have led countries to rethink their policies, nor is there any convincing reason to expect it to happen. It was widely known, long before the first HDR in 1990, that in spite of her low per capita real income Sri Lanka’s achievements in life expectancy and literacy were outstanding, in comparison not only with neighbors, but also with countries (developed and developing) with substantially higher per capita incomes. This knowledge did not demonstrably lead other countries to learn from Sri Lanka’s experience.”

On thinking about this issue 16 years after Srinivasan was writing, I would argue that there has been more cross-country learning among developing

countries than he suggests, but that it remains unclear what role is played in that learning process by country comparisons in terms of a mashup index such as the HDI. Possibly more powerful comparisons have been based on simpler “one-dimensional” indices that measure something reasonably well defined and unambiguous, such as poverty incidence or infant mortality. In this respect, a mashup index may actually help to hide poor performance through aggregation. An important role has also been played by comparisons of experiences with specific policies, and the process of adapting those policies to new settings. The learning process about antipoverty policies provides examples, of which the most prominent in recent times is the set of policies known as Conditional Cash Transfers, where a now famous program in Mexico, PROGRESA (now called Oportunidades), has been cloned or adapted to many other countries.³⁸ To the extent that a country government learns about seemingly successful policy experiences elsewhere via seeing its low ranking in some mashup index, the latter will have contributed to better policies for fighting poverty. However, it does not appear likely that this is how the learning typically happens, which seems to be more directly focused on the space of policies than country rankings in terms of the mashup index.

If a country was keen to improve its ranking and the index is sufficiently transparent about how it was constructed, it should be clear what the country’s government needs to do: it should focus on the specific components of the index that it is doing poorly on. This is what Høyland, Moene, and Willumsen (2010) dub “rank-seeking behavior.” It has been claimed that the DBI (or at least some specific components, notably business entry indicators) have stimulated policy reforms to improve country rankings based on the index.³⁹ Although the attribution to the DBI would seem difficult to establish, it has been argued that the mashup index plays a key role in promoting such reforms. The Doing Business website argues that a single ranking of countries has the advantage that “it is easily understood by politicians, journalists and development experts and therefore creates pressure to reform.” Of course, the reform response will then focus on those components of the index that rank low *and* are easily changed. Anecdotally, a cabinet minister in a developing country (that will remain nameless to preserve confidentiality) once told me that he had been instructed by his president to do something quickly about the country’s low ranking in the DBI.⁴⁰ The minister picked the key indicators and, by a few relatively simple legislative steps, was able to improve markedly the country’s ranking. But these indicators were only *de jure* policy intentions, with potentially little bearing on actual policy implementation at the firm level. Deeper characteristics of the business and investment climate in the country did not apparently change in any fundamental way, and the minister readily admitted that there was unlikely to be any significant impact on the country’s development.

Nor should it be presumed that efforts to improve a county's ranking by manipulating the few proxies for poor performance that happened to get selected for the mashup are costless. Targeting reform efforts on a few partial indicators, which on their own may bring little gain, can have an opportunity cost. This has been an issue with DBI. [Arrunada \(2007\)](#) argues that an exclusive focus on (for example) simplifying the procedures for business start-ups risks distorting policy by not putting any weight on the benefits (to firms and the public at large) derived from formal registration procedures.

There are also applications of mashup indices, along with other composite indices, as explanatory variables in policy-relevant models for outcomes of interest. For example, the Doing Business indices have been widely used in a (large) academic literature as explanatory variables for (among other things) productivity, entrepreneurship and corruption.⁴¹ Such applications are potentially important, although arguably it is the component series that should be the regressors, not the composite index, thus letting the regression coefficients set the weights appropriate to the specific application.⁴² In this case the dependent variable provides the relevant basis for setting weights, and the mashup index can be discarded.

It is not obvious how useful an aggregate (country-level) mashup index is for policymaking in a specific country. Development policymaking has increasingly turned instead to microdata on households, firms, and facilities. These are data on both the outcomes of interest and instrumentally important factors, including exposure to policy actions. Such microdata invariably reveal heterogeneity in outcomes and policies within countries. As [Hallward-Driemeier, Khun-Jush, and Pritchett \(2010\)](#) argue, the *de jure* representation of policies at country level (such as used in the DBI) may actually be quite deceptive about *de facto* policy impacts on the ground. *De jure* rules may have little relationship with the incentives and constraints actually facing economic agents. Indeed Hallward-Driemeier, Khun-Jush, and Pritchett find virtually no correlation in Africa between country-level policies and policy actions reported in microenterprise data; the within-country variation in the latter exceeds the between-country variation in *de jure* rules. This reflects the potential for idiosyncratic deals by firms to get around rules.

The (domestic and international) policy relevance of any composite index of development data is also questionable in the absence of any “contextuality”—the many conditions that define the relevant constraints on country performance. It is not credible that any one of these indices could be considered a sufficient statistic for country performance even with regard to the development outcome being measured. Very poor countries invariably fare poorly in the rankings by the various indices discussed above. However, these indices tell us nothing about how we should judge the *performance* of these countries, given the constraints they

face. We may well rank them very differently if we took account of the country's stage of economic development. Such conditional comparisons raise their own concerns that need to be taken seriously, as discussed in [Ravallion \(2005\)](#). However, without greater effort to allow for the circumstances and history of a country, it is not clear what we learn from the index. The greater use of benchmarking and time series comparisons will help here, though we also have to be aware of the fact that differing initial conditions at the country level can have lasting effects on a country's development path.

Policy applications also call for greater transparency about the tradeoffs built into the index. Consider a simple characterization of the problem of allocating public resources across a set of indicators that have been aggregated into a composite index. The policymaker has a set of policy instruments available for improving the index. Let us also assume that these policy instruments have known costs that can be mapped one-to-one to the underlying indicators. A policymaker deciding how best to improve the composite index by shifting resources between any two components should compare their MRS in the composite index with the relative marginal costs of the corresponding policy instruments. And the optimal allocation of a given budget will equate the MRS with the ratio of those marginal costs.⁴³ Yet, as we have seen, many existing mashup indices have said little or nothing about those tradeoffs. Unless the mashup index considers, and reveals, its MRSs across components, or its marginal weights, it will be impossible to assess whether it is acceptable as a characterization of the development objective, and impossible to advise how policy can best be aligned with that objective.

If one unpacks the aggregate index, a potential application is in allocating central funds across geographic areas—the “targeting problem.” Here the value-added of the mashup aggregation becomes questionable if its components can be mapped (at least roughly) to policy instruments; indeed that is sometimes why the data were collected in the first place. Then the obvious first step when given a mashup index is to unpack it. The actionable things based on such data are not typically found in the composite itself but in its components. Thankfully many of the mashup indices found in practice can be readily unpacked, though it remains unclear what policy purpose was served by adding them up in the first place.

This point is illustrated well by proposals to use “multidimensional poverty” indices for targeting. The MPI is intended to inform policymaking. Alkire and Santos (2010b, p. 7) argue that “the MPI goes beyond previous international measures of poverty to identify the poorest people and aspects in which they are deprived. Such information is vital to allocate resources where they are likely to be most effective.”

But is it the MPI or its components that matter for this purpose? Following [Alkire and Foster \(2007\)](#), the MPI has a neat decomposability: we can reverse the mashup aggregation. This is useful, for only then will we have any idea as to how

to go about addressing the poverty problem in that specific setting. Should we be focusing on public spending to promote income growth or better health and education services?

Consider the following stylized example (simplifying the MPI for expository purposes). Suppose that there are two dimensions of welfare, “income” and “access to services.” Assume that an “income-poor” but “services-rich” household attaches a high value to extra income but a low value to extra services, while the opposite holds for an “income-rich” but “services-poor” household.⁴⁴ There are two policy instruments: a transfer payment and service provision. The economy is divided into geographic areas and a given area gets either the service or the transfer. We then calculate a composite index like the MPI based on survey data on incomes and access to services. There is bound to be a positive correlation between average income and service provision, but (nonetheless) some places have high income poverty but adequate services, while others have low income poverty but poor services. The policymaker then decides whether each area gets the transfer or the service. Plainly the policymaker should not be using the aggregate MPI for this purpose, for then some income-poor but service-rich households will get even better services, while some income-rich but service-poor households will get the transfer. The total impact on (multidimensional) poverty would be lower if one based the allocation on the MPI rather than the separate poverty measures—one for incomes and one for access to services. It is not the aggregate mashup index that we need for this purpose but its components.

Conclusions

The lesson to be drawn from all this is not to abandon mashup indices. Composite indices derived from development-data mashups are often trying to attach a number to an important, but unobserved, concept, for which prevailing theories and measurement practices offer little guidance. And there are clear attractions to finding a way of collapsing a (potentially) large number of dimensions into one. Rather the main lessons are (first) that the current enthusiasm for new mashup indices needs to be balanced by clearer warnings for, and more critical scrutiny from, users, and (second) that some popular mashup indices do not stand up well to such scrutiny.

While there is invariably a gap between the theoretical ideal and practical measurement, for past mashup indices the gap is huge. Greater clarity is needed on what exactly is being measured. And more attention needs to be given to the tradeoffs embodied in the index. In most cases the tradeoff is not even identified in the most relevant space for users to judge, and in cases where it can be derived from the data available it has been found to be questionable—implying, for

example, unacceptably low valuations of life in poor countries. There is a peculiar inconsistency in the literature on mashup indices whereby prices are regarded as an unreliable guide to tradeoffs, and are largely ignored, while the actual weights being assumed in lieu of prices are often not made explicit in the same space as prices. Thus we have no basis for believing that the weights being used are any better than market prices, when available. Nor do we have any basis for believing that the weights bear any resemblance to defensible shadow prices. Aggregating under such conditions risks stifling, rather than promoting, open debate about what tradeoffs are in fact acceptable, when such tradeoffs need to be set.

Mashup producers need to be more humble about their products. The rhetoric of these indices is often in marked tension with the reality. Not all are as ambitious as *Newsweek's* effort to find the "World's Best Countries" using a mashup of mashups. But exaggerated claims are not uncommon even in the more academic efforts. One is struck, for example, that the "multidimensional poverty indices" proposed to date actually embrace far fewer dimensions of welfare than commonly used measures based on consumption at household level. Arguably the seeming precision of these mashup indices and their implied country rankings (so closely watched by the media) is more an illusion than real, given the considerable uncertainties about the data and how they should be aggregated. As some commentators have suggested, it would be more defensible to try to identify broad country groupings rather than precise rankings of individual countries.

The uncertainty about the components and their weights is not adequately acknowledged by mashup producers, and users are given little guidance to the robustness of the resulting country rankings. Today's technologies permit greater openness about the sensitivity of country rankings to choices made about a mashup index's (many) moving parts. For nonmarket goods it appears to be highly implausible that the weights would be constant across everyone in a given country, let alone across all the countries (and peoples) of the world. Knowing nothing else about their design, this fact alone must make one skeptical of past mashup indices.

Policy relevance is often claimed, but is rarely so evident on close inspection. It is unclear what can be concluded about "country performance" toward agreed development goals in the absence of an allowance for the (country-specific) contextual factors that constrain that performance. (The words "performance" and "impact" are used too loosely in the mashup industry, though this is also true in some other areas of policy discourse.) There are also potentially important "targeting applications," though here policymakers might be better advised to use the component measures appropriate to each policy instrument rather than the mashup index.

With greater attention to such issues, thoughtful users of these increasingly popular indices of development will be better informed and better able to judge

the merits of the index. Some of the mashup indices in recent times have contributed to our knowledge about important development issues, though arguably much of this was achieved by the primary data collection efforts rather than the mashup per se. In the absence of more convincing efforts to address the concerns raised by this paper, we should not presume that mashups of pre-existing development data have taught us something we did not know—adding explanation, understanding, or insight where there was none before. That is not what happened when the mashup index was formed. Rather it took things we already knew and repackaged them, and too often in a way that will be opaque to many users, and yet contentious if those users understood what went into the mashup.

Arguably mashup indices exist because theory and rigorous empirics have not given enough attention to the full range of measurement problems faced in assessing development outcomes. The lessons for measurement from prevailing economic theories only take us so far in addressing the real concerns that practitioners (including policymakers) have about current measures. A mashup index is unlikely to be a very satisfactory response to those concerns. Theory needs to catch up. It also needs to be recognized that the theoretical perspectives relevant to measurement practice are not just found in economics, but also embrace the political, social, and psychological sciences.

Thankfully progress in development does not need to wait for that catch up to happen. A composite index is not essential for many of the purposes of evidence-based development policymaking. Recognizing the multidimensionality of development goals does not imply that we should be aggregating fundamentally different things in opaque and often questionable ways. Rather it is about explicitly recognizing that there are important aspects of development that cannot be captured in a single index.

Notes

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1. A common rescaling method is to normalize the indicator x to be in the (0,1) interval by taking the transformation $(x - \min(x)) / (\max(x) - \min(x))$ where $\min(x)$ is the lowest value of x in the data and $\max(x)$ is the highest value, and then add up the rescaled indicators. The most common ranking method is to rank countries by each indicator x and then derive an overall ranking according to the (weighted) aggregate of the rankings across components (a version of the voting method called the Borda rule).

2. See [Anand and Sen \(2000\)](#) for a useful overview of the construction of the HDI and how this has changed over time. The 2010 HDR introduced some further changes to the variables and aggregation function. I will comment on these changes later.

3. See [Ravallion \(2010a\)](#) for further discussion of multidimensional indices of poverty, including the MPI.

4. This developed from an original data compilation documented in [Djankov and others \(2002\)](#).

5. The DBI project does not apparently pay these local experts, though, of course, their time has value, and so it should be included in assessing the full cost of the DBI.

6. Why, for example, does “economic dynamism” matter independently of the standard of living in the *Newsweek* index? The way we normally think about this is that it is not economic growth per se that helps deliver human welfare but the realized level of living. But maybe there is some other concept of what it means to be the “best country” that motivated this choice, such as the possibility of being the best country at some time in the future. There are also some puzzles in the choices made for filling in missing data; for example, for some unexplained reason a “Global Peace Index” was used for the Gini index of inequality when the latter was missing. Greater conceptual clarity might also help guide such choices.

7. The latest update is described in [Chen and Ravallion \(2010\)](#).

8. The Bank devotes a great deal of attention to the measurement of health and education attainments and the quality of public services as part of its Human Development Vice-Presidency and its Human Development and Public Services division within the research department.

9. For example, under certain conditions a money metric of aggregate social welfare can be derived by deflating national income by appropriate social cost of living indices; for a good overview of this literature see [Slesnick \(1998\)](#).

10. Presumably in response to this question, more recent HDRs have provided a “nonincome HDI” that excludes GDP per capita. However, the bulk of attention goes to the ordinary HDI. [Anand and Sen \(2000\)](#) discuss the specifics of how GDP per capita enters the HDI. (The income variable switched to Gross National Income in the 2010 HDR.)

11. [Blackorby and Donaldson \(1987\)](#) call these “welfare ratios” and show that aggregating empirical money-metric welfare (“equivalent income”) functions into empirical social welfare functions can be problematic unless the money metric of utility can be written as a welfare ratio.

12. For example, private and public spending on health and education is a component of GDP, while measures of health and education attainments also enter separately in the HDI. In the case of the *Newsweek* index, mean consumption enters both directly (on its own) and indirectly via other variables, notably the poverty rate, which is also a function of inequality, which also enters on its own.

13. Consider any (differentiable) function f of x_1, x_2 . The MRS of $f(x_1, x_2)$ is simply the ratio of the first derivative (“weight”) with respect to x_1 divided by the first derivative with respect to x_2 . This gives how much extra x_2 is needed to compensate for one unit less of x_1 , where “compensate” is defined as keeping the value of $f(x_1, x_2)$ constant. (More general definitions are possible without assuming differentiability.)

14. These issues are discussed further in [Ravallion \(2010b\)](#). Also see the overview of the debate on the new HDI in [Lustig \(2011\)](#).

15. [Stiglitz, Sen, and Fitoussi \(2009\)](#) note approvingly that popular composite indices use explicit weights. Nonetheless, the weights can remain opaque in the most relevant space for user assessment. The tradeoffs in those dimensions can also be crucial to the “normative implications,” which are often unclear for prevailing composite indices, as [Stiglitz, Sen, and Fitoussi \(2009\)](#) also point out.

16. For example, the health, education, and income components of the HDI get equal weight, similarly to the MPI, and the EPI gives equal weight to environmental impacts on the ecosystem and human health.

17. See the discussion of the “Performance Based System” (which includes the CPIA) in [African Development Bank \(2007, ch. 4\)](#).

18. This is easy to see if one assumes that the number of countries is large and the component variables have continuous distributions, with smooth unimodal densities (such as normal densities). The MRS between two components of a composite index based on average ranks will then be the relative probability densities and it is plain that the curvature of the implied contours is theoretically ambiguous.

19. In the case of the *Newsweek* index, scaled life expectancy gets the same weight as (say) scaled test scores for education.

20. Contributions on this issue include [Kelley \(1991\)](#), [Ravallion \(1997\)](#), and [Segura and Moya \(2009\)](#).

21. For further discussion of the implicit tradeoffs built into the HDI and how they have changed see [Ravallion \(2010b\)](#).

22. This is calculated by equating Zimbabwe's HDI to that of the DRC, while holding schooling and income constant at Zimbabwe's current level, then solving for the required value of life expectancy. For details see [Ravallion \(2010b\)](#).

23. The weights on the HDI's primary dimensions have varied over time due to (often seemingly arbitrary) changes in the bounds used for scaling the indices. However, as noted already, the weights on the HDI's core dimensions have never been explicitly identified or discussed in the HDRs. See [Ravallion \(2010b\)](#).

24. In switching to a geometric mean in the 2010 HDR, the weights on the three achievement variables changed, though their logs are still equally weighted.

25. These can stem from "frame of reference" effects, whereby a person's perception of the scales depends on the set of his or her own experiences and knowledge. (This is also called "differential item functioning" in the literature on educational testing.) In one of the few tests for such effects [Beegle, Himelein, and Ravallion \(2009\)](#) use vignettes to anchor the scales and find that regressions using subjective welfare data are quite robust to this problem (using survey data for Tajikistan).

26. Surveys of willingness-to-pay have also been widely used in valuation, including valuing lower risks of loss of life; in a developing-country context, see [Wang and He \(2010\)](#), whose results (for China) confirm intuition that the implicit value of life in developing countries built into the HDI is too low.

27. For expositions in the standard "unidimensional" case see [Atkinson \(1987\)](#) and [Ravallion \(1994\)](#). [Duclos, Sahn, and Younger \(2006\)](#) provide dominance tests for "multidimensional poverty." On ranking countries in terms of a composite index of mean income and life expectancy, see [Atkinson and Bourguignon \(1982\)](#). Also see [Anderson \(2010\)](#), who applies ideas from the literature on the measurement of polarization to the task of making cross-country poverty comparisons in terms of mean income and life expectancy.

28. An exception is the WGI, which takes seriously the imprecision in the underlying measurements of governance variables and takes account of this in its aggregation procedure, which also facilitates the construction of confidence intervals; for details see [Kaufmann, Kraay, and Mastruzzi \(2009, Appendix D\)](#). The WGI is seemingly unique amongst mashup indices in this respect.

29. One of his methods seems to give perverse rankings; but even ignoring this method considerable reranking is evident. Luxembourg's rank ranges from 3 to 93 if one ignores the most extreme outlier method.

30. [Alkire and others \(2010\)](#) also provide measures of "rank concordance," which suggest that the null hypothesis of rank independence can be rejected with 99 percent confidence.

31. In calculating the reweighted index I used a weight of 0.74 on governance and 0.26 on the mean of the other three components; the relative weights are the same as those used for IDA allocations, though the absolute weights differ slightly given that another variable enters into the allocations, as noted above.

32. These calculations use the 2009 CPIA ratings available at the relevant World Bank and African Development Bank websites. There are 39 countries with CPIA ratings from both institutions.

33. They use a Bayesian estimation method, also taking account of the ordinal nature of some of the data.
34. Also see the results on the EPI reported in Foster, McGillivray, and Seth (2009).
35. See www.oecd.org/document/35/0,3746,en_2649_201185_47837411_1_1_1_1,00.html.
36. An exception is the DBI, which relies on primary data collected by the team.
37. For example, in the press release for the MPI, one of the authors is quoted as saying that “the MPI is like a high resolution lens which reveals a vivid spectrum of challenges facing the poorest households.” The press release does not point out that the MPI relies entirely on existing publicly available data. The contribution of the MPI is to mashup these data.
38. For further discussion see Fiszbein and Schady (2009). The Mexico program had antecedents in similar types of policies found elsewhere, including Bangladesh’s Food for Education Program and the means-tested school bursary programs found in some developed countries.
39. A page on the Doing Business website claims “26 reforms have been inspired or influenced by the Doing Business project.”
40. Høyland, Moene, and Willumsen (2010) give other examples of such rank-seeking behavior.
41. A useful compendium of research using these data can be found on the Doing Business website. Also see Djankov’s (2009) survey.
42. See Lubotsky and Wittenberg (2006) for a formal exposition of this argument.
43. This statement requires certain restrictions on the curvatures of the relevant functions, which I will ignore for the purpose of this discussion.
44. Sufficient conditions are that there is declining marginal utility to both income and services and that the marginal utility of income (services) is nondecreasing in services (income).

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Impact Analysis of Rural Electrification Projects in Sub-Saharan Africa

Tanguy Bernard

The author reviews trends in rural electrification over the past 30 years in Sub-Saharan Africa. In particular, it is shown that motivations for rural electrification programs have evolved significantly over the years, following changes in development paradigms. The author finds, however, that knowledge of the impact of this has only marginally improved: low connection rates and weak productive utilization identified in the 1980s remain true today, and impacts on such dimensions as health, education, or income, though often used to justify projects, are largely undocumented. Indeed impact evaluations are methodologically challenging in the field of infrastructures and have been limited thus far. Nevertheless examples of recent or ongoing impact evaluations of rural electrification programs offer promising avenues for identifying both the effect of electricity per se and the relative effectiveness of approaches to promoting it. JEL codes: N77, O18, O20

The last few years have witnessed a renewed interest in infrastructure development in Sub-Saharan Africa. Following years of macroeconomic structural adjustment programs, it is now estimated that the continent's low infrastructure development is responsible for a 2 percent shortfall in economic growth per country. Particularly important are the growing concerns with the continent's low power generation and distribution capacities. In its latest report on infrastructure development in the region, the [World Bank \(2009\)](#) calls for \$930 billion to be invested over 10 years in the continent's infrastructure, of which nearly half should be dedicated to the power sector. In fact, despite similar levels in the 1980s, Sub-Saharan Africa's electricity generation capacity per inhabitant is now one-tenth of that in South and East Asia, and electricity coverage is only 40 percent. Within the power sector, rural electrification (RE) remains particularly

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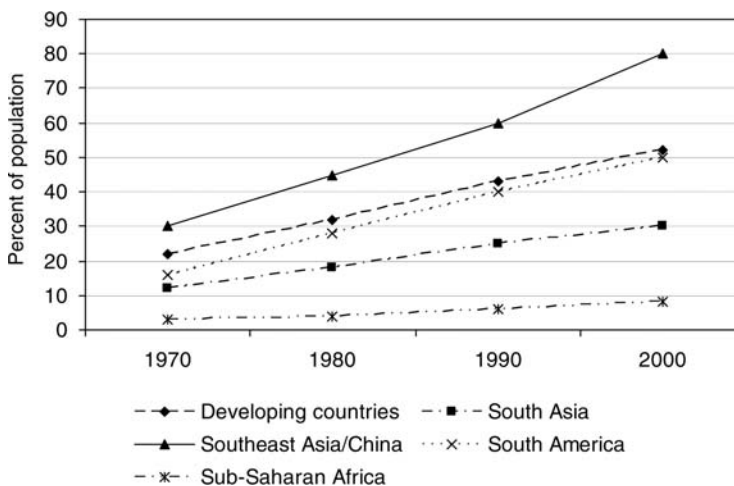
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low in Sub-Saharan Africa where electrification rates have stagnated over the past 30 years at less than 10 percent, while they reached 50 percent for developing countries as a whole (figure 1). Overall, and despite the important energetic potential of the continent, there are about 226 million Africans living in rural areas without access to electricity.

Thus the [World Bank \(2009\)](#) recommends that 25 percent of investments in the energy sector (about \$10 billion per year) be allocated to produce and distribute electricity into rural areas. And while far off the stated objective, African governments and several international donors—including the World Bank, the United Nations Development Program, the African Development Bank, and the European Union, along with many bilateral aid agencies—have increased their focus toward promoting RE.

The support of donors and public sectors to RE rests on three complementary sets of justifications. First, RE is believed to help alleviate poverty. In the short and medium run, local economic growth enabled by access to a reliable source of power can directly and indirectly benefit the poor through higher productivity and enhanced employment opportunities. Further, human capital development (in terms of health and education) facilitated by electricity can help lift constraints to the poor’s economic and social well-being. In the longer run, RE can reduce environmental pressures, thereby facilitating the environmental sustainability of the local development process. Overall, while rural electrification is not an explicit target of the Millennium Development Goals (MDGs), many believe that it is a

Figure 1. Access to Electricity in Rural Areas of Developing Countries



Source: [Hannyika \(2006\)](#).

necessary condition to their attainment in rural areas (including Jeffrey Sachs, director of the MDG project).

Second, the involvement of donors and public sectors in promoting RE is justified by the typically low private sector engagement in the domain—despite potential rents from natural monopoly situations. In fact one major obstacle to RE programs relates to their important costs and limited returns in the short and medium run—in contrast with cellphone development for instance. Indeed investments for grid extension and off-grid schemes to reach remote and scattered communities are often substantial,¹ and the (initially) low electric consumption level of rural populations, along with tariff policies meant to equalize the price of a kilowatt-hour between rural and urban areas (for a given level of service), imply limited returns. Overall if successful electrification programs are often those that have managed to keep costs low and recover part of the investment, it remains that RE usually requires substantial subsidies.²

Lastly, RE development, as for most public infrastructure, responds to political incentives for governments. Apart from its potential effects on local growth and poverty reduction, electricity is usually perceived as the key to the modern world. Without it, people and communities are being deprived of many services often considered as basic in rich countries,³ and governments consider it their duty to promote RE as a means to enhance economic and social cohesion across the territory. It is notable that RE in today's rich countries was often based on temporary political will rather than actual assessment of its socioeconomic returns.⁴

Yet, and despite decades of investments in the sector, little is known about the effective impact of RE on households' well-being (Barnes and Halpern 2000), and most project documents base their expected impact assessments on a priori beliefs. The important level of government and donor subsidies for RE at a time of limited resources and competing investment needs therefore calls for deeper investigations.⁵ This is particularly the case in Sub-Saharan Africa where, absent of robust evidence, the dependence of public investment on international aid makes these vulnerable to paradigm shifts that have characterized the past decades. In fact most of what is known today was known sometime ago, particularly in terms of low connection rates and weak productive use of rural electricity. Further, actual impacts of RE on their beneficiaries remain largely unknown due to attribution difficulties, although recent studies provide promising examples of robust evaluations.

Unstable Support to RE in Sub-Saharan Africa

Over the past 30 years, one can distinguish three phases with respect to RE policies.

Period 1: Infrastructures for Development

Until the early 1980s, under-development was primarily understood as a lack of equipment to support growth, and investments in infrastructures were given a central role in development policies. In rural areas in particular, growth enhancing investments were in part meant to limit migrations to already saturated urban centers. In this context, RE was considered an important part of the solution. By bringing in modernity and a reliable source of energy to support economic activities (agriculture and nonagriculture), it was expected that RE would contribute to limiting rural to urban migration. It was also hoped that households would switch away from fuel woods and thus limit the related deforestation for which forecasts were then catastrophic (Arnold and others 2006). Finally, RE was meant to contribute to long term growth via its effects on human capital development, thereby contributing to enhancing productivity and future revenues (Tendler 1979).⁶

With these predicted benefits, and despite the lack of data to support them, RE programs in the period were given strong support. In addition, if initial investments were high, marginal costs were believed to decrease rapidly as connection and consumption rates increased. Electricity being a synonym for modernity, its “political returns” were also deemed significant.⁷

Period 2: Structural Adjustments

In the 1980s and the early 1990s, infrastructure programs were no longer considered the first priority in Sub-Saharan Africa. Not only did infrastructure development in the previous period contribute to the unsustainable debt burden of most countries, but they did not generate the expected growth in return. The crisis of the 1980s and the structural adjustment plans that followed led to a reassessment of the relative impact of these programs.

This concerned particularly the RE programs, given their high costs⁸ and disappointing results—in the rare cases where these were effectively assessed (Rambaud-Measson 1990). Particularly disappointing were the observed low connection rates, despite improved access, and the rare productive use of the electricity provided (De Gromard 1992). In fact one observed that only 25 to 50 percent of households in electrified villages were connected; and for those who were connected, electrical consumption was mostly related to house illumination and radios or televisions. Environmental benefits were also deemed limited, as the impact of wood fuels on deforestation was much lower than initially thought (apart from peri-urban areas), and connected households did not reduce their use of wood as a result of having electricity—in particular for activities such as cooking and heating. Further, benefits in terms of health and education remained

largely unknown, and rural to urban migration did not seem to decrease in villages with electricity. Finally, it was observed that RE concerned essentially wealthier households, for whom the large subsidies involved in RE programs were not justified.⁹

Overall the favorable cost–benefit analyses performed in the previous period appeared overrated, in particular on the side of benefits that remained limited or unknown (Pearce and Webb 1987).¹⁰ At the same time the underlying rationale for RE itself was questioned, with several macro- and microstudies arguing that it is the growth of income that creates the demand for electricity and not the opposite (Foley 1992). At the least RE could thus contribute to an accelerating of growth, but did not constitute a necessary condition to its start (Pearce and Webb 1987).¹¹

RE programs were thus judged rather negatively over the period: as noted in a report by the International Labor Organization (Fluitman 1983), “A major impression one retains from a review of the pertinent literature and statistics is that the benefits of rural electrification, including the social benefits, tend to be over-estimated and the costs under-stated. Multi-million dollar schemes, it appears, are repeatedly based on conventional wisdom fuelled by extraneous motives rather than arithmetic. The role of subsidies is therefore debatable, particularly in countries yet unable to satisfy needs more basic than electricity. In our view, the time may have come to substitute the benefit of hindsight for the benefit of the doubt.”¹²

Period 3: Poverty Reduction

The late 1990s saw an increased focus of development policies toward fighting poverty in its various dimensions. And with the adoption of the MDGs in 2000, the importance of energy as a necessary condition is now underlined—to fight poverty, enhance health and education, support women empowerment, prevent degradation of natural resources, etc. (see for example Dfid 2002; IEA 2002). For Jeffrey Sachs, “Without increased investment in the energy sector, the MDGs will not be achieved in the poorest countries” (Modi and others 2005). As a result, many RE project documents now use the MDGs as their main justification, although with little data to support these claims (World Bank 2008a), and a number of international initiatives have emerged, seeking to catalyze funding for the sector.¹³

To avoid failures observed since the 1980s in terms of low connection rates and limited productive use, options are also considered to promote services without which energy access will not lead to significant progress. Accordingly electrification must be thought as an input among others in integrated projects involving access to productive equipment (via grants, loans, or credit-bail) or

training on the usage of electricity (Peters, Harsdorff, and Ziegler 2009). In addition the problem of low connection rates, particularly among the poor, implies reconsidering the use of targeted subsidies, prepaid meters, or other technologies lowering barriers to connection.¹⁴

Following the Paris declaration on aid effectiveness, the past few years have also witnessed a growing number of impact studies meant to measure and compare the effects of projects on their beneficiaries, according to different intervention modalities. Such studies are relatively widespread in the field of public health and education, but remain rare in the field of infrastructure in general and quasi-inexistent for rural electrification in particular. The recent increase of RE programs offers the possibility to measure their impact on targeted populations and to study the conditions under which these can eventually be enhanced. In turn these studies may contribute to limiting the type of policy changes described above that can be particularly pervasive in the field of infrastructure, often leading to uncompleted projects and lack of maintenance (Estache and Fay 2007).

Low Connection Rates

Just as in the 1980s, connection rates by rural African households to electricity, where the provision exists, remain low today. Within grid-electrified villages, studies have for instance documented connection rates of 12 percent in Botswana (Ketlogetswe, Mothudi, and Mothibi 2007), 39 percent in Ethiopia (Bernard and Torero 2009), and 30 percent in Senegal (ESMAP 2007). With off-grid technologies, Jacobson (2007) finds similarly low pick-up rates in Kenya, where 5 percent of households with access to solar kits did purchase one. Without surprise, low connection rates are particularly prevalent among poorer households. For instance Heltberg (2003) shows that less than 5 percent of the households in the lowest income quintile in Ghana and South Africa have access to electricity, while it reaches 25 and 50 percent for the highest quintile. And while such trends also exist in urban areas, connection rates in cities are nevertheless much higher. These low connection rates are not only disappointing from the standpoint of bringing reliable energy to deprived populations, they also pose the problem in terms of cost recovery by significantly raising the average connection costs, further challenging future RE initiatives.

Connection costs are an important part of the explanation. In fact, despite important levels of subsidies, rural households are usually responsible for 10 to 20 percent of the overall cost of connection, which usually amounts to \$50 to \$250. In Sub-Saharan African countries where a large part of the population lives below \$2 a day, these prices naturally tend to exclude the poorer ones. In

order to raise the number of connections, most programs use subsidies, and the past few years have led to a better understanding of the means to enhance their targeting efficiency.¹⁵ However, little if any studies have robustly tested for the effects of subsidy levels on the electricity demand for various social groups. Instead levels are usually based upon a priori estimations of demand levels and an overall amount of subsidies to be allocated.

Even with subsidies specifically dedicated, connection rates remain low, suggesting that price policies may not fully explain the observed levels.¹⁶ In fact low connection rates contrast with the elevated budget shares that households dedicate to their energy consumption, reaching 4 percent of total expenditure by the poorest rural households in Ghana, 7 percent in South Africa, 15 percent in Uganda, and 10 percent in Ethiopia.¹⁷ In an in-depth study by *ESMAP (2003)* in the Philippines, the authors estimate the total demand for lumens via the budgets allocated to lighting by kerosene, and find very high levels of corresponding willingness to pay.

One explanation may lie in households' low perception of the benefits of electricity. Although most studies find an important demand for electricity, households mainly perceive it as a luxury good rather than a so-called productive investment—actually, *Peters, Hardorff, and Ziegler (2009)* remind us how industrialized countries have extensively relied on promotional campaigns to explain the potential benefits of electricity in rural areas. In fact in rural areas the lack of demonstration effect, whereby households can learn from others' experiences with electricity use, may further contribute to this perception (*Ranganathan 1993*). In such a case a critical mass of connected households is necessary to generate a more generalized connection behavior in the communities.¹⁸ Another explanation may relate to the fear of poor households of a weakly understood billing system. In fact it is often the case that connected households consume much less electricity than their flat social rate allows them to (*Peters, Hardorff, and Ziegler 2009*).

Overall, depending on the hypothesis retained, interventions to enhance connection rates may take very different shapes. They may for instance consist in providing very high subsidies or limit the validity of the subsidy through time in order to generate rapidly the needed critical mass of customers. They may otherwise focus on information campaigns to provide the necessary information on various usages. They could also rely on prepaid meters to overcome fears of weakly understood payment schemes (as is the case with cellphones for instance). The relative performance of these approaches (and eventually their complementarities) must be assessed through reliable comparisons. In Ethiopia for instance, a study by *Bernard and Torero (2009)* compares connection rates for various levels of subsidies allocated on a lottery basis, allowing an assessment of the impact of subsidies on connection rates among various social groups. In Benin, a study measuring the importance of information on household connections is being

prepared by Leonard Wantchekon. The same study will also assess the effect of prepaid meters and participatory designs of local ground plans.¹⁹

Limited Productive Use

As with low connection rates, the low productive use of electricity remains true today as it was in the 1980s. Use of electricity in rural areas is still mainly dedicated to illumination and radio or television, and the rare utilization for agriculture, handicraft, and services are far below the important growth catalyzing effect expected. In a recent study in Kenya for instance, Arne Jacobson (2007) shows that the only “economic” use of off-grid electrical energy is linked to the pursuit at night of certain activities such as accounting and paperwork in small businesses or the preparation of lectures by teachers. Similar observations are also found in villages with access to the centralized grid system (see for instance the ESMAP 2007 study in Senegal). This further limits the argument of RE as an important means for fighting poverty. It also jeopardizes the program’s sustainability given the limited use (and hence low profitability) of electric lines.²⁰

Use of electricity for domestic activities is also limited. The energy ladder hypothesis, according to which households would rapidly switch to more efficient and clean fuels as these become available and their income increases, has not been verified. In reality most observations suggest that households only *complement* their energy portfolio with electricity, but do not decrease their previous use of fuel for particular usages. For instance Madubansi and Shackleton (2007) find that over an 11-year period after village electrification, fuel wood consumption had not changed in five South African villages, and Hiemstra-van der Horst and Hovorka (2008) report similar results in Botswana.²¹ They suggest that this may be due to price and habits-related reasons—such as taste of food—and that providing access to alternative energies will not be sufficient to promote their intensive use.

Overall, electrical energy is mainly used for illumination as well as for *connecting* rural areas with their urban counterparts (via radio, television, and cell-phones). One explanation for this apparent suboptimal use is the lack of economic opportunities. In this case RE may need to be allocated in priority to more economically dynamic areas (Foley 1992). Another related explanation is that electricity cannot alone kick-start local growth and that RE needs to be designed as part of integrated development plans (for instance along with other infrastructures), which was also pointed out in the 1980s. A third explanation links to the lack of access to finance to purchase the necessary productive equipment.

To account for these, several RE programs comprise additional features such as access to credit or direct provision of productive equipment such as mills and

threshers (for example the so called Multifunctional Platforms). At the household level, other approaches propose to sell “electricity services” instead of electricity per se, through the lease of electrical equipment (low voltage refrigerators, compact fluorescent lamps, mills, etc.) as part of their connection plan. The [ESMAP \(2007\)](#) study in Senegal lists a number of potential interventions for the use of electricity to raise agricultural productivity. Overall, while solutions may exist, the weak levels of usage still observed today suggest that these are not systematically exploited. One of the reasons may be the lack of credible evidence with respect to their efficacy. Studies such as experimental ones can help to test alternative approaches (or various levels of a given approach) one against another, at a pilot level.

Largely Unknown Impacts

While funding for RE programs often rests on their supposed impacts on such outcomes as health, education, or poverty level, there is still very little empirical evidence to substantiate them. For instance, in an extensive literature review, [Brenneman \(2002\)](#) finds a number of contradictory results across studies, partly due to the lack of robust comparisons of populations with and without electricity. Similarly [Sebitosi and Pillay \(2007\)](#) observe that of two reports assessing the impact of the same RE program, one reported the outcome as being “near total success” and the other as “near total failure.” Overall one observes little effort to measure the impact of RE ([Briceño and Klytchnikova 2006](#); [Estache and Fay 2007](#); [World Bank 2008b](#)). This in turn may have contributed to the inconstant support to the sector over time.

Several difficulties explain this lack of evidence, most of which are common to infrastructure programs in general. First, energy mostly acts as an enabler of development, potentially affecting a large array of outcomes (economic, social, environmental, etc.). In the absence of clearly stated objectives, aggregating all potential benefits toward computation of cost–benefit ratios may be perilous. Second, RE programs affect final outcomes—such as poverty—through long causal chains where the outcome depends heavily on the interaction of other external factors. As a result, impact results from a particular study may lack the type of external validity necessary to inform other potential programs in the field. Third, the progressive realization of RE impacts raises the issue of the appropriate timing for their measure. All three difficulties may be partially overcome by assessing the impact of RE on clearly stated objectives that are to be fulfilled in the relatively short run through rather simple causal chains. Alternatively intermediate indicators of impact that are likely affected in the short run (such as changes in time allocated to reading at night), and assumed to be related to the final outcome in the longer run (such as school performance), may be used.²²

Lastly, the impact assessment of RE poses a number of attribution problems. That is, the ensuring that observed changes in final outcomes are in effect due to RE and nothing else. In other words, simple “before and after” comparisons will fall short of separating correlation from actual causality running from the provision of electricity to changes in the outcome. In fact, if RE impacts were large and rapid enough, a plausibility judgment could be made to attribute effectively those observed changes to the newly provided electricity. However, with electricity mostly acting as an enabler of changes, the latter may be more diffuse and lengthy to occur, such that judgment calls may wrongly conclude that there are limited impacts. On the contrary, longer term impact assessments based on before and after comparisons are prone to confuse changes in outcomes that result from electrification and changes that are due to all sorts of other changes that naturally occur in a household’s environment. Commonly cited examples of successes of RE on poverty levels, such as those in India, Peru, or the Philippines, typically fail to account for such other sources of change in households’ income over the period studied.

Further, comparisons of units “with” and units “without” electricity raise the problem of differences in initial conditions, such that impact measures may in part capture these initial differences and not just the effect of electrification. At the village level, it is often the case that electricity is installed in priority, in richer villages where potential gains from it are higher, leading to the so-called “placement bias.”²³ At the household level, connection fees being often substantial, better-off households are usually the first to be connected—a regularity observed in most of the literature reviewed here—leading to the so-called “self-selection bias.” Failing to account for these differences typically leads to an overestimating of the impact of electrification. One such example is given by [Barkat and others \(2002\)](#) in their study of RE in Bangladesh, who conclude that there is a large impact of RE, based on the finding that average annual income of households in villages with electricity is 64.5 percent higher than that of households in nonelectrified villages, and that within electrified villages connected households have an income 126 percent higher than nonconnected ones. It is, however, likely that households in electrified villages were initially wealthier than their nonelectrified counterparts, such that the observed differences are only partly explained by electrification per se.²⁴

Overall, benefits attributed to RE programs rest largely undocumented for lack of impact evaluations. And absent of robust evidence, the current support to the sector may weaken with upcoming changes in development paradigms. Thus the club of Agencies and National Structures in Charge of Rural Electrification in Sub-Saharan Africa notes: “The issue of impact evaluations on development outcomes is central for rural electrification projects, in that the expected indirect effects on income, health, education, agriculture etc. are difficult to measure, and

often more important and more fundamental than the direct effects of electrification. The situation of the sector is all the more difficult that the observed effects are often disappointing: low penetration rates, access rates biased against the poorer categories of the population, weak spillovers on rural economic growth etc. Several analyses have indeed shown that RE is often limited to domestic consumption” (www.club-er.org).

Recent and Upcoming Impact Evaluation Studies

Over the past decade, robust impact evaluation studies based on the comparison of so-called “treatment” and “control” groups have rapidly developed in the fields of health, education, and other development interventions, based on various empirical methodologies (see for example [Ravallion 2005](#), for a review). Yet, despite the important resources allocated and the need for evidence, such studies have rarely been designed to measure the impact of RE. Nevertheless, recent studies have attempted to do so, some of which are described below.

Instrumental Variable Estimate

Since the end of the apartheid regime when two-thirds of the population had no access to electricity, South Africa has engaged in an ambitious Universal Electrification Plan (UEP). Between 1993 and 2001, two million households have thus gained access to electricity throughout the country. In her study of the impact of RE, Taryn [Dinkelman \(2008\)](#) uses the roll-out of the UEP to compare labor market outcomes in rural communities that had received access to electricity before 2001, to those that were yet to be covered. Her argument is that time saved from fuel collection and other chores that can be better provided with electricity can be utilized toward other income generating activities.

The author uses two waves of census data covering rural KwaZulu-Natal, the first wave occurring before electricity was brought to those communities targeted by the UEP. Importantly, however, communities to be electrified early were not randomly chosen, but often politically motivated toward poorer areas. In other words, electrified villages started from a “lower” level than nonelectrified ones, such that simple comparison would tend to underestimate the effect of RE.

To account for these placement biases, Dinkelman relies on a quasi-experimental method, using a community’s land gradient as a predictor of electrification—land gradient significantly affecting costs of line construction. Assuming that gradient is not directly related to the employment rate among women, it allows the author to correct her impact estimates from the initial placement biases. She finds that the share of households using electric lighting rises by 23 percent and the share of

those cooking with wood falls by 4 percent within five years, in electrified communities. Further, her results show that thanks to electrification women are 13 percent more likely to participate in the local labor market.

Difference-in-difference Estimators on Matched Samples

In 1997, the recently created Electricity of Vietnam switched its RE focus from agriculture and small-scale industries to providing reliable power to households. From a pre-reform level of 50 percent, connection rates of rural households consequently jumped to 77 percent by 2001 and to 90 percent by 2009.

To document how electricity affected rural lives, [Khander and others \(2009\)](#) rely on surveys collected in 2001 and 2005 in 42 communes electrified over the period. A random sample of 30 households was drawn from each of the communes, among which a significant subset of households had not yet been connected to the grid by 2005. To account for the fact that factors determining households' decisions to connect may well be linked to outcomes of interest, they use difference-in-difference estimators to compare *evolution* of outcomes between so-called "treated" and "control" households. Fixed effects are used to account for community-level and household-level characteristics that could be related to both the decision to connect and to the outcome of electrification, thereby biasing the results (likely upward). Further, to account for eventual different outcome growth trajectories between treatment and control groups, they apply their fixed-effect, difference-in-difference estimator on previously matched samples of treatment and control observations using propensity score matching techniques.

Overall they find that electricity led to an increase in farm income, but not in other sources of income. They attribute this (surprising) result to the use of electric pumps for irrigation, although they cannot directly test for it. They also find improvement in school enrollment for both boys and girls of more than 10 percent. Finally, using triple difference (differences of the previous double-difference estimates, between early connecting and later connecting households), they find that returns are higher for early connectors than for later ones in terms of income, although no such effect is found on schooling outcomes.

Randomized Household-level Encouragement

Starting in 2005, Ethiopia's Universal Electricity Access Program has set out to electrify most rural towns and villages, with a budget of close to a billion dollars for its first five years. In a country where RE rates are close to 1 percent, it is expected that increased access to a reliable source of power will improve households' welfare by improving conditions for education, creating scope for new

income-generating activities, expanding communications and access to information, and other such channels.

Within each selected town or village, households are responsible for paying the costs of connecting their house to the main line, which typically amounts to between \$50 and \$100. In a country where 80 percent of the population lives on less than two dollars a day, these costs are likely to be prohibitive for a large number of households, limiting the expected impact of RE on growth. To facilitate the connection of poorer households, Ethiopia's power utility has traditionally proposed low interest loans to its clients, thereby smoothing connection costs over three to five years. It appears, however, that take-up of such loans is quite limited, particularly among the poorest households, which are reluctant to engage in long-term financial commitments.

In their study, [Bernard and Torero \(2009\)](#) set out to test the relative efficiency of connection subsidies for various levels of household income. In fact, so-called "smart subsidies" have often been advocated in rural electrification projects, but they have rarely been implemented and—to our knowledge—have never been tested. The study relies on the random allocation of vouchers covering 10 to 20 percent of a household's connection cost, in 10 village communities electrified over the year 2008. A baseline survey conducted before electrification, and a comparison survey conducted a year later, enables comparison of household connection rates over time, between voucher recipients and nonrecipients. The random nature of the voucher distribution further allows their use as instrumental variables for household connection decisions, enabling the identification of the electrification's impact on such outcomes as men, women, and students' time allocation.

Randomized Phasing-in Across Communities

With 2 percent of the population having access to electricity in 2007, RE remains dramatically low in Kenya. Further, and as elsewhere on the continent, high costs of grid extension only allow for small incremental increases in household connection rates. In response, various off-grid solutions have emerged over recent years, based on Kenya's natural endowment with sun and water courses. In their ongoing study, [Chemin and De Laat \(2010\)](#) study the impact of one such scheme in the district of Kirinyaga, where Green Power, a Kenya-based NGO, has engaged in promoting access to electrical power to 1,600 households.

The project involves microhydraulic schemes to harness power from the various streams in the Mount Kenya region, from which the electricity is then transmitted to 20 separated microgrids covering each of 80 households. The impact evaluation of electricity is based on household surveys of the 1,600 households set to be connected gradually over the coming four years, along with 600

neighbors. A baseline survey was implemented in late 2007, to be compared with a follow-up survey in 2010. Questionnaires cover diverse aspects of poverty, activities, and time allocation, which are likely to be affected by access to the new energy source.

Impact of electrification will be measured by comparing households from those minigrids that were connected early on to those where power will only come later. In order to account for potential placement biases, Green Power randomly chose which of the 20 minigrids were to be connected first. To further ensure that households within the first 10 minigrids to be electrified were sufficiently similar *ex ante* to those in the following 10 minigrids, a paired matching was conducted based on observable characteristics collected at the baseline. Accordingly one element of each pair will access electricity early, while the other one will only access it later on. Differences within pairs measured in 2010 will therefore provide reliable estimates of the short-term impact of electricity on households in the community. Lastly Chemin and De Laat have randomized access to a microcredit program across households with and without access to electricity. The purpose is to test the eventual presence of credit constraints, limiting the realization of electricity's impact on household income.

Conclusion

No one doubts that RE positively affects household well-being. In addition, if RE is not necessarily a sufficient condition to long-term development of rural areas, it is probably a necessary one. Yet the interest for such projects—by nature intensive in resources—has considerably varied over the past 30 years, when RE went from being among the priorities to being considered as expensive and of limited effectiveness. While changes of paradigms in the development community led to these changes, the lack of reliable measures of RE impacts may have also contributed to it.

Measures of success are most often based on intermediary indicators of connection rates and utilization of electric energy. Yet both remain very limited in electrified villages in Sub-Saharan Africa, particularly among the poor. While innovative approaches and complementary interventions are regularly tried, one finds a severe lack of robust studies which compare their performance and bring to light the reasons for failures.

Measures of final impact are mostly nonexistent. While numerous public health and education programs have been the object of robust impact evaluations over the past few years, there are comparatively little studies to assess the role of infrastructure in general and RE in particular on various dimensions of poverty. This is in part due to the specific difficulties of this type of study. Nevertheless a

pragmatic approach of impact measures should allow for the test and measure of the effect of RE programs on their beneficiaries (which are the final impacts), as well the most appropriate means to promote it (how to increase connection rates and the utilization of electrical energy). Similar efforts should be applied to other infrastructure sectors to assess their relative and eventually combined effects.

Notes

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1. Total costs to connect a rural household usually vary between \$1,000 and \$2,000, of which 10 to 20 percent are covered by the household itself.

2. See for instance [Barnes \(2007\)](#) for a historical description of RE programs in Costa Rica, the Philippines, Bangladesh, Thailand, Mexico, Tunisia, Chile, China, the United States, and Ireland.

3. For instance in a recent study by UNICEF in Nigeria, rural households ranked electricity as their second priority after safe water, but before health centers, roads, education, and fertilizers ([ESMAP 2005](#)).

4. In the United States for instance, RE essentially developed as part of Roosevelt's New Deal in the 1930s.

5. For sake of brevity, issues regarding the financial sustainability of RE programs are not discussed here, despite their obvious importance.

6. For instance the third [Zambian National Development Plan \(1978–83\)](#) noted: "The direct and indirect benefits of a rural electrification program can be summed up as increasing agricultural production, promoting rural industries, effecting improvements in the fields of health, education, training and the standard of living in general and generating employment opportunities which will reduce migration from the countryside to towns" ([Fluitman 1983](#)).

7. At the same time, the 1973 and the 1979–80 oil shocks helped promote investments in solar, microhydraulic, and wind energy, particularly fit for rural areas. This was notably the case for many African countries relying essentially on thermal power stations for which fuels were mostly imported. In fact at the time 70 percent of hydraulic power was then localized in only four countries (Zaire, Cameroon, Angola, and Tanzania), 70 percent of fossil oil resources were in Nigeria, and 95 percent of coal reserves were in South Africa and Zimbabwe.

8. At the time, RE could represent 10 to 20 percent of public investments in the energy sector, itself representing 25 percent of the total public investment budget ([De Gromard 1992](#)).

9. In addition, the collapse of the oil prices weakened the interest for new energy sources, further contributing to the decline of RE programs.

10. For instance the [World Bank \(1994\)](#) ranked energy projects among those infrastructures with the lowest economic returns between 1974 and 1992 (economic rates of return then reached 12 percent for energy, 17 percent for irrigation, 20 percent for telecommunications, 21 percent for transport, and 23 percent for urban development).

11. The debate continues today. For instance, in a recent study, Yemane [Wolde-Rufael \(2006\)](#) uses time series on 17 African countries and tests for a causal relationship between electric consumption and GDP. Results indicate a causality in only 12 countries: running from GDP to electric consumption in six, from electric consumption to GDP in three, and a two-way relationship in three others.

12. If RE programs were not totally abandoned, their modalities were reassessed, involving in the early 1990s the entry of private entities to enhance management and services through

competition between power providers. However, if they have sometimes been associated with improved connection rates and services in urban areas, rural zones have mostly remained underserved due to their low profitability (Hanniyika 2006).

13. For instance: the European Union Energy Initiative aims to raise awareness and funding for energy projects in Africa; the World Bank's Lighting Africa initiative supports innovative solutions for energy on the continent; and the AfricaConnect initiative attempted to declare 2010 the year of electrification in Africa.

14. At the same time, to cope with the private sector's failure in providing energy to rural areas in the previous period, new government agencies are now being set up with the objective of promoting RE through better incentives for private sector, through their direct intervention into the financing of projects, or both. For a review of the reforms and the creation of rural electrification agencies in Africa, see Mostert (2008).

15. For a long time subsidies took the shape of lower consumption tariffs. Without targeting mechanisms, however, the largest amount of subsidies were received by the largest consumers—not necessarily the ones for whom the subsidy was designed in the first place. For similar reasons, supply-oriented subsidies often failed to reach the poor. Connection subsidies can, in theory, partially overcome these issues. However, smart subsidies targeted at the most needy households are rarely used (see Barnes and Halpern 2000 and Barnes 2000 for historical descriptions of the evolution of these subsidies).

16. For instance the connection rates observed in Botswana by Ketlogestwe, Mothudi, and Mothibi (2007) are low despite a payment system whereby households only cover 10 percent of the fees at the time of connection, and the 90 percent remaining over a period of 10 years.

17. Note that these costs are probably undervalued as they do not account for opportunity costs linked to the time dedicated to fuel collection or the nonutilization of productive equipment.

18. For instance there are numerous examples of electrified villages where no connection was observed. Even in India where the 1970s' electrification programs were linked to a nearly 100 percent consumption subsidy for electric irrigation, one still found villages without any households connected.

19. On this last point, the study is meant to compare the impact of a participatory approach, on the choice of the line trajectories within the villages, to a more conventional approach where ground plans are defined by external engineers. Participatory planning is a hotly debated issue in other domains of development interventions (such as irrigation or school management). Some argue that local participation leads to better suited and hence more efficient and more sustainable designs. Others oppose that local participation often leads to elite capture and lower performance. The net effect is therefore ambiguous and necessitates empirical answers based on comparisons of *similar* villages with participatory planning to others with more top-down approaches, but where electrification occurs at the same time.

20. Note, however, that RE in northern countries did not lead to instantaneous productive use of it. Rather electricity was long used only to power telegraph, then lights, then radios.

21. In Ethiopia a study actually finds a positive elasticity of fuel wood consumption with respect to income where electricity access is available.

22. One of the mechanisms through which RE is meant to impact on households' revenues is through the relaxing of their time constraint. Time is saved from certain activities (collection of fuel wood or water, time necessary to purchase kerosene or diesel, etc.). Time is gained for certain activities such as the capacity to read at night. Time is reallocated between various part of the day (for instance cooking can be done at night, offering scope for other activities during the day). Theoretically these effects can be most important for children and women (IEA 2002; Barnes 2007). However, they are rarely measured effectively.

23. In fact, as early as 1975, the World Bank established a list of four criteria to select the location of RE projects: (i) good quality of infrastructure; (ii) growth in local incomes; (iii) presence of other development programs in the locality; and (iv) proximity to the national grid.

24. Similarly an on-going study in Benin shows that children from electrified households perform better in school than their nonelectrified peers. It is, however, likely that children from connected households were also more wealthy to start with, which may have influenced their academic performance independently of their access to better lighting (through better nutrition or easier access to books, for instance).

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What Can We Learn about the “Resource Curse” from Foreign Aid?

Kevin M. Morrison

A large body of literature has arisen in economics and political science analyzing the apparent “resource curse”—the tendency of countries with high levels of natural resources to exhibit worse economic and political outcomes. The author examines the purported causal mechanisms underlying this “curse” and shows that they all center on the revenue that these resources generate for the government. As such, it is not surprising that the most recent literature on the topic has demonstrated that, in the hands of a competent government, natural resources have no negative consequences and may actually have positive effects. The important question therefore is: What can be done in countries without effective governments? Policy proposals have centered on (a) taking the resources out of the hands of the government or (b) having the government commit to use the funds in certain ways. Neither of these has been particularly successful, which we might have predicted from research on another important nontax revenue source for developing countries: foreign aid. The close parallels between the foreign aid and “resource curse” literatures are reviewed, as are the lessons from the aid literature. These lessons suggest the need for an important change in approach toward poorly governed resource-rich countries. JEL codes: F35, F50, H27, O19, Q3

What approach should high-income countries adopt toward low-income countries rich in natural resources like oil, if they want the resources to be used for development? As commodity prices have boomed over recent years, billions of dollars have been generated for developing countries. Yet instead of being welcomed, this extra revenue has been greeted by most observers with a great deal of trepidation. While there has been some hope that this windfall will have a beneficial development impact, an influential body of research has argued that countries rich in natural resources do worse economically and politically than they otherwise should, so

there has been far more emphasis in the international community on how countries need to avoid the “curse” that apparently comes along with natural resources (for example [Overseas Development Institute 2006](#); [Naím 2009](#)). Is there anything rich countries can do to counteract these apparently negative effects, particularly as commodity prices will likely remain at historically high levels ([World Bank 2009](#))?

I will attempt to answer this question by examining the experience with foreign aid. While the comparison between foreign aid and natural resources may initially seem strange, I argue in this paper that the relevant differences between natural resource revenue and foreign aid are in fact few. As I will detail, the problems linking natural resource wealth to poor political and economic outcomes derive from how the revenue from these resources is used. As such, in many cases there should be no particular difference between a country getting its revenue from aid or, for example, oil. Not surprisingly, as reviewed below, the literature analyzing the effects of aid describes very similar effects as those in the “resource curse” literature, though this body of work tends to get much less attention.

The similarities between these two revenue sources have important policy consequences. Though they act in similar ways, policy prescriptions for natural resources and foreign aid have diverged sharply in recent years. While foreign aid donors have been moving in a direction that emphasizes partnership with recipient country governments, policy prescriptions regarding natural resources have focused on taking the resources out of the hands of governments. The reasons for these two directions are reviewed below, and I show that foreign aid policy used to look very much like natural resource policy looks now. The poor experience with aid effectiveness historically suggests that current policy regarding natural resources is unlikely to be successful—a suggestion which the recent record supports.

The next section reviews the literature linking natural resources to poor economic and political outcomes, detailing how the major problems are caused by the revenue these resources generate. I will also discuss the policy recommendations made to deal with these problems and their lack of success. In the following section, I review how the aid community for decades experimented with various mechanisms to improve the effectiveness of aid in poorly governed countries—many mechanisms quite similar to those recommended now for natural resources—and found their success limited. As a result, the aid community has in recent years changed its approach. In the next section, I discuss how this new approach might be applied in the case of natural resources—a very different tactic than is being implemented now.

The Revenue Curse

According to an influential literature, the presence of natural resources has negative economic and political consequences, such as worse economic growth

(for example [Sachs and Warner 1995](#)) and more authoritarian political regimes (for example [Ross 2001](#)). This section examines the causal mechanisms linking the resources to these effects: “Dutch Disease”, revenue volatility, and a broad area I refer to as “political deterioration.” Most importantly, I will demonstrate that each of these underlying causal mechanisms connecting natural resources and these outcomes can be linked to (a) natural resource revenue and (b) how governments use that revenue. This indicates that we may be able to learn about how to manage this revenue from what we know about how to manage other kinds of nontax revenue.

One of the most well known effects of the discovery of natural resources is the appreciation of the real exchange rate, leading to what is often referred to as “Dutch Disease.” The appreciation of the exchange rate is caused by the rise in the value of natural resource exports, and it generally makes other (non-natural resource) commodity exports less competitive. With imports now cheaper, it also becomes more difficult for domestic producers to compete in the local market. In addition, as local labor and assets are used by the natural resource sector, their prices increase, making them more expensive for producers in other sectors. The overall result is a privileging of the natural resource and nontradeable sectors, crowding out the traditional exports in an economy (manufacturing, agriculture, or both).

However, Dutch Disease does not *necessarily* occur when natural resources are discovered—whether it does depends to a great extent on how the government spends the resulting revenue. As Sachs ([Sachs 2007](#), p. 184) has argued: “The real fear of the Dutch Disease, in short, is that the non-oil export sector will be squeezed, thereby squeezing a major source of technological progress in the economy. *But this fear is vastly overblown if the oil proceeds are being properly invested as part of a national development strategy.* If the proceeds from oil are used not for consumption but for public investment, the negative consequences of real exchange rate appreciation can be outweighed.” In other words, a competent government should be able to avoid this aspect of the “resource curse” (also see [van Wijnbergen 1984](#)).

Indonesia’s experience with its oil boom in the late 1970s demonstrates how this might occur in practice. Instead of spending its increased revenue on current spending (as Mexico did for example, by mainly promoting its state oil company), the Indonesian government spent the oil revenues on agriculture and industry, the tradeable sectors, in order to strengthen production. As [Usui \(1997\)](#) notes, perhaps the most striking aspect of Indonesian policy was its emphasis on agriculture. The Indonesian government used the oil revenues to encourage a boom in rice production, promoting research and extension, investment in irrigation, and subsidizing fertilizer use. The government’s procurement agency kept the producer price of rice high and subsidized the use of fertilizer in order to take

advantage of new Green Revolution crops. As a result of these incentives to farmers, Indonesia was self-sufficient in rice production by the mid-1980s (Booth 1988).

Malaysia provides a similarly successful example of avoiding Dutch Disease. Revenues from crude petroleum discovered in the mid-1970s, and subsequently from liquefied natural gas, were invested as opposed to consumed. This policy built on Malaysia's attempt to diversify its economy away from dependence on rubber and tin. As in Indonesia, much of this strategy revolved around modernizing the agricultural sector, as the government developed programs to launch new commercial crops (like palm oil) and improve the performance of already existing crops (such as rubber). These actions were part of an overall focus on investing resource proceeds into economic and social infrastructure—half of public investment went into energy, communications, and transport, while 10–17 percent went into education, housing, and health (Abidin 2001).

In addition to Dutch Disease, natural resource exporters also face a problem of volatility in revenue. As Humphreys, Sachs, and Stiglitz (2007b) have discussed, this volatility has several sources, including resource extraction rates that vary over time, governments' back-loaded contracts with producing companies, world price fluctuations, and procyclical lending that tends to accentuate booms and busts. The volatility creates a problem for fiscal policy: because there are diminishing marginal benefits to public spending, the social gain from spending more in some years does not make up for the social cost of spending less in others.

However, like Dutch Disease, this is a problem that can be overcome with a competent government in place—one that can “smooth” spending over a period of time. There are a variety of ways that this can be accomplished, though the most popular option recently has been to set up “natural resource funds,” which (when they function well) store revenues when natural resources are booming and then augment public spending when revenues diminish.¹ For example, Chile established a Copper Stabilization Fund (CSF) in 1985 with the purpose of stabilizing the exchange rate and fiscal revenues in the context of rapidly changing copper revenues. A savings rule was determined that transferred resources into the fund at a rate based on the difference between copper's actual price and the government's estimated long-term copper price. The higher the actual price was in comparison to the long-run price, the more resources were transferred (and vice versa, if the price differential were negative). The fund has generally accomplished its purpose, and budget expenditures have not closely followed revenue variability, as was the case prior to the CSF (Fasano 2000).

The final causal mechanism (or set of mechanisms) linking natural resources to a “curse” can broadly be called “political deterioration.” Natural resource rents have been linked to greater corruption and weaker accountability (Leite and Weidmann 2002) and less democratization (Ross 2001). Accountability

arguments tend to center on the ability of governments with these revenues to avoid taxing their citizens, which is often thought to have played a key role in the development of Western representative institutions (Tilly 1990; Ross 2004). Many explanations for the link between natural resources and less democratization have similarly focused on revenue (Anderson 1995; Karl 1997), as these resources simply give political regimes more money with which to pursue their various strategies for staying in power. As Jensen and Wantchekon (2004, p. 821) state: “The key mechanism linking authoritarian rule and resource dependence, both in democratic transition and democratic consolidation, is an incumbent’s discretion over the distribution of natural resource rents.”

As with the first two “resource curse” mechanisms, however, the fact that these political mechanisms revolve around the use of revenue indicates that the effects are likely due to the institutions in place when these revenues arise. For example, building on this logic, I (Morrison 2009) have argued that these revenues are not “anti-democratic” or even “pro-democratic”, but simply stabilizing, in the sense that they solidify whatever political regime they enter. I used panel data from 104 countries over the period 1973–2001 to show (using ordinary least-squares analysis [OLS]) that nontax revenue—generated, for example, by state-owned natural resource companies—is associated with lesser probability of a regime transition in both democracies and dictatorships (measured in a variety of ways).

One good example of this dynamic is Botswana, a country that has *benefited* from its natural resources economically and politically. Botswana’s growth rate has been among the highest in the world over the past 40 years, and it has had freely contested democratic elections since independence. In their analysis of Botswana’s success, Acemoglu, Johnson, and Robinson (2003, p. 105-6) note the critical importance of the existing institutions when diamonds appeared on the scene: “By the time the diamonds came on stream, the country had already started to build a relatively democratic polity and efficient institutions. The surge of wealth likely reinforced this. Because of the breadth of the BDP [Botswana Democratic Party] coalition, diamond rents were widely distributed, and the extent of this wealth increased the opportunity cost of undermining the good institutional path.”² By contrast—though through a similar dynamic—when oil prices surged in the 1970s and massive rents accrued to Mexico’s authoritarian party, it stabilized that party against strong democratization forces (Magaloni 2006).

In sum, the various negative effects that have been attributed to natural resources are caused by the revenue that these resources generate and how governments use that revenue. For this reason, it is not surprising that the most recent and important theoretical work on the “resource curse” is highlighting the fact that these resources have very different effects depending on the institutional

environment in place in a given country (Hodler 2006; Mehlum, Moene, and Torvik 2006; Robinson, Torvik, and Verdier 2006; Bhattacharyya and Hodler 2009). In beneficial institutional environments, natural resources have no negative effect and can even have positive economic impacts, while in poor institutional environments these resources have negative effects. Similarly, on the political side, most recent theoretical work has focused on how these resources can stabilize democratic regimes, and not just authoritarian ones (Dunning 2008; Smith 2008; Morrison 2009).

This theoretical turn has been supported by several recent empirical works. Using panel data from 124 countries over the period 1980–2004, and several different measures for natural resources, democracy, and corruption, Bhattacharyya and Hodler (2009) find (using OLS and two-stage least-squares [2SLS] estimation with instrumental variables) that resource rents lead to an increase in corruption if the quality of the democratic institutions is relatively poor, but not otherwise. Using panel data from 80 countries over the period 1975–98, Boschini, Pettersson, and Roine (2007) use four different measures of natural resources to show (using OLS and 2SLS) that appropriable natural resources have a negative effect on growth in low-quality institutional environments and a positive effect in high-quality institutional environments. They use seven different measures of institutional quality, including indicators of the rule of law, the protection of property rights, the risk of expropriation, and the risk of repudiation of contracts by the government (Kaufman, Kraay, and Zoido-Lobaton 2002; Keefer and Knack 2002).

Similar results have been found by others. Using the original data of Sachs and Warner (1995), consisting of 87 countries, Mehlum, Moene, and Torvik (2006) show (using OLS) that natural resources only reduced per capita income growth over the period 1965–90 in countries with poor institutions, but not those with good ones (measured using indices in Keefer and Knack 2002). And Hodler (2006) uses a measure of natural resources per capita and various measures of ethnolinguistic and religious fractionalization to show (using OLS and 2SLS) that natural resources increase per capita income in homogeneous countries but reduce it in very fractionalized ones.

While these theoretical advances and empirical results are encouraging, in that they dispel the notion that natural resources must be associated with a curse, they also raise a troubling problem: What can be done with these resources when they accrue to countries with poor institutional environments? Several options have been suggested. Given that the major problem is how governments use natural resource revenues, one of the central thrusts of policy recommendations has been to lessen government control over how these revenues are used. This can be done in one of two ways. The first is to take the resources away from the government or otherwise bypass the government in some way, including proposals

to privatize state-owned oil companies (Weinthal and Luong 2006) or distribute oil wealth directly to citizens (Birdsall and Subramanian 2004). The second way is to keep the resources in the hands of the government but attempt to change the government's actions somehow. This has included putting the money in natural resource funds (Varangis, Akiyama, and Mitchell 1995) that include some sort of conditions over the way the funds are used, overseen, or both.

As discussed in greater detail below, where they have been implemented, these policies have not been particularly successful. For example, countries where natural resource funds seem to have worked properly are countries that were managing their fiscal situation well to begin with (Davis and others 2001; Pegg 2006; Independent Evaluation Group 2009). While disappointing, the lack of effectiveness of these mechanisms should not be surprising. The countries discussed above—examples that avoided the “resource curse”—were successful in managing their resources not because they put in place some particular mechanism to insulate themselves. Rather these were countries whose growth trajectories indicate they were doing many things right—managing their natural resources well was just part of their overall economic competence. In addition, while the mechanisms suggested by the policy community with regard to natural resources may be seen as innovative in that community, their lack of success would not seem strange to those who focus on another major revenue source for developing countries: foreign aid. The reasons why, and the implications of the experience with foreign aid, are explored in the next section.

The Lessons of Foreign Aid

In addition to highlighting the importance of the institutional environment for determining the effect of natural resources, the fact that the “curse” of these resources is caused by revenue raises an important question: Why is natural resource revenue different from other kinds of revenue, particularly others that are not generated through taxation? Though one of the first influential analyses of states dependent on oil mentioned similarities between oil rents and other types of externally obtained revenues (Beblawi 1987), it is only recently that scholars have begun to explore these similarities in more depth.

The principal external revenue with which natural resource revenue has been compared is foreign aid (Bräutigam 2000; Svensson 2000; Moore 2001; Therkildsen 2002; Collier 2006; Morrison 2007; Smith 2008). As Collier (2006, p. 1483) notes, “both are ‘sovereign rents’.” And in fact, it is striking to note how similar the literatures on the effects of aid and natural resources are. Scholars have linked aid to poor economic and political outcomes because of exactly the three causal mechanisms discussed above: Dutch Disease (for example Younger 1992;

Adam and Bevan 2003; Rajan and Subramanian 2005), aid volatility (Bulir and Lane 2002; Arellano and others 2009), and political deterioration (for example Knack 2001; van de Walle 2001; Bräutigam and Knack 2004). And as the severity of these mechanisms depends on the institutions in place in a country, many scholars have argued that aid's effect is contingent on the institutional environment in place, just as with recent research on natural resources (for example Isham, Kaufmann, and Pritchett 1997; Burnside and Dollar 2000, 2004; Kosack 2003; Mosley, Hudson, and Verschoor 2004; Gomanee and others 2005; Kosack and Tobin 2006; Wright 2008; Baliaoune-Lutz and Mavrotas 2009; Morrison 2009).³

However, despite these apparent similarities, policy recommendations regarding these two revenue sources have moved in almost opposite directions in recent years. As discussed above, the general thrust of the natural resource literature has been to take the money out of the hands of the government, or at least attempt to change the way the government uses it. In the aid community, by contrast, the movement has been toward ensuring governments have “ownership” over the way they spend the resources. If donors are concerned about development outcomes, this approach has implied giving aid to those countries that already have good institutions and policies in place, as opposed to trying to change the behavior of governments.⁴

Why has the foreign aid community moved in this direction? The answer is that for decades donors tried tactics very similar to those that are now being recommended for natural resources—attempting to change governments' behavior or bypass them to some degree—and found them to be largely unsuccessful. As such, it is worthwhile to review the literature that has studied these tactics. Donors' efforts in this regard took one of two forms, policy conditionality (attempts to change governments' behavior) or projects (attempts to bypass the government to some degree). This section looks at these efforts in turn.

Policy conditionality—attempting to change a government's policies in exchange for money—has been one of the more controversial aspects of foreign aid practice over the past few decades. Underlying the ideas of both the practitioners of it (most donors) and its critics (many non-governmental organizations) has been the assumption that these conditionalities actually work—that is, the assumption that governments actually implement the policies required by foreign donors. In fact, while there are certain instances in which these conditions have probably influenced a government to act in a specific way, studies have largely concluded that these conditions have no systematic influence on policy (World Bank 1992b; Mosley, Harrigan, and Toye 1995; Collier 1997; Alesina and Dollar 2000; Burnside and Dollar 2000; van de Walle 2001; Easterly 2005; Heckelman and Knack 2008).⁵

There are two principal reasons why conditionality has not worked in general. The first is on the recipient side—simply put, there are strong political forces in

place opposed to the policy conditions. If this were not true, conditionalities would of course usually be unnecessary: the policy would already be in place. Opposition may be in the executive branch or outside it, but either way it is likely to continue even if the policy is instituted at first. As such, policies adopted because of conditionalities are often reversed or simply ignored in practice. This raises the second reason conditionality has not worked, this one on the donor side: donors have strong incentives to continue to disburse funds even if conditionalities are not met. These incentives can be political, such as the need to support a government for strategic reasons; or they can be economic, such as the need not to disrupt strong trade or investment relationships with the country. The incentives can even be bureaucratic, such as the need for aid agencies to disburse all their funds in order to get the same amount of funds the following year. Regardless of their origin, these incentives often mean that aid is disbursed regardless of whether or not conditions are met ([World Bank 1992b](#)).

The other donor approach to making aid more effective—implementing projects—has similarly led to disappointing results. Projects do not bypass the country's government to the extent that, for example, privatizing state-owned oil companies would—many are designed in cooperation between donors and governments. However, there is little doubt that project-based aid is meant to reduce the discretion of recipient countries in terms of how to spend the money. Principal-agent theory suggests, for example, that as preferences between a donor (the principal) and the recipient country (the agent) increasingly differ, the donor should augment its control of how the money is spent ([Winters 2010](#)). Policy prescriptions in this regard are not difficult to find: [Radelet \(2004, p. 13\)](#) writes, for example, that “in weak, failing, and poorly governed countries, donors should retain a strong role in setting priorities and designing programs.”

Nevertheless, three problems have undermined donor-financed projects. First, aid that goes to finance projects is largely fungible, in the sense that it simply enables a government to take money it would have spent on that item (for example, a school) and spend it on another item ([Feyzioglu, Swaroop, and Zhu 1998](#)). In this way, while donors may fund a school, their money may simply free the government to spend its money on other priorities (arms, for example). Second, taking the money out of the hands of the government hinders the building of a capable state, a necessity for development if historical experience is any guide. Proliferation of projects funded by dozens of different donors has made it extremely difficult for governments to monitor what is going on in any given sector, and the high transaction costs tend to undermine bureaucratic quality ([Knack and Rahman 2007](#)).

Third, and perhaps most important for comparison to natural resource revenues, there is now a fair amount of evidence regarding the inability of projects to succeed in the context of a poor policy environment ([World Bank 1992a](#); [Easterly](#)

2002). The reason is fairly intuitive. If a donor builds a road, for example, in a country where there is no funding for maintenance from the government, or where the economic policies do not encourage new investment and entrepreneurship, the road is likely to be ineffective in spurring economic development.

What are the overall implications for natural resources of the aid literature on conditionality and projects? Essentially the aid literature provides a framework by which to understand better the disappointing results—and pessimistic prospects—for the various policy proposals put forward for avoiding the “resource curse.” For example, consider the proposals to take natural resources out of the hands of the government. Privatization of the resources—one of the ways to do this—has experienced the same type of problems that have plagued project-based aid. In the absence of a good institutional environment—such as a developed legal system, a tax administration to collect revenues, and a corporate governance regulatory structure—privatizing the resources has led to a few people getting very rich and countries as a whole seeing little benefit (Stiglitz 2007). While some may argue that in the longer term the newly rich will begin to demand better institutions, there is no particular historical or theoretical reason to expect this (Hoff and Stiglitz 2005).

Transferring natural resource revenues in lump-sum form to citizens—another way of taking the resources out of the hands of the government—is similarly unlikely to succeed. As Sachs (2007) argues, what poor countries need to develop are infrastructure and primary health and education, services that must be provided by the government. Transferring resources to citizens in the absence of good governance is unlikely to result in any wide-scale development of the country, as such development requires a functioning government.

While much of the discussion here has focused on the economic impacts of these mechanisms for dealing with natural resources, there are also reasons to doubt their ability to improve the political situation in a country. For example, one might expect that taking money out of the hands of an authoritarian regime—by distributing the money to citizens, for example—would help to destabilize the regime. However, I (Morrison 2007) have shown that even if one assumes that the arrangement works perfectly (for example there is no corruption), under a broad set of conditions this type of arrangement will not destabilize the dictatorship. I used the game theoretic framework advanced by Acemoglu and Robinson (2006), analyzing how redistributive conflicts between rich elites and citizens affect political regime transitions (also see, for example, Rueschemeyer, Stephens, and Stephens 1992; Boix 2003), and I demonstrated that distributing money to citizens essentially defuses demands for regime change from lower- and middle-income citizens who would benefit under a democracy.

The foreign aid literature also indicates that the other set of policy mechanisms—aiming to change the way governments use natural resource rents—is also unlikely

to be successful. The general conclusion has been that in the absence of “ownership” on the part of the government—that is, without the government supporting the policies of its own accord—any policies put in place on the basis of “conditions” are likely to be reversed. Even if one sets up a natural resource fund to finance social spending, for example, the implication is that eventually this fund will be raided by the government for other purposes (Humphreys and Sandbu 2007).

Perhaps the best example of these problems in the case of natural resources has been the largest attempt to shield natural resource revenues from bad governance: the Chad–Cameroon pipeline project overseen by the World Bank starting in 2000. Despite the Bank’s “unprecedented system of safeguards assuring that the revenues are used to reduce poverty,” there were major problems of noncompliance with the Bank’s various desires (Pegg 2006; Gould and Winters Forthcoming).⁶ Chad’s President Idriss Déby spent \$4.5 million of his country’s \$25 million “signing bonus” on his military. The IMF (2003) found that the government was not allocating sufficient funds to health, education, and other priority sectors. And the group that monitors Chad’s compliance with environmental and social safeguards found that the government was not following the country’s own stated poverty reduction strategy (International Advisory Group 2004). In 2005, Déby amended his country’s revenue law to spend more on the military, in direct violation of Bank conditions. While the Bank protested initially, it eventually capitulated.⁷ In March 2008, Déby used a state of emergency decree to suspend Chad’s compliance with the remaining Bank conditions with regard to poverty spending. Finally, in September 2008, the Bank decided to cancel the project.

In other words, the most elaborate measures designed to date to change the way a government uses its natural resources were unsuccessful. A recent evaluation of the project by the Independent Evaluation Group of the World Bank concluded that the project’s fundamental objective of reducing poverty and improving governance was not achieved. Just as significantly, the review concluded that “no alternative program design or closer supervision would have allowed to achieve [*sic*] the program’s development objectives in the absence of government commitment” (Independent Evaluation Group 2009, p. viii).⁸

Do these lessons and experiences mean that aid and natural resources can never have developmental effects? Certainly not—in fact, that is exactly the message from the literature reviewed above studying the conditional effects of these revenues in different institutional environments. And largely on account of that research, many donors have begun to change their relationships with recipients in two important ways in order to ensure that aid is more effective.

The first might be seen as an attempt to change the institutional environment itself. The World Bank and the International Monetary Fund (IMF) now require “Poverty Reduction Strategy Papers”, documents outlining the government’s

poverty reduction policies that are drawn up in consultation with non-governmental organizations (NGOs), the private sector, and other important actors in society. This venturing into areas of governance has been criticized by some observers (for example [Srinivasan 2001](#)), who argue that these organizations have no expertise or remit to involve themselves in a country's politics in this way. However, the Bank and the IMF hope that this deliberative approach will lead to more sustainable, country-owned policies that donors can support ([World Bank 2002](#), p. 240). It is unclear whether this will be more successful than previous forms of conditionality. There are some social science theories that indicate building societal consensus may be possible under certain conditions, but these conditions are extremely rigorous, such as complete equality among participants in the deliberation ([Morrison and Singer 2007](#)).

The second way that donors have changed their aid delivery is to limit to whom they give it. Following the implications of the research reviewed above, some donors have begun to implement a principle of "selectivity," by which they mean that recipient countries should receive more aid if they already have good policies in place. This idea took particular hold of the donor community after work by Craig Burnside and David Dollar at the World Bank showed that aid was more effective in certain policy environments ([World Bank 1998](#); [Burnside and Dollar 2000](#)). This work has generated a large response, with some scholars confirming their results and others arguing that their results are not robust (a good review is provided by [Easterly 2003](#)). However, as one of the critics of their empirical analysis, William Easterly (2007, p. 645), writes, "whether the Burnside and Dollar results hold (specifically whether aid has a positive effect on growth when policies/institutions are good) is something of a red herring regarding the issue of selectivity. The idea that aid money directed to governments would be more productive if those governments had pro-development policies and institutions is very intuitive."

Perhaps it is not surprising, then, that evidence indicates that donors have indeed paid increasing attention to the institutional environment of recipient countries ([Dollar and Levin 2006](#)). The World Bank, for example, allocates loans from its International Development Association on the basis of its Country Policy and Institutional Assessment. And the United States now allocates part of its aid through the Millennium Challenge Corporation, which has strict economic and political criteria that must be met before aid is granted to a country ([Radelet 2003](#)). The approach has become important and influential enough that the Development Assistance Committee of the OECD—the main group of bilateral donors—is concerned that some states will be "left behind" by donors ([OECD/DAC 2002, 2009](#)).

If the thrust of this paper regarding the similarities between foreign aid and natural resources is correct, the policy community might consider how to

formulate a “selectivity” approach to natural resources. After all, the lessons from foreign aid indicate that the disappointing performances of the current policy recommendations with regard to the “resource curse” are likely to continue. The implications of this approach, and some of the practicalities of it, are discussed in the next section.

A “Selectivity” Approach to Natural Resources

To begin the discussion of a selectivity approach to natural resources it is worthwhile to restate one of the most important points of the previous two sections. The literature reviewed above indicates that the economic and political environment determines the effects of both natural resource revenue and foreign aid. For well governed countries, therefore, the message of the literature is that if one takes the proper precautions—which are now fairly well known (Humphreys, Sachs, and Stiglitz 2007a) and illustrated by the countries discussed above—one need not worry about a “resource curse.” In fact, the evidence seems to indicate that well governed countries should expect to benefit from their natural resources. This is an important take-away from this literature review.

If the international community has a role in these countries’ use of their natural resources, it will be in providing necessary financing and helping them to implement best practices in terms of resource management. One of the important elements of these efforts should center on transparency. This element has been emphasized by the Extractive Industries Transparency Initiative (EITI), supported by the World Bank and other donors, which argues that oil companies and oil-producing governments should publish what they pay and receive during extractive industry transactions. The idea is to enable citizens in both selling and purchasing countries to make informed economic and political decisions.⁹ A similar focus on transparency is emphasized by the recent Natural Resource Charter, drafted by high-profile academics and practitioners, which attempts to summarize best practices with regard to resource management.¹⁰

However, given the discussion above about ownership and the importance of the governance environment in terms of the success of initiatives, the effectiveness of non-binding agreements such as the EITI is likely to be limited to those governments who for whatever reason want to use the resources well. In fact, 24 countries have pledged to adopt the transparency measures of EITI, but not a single one has fully complied (Ross 2008).¹¹ Again, there seem to be sharp limits to what can be accomplished by trying to get governments to change their behavior.

Obviously a key question from this perspective therefore is: How does one know when a government will use its natural resources in an effective way? This

question has in fact been a major focus for the donor community—obviously the very idea of selectivity implies that one must decide the basis on which evaluations of governments will be made. While at one point there was some agreement regarding the policies necessary for economic development, this consensus began to evaporate in the late 1990s (Stiglitz 1998), and even before the recent global financial crisis there were reasonable arguments that even looking for such a consensus might be misguided (Rodrik 2007). In the foreign aid context, Kanbur, Sandler, and Morrison (1999) have argued that this lack of consensus means that donors should decide for themselves what kind of policies they want to support. Since donors have different preferences over policies, each of them should support the countries that are closest to its preferences. As mentioned above, the United States has done this in the form of its Millennium Challenge Corporation, an agency that doles out part of the U.S. aid budget along criteria meant to reward what the United States considers to be good policy performance (Radelet 2003). Other donors have other instruments and criteria (OECD/DAC 2004).

It is useful in this light to think of a second group of countries. For any given donor, these countries are resource-producing but do not meet the donor's selectivity criteria. The message of the literature on aid effectiveness is that the donor should be quite skeptical that policy instruments can ensure that natural resources have economically and politically positive effects in these countries. The prospects of changing a government's policies are dim, and the ability of projects to spur development without a beneficial policy environment are similarly poor. In other words, it is highly unlikely that—from the donor's perspective—the resources sold by the producer country will have a beneficial effect for that country.

From a development perspective, the best option would seem to be “delaying extraction of resources below the ground until the country can reinvest the resources well above the ground” (Stiglitz 2007, p. 40). Given the political and economic incentives involved in trading natural resources, it is unrealistic to expect rich countries to close their markets to these countries.¹² However, there certainly seems to be no justification in the literature for helping these countries to develop their natural resources. In other words, donors might follow a “trade but no aid” strategy, in which they open their markets to natural resources from the producer countries but provide no financial assistance in terms of developing the resource sector. Obviously if the country's policies improve, so could aid from the donor, and even if the donor does not provide aid, it might still stay involved with the country in various ways, such as trying to help build capacity in the government where it is possible (OECD/DAC 2009).

Finally, there is a third set of countries that warrant attention here. These are the countries that produce natural resources but which the population in a given

purchasing country (or set of countries) views as having truly unacceptable policies. By “unacceptable,” I mean that the policies are so poor that purchasing countries may decide against even buying resources from these countries, despite the political and economic incentives pushing otherwise.¹³ Given the power of those incentives, this is likely to be an extremely small set of countries. Nevertheless, there are in fact important examples of purchasing countries pursuing this kind of approach.

Since 1997, for instance, the United States has prohibited American energy companies from trading with the Sudanese government. The Executive Order instituting these sanctions cited Sudan’s “support for international terrorism, ongoing efforts to destabilize neighboring governments, and the prevalence of human rights violations, including slavery and the denial of religious freedom.” Reflecting the focus on revenue highlighted in this review, Secretary of State Madeleine Albright said the sanctions were intended to “deprive the regime in Khartoum of the financial and material benefits of U.S. trade and investment, including investment in Sudan’s petroleum sector.”¹⁴ It is notable that the United States has continued this policy despite the fact that Sudan is able to sell its oil to other markets. Since 1999, the Sudanese government has received about \$500 million a year from petroleum exports despite the U.S. sanctions, much of it sold to China, which meets about 7 percent of its energy needs with Sudanese oil (Baldauf 2007). There is a close parallel here with the issue of selectivity in aid: Western donors have begun to complain about China’s aid policy in Africa, because China is giving aid to countries these donors would prefer did not receive it (McGreal 2007).

A second important example is the Kimberley Process Certification Scheme (KPCS) instituted by the United Nations to prevent diamond production from fueling rebel groups and human rights abuses in producer countries. The goal of the KPCS is to keep illegitimately produced diamonds out of the international market, an idea that arose out of research indicating that—like other natural resources—producing diamonds in certain environments had terrible consequences for the producer country.¹⁵ As a result of pressure from international NGOs, an agreement was reached between the major diamond trading and producing countries, the diamond industry, and NGOs to establish a diamond certification scheme. Though faults in the scheme may remain (NGOs like Global Witness and Amnesty International have argued that improvements are needed), what is important here is the basic principle: an international agreement exists to restrict the buying of an important natural resource for reasons of human welfare.

The Kimberley Process example indicates how NGOs and policy-oriented research helped to focus attention on how actions in rich countries encourage the negative effects of diamonds. The selectivity approach indicates that their efforts

might be focused more broadly. In fact, the development community is increasingly focusing not just on aid policies, but also on how trade, migration, and other policies affect developing countries. Perhaps the best known evaluation of these various policies is the Center for Global Development's Commitment to Development Index, which evaluates rich countries in terms of their contribution to development.¹⁶ Importantly, in the Index's evaluation of donors' aid policies, it downgrades countries for giving aid to corrupt and undemocratic regimes, but the analysis of rich countries' trade policies—particularly with regard to natural resources—includes no such devaluation. The approach presented here indicates that these policies may be just as important.

Conclusion

I have made two central points. The first is that recent work on natural resources strongly suggests that the “curse” of these resources—that they seem to result in worse economic and political outcomes—is a function of the institutional environment in which these resources are found and how the revenues are used. If the country in which resources are found is well governed, these resources can have beneficial effects. Given that we now know much about how to manage these resources, this should be encouraging news to well governed countries and the international community. As with any policy management, mistakes can be made even in well governed countries, but there seems to be no particular reason to fear a curse in these countries.

The second point concerns the problem that this first point raises—what can be done when natural resources accrue to poorly governed countries? To answer this question, I have drawn lessons for natural resource management from the existing literature on a resource that is similar in many ways: foreign aid. Unfortunately, the aid literature indicates that we should be skeptical about the ability of various policy “mechanisms” to insulate countries from the negative effects of natural resources. In poorly governed countries, there may be very little the international community can do to prevent these resources from having negative effects.

Because of this, I have essentially argued for a graduated approach—a “selectivity” approach—to interacting with countries that have natural resources. In well governed countries, the international community should help in the development of natural resources, particularly focusing on the lessons of successful resource-rich countries and emphasizing transparency of accounts. Just as with aid, the emphasis here should be on enabling the country to pursue an agenda it owns. For those countries that do not meet a donor's selectivity criteria for aid, it is unrealistic to expect the donor to stop buying the resources, but there seems to

be little justification (from a development perspective) for them to finance the country's resource sector. Donors will be tempted to use conditionality to improve the country's policy environment, but existing studies have generally concluded that there is no systematic relationship between conditions and policy reform. Finally, at the worst extreme in terms of governance, there is a serious argument to be made for not purchasing the natural resources.

The existing literature suggests that the use of this type of graduated approach should enable the greatest development impact from countries' natural resources. As mentioned at the beginning of this paper, this impact is potentially enormous. Natural resources do not have to be a curse—this much has become clear in the literature. If it continues to be one, it will likely be the fault not only of the countries with those resources, but also of the international community.

Notes

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1. These types of funds can also help with Dutch Disease effects if used properly.
2. For a less sanguine view of Botswana's development path, see [Hillbom \(2008\)](#).
3. To be sure, some remain skeptical that aid ever has a positive impact. See, for example, [Rajan and Subramanian \(2008\)](#).
4. It should be noted that while much academic and policy-oriented work has emphasized the benefits of this approach, many donors continue to deliver aid in more traditional ways.
5. Two instances where conditions seem to have helped a government with policy reform are documented by [Devarajan, Dollar, and Holmgren \(2001\)](#), who argue that, in the cases of Ghana and Uganda, leaders committed to reform welcomed conditions because they helped to signal the seriousness of their efforts. Nevertheless, generalizing from these cases is difficult, not least because deciphering the commitment of leaders is challenging.
6. The quotation is from the World Bank's website on the Chad–Cameroon pipeline: <http://go.worldbank.org/RQSFYMZPE0>.
7. The 2005 standoff is particularly indicative of the similarities between this experience and donors' experience with aid conditionalities. Chad was in the midst of political turmoil and approaching an election. Despite its qualms about Déby, the World Bank and its major shareholders probably preferred him to the alternatives, or to an unstable country ([Bank Information Center 2006](#)). The agreement to resume lending to Chad happened just after a U.S. State Department visit to the country, and just before the national elections. In sum, just as with foreign aid, a variety of conflicting interests rendered ineffective the attempts to make these resources promote development in a clearly anti-development environment.
8. It is notable that the "Management Response" to the report agreed: "A project of this sort *cannot* succeed without Government commitment and responsibility" ([Independent Evaluation Group 2009](#), p. xx).
9. See <http://eitransparency.org/>.

10. See <http://www.naturalresourcecharter.org/>.
11. In yet another parallel between natural resource revenues and foreign aid, similar transparency measures are being encouraged for foreign aid. For example, a website has been set up by the government and donors in Mozambique to publicize the details of aid the country receives (www.odamoz.org.mz). According to Oxfam America, the United States consistently fails to submit up-to-date information, and the website receives no information at all from China, Korea, Brazil, Russia, or India.
12. An interesting alternative would seem to be a market-driven solution, by which companies offer the equivalent of “fair trade” gasoline to those consumers willing to pay extra for knowing that the gasoline comes from responsible governments. I have, however, seen no discussion of this idea. I am grateful to Macartan Humphries for suggesting this to me.
13. See Wenar (2008) for an interesting treatment of this issue.
14. See <http://www.eia.doe.gov/cabs/sanction.html>.
15. See http://www.globalwitness.org/pages/en/the_kimberley_process.html.
16. See http://www.cgdev.org/section/initiatives/_active/cdi/.

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Density and Disasters: Economics of Urban Hazard Risk

Somik V. Lall • Uwe Deichmann

Today, 370 million people live in cities in earthquake prone areas and 310 million in cities with a high probability of tropical cyclones. By 2050 these numbers are likely to more than double, leading to a greater concentration of hazard risk in many of the world's cities. The authors discuss what sets hazard risk in urban areas apart, summarize estimates of valuation of hazard risk, and discuss implications for individual mitigation and public policy. The main conclusions are that urban agglomeration economies change the cost–benefit calculation of hazard mitigation; that good hazard management is first and foremost good general urban management; and that the public sector must perform better in promoting market-based risk reduction by generating and disseminating credible information on hazard risk in cities. JEL codes: Q54, R3, H41

Hurricane Katrina in 2005 caused close to US\$100 billion in direct damages in New Orleans. The January 2010 earthquake in Port-au-Prince resulted in more than 200,000 fatalities. These and other recent disasters in cities remind us of the large and perhaps growing risk that urban areas face from natural hazards. Storms, earthquakes, floods and tsunamis do not seek out cities. But when they do occur in an urban area, the large concentration of people and assets tends to increase their impacts. This concentration is the result of economic forces such as economies of scale and specialization in production (World Bank 2008). They generate agglomeration economies that further encourage urban growth up to a point where congestion costs start to dominate. The attraction of cities means that moving out of harm's way is not usually a feasible risk reduction strategy. The stakes—most clearly reflected in higher wages and productivity—are too high.

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Urban hazard risk cannot be eliminated, but it can be reduced. We argue that markets can provide incentives for private mitigation efforts and mechanisms for risk transfer. But there remains a significant role for economic policy and urban management to facilitate market based responses and to act when markets fail. Three areas are of particular importance. First, municipal governments must ensure good general urban management that helps reduce risk. This includes, for instance, managing land to exclude hazardous areas from development, maintaining drainage systems, ensuring the safety of public buildings, and providing effective first responder services. Second, public agencies need to facilitate private risk reduction efforts by creating and widely disseminating information about hazard risk. This generates broad awareness that helps individuals and firms to decide how much risk they are willing to accept. And it avoids information asymmetries, for instance, where private firms such as insurance companies collect but do not share such information. Third, urban governments may need to intervene selectively to address specific welfare impacts such as the disproportional risk faced by poor people when only hazard-prone land is affordable.

Throughout this paper we adopt the standard risk model used in the natural hazards community (see, for example, ISDR 2009). Risk of losses—mortality, injuries, or economic damages—is a function of the probability that a hazard event of a given magnitude will occur, exposure of people or assets, and vulnerability which includes factors that make it more or less likely that the exposed elements are affected.¹ A hazard event turns into a natural disaster when it takes place in an area of high exposure and vulnerability.

The paper is organized in three main sections. First, we discuss why a separate treatment of urban hazard risk is warranted. We argue that the benefits of economic density in cities will continue to encourage concentration of people and assets at risk from natural hazards. This geographic concentration changes the range of options and priorities for dealing with natural hazard risk. Second, we survey past research and present new findings that show how hazard risk implicitly enters the cost–benefit calculations of firms and households. The evidence suggests that if information is available and land markets work well, natural hazard risk is priced into real estate markets. This encourages market-based risk reduction. But it also means that poor people are attracted by lower land prices in hazard prone locations leading to disproportional risk exposure for low-income groups. Third, we discuss policy options for mitigating urban hazard risk. We distinguish between large scale *collective* measures to reduce risk and *individual* level risk mitigation. We also highlight the importance of good general urban management in reducing risk, and we argue for a much larger public sector role in creating and disseminating hazard related information that encourages market-based risk reduction approaches.

Why Urban Hazard Risk Is Different

Why treat urban hazard risk separately from hazard risk in general? Many of the concepts and lessons relevant to hazard risk reduction apply generally—in rural, peri-urban and urban areas. But some issues are specific to cities. Most importantly, as they increase in size, more people and assets will be exposed to natural hazards in dense urban areas. This density, of people and economic activity, not only changes the risk equation, it can also change the economics of hazard risk reduction strategies. We first summarize what drives urban hazard risk, before discussing the implications of recent research in urban economics and economic geography for natural hazard risk in cities.

Hazard Risk in Cities Is Large and Increasing

Global disaster damage statistics are not classified by urban versus rural location. We therefore have no concrete empirical evidence as to whether natural hazard events have more severe impacts in urban areas as compared to rural areas. Despite this uncertainty, there are several factors that increase hazard risk in cities, including physical geography, land scarcity, externalities due to dense habitation, and rapidly rising exposure. Income growth that decreases vulnerability tends to be faster in cities and works in the opposite direction. A core message is that in a rapidly urbanizing developing world, the growth of population and economic assets in cities will likely lead to an increasing concentration of hazard risk in the urban areas of developing countries.

Geography. The interplay of economic and physical geography is one reason for high hazard risk in urban areas. Many cities have historically emerged at a location with good accessibility or favorable natural endowments such as a river crossing, a coastal location, or fertile volcanic soils. Those geographic settings are often associated with an increased probability of hazard events—floods, cyclones, and volcanic eruptions. Agriculture in most of southern Italy is difficult due to poor soil quality. An exception is the area around Mount Vesuvius near the city of Naples where rich volcanic soils have been farmed for centuries despite the risk of new eruptions. Globally an estimated 9 percent of the population lives within 100 kilometers of a historically active volcano, many in cities and with high concentrations in Southeast Asia—particularly in Indonesia and the Philippines—and Central America (Small and Naumann 2001). Similarly, low elevation coastal zones, many exposed to cyclones and storm surges, cover 2 percent of the world's land area but contain 10 percent of the world's population and 13 percent of the world's urban population (McGranahan, Balk, and Anderson 2007).

Land Scarcity. Competition for land in urban areas is intense. City managers often exacerbate land scarcity by restricting high density development. The desire to live close to jobs and amenities means that even marginal city areas such as floodplains, areas with unstable soil, or steep slopes will be settled—often, though not always, by poor people. In Santo Domingo’s largest slum, 45 percent of houses located near a river are flooded when it rains (Fay, Ghesquiere, and Solo 2003; Fay and others 2001). Housing prices reflect this risk with the poorest living in the lowest quality housing in the most at-risk areas. In cities such as Caracas or Rio de Janeiro, poor families occupy steeply sloped ground which is prone to landslides. This sorting process, with low income households and squatters occupying the most hazardous urban land, is not static. Detailed data for Cali, Colombia, show that localized hotspots of small scale disaster events change location as inner-city neighborhoods gentrify, governments improve hazard management, and new informal settlements emerge at the periphery (ISDR 2009).

Externalities. Land scarcity leads to higher land prices and therefore to higher density occupation. Larger building sizes in cities may increase damages and loss of life in severe earthquakes especially where building standards are lax. The collapse of larger buildings in dense urban areas can cause neighboring buildings or critical supply infrastructure to be damaged even if they otherwise withstood the event (Kunreuther and Roth 1998; Nakagawa, Saito, and Yamaga 2007). These spillovers or externalities are absent in more sparsely populated rural areas where damages to smaller sized and dispersed dwellings will cause less or no collateral damage.

Exposure. The main reason why urban risk is large and increasing is the rise in exposure. Urban populations are growing in practically all developing countries. About half of this increase is natural growth, that is fertility of urban dwellers (Montgomery 2009). The remaining growth is due to urban expansion and migration, which reduces the national share of rural residents except where rural fertility is vastly larger.

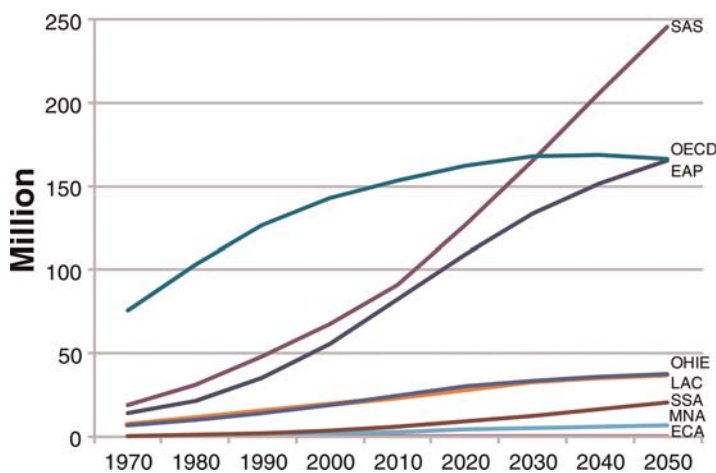
The latest UN urban population estimates suggest that, globally, urban population exceeded rural population for the first time in 2008 (UN 2008). In less developed regions, this threshold is expected to be reached by 2019. Although we can only speculate about the global distribution of disaster damage in cities today and in the future, newly available, geographically referenced data yield estimates of urban exposure to natural hazards. We prepared city-specific population projections for 1970 to 2050 and combined these with a comprehensive database of tropical cyclone and earthquake events during 1975–2007 (ISDR 2009; see World Bank 2009). Cities are included if their population exceeded 100,000 in a

given year. There were about 3,700 such cities in 2000. By 2050, there could be 6,400.

Population in large cities exposed to cyclones is estimated to increase from 310 to 680 million between 2000 and 2050. These estimates assume that cyclone frequencies, severity, and geographic distribution over this period will be similar to the 1975 to 2007 period. Climate change will likely affect sea surface temperature and other factors determining cyclone patterns, but the precise nature of these effects is still vigorously debated in the scientific literature, although a decrease in cyclone risk is unlikely. As seismic activity is more stable over time, these caveats do not apply for earthquakes. Our estimates suggest that urban population exposed in areas with a significant probability of a major earthquake increases from 370 million in 2000 to 870 million in 2050. In both cases, this increase in urban hazard exposure is likely not a net increase in total exposure (rural + urban) since some share of these additional urban residents will have come from hazard affected rural areas.

The largest anticipated urban population exposed to cyclones is in south Asia, where it is estimated that 246 million residents of large cities will be living in areas affected by severe storms by 2050 (Figure 1). OECD countries and the East Asia and Pacific region each will have about 160 million urban residents exposed to cyclones. South Asia also experiences the second largest growth in urban

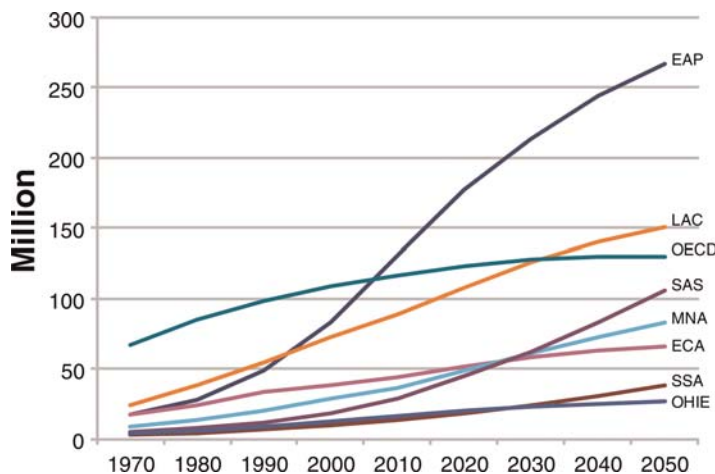
Figure 1. Population in Large Cities Exposed to Cyclones (1970–2050)



Notes: EAP = East Asia and Pacific, ECA = Europe and Central Asia, LAC = Latin America and Caribbean, MNA = Middle East and North Africa, OECD = Organisation for Economic Cooperation and Development, OHIE = Other High Income Economies, SAS = South Asia, SSA = Sub-Saharan Africa.

Source: World Bank (2009).

Figure 2. Population in Large Cities Exposed to Earthquakes (1970–2050)



Notes: EAP = East Asia and Pacific, ECA = Europe and Central Asia, LAC = Latin America and Caribbean, MNA = Middle East and North Africa, OECD = Organisation for Economic Cooperation and Development, OHIE = Other High Income Economies, SAS = South Asia, SSA = Sub-Saharan Africa.

Source: World Bank (2009).

cyclone exposure between 2000 and 2050 at about 2.6 percent per year. This is exceeded only by Sub-Saharan Africa's 3.5 percent, although that region's total exposure will remain relatively small at 21 million in 2050.

Urban exposure to earthquakes is expected to be largest in East Asia and the Pacific at 267 million in 2050 from 83 million in 2000 (Figure 2). Exposure is also high in Latin America and the Caribbean (150 million in 2050) and OECD countries (129 million in 2050). The fastest growth of urban earthquake exposure is expected to occur in South Asia (3.5 percent) followed by Sub-Saharan Africa (2.7 percent).

What applies to population, applies even more to economic assets and output. Cities are engines of growth and firms prefer to locate in urban centers with good access to labor markets, complementary inputs, and customers. Increasing returns and specialization raise productivity to levels not achievable in rural areas. Each urban unit of area therefore generates far greater output and hosts a larger stock of economic assets, public infrastructure, and private property. Estimates of GDP for cities are not widely available, except for a few countries and some of the larger world cities. These suggest that urban output per capita tends to be several times higher than in rural areas. Relative economic exposure to natural hazards will therefore be considerably higher in cities than in rural areas.

These exposure trends have profound implications for urban hazard risk profiles. With climate change, event probabilities may increase for hydro-meteorological

hazards. Vulnerability—the characteristics of exposed assets or people that make them more or less likely to be damaged by a hazard event—may also increase initially as fast urban growth leads to rising slum populations in sub-standard housing. But the main driver of hazard risk in urban areas today and over the next few decades will simply be the greater accumulation of exposure, likely exceeding the contribution of climate change by some margin (see for example ISDR 2009).

Some Factors May Reduce Urban Risk. Urban areas also have characteristics that mitigate hazard impacts. Firstly, urbanization tends to be associated with increasing incomes and better education. These generally reduce damages (Kahn 2005; ISDR 2009). Loss of life is much lower in rich countries. Economic damages tend to be larger, but when measured as a share of exposed wealth, they are smaller than in poor countries. Higher incomes reduce both dimensions of vulnerability. Damages will be lower because of better quality housing, higher affordability of mitigation, and better institutions that lead to enforcement of rules and regulations aimed at reducing impacts. And wealthier households have greater coping capacity, for instance, the means to rebuild damaged structures quickly. Secondly, there are scale economies in risk mitigation. For example, risk control measures benefit more people, enforcement of standards is cheaper, and the cost of first responder services is shared by a larger population. Finally, urban areas may be favored in risk reduction expenditures, since most decisionmakers and media reside in cities. Urban hazard impacts receive more attention and recovery efforts receive more resources. Whether, or to what extent, this “urban bias” exists is an interesting question for empirical evaluation.

Economic Geography Changes the Risk Equation

The defining characteristic of cities is the concentration of people and economic assets in a relatively small space. Globally, a conservative estimate of economic concentration or density suggests that half of worldwide GDP is produced in just 1.5 percent of the world’s land, almost all of it in cities (World Bank 2008). This area is home to about one-sixth of the world’s population.

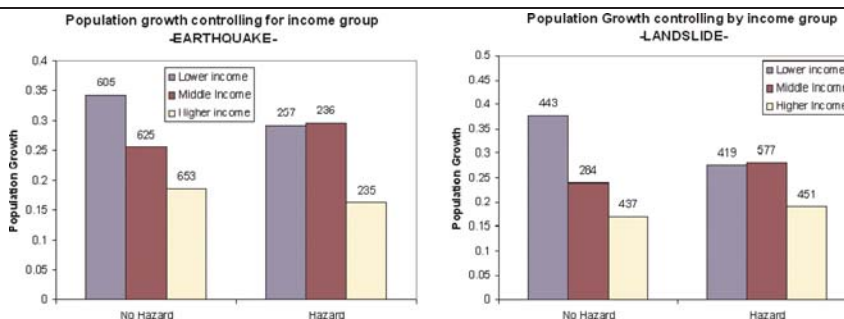
When cities function efficiently, they attract firms in industries and services that value agglomeration economies. In fact, these economies are the reason that cities exist (Duranton and Puga 2004). They can occur within a given sector, when firms in the same industry locate in a metropolitan area to enjoy access to specialized suppliers or expertise that could not be supported by lesser concentrations. Or they can occur across industries, as when firms from different industries benefit from collocating because the diversity of their skills and experiences encourages innovation. Agglomeration economies can be in consumption as well as production. Large cities attract residents because of generally better service

provision and a wider variety of restaurants, museums, and other forms of entertainment. Empirical research confirms that these economies are substantial. Average productivity increases by 4 to 20 percent with each doubling of metropolitan population, and these productivity effects are particularly pronounced in certain industries (Rosenthal and Strange 2004).

Agglomeration economies change how households and firms respond to natural hazard risk. Most hazards have relatively low probabilities. So cities in hazard zones remain attractive even if the consequences of a hazard event would be large. Well-known earthquake hotspots like San Francisco, Istanbul, or Tehran have not seen a decline in population. Even when the frequency of events is high, many cities have natural advantages or accumulated infrastructure that ensure their continued attraction. In the last 30 years, the resort city of Cancun in Mexico has been hit by a hurricane about once every three years, including four category 4 or 5 storms (ISDR 2009). This has not diminished its status as one of the most visited holiday destinations in North America. If cities deliver economies of scale and agglomeration, the stakes of being physically close to economic density will be high enough for people not to be deterred by hazard risk. Rather than move out, mitigation (for example retrofitting buildings) and risk transfer (for example insurance) will be the main responses to risk.

But if cities are inefficient—either due to weak institutions or bad policies—the economic gains from agglomeration will be low, making these locations less attractive to households and business owners. In those cases, hazard risk may further diminish growth prospects. A simple analysis of global cities suggests that population growth between 1960 and 2000 is slower in low income country cities at risk from earthquakes. Middle income and high income country cities do not exhibit any statistical differences in growth rates (Figure 3). Similar patterns are found for landslide risk.

Figure 3. Population Growth Rates for Cities with Populations Over 100,000, Combined with Hazard Distribution



Source: Authors' calculation based on Henderson (2003); Dilly and others (2005).

This section has summarized the broad patterns and trends that shape hazard risk in cities across the world. In the following section we will discuss how hazard risk in individual cities is reflected in real estate prices and how it shapes the distribution of urban population by income.

The Valuation and Distribution of Hazard Risk in Cities

Although hazard risk has a relatively small impact on city growth globally—other factors such as economic geography dominate—we expect that differences in risk within a city will have an impact. Evidence from empirical research is scarce but suggests that natural hazard risk is priced into property values if risk awareness is high. Much of the empirical evidence is based on estimation of hedonic models, where land and housing prices reflect the value of a property's physical characteristics such as size, and the characteristics of its neighborhood (Rosen 1974). The present value of a property is thus the capitalized sum of benefits derived from it, including the relative safety or risk level of its location.

Flood zone disclosure is mandatory in some areas of the United States, such as parts of North Carolina, so buyers are aware of flood risk before buying a property. Using a hedonic property price model, Bin, Brown Kruse and Landry (2008) find that the property market reflects geographic differentials in flood risk, reducing property values on average by 7.3 percent. This property price discount is about equal to the flood insurance premium for homes in the flood zone. Bin and Polasky (2004) examine the effect of Hurricane Floyd (September 1999) on property values in North Carolina. The storm affected 2 million people and damaged property worth \$6 billion. Most properties did not have flood insurance before the hurricane but the event increased the awareness of flood hazards and houses located on the floodplain faced a price reduction of 4 to 12 percent. These price reductions were about 8 percent higher than the capitalized value of insurance premiums, suggesting the existence of noninsurable costs associated with flooding.

In Istanbul property values in 2000 were found to be lower near the seismic fault lines in the Sea of Marmara compared to those further away (Onder, Dokmeci, and Keskin 2004). In contrast, proximity to the fault line had no impact on property values when data from 1995 were used for the analysis. Presumably information on distance from fault lines influenced property values as households became more conscious of hazard risk only after the Kocaeli earthquake in 1999. Awareness of the consequences, especially recent memory of a hazard event, therefore clearly influences housing market response.

New evidence for Bogota compiled for the World Bank–UN Assessment on the Economics of Disaster Risk Reduction confirms that risk levels influence home

prices (Atuesta and others forthcoming). Some 800,000 buildings in Bogota were matched on a range of characteristics such as size, construction quality, distance from the city center, and whether residential, commercial, or industrial. Because the only visible difference among comparable properties is their level of hazard risk, this allowed assessing whether property values are lower in riskier areas. In general, the analysis found that property prices rise with increasing distance to the city's areas of highest seismic risk, such as La Picota Oriental, San Juan Bautista, and La Arbolada Sur. For example properties in the riskiest decile are valued 7 to 10 percent less than similar properties in the next riskiest decile. At the extreme, comparable properties are on average twice as expensive in the areas that are furthest from places where earthquake impacts are predicted to be highest.

If risk is reflected in housing prices, then private investment in mitigation should also be capitalized into property values. In principle, home owners should be able to recover investments in mitigation, such as earthquake proofing structures, through increases in property prices. Evidence from Tokyo, Tehran, and Bogota confirms this. Nakagawa, Saito, and Yamaga (2007) use a 1998 hazard map of the Tokyo Metropolitan Area to examine the extent to which housing rents reflect earthquake risk as well as earthquake-resistant materials used in construction. The study exploits the fact that the building codes were amended in 1981 to enhance the earthquake-resistant quality of structures. Any building constructed after 1981 needed to conform to the new standard. The study finds that the rent of houses built prior to 1981 is discounted more substantially in risky areas than that of houses built after 1981.

In Tehran, Willis and Asgary (1997) interview real estate agents to examine the capitalization of investments in earthquake risk reduction on property values and assess if home buyers are willing to pay for improvements incorporated into a house. The estimates suggest significant price differences between earthquake-resistant and nonresistant houses, across all districts in the city. The adoption of such measures in Tehran is limited, however, which may be due to inadequate public information about earthquake risks as well as affordability.

More general evidence comes from an analysis of global office rents. Investors need to balance hazard risk with gains from economic density. Gomez-Ibañez and Ruiz Nuñez (2006) constructed a dataset of central business district office rents for 155 cities around the world in 2005 to identify cities where rents seem elevated or depressed by poor land use or infrastructure policies. The dataset also includes information on many factors that determine the supply and demand for central office space, such as construction wage rates, steel and cement prices, geographic constraints, metropolitan populations, and incomes. We combined this dataset with hazard risk information from a global assessment (Dilley and others 2005) and examined whether city demand—as reflected in office rents—is

sensitive to risk from natural hazards. The results from this analysis can only be considered as crude indicators of correlation, not precise magnitudes of causal relationships. Controlling for factors such as construction wage rates, vacancy rates, urban population numbers and density, as well as environmental quality factors, we find that being in an earthquake zone significantly lowers office rents. A measure of the magnitude of earthquake risk yields the same result. Similar regressions for floods and cyclones did not generate statistically significant correlations.

Changes in home prices in response to hazard risk are a manifestation of household's coping strategies. Households accept higher risk in return for lower housing costs. This trade-off is not always a free choice. Hollywood stars may choose to reside in the wildfire-prone hills surrounding Los Angeles to enjoy the stunning views. But poorer households may locate in undesirable areas that they can afford because alternative locations in safe but distant neighborhoods incur high commuting costs. This sorting of households is well-known in the environmental equity literature (see for example [Bowen 2002](#)). There is less formal evidence in the natural hazard context, and reliable identification of causes and impacts is difficult in both fields.

When facing risk from natural hazards, individuals can respond in three main ways: they can move out of harm's way; they can self-protect, for instance by retro-fitting their properties; or they can transfer risk to property, though not to life, where insurance markets function. Following Hurricane Andrew in 1992—one of the largest natural disasters to affect the United States—the economic status of households explained most of the differences in their responses ([Smith and others 2006](#)). As property prices in the worst affected areas fell the most, low income households responded by moving into low-rent housing offered in these locations. Middle income households moved away from such areas to avoid risk. And the wealthy, for whom insurance and self-protection are the most affordable, did not change where they lived.

In developing countries, urban risk profiles are further influenced by the strong divide between formal and informal land markets. While formal developments may respect land use regulations, informal settlements spring up on any parcel available, often in hazard prone locations that are consciously avoided by formal builders. In Dhaka, for example, informal settlements are scattered throughout the metropolitan area. Many of these slums are in locations at risk from flooding ([World Bank 2005](#)). In Bogotá, poor people face a disproportionately high burden of earthquake risk, as they sort into high density low rent properties, which are located in higher risk locations. On average the city's poor live in locations that have twice the seismic risk compared to where rich households are located.

A major reason why poor households in informal settlements are willing to accept substandard housing and higher risk is because they want to be physically

integrated in the urban labor market. Evidence from Pune, India, shows that poor households prefer to live close to their workplace in centrally located slums rather than in better quality housing at a city's outskirts (Lall, Lundberg, and Shalizi 2008). Many of these slums are located on riverbanks that are prone to flooding or on hillsides. Slum residents are also willing to pay a premium to live with households sharing their language, religion, education levels, and length of tenure in the neighborhood—community structure and social capital are important. An assessment of the welfare impact of relocating slum dwellers from their current location to places in a city's periphery shows that relative to no intervention (allowing slum dwellers to be in their current location, with the same service levels and housing conditions), upgrading services *in situ* is the only policy intervention examined which increases welfare of these slum dwellers. This has implications if relocation of low-income households out of hazardous areas is the only viable option. Communities should then ideally be resettled as a group to preserve social structures and with similar access to job opportunities, for example by providing affordable public transportation.

The challenges of informal development in hazardous locations are most severe when local governments have weak administrative capacity. This is often the case in expanding urban areas just outside the administrative city limits. In Dakar, Senegal, for example, the fastest population growth in the metropolitan region over the last 20 years happened in peri-urban areas. Forty percent of the population growth in these peri-urban areas occurred on high-risk land, a percentage almost twice that in rural and urban areas (Wang and others 2009). Why are peri-urban areas more vulnerable? These settlements are often unplanned due to a lack of development standards and land-use plans compounded by weak institutional structures. For instance, these essentially urban areas may still be governed by structures designed for rural administration. They therefore lack adequate infrastructure, have weak property rights, and may be located in areas initially avoided during early settlement because of environmental or hazard factors. Their attraction, as illustrated by the case of Dakar, is that they provide cheap and readily available land for a rapidly growing urban population. In many of the world's megacities, annual growth rates of population in peripheral urban areas are around 10 to 20 percent higher compared to areas near central business districts (Pelling 2003).

Implications for Public Policy

Hazard management is a task both for the public sector and for private households and firms. For the public sector, this includes ensuring the safety of municipal buildings and public urban infrastructure, encouraging and supporting

private sector hazard risk reduction, and developing first response capacity. A considerable share of hazard risk stems from relatively small but frequent events which cause localized damage and few injuries or deaths (Bull-Kamanga and others 2003). An analysis of detailed records of 126,000 hazard events in Latin America showed that more than 99 percent of reported events caused less than 50 deaths or 500 destroyed houses (ISDR 2009). In aggregate, these accounted for 16.3 percent of total hazard related mortality and 51.3 percent of housing damage. The probability of larger events may or may not be predictable. Some cities in earthquake zones have generated seismic maps (for example liquefaction hazard maps showing where soils may become unstable). But seismic dynamics are so complex that the precise areas within the city where damage will occur cannot usually be pinpointed precisely. Furthermore there is no simple engineering fix that would remove the hazard from a particular area. *Individual* dwelling, unit level mitigation is therefore necessary everywhere in the general area of high ground-shaking probability. For other hazard types, like landslides and floods, potential risk areas can be more easily delineated. Households in the risk zone have limited options for protecting against these hazards individually. But some form of large, *collective* risk mitigation is sometimes feasible, such as levees or slope stabilization measures.

The following paragraphs discuss the role of public policies in urban hazard risk reduction in three main areas: (1) Ensuring good, routine urban management, including smart land use management and collecting and disseminating comprehensive information about hazard risk; (2) carefully assessing the benefits of large-scale *collective* disaster reduction infrastructure; and (3) encouraging mitigation efforts at the *individual* level.

Urban Management

Urban hazard risk reduction begins with everyday city management. Many standard public functions that appear unrelated to hazard risk management can affect exposure or vulnerability to natural hazards.

Maintenance of Public Services. Natural disasters are the man-made consequences of geophysical hazard events. This applies for large as much as for small-scale hazards. But smaller disasters can be more easily avoided. Good, routine urban management already reduces hazard risk considerably. By mainstreaming hazard risk reduction in everyday urban planning and management, damages can be avoided early on. For instance floods in developing country cities are often the consequence of insufficient maintenance of drainage systems. In South Asia, monsoon rains often encounter drainage ditches that are used as garbage dumps, because regular refuse collection is insufficient. Drains lose their function to

transport runoff away from settlements. For example Mumbai spends about 1 billion rupees (\$25 million) per year on preparing for monsoon rains. Yet the 2005 monsoon caused 300 deaths.² Unchecked urban development that leaves too little porous green space further increases runoff and flood risk.

Smart Land Use Management. Land use planning is a core task of city government that shapes hazard risk. For risk reduction the main objective is to prevent development of hazard prone land. In fast growing cities land for new development is scarce. Poor people often cannot afford transport charges and need to locate close to city centers to have access to labor markets. They end up on the least desirable land, such as flood plains or steep and unstable slopes. To reduce settlement of these areas cities need to use a combination of regulation and incentives. Zoning enforcement must attempt to prevent settlement of the most risky areas. This is not easy since informal settlements can spring up overnight and once established are difficult to relocate.³ To absorb a growing population while excluding risk-prone areas, cities need to ensure a supply of suitable land for new development. As these areas will be further from economic opportunities, land development must be accompanied by affordable transport services.

Increase Supply of Formal Housing in Safe Areas. In many countries, excessive land regulations have led to shortages in formal land supply in safe areas and driven up prices. This makes it difficult for many households to enter the formal land market. One frequently used land-use regulation is restriction of building heights, which leads to inefficient use of the most desirable land. These limits are imposed via restrictions on a structure's floor-area ratio (FAR), which equals the total floor area in the building divided by the lot size. Throughout the world, zoning regulations usually specify maximum FAR values in different parts of a city. But these FAR limits typically do not represent severe constraints on development, as they often roughly match the developer's preferences in a given location. In effect, FAR restrictions often "follow the market," providing a way for city planners to ensure that the character of development does not diverge greatly from the norm. But not all cities adapt regulations with such flexibility. In Mumbai, for instance, planners went against the grain of markets (World Bank 2008). FARs were introduced in 1964 and set at 4.5. Rather than raising the allowable density over time to accommodate urban growth, planners in Mumbai went the other way, lowering the index to 1.3 in 1991. These regulations hold Mumbai's buildings to only between a fifth and a tenth of the number of floors allowed in major cities in other countries. The city's topography should exhibit a high-density pattern similar to that in Hong Kong, China, but it is instead mostly a low-rise city outside the central business district. Space consumption averages 4 square meters, one-third of the level in Shanghai and less than one-fifth of that in

Moscow. People still keep coming to Mumbai, but face skyrocketing housing prices and rapid slum formation.

Expand Property Rights. The literature on property rights provides three primary justifications for titling (Brasselle, Frédéric, and Jean-Philippe 2002). First, the “assurance effect” implies that a title will provide households with secure tenure which will increase the household’s incentives to invest in their dwelling (Jimenez 1984). Second, the “collateralization effect” infers the ability to use a property as collateral and thus gain access to credit markets, making upgrades more affordable (Feder and Nishio 1998). Third, the “realizability effect” lowers the transaction costs of transferring one’s property to others (Besley 1995). Willingness to invest in hazard mitigation will increase, if households expect to reap the long term benefits of greater safety and increased home values. In Madhya Pradesh, India, for instance, slum dwellers with titles spend about twice as much on home maintenance and upgrading housing quality compared to other slum dwellers (Lall, Suri, and Deichmann 2006). Property rights are also associated with a higher degree of community participation (Lanjouw and Levy 2002; Lall and others 2004). Community-based hazard risk reduction strategies may therefore more likely succeed in neighborhoods where tenure security is high. But realizing the benefits from titling programs faces numerous institutional constraints, as documented in the literature.

Provide Information. A core task of the urban public sector is the collection of information that is relevant to urban planning and management. This includes producing credible information on hazard risk and making it easily available to all stakeholders. Such information is often produced by private firms as well, but selective disclosure creates information asymmetries that put households at a disadvantage. Data on hazard probabilities and vulnerability of structures and people feed into comprehensive risk assessments. These are based on models that should be considered a public good—transparent and accessible to all.⁴ Such information allows residents to make informed location choices, enables markets to price hazard risk appropriately, encourages the emergence of private insurance markets, and serves as a sound basis for transparent zoning decisions and other land use regulations.

Hazard risk varies across space, so information on hazard event probabilities, exposure, and vulnerability needs to be collected and disseminated spatially. New technologies have made it easier and cheaper to collect geographic data. These include satellite images, with a resolution high enough to replace far more expensive air photos, and global positioning systems that facilitate field data collection. Easy-to-use geographic data browsers (such as Google Earth) make spatial data available to everyone. Most importantly, while hazard mapping has been

performed for many decades, new technologies allow constant updating of information at relatively low cost. Making these technologies accessible to cities—not only the largest, but also smaller and medium sized cities with limited local capacity—should be a priority for national governments and donors.

Institutionalize Urban Hazard Management. Risk management will be most effective if hazard related tasks are closely integrated with other urban management activities. Several cities have started to institutionalize hazard risk management within their local administrations. Table 1 provides a snapshot of policies from Bogotá, Metro Manila, Istanbul and Seoul. These examples illustrate that there are different models of hazard risk management and that experience varies across countries. A key ingredient is strong institutional capacity at the local level. Yet most developing country cities are severely resource and capacity constrained, while facing a backlog of public investment and continued population growth. These cities will need to invest billions of dollars in public infrastructure and services, as many of them will double in size over the next three decades. Mainstreaming risk reduction in urban planning and management will help to reduce risk, and at a lower cost compared to ex post mitigation.

This also raises the issue of organizing hazard management tasks across levels of government (see for example [Demeter, Aysa, and Erkan 2004](#)). As with decentralization more generally, the distribution of administrative, fiscal, and implementation functions will need to be adapted to the size and capacity of each country. Central government institutions provide the legal framework, coordination, and resources that are scarce at the local level, such as technical expertise and financing for large scale investments. Other tasks, especially for preparedness, will require strong local leadership and participation. In the Philippines, for instance, this happens through disaster coordinating councils at regional, provincial, and barangay (local authority) levels. These take advantage of what is most abundant locally: a large and relatively inexpensive labor force with detailed knowledge about local conditions. Institutionalizing the intergovernmental division of responsibilities is a complex task, but it is necessary for effective hazard management.

Costs and Benefits of Large-scale Collective Hazard Mitigation

Improving urban management to reduce hazard risk is something cities *must* do to support risk reduction. The decision to invest in larger protective infrastructure is more complex. For instance if parts of a city are at risk of flooding from river overflows or storm surges, large scale infrastructure investments in dams or levees can reduce that risk. Such investments raise several important questions.

Table 1. Policies and Experiences of Hazard Risk Management (Selected Cities)

| <i>City</i> | <i>No. of local governments under jurisdiction</i> | <i>Legislation for hazard risk management (DRM)</i> | <i>Key elements of hazard risk management</i> | <i>Stakeholder involvement</i> | <i>Experience</i> |
|------------------|--|---|--|---|--|
| Bogotá, Colombia | 20 localities | Established in 1987, DRM is governed by the District System for Emergency Prevention and Attention. | <ul style="list-style-type: none"> • A national plan for prevention and attention of disasters has been prepared which was incorporated in the territorial and land-use plans for Bogotá Metropolitan area in 1998. • In 1995, a resettlement plan was initiated for informal settlements residing in high-risk zones to relocate households to safer areas. | Strategic alliances between institutions, academia and private enterprises. | The city has made concerted efforts to ensure households avoid locating in precarious areas. However, efforts are weak in adjacent municipalities like Soacha, where technical capacities are limited. |
| Istanbul, Turkey | n.a. | Since 1999, legal reforms in the country provided metropolitan cities greater jurisdictional authority over land and buildings. | <ul style="list-style-type: none"> • Metropolitan Municipality of Istanbul established AKOM, a 24/7 state of the art disaster coordination system. • Municipalities increased authority over building construction supervision and compulsory earthquake insurance laws. | n.a. | The city needs to strengthen enforcement of norms and standards, and improve involvement of local governments. |

| | | | | | |
|---------------------------|----------------------------------|--|---|--|-----------------------------|
| Metro Manila, Philippines | 17 local government units (LGUs) | Apex Organization: Metro Manila Disaster Coordinating Council. All LGUs have their own disaster coordinating councils. | Each LGU prepares its own comprehensive land use plan which is submitted to the Housing and Land use Regulation Board for ratification. | n.a. | DRM is focused on response. |
| Seoul, South Korea | 25 self-governing districts | 2001 Comprehensive Earthquake Prevention Plan. | Requires existing buildings to be tested against seismic activity based on earthquake resistant design standards from 1999 to 2005. | 2001 action plan involving Seoul Red Cross and incorporates a public-private partnership for local earthquake management plan. | n.a. |

Note: n.a. Not applicable.

Source: (www.emi-megacities.org/megaknow).

Do the Benefits Justify the Costs?. Investments in large scale infrastructure compete with other demands for scarce resources in developing country cities. The cost–benefit calculation largely depends on the value of land. In dynamically growing cities, where land is scarce, large scale investments to make land habitable or reduce significant risk may well be justified. An analogy is the large scale land reclamation in cities such as Hong Kong, Singapore, or around the urban core of the Netherlands. Limited alternative expansion options in the vicinity of high economic density raise the value of land significantly. This shifts the cost–benefit ratio in favor of large protective investments. A strict test is whether a developer would, in principle, be willing to pay a price for the reclaimed or protected land that reflects the cost of the intervention.

The viability of large scale disaster mitigation infrastructure will be very different in cities with a stagnant economy and little or no population growth. Declining cities are a phenomenon of mature economies and transition economies, such as former socialist countries with demographic decline or strong geographic shifts in economic and population centers (Pallagst 2008). Examples are found in Central and Eastern Europe but also parts of Scandinavia and the Mediterranean, as well as the old industrial core of the U.S. Midwest. Over time, given demographic trends in many middle income countries, “shrinking cities” may also occur in some of today’s emerging economies, for instance in East Asia.

The best known example in a natural disaster context is New Orleans. Public investments in the wake of Hurricane Katrina in 2005 have sparked a vigorous debate on the role of large scale protective investments to encourage the rebuilding of New Orleans within the pre-Katrina city limits. It is estimated that \$200 billion of federal money will be used to rebuild the city. Some have provocatively suggested providing residents in the city’s flood-prone neighborhoods with checks or vouchers instead, and letting them make their own decisions about how to spend that money—including the decision about whether to relocate (Glaeser 2005). The choice is between spending \$200 billion on infrastructure versus giving each resident a check for more than \$200,000—in a place where annual per capita income is less than \$20,000. From an urban economics perspective, it may not be the best use of scarce funds to invest in rebuilding large scale protective infrastructure in New Orleans, a city in decline that reached its peak of economic importance in 1840.⁵ The calculation for a dynamically growing city may be very different.

Are there Adverse Impacts on Poor Population Groups?. Large scale protective infrastructure turns undesirable land—often the only space available for the poor—into coveted real estate. Development of this land may well displace poor residents who will have no place to go but other risk-prone parts of a city or places that are far from economic opportunity. These displacements need to be anticipated by

requiring set-asides for low income households, designing proper compensation mechanisms, socially responsible resettlement schemes, or alternative housing options with good accessibility to jobs and services. Planning protective infrastructure must therefore be embedded in broader urban development planning. The costs of mitigating distributional impacts need to be considered in the overall cost–benefit analysis. This may shift the balance in favor of smaller scale risk reduction strategies such as early warning or mitigation at the individual level.

Will the Investment Be Climate-proof?. Engineering designs for hazard resistant structures typically follow a standardized risk based approach. For instance according to the American Society of Civil Engineers, in the United States major dams are designed so that the probability of a failure causing more than a thousand fatalities is less than once every 100,000 to 1 million years. Estimating these risks is difficult, especially where the geophysical baseline information is limited. Furthermore the level of risk may not be static. With climate change, floods, or storm surges return periods may shorten considerably during the life span of long-lived infrastructure. What was once a 1 in a 500-year event (or a 1 in 10 chance every 50 years), may become a 1 in a 250 or a 1 in a 100-year event. Making structures climate resilient requires designs with a high margin of safety. Storm surge protection in the Netherlands is designed to withstand events with a 10,000-year return period. This increases costs. But the alternative is to face higher than expected risks after protective investments have increased exposure by encouraging people and firms to move into harm's way.

Do Alternative Mitigation Strategies Exist?. Some hazard risk is made more severe by human interference in natural systems in the vicinity of urban areas. Increased urban flooding—for instance in South and Southeast Asia—is often attributed to deforestation in upper watersheds. But many scientists believe that the conversion of wetlands to urban use has contributed, perhaps more significantly than was thought, to more frequent floods (Bonell and Bruijnzeel 2004). Draining wetlands reduces the absorption capacity of soils, removing the natural buffer function of these areas. Compared to costly flood control infrastructure, restoring the ability of the land to regulate water flow may be a more cost effective risk reduction strategy with additional ecological benefits.

Large scale protective infrastructure will sometimes be justified on economic grounds where land is scarce and valuable, financial resources are available, no lower cost options exist, and environmental and social impacts can be minimized. But, as the discussion in the previous paragraphs showed, the bar must be set fairly high.

Encouraging Individual Level Risk Mitigation

As discussed earlier, the evidence from hedonic analysis suggests that a hazardous location and vulnerable building quality reduce housing prices. Yet, even in high-risk cities and neighborhoods, individual level mitigation efforts are often scarce.⁶ Economic and behavioral reasons provide some possible explanations.

Why do individuals often not invest in hazard mitigation? Limited mitigation in private buildings may be related to home ownership in cities. In rural areas, most people live in dwelling units owned by the household. The person responsible for the strength of the structure is also the person bearing the consequences if the structure fails. In urban areas, many multiunit apartment buildings are owned by landlords who do not live in them, so the person responsible for the structural integrity of the building is not at major risk of being injured or killed when the structure collapses. The relationship between landlords and tenants (that is renters) of residential buildings in urban areas exhibits the properties of the well-known *principal-agent* (PA) problem in information economics.⁷ Not only are the objective functions of the two parties different from each other, but their information sets are likely very different as well.

For a nonresident landlord, the consequences of poor construction or lack of retrofitting are related primarily to physical damage to the building. The potential cost of human life or destruction of tenants' property may not be incorporated fully in the landlord's investment decision, especially when criminal prosecution for negligence in construction or maintenance is unlikely. Traditional cost-benefit analysis for retrofitting investment which does not incorporate the expected loss of tenants' lives shows that potential building damage alone is typically not sufficient to justify investment on the part of building owners (Ghesquiere, Jamin, and Mahul 2006).

An expectation of government aid in the event of a natural disaster further dampens the perceived benefits of retrofitting for the landlord (OECD 2004). Studies have also shown that house owners may be making decisions based not on an expected utility model but rather using simplified heuristics that do not fully incorporate the probability of disaster, even when it is perfectly observed (Kunreuther and Kleffner 1992). Finally there is often a high level of mistrust between home owners and contractors, who may provide substandard building services. Without independent assessment as to whether a retrofitting solution is adequate and cost-effective, landlords may not want to risk scarce capital.

In many developing countries, building code design, regulation, and enforcement are inadequate, if they exist at all. This lack of regulation, often exacerbated by widespread corruption (see for example Escaleras, Anbarci, and Register

2007), diminishes the potential legal consequences for the landlord, while making it harder for tenants to pursue legal action. Disasters are often seen as “acts of God,” and only gross negligence is prosecuted. In countries where legal institutions are weak, prosecution in any instance may not be feasible (Jain 2005).

On the other hand, the benefits from retrofitting may be high for those tenants who expect to occupy the building long-term—for instance, where rent control makes staying very attractive or where housing markets are illiquid and prices are high relative to rents. Why do long-term tenants then not directly finance, or otherwise initiate, retrofitting in their places of residence? The simplest explanation is that individuals are not fully aware of hazard risk, which is a function both of the probability of a hazard event such as an earthquake and of the vulnerability of their dwelling units. This risk can vary significantly even within a given neighborhood of an earthquake-prone city (Nakagawa, Saito, and Yamaga 2007). The behavioral economics literature also shows that, especially for rare events like large-scale earthquakes, probabilities are often not accurately assessed. Individuals adhere to a “selective fatalism,” choosing to downscale the importance or likelihood of events over which they perceive having little or no control (Sunstein 1998).

Since infrastructure investment for risk mitigation is likely to accrue benefits only in the long term on average, individuals’ subjective discount rates over time also play a potentially important role in evaluating the costs and benefits of such investment (Kenny 2009). Because of the multitude of risks often faced by individuals in resource-poor countries—such as higher mortality from disease or traffic accidents—discount rates may be higher than in industrialized countries, thus creating a high opportunity cost of investments that yield payoffs only in the long run or not at all.

But even where the risk is generally known, there are a number of possible reasons for tenants’ complacency. First, financial constraints, including low liquidity and low access to credit, can be significant barriers to investment. Access to credit is particularly low where owner-residents or landlords have only *de facto*, not *de jure*, tenancy, so they cannot use their dwelling as collateral. Second, tenants often do not have the legal authority to make changes to their building’s structure. Third, appropriate retrofitting procedures involve structural changes to the entire residential structure, not to individual apartments. Anbarci, Escaleras, and Register (2005) show that collective action problems, like the decision of a building’s tenants to invest in retrofitting, are exacerbated by inequality: heterogeneous agents bargaining for collective action may not be able to agree on an adequate distribution of costs, inducing a noncooperative equilibrium in which each individual self-insures or does not insure at all.

Policies to Increase Private Mitigation Efforts. Strengthening building codes and effective enforcement have reduced the number of vulnerable dwelling units in countries such as Japan or the United States. Hazard insurance further protects against some of the consequences of a disaster.⁸ But high insurance coverage can also reduce the incentive to implement loss reduction measures (Kunreuther and Kleffner 1992). Insurance covers the loss of property, but earthquakes and other hazards can also cause high mortality. Governments therefore frequently mandate the implementation of cost-effective mitigation. Insurance premiums should then reflect the lower risk. But in environments with weak institutions and enforcement, regulation by itself is not sufficient, and insurance is typically unavailable in poorer countries because of limited affordability as well as inadequate information about hazard probabilities and vulnerability.

Appropriate policies to increase sensible mitigation measures in cities with weak institutions should try to align the objectives and information sets of tenants and landlords. Using the principal–agent framework, policies will differ in the degree of government intervention in markets. The least interventionist policy is information disclosure to both tenants and landlords. This information has two components: hazard probability and building vulnerability. First, in the context of earthquake risk, for instance, tenants must be made aware of the risks of living in buildings close to active fault lines and on vulnerable soils. This requires investment in geological surveys and seismic monitoring technology and dissemination of the resulting information as a public good.

The assessment of building quality is more complex. This requires an engineering assessment of each structure. This is costly, so the question is whether the landlord, who will likely pass on the cost to tenants, or the government should cover the cost. A compromise is where an initial public engineering inspection yields a simple vulnerability score. If the score is above a certain threshold, the building owner is required to obtain a more thorough inspection that proves the building's integrity.⁹ Improved information could also mitigate the problem of selective fatalism discussed earlier. It will help tenants make the link between housing choice and hazard risk. Since price is often the most easily processed signal of underlying quality, public disclosure of idiosyncratic earthquake risk could generate a rental market with an informative price gradient (Brookshire and others 1985).

With better information landlords may also revise their cost–benefit calculations. A landlord's decision not to act on the improved information could generate a social cost on such negligence in the form of public shaming. This added cost could tip the balance in favor of mitigation investments. Such strategies have been implemented successfully in the control of industrial pollution through public disclosure of emission levels of firms using a simple rating system

(Wheeler 2000). The driving forces behind these efforts have been national environmental agencies as well as non-governmental organizations.

Another important source of inefficiency through PA interaction is informational asymmetry. Landlords will often have more information than their tenants about hazard risk and building safety. Landlords have little incentive to reveal this information to tenants. Policy intervention in this case should be aimed at reducing the extent of asymmetry by making the same information available to both parties. One possibility is to introduce monitoring agreements into rental contracts, although the effectiveness of such agreements would need to be proven in practice. Risk information disclosed through these agreements enables potential tenants to judge the extent of retrofitting or sound construction accurately. Mandating such agreements would exert pressure on landlords, through the market mechanism, to engage in retrofitting investment. The cost of monitoring—hiring trained engineers to survey and test the construction of buildings—can be borne by some combination of the government, landlords, and tenants. The success of this approach will critically depend on avoiding rent seeking by monitors.

Finally, another strategy is direct support to landlords to engage in retrofitting investment, for instance in the form of subsidized credit or tax breaks, or direct penalties for not doing so. This policy involves significantly more government intervention. The economic literature on optimal contracting methods for different types of principal–agent interaction can provide some guidance. For example Hiriart and Martimort (2006) show that in the context of regulation of environmentally risky firms, mandating an extension of liability for environmental risk to stakeholders (principals) in endogenously formed contracts can be welfare-improving for both parties. The concept of extended liability could potentially be adapted to the landlord–tenant relationship in the disaster mitigation case: if landlords were held liable for the avoidable consequences of hazard events that affect their tenants, their cost–benefit calculations would likely change dramatically.

Gawande and Bohara (2005), who examine law enforcement of oil spills involving U.S. flag tank vessels, find that the optimal contract is a mixture of ex ante incentives and ex post penalties. This carrot-and-stick brand of contracting could be beneficial in the disaster mitigation case as well. Giving landlords monetary incentives to retrofit, and threatening penalties in the case when they have not, could be an effective combination.

Using incentives or penalties to align retrofitting objectives may be most appropriate for the construction of new urban residential buildings in fast growing cities. There are significant opportunities to influence construction quality and avoid past mistakes. Some form of direct support, paired with public disclosure agreements of the sort discussed above, could provide significant incentives to

landlords to construct buildings capable of withstanding hazard impacts. As with all types of subsidies for hazard risk reduction, however, these need to be carefully designed to avoid moral hazard that can reduce incentives for autonomous risk reduction efforts or encourage building in areas of clearly delineated high risk—as is often the case with subsidized risk transfer, such as flood insurance.

Summary

Natural hazard risk in urban areas is large and increasing. It is largely driven by rising exposure of population and assets and may increase further with climate change. Even in the most hazard-prone cities, disaster risk is unlikely to reduce population growth, because the economic premium from agglomeration economies and the amenity value of large cities dominate the location decisions of firms and people (World Bank 2008). So eliminating risk by avoiding cities in hazard zones is not usually an option. Instead urban hazard risk needs to be managed and reduced to the extent possible. Our discussion of economic aspects of urban hazard risk leads to three main implications.

All Cities Are Not Equal

First, the cope-mitigate-transfer framework of risk management (Ehrlich and Becker 1972) can also guide policies for different types and sizes of cities. Reducing urban hazard risk through large scale mitigation measures must carefully consider urban dynamics: it will often be justified in rapidly urbanizing places that are attracting skilled workers and private investment, where land is scarce and fiscal capacity is sufficient; but it is unlikely to have sufficient benefits in stagnating or declining cities. This applies to ex ante investments as much as to the decision to rebuild. Sometimes, rather than “build back better” (see for example Kennedy and others 2008), the preferred strategy is “better build elsewhere.”

This yields a simple typology (table 2). For the largest and most dynamic cities we expect that the benefits from agglomeration economies outweigh greater risk, especially when the probabilities are relatively small for any reasonable time period (as in the case of earthquake risk). Risk mitigation (for example retrofitting buildings) and risk transfer (for example insurance) will be the main responses, especially where credible information on risk is available. In secondary or intermediate cities, people are more likely to move to more dynamic cities or to invest in mitigation. Insurance is less likely to be an option because persistent information failures and smaller size mean that there is no transparent and large enough market. For small, stagnant, or declining cities, moving, coping, or

Table 2. Typology of Cities

| <i>City type</i> | <i>Cope or move</i> | <i>Mitigate</i> | <i>Transfer risk or insure</i> |
|--|---------------------|---------------------------|--------------------------------------|
| Advanced urbanizers “superstars” | X | ✓ | ✓ |
| Secondary or intermediate cities | ✓ | ✓ | X(information failures, market size) |
| Market towns or incipient urbanization | ✓ | X (costs exceed benefits) | X |

low-cost locally initiated mitigation efforts may be the main response. Significant investment in large scale collective mitigation is unlikely to be cost effective and insurance markets will not extend to the smallest towns.

Quality of Urban Management Is Key

The second major conclusion is that hazard risk reduction in cities requires, first and foremost, good general urban management. It needs to be seen as an integral part of urban planning and management, not as a separate activity. Urban disasters are frequently the consequence of poor urban management. Three aspects are particularly important: Most importantly, hazard proofing new urban infrastructure should be standard procedure, but is frequently ignored. This includes adherence to structural engineering standards for public buildings, but also sizing of drainage systems for peak events or developing steeply sloped land without increasing the probability of landslides.

Secondly, maintenance of infrastructure and good basic service provision reduce the impacts of hazard events and prevent further indirect damages.¹⁰ Poor service delivery not only has adverse direct effects on household welfare, it can also convert everyday hazards into disasters (Bull-Kamanga and others 2003). For instance where drainage networks are poorly maintained, even moderate floods can cause deaths from waterborne diseases and cross-contamination between water and sewer lines. Where roads on steep terrain are not kept in good condition, they can increase erosion and landslide risk. These “institutional” efforts to achieve minimum standards in service delivery should form the bedrock of hazard risk reduction strategies.

Finally, land use management, in particular zoning, needs to prevent the settlement of the most hazardous areas. Poor people often bear a disproportionate burden of hazard risk because land scarcity forces them to “sort” into informal settlements or low rent dwellings in hazard prone areas such as flood plains or steeply sloped land. For instance in New Orleans: “After [Hurricane] Betsy [in 1965] highlighted the differentials of flood risk, the middle classes moved away

from the eastern part of the city and the lowest lying districts became increasingly unimproved rental properties—the preserve of low income and elderly residents” (Muir-Wood 2008). While enforcement of zoning laws may limit development in hazardous locations, it can cut poor people off from labor market opportunities by forcing them onto cheaper land far from the city center. Complementary demand side policies, such as reforming land use regulations for higher density growth, rent vouchers, or improving access to housing finance, can help informal sector residents move into better quality dwellings. Investments in affordable transport integrate lower-cost residential areas and expand a city’s economic reach—creating a larger integrated labor market. With good transport services, households do not need to locate in informal settlements in hazard-prone parts of the city. Local governments must develop the capacity to balance the need for flexible land use management with enforcement of zoning and building standards.

Credible Risk-related Information Must Be a Priority

Generating and disseminating hazard information is perhaps the least distortionary urban hazard management policy. Where credible information on the distribution of geophysical hazard risk and the vulnerability of structures exists, empirical evidence suggests that hazard risk is capitalized into prices for residential properties and office space. Informed residents can choose between moving to less risky locations, investing in mitigation *in situ*, or transferring risk through insurance where available. In fact credible and public information provides a basis for the emergence of efficient private insurance markets. Where risk assessments are generated by the insurer and not disclosed, information asymmetries put residents at a disadvantage. Finally, public risk information serves as a sound basis for transparent and least distortionary zoning decisions and other land use restrictions. Unfortunately encouraging data sharing, even when data generation was funded with public resources, is not a trivial task. Public agencies often see data as a strategic or marketable asset rather than as a public good whose wide and inexpensive distribution increases overall welfare.

Public policies should facilitate the development of market based instruments for the better managing of hazard risk, provide the right regulatory environment, and selectively intervene where clearly defined social and environmental externalities exist. Common institutions that allocate property rights, manage land use, monitor zoning compliance, and disseminate credible information on hazard risk are the most important instruments for balancing gains from economic density with risk from natural hazards. As many cities in developing countries will double in size over the next few decades, there is an opportunity to manage this growth to minimize hazard risk. This will challenge management capacity at all

levels of government—from urban development ministries to small town mayors. But the payoffs in saved lives and avoided damages will be high.

Notes

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1. Vulnerability in this definition includes factors that affect the likelihood of damages during the event and factors that allow communities to recover from those impacts (coping capacity). While both aspects of vulnerability are important, this paper focuses mainly on ex ante risk reduction, for instance measures that reduce the vulnerability of buildings to damages from earthquakes or wind storms. The second aspect is most relevant for post-disaster response and recovery and includes policies such as first responder services, cash transfer programs, and strengthening social insurance and social protection (see Vakis 2006). Note that a more comprehensive social risk management framework has been the basis for the World Bank's social protection portfolio (World Bank 2001). While not specific to urban disaster risk, many of its elements have become integral to natural hazard risk reduction efforts.

2. (http://uk.reuters.com/article/homepageCrisis/idUKBOM301508.CH_242020080528).

3. To prevent settlement of steep lands in Bogotá, the city government establishes communal facilities in those areas, such as public parks or cemeteries. Local residents then ensure that no encroachment occurs, as they benefit from these amenities (Francis Ghesquieres, personal communication).

4. Risk modeling companies typically use proprietary models and require nondisclosure agreements with licensees (Murnane 2007).

5. The Civil War and the relative decline of water-based transportation relative to rail caused the city to lose ground, relative to northern cities, through much of the nineteenth century. New Orleans's population peaked at 627,000 residents in 1960 and began to decline following Hurricane Betsy in 1965 to 485,000 residents in 2000 (Glaeser 2005).

6. Richard Sharpe (Earthquake Engineering New Zealand) reported on evidence from Istanbul that many areas with the highest potential ground acceleration in the likely event of a future earthquake are occupied by five-floor apartment buildings. Inspection of a sample of these buildings suggests that most would not be able to withstand a major earthquake (51 percent were at high risk, 28 percent at very high risk). Building collapse will likely lead to high mortality. Yet, structural retrofitting of these buildings is extremely rare, at costs of external retrofitting solutions of 19 percent of reconstruction costs (Sharpe 2008).

7. See for example Laffont and Martimort (2002); the discussion of the principal–agent problem is based on Adhvaryu and Deichmann (2009).

8. We do not cover insurance issues in detail in this paper, because there are relatively few aspects that are specific to urban settings. World Bank (2010) provides a general overview of the economics of hazard insurance.

9. New Zealand, a country with high seismic activity, uses this approach.

10. The poor record on infrastructure maintenance has been highlighted by [Estache and Fay \(2007\)](#), among others. At 4 percent of GDP, estimates of required maintenance expenditures equal those required for new infrastructure investment.

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Coping with Crises: Policies to Protect Employment and Earnings

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The continuing failure of many countries to adequately mitigate the adverse labor market impacts of economic downturns is of concern, since labor market volatility can exacerbate poverty and stunt growth. This article aims to identify potentially effective policy responses to crises by navigating the potential tradeoffs between offsetting adverse short-term impacts of economic downturns on the quantity and quality of jobs, and preserving incentives for economic recovery. The authors propose a taxonomy that categorizes interventions depending on whether they mitigate the negative short-term impact of crises or whether they stimulate recovery. The taxonomy helps policymakers to identify “win–win” policies that avoid potential tradeoffs between these objectives by simultaneously serving both. Common elements of effective interventions are feasibility, flexibility (for example the capacity for scaling up and down), and incentive compatibility—and there is no substitute for being prepared. Having sound safety nets in place before a crisis is superior to haphazardly implementing responses after a crisis hits. JEL codes: E24, I38, E61, D9, J02

Although economic crises are difficult to predict, their recurrence is a salient feature of emerging and developing economies. Nevertheless, many countries continue to lack an effective policy infrastructure that can mitigate the impacts of economic downturns on workers and their families while fostering recovery and long-run growth. This was painfully highlighted by the quest for quick responses to the global downturn of 2008–09 and by the ad hoc and reactive nature of many of the policies implemented.

The weak ability of governments to systematically foresee, monitor, and contain the adverse labor market impacts of crises is of particular concern. The labor market is a prime channel through which shocks are transmitted to households,

and even temporary deteriorations in employment opportunities can leave lasting scars on human capital accumulation, household welfare, and future labor productivity. Moreover, the share of aggregate income that goes to labor tends to fall precipitously during crises and recovers only slowly and partially (Diwan 2001) so that early signs of recovery in indicators such as GDP growth may obscure protracted pain in the labor market (Agenor 2002; Reinhardt and Rogoff 2009). This concern is especially relevant for developing countries where poverty incidence is high, labor is typically the only asset for the majority of the population, and where economic shocks can be particularly pernicious for the poor (Lustig 2000). In addition, the ability of developing country governments to respond quickly and effectively to shocks is often limited by poor governance, weak institutional capacity, and by widespread market imperfections (see for example Fields 2007).

The main objective of this paper is to guide policymakers through the challenges inherent in crafting effective packages to limit earnings volatility and maximize household welfare in the presence of these imperfections and constraints. The focus is on navigating tradeoffs between offsetting adverse short-term impacts and preserving incentives for economic recovery and future growth. We review the effectiveness of policies commonly enacted in response to crisis using a taxonomy that classifies policy interventions depending on whether (i) their most immediate objective is to contain the impact of the shock or to accelerate recovery and (ii) they are designed to protect firms and employment (that is, the demand side) or workers and earnings (that is, the supply side). This classification highlights the potential tradeoff between mitigating short-term impacts and maximizing long-term efficiency. It also helps to identify potential win–win policies that avoid this tradeoff.

The paper contributes to the literature by reviewing evidence on the effectiveness of labor market and social protection policies commonly used during times of crisis, and by highlighting the importance of intertemporal tradeoffs. The synthesis is useful since the empirical evidence on the effectiveness of these policies in times of crisis is surprisingly sparse and scattered. Moreover most of the evidence focuses only on interventions that protect workers' earnings and often neglects those designed to maintain firms' productivity and employment. Finally the paper highlights the crucial role of country-specific and crisis-specific characteristics—such as available fiscal space, dominant labor market transmission mechanisms, administrative capacity, and political economy conditions—in determining the elements of an effective policy package.

The remainder of the paper is organized as follows. The next section presents the economic rationale for government intervention during times of crisis by reviewing evidence on how households and firms may otherwise respond to shocks with unnecessarily costly adjustments. We then propose a policy taxonomy which (i) highlights intertemporal tradeoffs between providing short-term

protection and maximizing long-run welfare and (ii) assesses the evidence on the effectiveness of commonly used interventions under each of the proposed categories. Following this we discuss how country and crisis-specificity determine which policy packages are optimal.

The Need for Policy Interventions

The main challenge for policymakers during crises is to implement a set of policies that maximize long-run household welfare whilst minimizing short-run negative impacts (Lustig 2000; Holzmann and Jorgensen 2001; Skoufias 2003). Although the reduction in aggregate income that is a defining feature of crises is inevitably painful (Kanbur 2009), the rationale for policy intervention depends on whether or not the adjustments made by households and firms in response to shocks are consistent with intertemporal optimization of household welfare and growth prospects. If they are, interventions to offset short-term shocks can backfire in the long run, as they may interfere with the necessary adjustment process, although it may be desirable to smooth the burden of adjustment over time. If they are not, short-term interventions are not only fully consistent with maximizing long-run household welfare, they are actually necessary to prevent long-run efficiency costs.

Whether or not crisis-related adjustments are efficiency-enhancing depends crucially on the pre-existence of market imperfections and failures. This section provides a detailed discussion of the implications of how the common occurrence of market imperfections in developing countries reduces the scope for efficient adjustment by households and firms. It also describes the negative long-term impacts of inefficient responses on the quality of labor supply (through its impacts on human capital accumulation) and on the quantity of labor demand (through its impact on firm survival and growth).

Adjustment by Households: Long-Term Consequences of Short-Term Crises

Experience from previous crises suggests that in the presence of market imperfections, even short-term crisis-induced reductions in earnings may force households into actions that are detrimental to their long-run welfare and can seriously undermine the quality of labor supply in the long run. Such actions include reducing investments in physical and human capital, depleting productive assets, and reducing essential consumption.

Confronted with economic stress, households tend to cut back on investments in education. They are especially likely to do so if they are poor or credit constrained (Ferreira and Schady 2009). In Indonesia, for example, the 1997

economic crisis was associated with significant declines in school enrolment among the poorest, particularly in rural areas where the percentage of 7–12-year-olds not enrolled in school doubled from 6 to 12 percent (Thomas and others 2004). However, the impact of crises on schooling outcomes need not necessarily be negative on average, as during crises the opportunity cost of children staying in school diminishes due to reductions in wages and deteriorating employment prospects (De Ferranti and others 2000). During the 1987–90 Peruvian crisis school enrolment rates rose on average, despite a drop in public spending on schooling by almost 50 percent (Schady 2004). Similarly, overall, secondary school attendance rates increased in response to the crisis in Argentina (Lopez Boo 2008).

Poor households may also spend less on health and nutrition and be forced to cut back on calorie intake, leading to weight loss and acute malnutrition. For example, estimates suggest that the 1988–92 Peruvian crisis led to 17,000 additional infant deaths (Paxson and Schady 2005), and that the 1997–98 financial crisis in Indonesia increased infant mortality by over 3 percentage points. Under-5-year-old mortality in Cameroon went from 126 per 1,000 in 1991 to 152 per 1,000 in the 1998 economic downturn, and mortality rates for the very young and the elderly increased (or declined less rapidly) during the Mexican crises (Cutler and others 2002).

Crises may also interrupt on-the-job human capital accumulation and destroy firm–worker specific human capital gains. Microeconomic studies of job loss show significant downstream effects on individuals' employment trajectories. Loss of a long-term job leads to periods of episodic employment, job search or time out of the labor market, and lower lifetime earnings (Hall 1995). These effects can be especially severe for those laid off during recessions (see, for example, Verho 2008). Finally, with limited or no access to insurance and credit, households may have no choice but to sell productive assets (for example livestock or household enterprise inventories), thereby sacrificing future income. Even if asset sales are able to soften the blow to consumption in the short term, physical capital losses jeopardize households' long-run earnings. In addition, the increased uncertainty that typically accompanies crises can cause households to forsake profitable opportunities for safer ones that have a lower but steadier return. A more detailed review of the literature on the impact of risk and shocks on household decision-making in developing countries is provided in Fafchamps (2003) and Dercon (2001).

Thus, in the presence of market imperfections, household responses to short-lived shocks can have long-run negative consequences on the future quality of labor. These consequences are often especially severe for the poor, who lack the capacity to cope with such shocks.

Adjustment by Firms: “Cleansing” or “Scarring”?

The long-term impact of economic downturns on aggregate efficiency in general and firm adjustment in particular is the subject of a lively debate. In the absence of market imperfections, adjustments undertaken by firms will be efficiency-enhancing in the long run. This observation forms the basis for the “cleansing” hypothesis: the idea that crises may accelerate the [Schumpeterian \(1939\)](#) process of creative destruction by weeding out unproductive arrangements and freeing up resources for more productive uses. This view features prominently in a host of macromodels (see for example [Caballero and Hammour 1994, 1999](#); [Hall 1995](#); and [Gomes, Greenwood, and Rebelo 1997](#)). While there are many mechanisms through which the “cleansing” effect can materialize, the basic insight is that the additional competitive pressure caused by crises facilitates efficiency-enhancing reallocation. For example, firms may be able to attract more highly skilled workers as the number of applicants rises or, conversely, they will fire the least productive employees. Banks may allocate credit more efficiently as a result of increased scrutiny; labor unions may be more willing to accept employment losses or wage cuts. These models do not predict that crises will enhance aggregate welfare or claim they are inherently desirable. Rather they suggest that, by improving the efficiency of resource allocation, they may have a silver lining.

However, in the presence of market imperfections, this cleansing effect may not materialize. [Barlevy \(2003\)](#), for example, points out that crises may well obstruct the process of creative destruction by exacerbating pre-existing labor and credit market imperfections. He argues that credit market imperfections are more likely to bind for relatively efficient producers, as—due to their higher fixed costs—highly efficient production arrangements are more vulnerable to financing constraints. Crises-induced tightening of credit constraints would thus hurt efficient firms disproportionately. In addition, crises may increase labor market frictions by increasing search costs and lowering average worker–firm match quality. This is because it takes longer for workers to move into suitable jobs, and relatively unproductive workers become less likely to quit their jobs to search for better alternatives ([Barlevy 2002](#)).

The empirical evidence is ambiguous. The available longitudinal firm-level data support the claim that firm dynamics and resource allocation are crucial determinants of countries’ comparative economic success and long-run productivity growth ([Restuccia and Rogerson 2008](#); [Hsieh and Klenow 2009](#); [Syverson 2010](#)). However, evidence from studies of manufacturing firms provides only weak support for the idea that allocative efficiency increases during downturns. If the cleansing hypothesis is correct, one would expect inefficient producers to be hurt disproportionately during downturns, resulting in a substantial reallocation of market shares from inefficient to efficient firms. Studies of aggregate

productivity dynamics during the 1980s' downturns in the United States and Israel do not find evidence of an increased contribution of reallocation to productivity growth (Baily, Hulten, and Campbell 1992; Griliches and Regev, 1995). Moreover jobs created during recessions are usually less productive, less well-paid, and less likely to last (Bowlus 1993; Davis, Haltiwanger, and Schuh 1996), suggesting that crises slow down the creation of productive matches and that the quality of jobs is pro-cyclical. Finally, economic downturns are typically associated with *excess* churning of firms and workers (Davis and Haltiwanger 1990, 1992; Davis, Haltiwanger, and Schuh 1996).

The few studies that test the cleansing hypothesis directly using plant-level data also yield conflicting results. Liu and Tybout (1996) find no evidence of systematic covariance of an efficiency gap between continuing and exiting plants over the 1980–85 business cycles in either Chile or Colombia, even though Chile suffered a recession in 1982. Casacuberta and Gandelsman (2009) conclude that the 2002 banking crisis in Uruguay had a cleansing impact since, even during the crisis, productivity was negatively correlated with exit. They also find some evidence that the crisis attenuated the link between productivity and exit. By way of contrast, comparing cohorts of entrants and survivors, Nishimura, Nakajima, and Kiyota (2005) find that the 1996–97 banking crisis in Japan induced the exit of relatively efficient firms amongst entering cohorts. Similarly in Indonesia the link between plant productivity and plant survival was significantly weaker during the East Asian Crisis than during both the pre- and post-crisis periods (Hallward-Driemeier and Rijkers 2010).

The ambiguity of the empirical findings has much to do with the fact that the long-term impact of downturns on firms' performance depends on a host of initial conditions—including the prevailing policy regime and political economy conditions, the nature of the shock, and the characteristics of the policy response. The last two points are elaborated upon later.

In terms of initial conditions, there is some evidence that policies that regulate labor market and firm dynamics are important determinants of both the depth of a downturn and the speed of recovery. Bergoing, Loayza, and Repetto (2004) find that countries with more distortionary regulations¹ experienced more severe downturns than those with more neutral regulatory regimes. Collier and Goderis (2009) assess how the ability of developing countries to cope with aggregate shocks varies depending on the structural policies implemented. Considering a wide variety of policies—including trade policies, financial depth, labor market regulation and openness—they find that regulations that delay the speed of firm closure are the most important determinant of short-term growth losses from adverse price shocks in mineral exporting countries.

Thus, in the presence of market imperfections, household and firms responses to crises may prove to be unnecessarily costly in the longer run. Since market

imperfections are a defining feature of most developing countries, the question for policymakers is not *whether* to intervene to minimize the adverse impacts of crises on employment and earnings, but *how* to intervene.

A Typology of Policy Options

This section reviews empirical evidence on the effectiveness of interventions enacted during past crises using a taxonomy that brings to the fore the potential intertemporal tradeoffs between minimizing short-term impacts and preserving incentives for recovery and long-run growth.

Labor-market-related policy interventions can be classified according to whether their main objective is to (i) contain short-term impacts of the shock or (ii) accelerate the recovery process and promote long-term growth. A key difference between the two categories of policies is their time horizon. This difference expresses itself in two ways. The first is the expected lifetime of the policy and the second is the lag between the time the policy is implemented and when the beneficial impact materializes. Policies designed to temper the short-term impact of crises are typically temporary in nature. Thus post-crisis reversibility is a critical feature of their successful design. Policies that can be scaled up quickly and effectively as crises evolve, and scaled down as recovery begins, fair well within this category; as do automatic stabilizers such as unemployment benefits or cash transfers systems that allow for the number of beneficiaries to change in response to need.

Policy interventions geared toward fostering recovery and accelerating long-run growth tend to be more permanent in nature and typically center on rectifying market imperfections. Their beneficial impact may take a while to emerge as they operate by enhancing allocative efficiency and stimulating productivity growth. Because of adjustment costs, firms' responses to such policies are typically slower than responses to more direct interventions. Similarly the full benefits of policies that aim to remedy imperfections in the market for skills may take a while to manifest themselves since skills formation takes time.

If not carefully designed, policies that focus on mitigating immediate impacts, while beneficial in the short run, may aggravate market imperfections and thus be counterproductive in the longer term. In Indonesia, for example, the 1997–98 crisis sparked pro-labor pressures that led to better enforcement of minimum wages and to the introduction of severance pay and dismissal regulations, leading to more severe rigidities in hiring and firing (Manning 2000). While more stringent regulation helped to raise earnings and employment stability of manufacturing workers, the employment elasticity of manufacturing output growth declined sharply after the crisis period, hampering job creation and the recovery (Narjoko and Hill 2007; Hill and Shiraishi 2007).

Conversely policies that are conducive to long-run growth, when incautiously implemented, may do unnecessary damage in the short run. Thailand’s recovery from the Asian crisis is a case in point: while the government introduced reforms conducive to long-run growth, the adjustment program proved to be too harsh, leading to an unnecessary decline in output (Dollar and Halward-Driemeier 2000).

However, there are also win-win policies that are beneficial both in the short and the long run. They tend to combine elements of both categories of interventions and simultaneously serve to minimize short-term impacts and accelerate the recovery. Figure 1 presents a rough grouping of commonly used policy interventions using the broad categories described above, and highlights how combining elements of different interventions may lead to such win-win policies.

Within each of the categories described above it is possible to further distinguish policies depending on whether they focus on maintaining jobs and productivity on the one hand, or on supporting labor income and fostering employability on the other hand. That is whether they work on the demand or the supply side. The proposed categorization is not intended to be rigid as

Figure 1. Policy Taxonomy



providing direct support and fostering the recovery can go hand-in-hand. Rather the key virtue of this taxonomy is that it alerts policymakers to the existence of potential tradeoffs between these objectives and helps them to identify win–win policies which can avoid these tradeoffs.

The two boxes on the left-hand side of figure 1 list commonly used policies to contain the impact of the crisis. Demand-side interventions are presented in the top-left box, and interventions to protect labor income are presented in the bottom-left box. The demand-side policies are typically designed to limit job destruction, to facilitate job replacement, or to do both. They include payroll tax holidays, wage subsidies, policies that facilitate temporary reductions in hours worked, and ad hoc interventions to provide credit to enterprises in difficulty due to sharp drops in output demand. Most of these policies operate by temporarily reducing the price of labor or providing financial resources to cover temporary and unanticipated declines in profit. These supply-side policies are presented in the bottom box.

Public works programs are a somewhat different but very commonly used form of demand-side intervention. These programs provide alternative sources of temporary, low-paid, publicly financed employment to workers displaced by the private sector. However, the most commonly used interventions to mitigate short-term impacts aim directly to support labor income via a range of social protection benefits, such as unemployment benefits and other cash transfers.

The boxes on the right-hand side of figure 1 list interventions to accelerate recovery and foster growth by enhancing efficiency and facilitating job creation (top box) or enhancing worker’s employability and human capital (bottom box). This category of policies is more varied in nature and a comprehensive review is beyond the scope of this paper. However, salient demand-side interventions in this category include (i) policies to enhance access to credit and improve the working of the credit market more broadly; (ii) reforms to reduce labor market rigidities and imperfections, including policies to facilitate business entry and to improve bankruptcy laws and so on. Prominent supply-side interventions in this category include training, job-search, and self-employment assistance programs. While growth enhancing in the long run and consequently commendable, the implementation of policies aimed at accelerating recovery at times of crises may prove to be excessively costly as they may aggravate the short-term burden of a crisis. On the other hand, the occurrence of a crisis may act as a catalyst for the political momentum required to implement unpopular reforms, such as increasing the retirement age.

Finally the rectangular boxes in the center of the figure highlight the win–win policies on the demand (top) and supply (bottom) side of the labor market. These policies typically combine elements of both broad categories of interventions. Of particular relevance on the demand side are productivity-enhancing public work

programs such as those that focus on building infrastructure. New and well-targeted financial support to the self-employed can also fit in this category together with temporary measures to replace some work hours with paid part-time training. On the supply side the most common policies in this category are conditional cash transfers (CCTs) that provide compensation for income shortfalls while nurturing human capital investment. Some would argue that unemployment benefits also fall into this category as, in addition to replacing lost income, they can also enable workers to pursue riskier, yet potentially more productive, options and thereby contribute to the efficient allocation of resources (Acemoglu and Shimer 2000).

On the other extreme of the spectrum—but not included in the figure—are a small set of policies occasionally used during economic downturns in response to pressures from powerful vested groups, which are not only ineffective in mitigating the crisis but can also harm recovery prospects. On the demand side they include the indiscriminate bail-out or nationalization of unviable firms, and increases in standard public sector employment. On the supply side they include interventions that interfere with the natural adjustment of the price of labor, such as increases in public sector salaries. These policies are undesirable in the long term as they tend to increase frictions and retard efficiency-enhancing adjustments. They are also ineffective in minimizing the negative short-term impact of the crisis as they tend to target groups that are the least affected, such as civil servants and the fortunate workers who have maintained their employment. Moreover they are extremely difficult to revert once the crisis is over.

What Works and What Does Not

Having presented the policy taxonomy above, we will now review the existing empirical evidence on the effectiveness of different commonly used interventions. Two striking findings emerge from a first glance at the literature: (i) the evidence is sparse and sometimes based on shaky data and methodology; (ii) it is also often inconclusive. These inconclusive results are explained by a variety of factors including the difficulty of adequately evaluating the impact of programs set up to achieve multiple objectives, the lack of clarity about the most appropriate counterfactual, and a tendency to evaluate policy responses as individual interventions rather than as part of broader policy packages.

Previewing the main findings we find that, on average, most interventions have limited impact. However, the estimates of their effectiveness are heterogeneous suggesting that context and design matter. Common elements of interventions that are effective are feasibility, flexibility, reversibility, and incentive compatibility. The effectiveness of policy responses is also enhanced if they are implemented in conjunction with other policies, if their design addresses directly the potential

trade-off between short-term impact mitigation and long-term efficiency enhancement, or does both. Unfortunately, since most evaluations assess policy interventions in isolation, it is difficult to draw precise conclusions regarding the nature of the complementarities between different policy interventions.

Policies to Contain the Negative Impacts of the Crisis. Policy interventions aimed at containing crisis impact can be crudely categorized as being aimed at protecting employment or providing replacement jobs, or as being focused on maintaining labor income.

Protecting Existing Jobs and Providing “Replacement” Jobs. Tax and wage subsidies are commonly used during economic downturns and their theoretical appeal is clear (see for example [Pauw and Edwards 2006](#)): they limit short-term labor retrenchment and can, in principle, be targeted to maximize protection for the most vulnerable groups, such as women and young workers. However, the available evidence (summarized in table A1) suggests that in practice implementing incentive compatible schemes is difficult. Wage subsidy schemes typically have high deadweight and substitution effects (in the order of magnitude of 20 percent). Their effectiveness also seems limited, although it varies with sector and firm size ([Abrahart, Kaur, and Tzannatos 2000](#)). For example, they have been found to be less effective in highly capital intensive sectors but are relatively more effective when targeted at small firms, perhaps because these firms pay lower wages ([Kang and others 2001](#)). Their impact may be (marginally) enhanced if they are combined with job search assistance ([Betcherman, Olivas, and Dar 2004](#)), underscoring the importance of implementing comprehensive policy responses. In the medium to long term, however, subsidies are unlikely to be economically or politically sustainable.

Public works programs are an even more common feature of crisis response packages ([Grosh and others 2008](#); [ILO 2009](#)) and the existing empirical evidence on their effectiveness as absorbers of excess labor during downturns provides scope for modest optimism. For example, the Argentinean *Jefes y Jefas* program—introduced during the Argentine crisis to provide support to unemployed household heads conditional on a work requirement—helped to reduce unemployment by 2.5 percent and could have been even more effective if better targeted ([Galasso and Ravallion 2004](#)). The limited available evidence also suggests that self-selection into public works programs provides a fairly efficient instrument for targeting those most impacted by a crisis ([Ravallion 2008](#)). Self-targeting through low wages assures that leakages tend to benefit the poor and also assures a credible exit strategy.

Yet the cost effectiveness of public works programs depends on their labor intensity, their targeting performance, their net wage, and possible indirect gains

to participants and their budget leverage, that is the extent to which the government is able to mobilize cofinancing from beneficiaries. Ravallion (1999) estimates that the cost of a \$1 gain in current earnings to the poor using public employment programs is about \$5 in middle-income countries and \$3.50 in low-income countries. According to these calculations, while the cost effectiveness of public works programs may be better than that of other transfer mechanisms, it is likely to be inferior to that of direct transfer programs. However, these cost–benefit calculations assume that all wages are resource costs and do not treat them as transfers. As such the estimated cost–benefit ratios are lower than the true social value of these programs. If they are set up to enhance productivity, for example by improving infrastructure, public works policies can also be win–win. That is, they can be designed to both minimize short-term impact and accelerate long-run growth. However, as will be explained in more detail below, when labor market adjustments to shocks occur primarily via a reduction in wages, public works programs will be less useful as a crisis response.

Maintaining Labor-related Income. When the labor market transmission of shocks occurs primarily via a reduction in formal sector employment and an effective unemployment insurance system is in place, unemployment benefits can act as an automatic stabilizer, effectively compensating those who lose their jobs. In times of crisis, an extension of the duration of the entitlement may be appropriate, and coverage can be extended to previously unprotected groups, such as workers with short employment histories, those completing prolonged training courses, or those exiting from public works. The introduction of unemployment benefits targeted to low skilled workers and those on low wages may also be an option in middle-income countries with good administrative capacity or to workers in small enterprises, as shown in Korea during the Asian financial crisis.

When in place, unemployment benefits can furthermore be used to compensate workers for a reduction in the number of work hours, with a view to allowing employers to retain workers in times of weak demand. Typically, those who reduce their work hours receive unemployment insurance benefits pro-rated for the hours lost. Benefit duration is limited to 20–30 weeks, and there is a floor (and sometimes a ceiling) for the percentage of the workforce affected by the policy (Abraham and Houseman 1993). In addition, where unemployment benefits are anchored to individual savings accounts—as in Chile and Colombia—their crisis mitigating potential can be further enhanced by allowing individuals to borrow from the accumulated funds, using pension wealth as a guarantee (Robalino, Milan, and Bodor forthcoming).

However, an effective system of unemployment insurance requires time and substantial institutional and fiscal capacity to implement and monitor (Vodopivec 2006). This is why only a small number of developing countries have such

systems in place with widespread coverage. For many developing countries unemployment benefits are simply not a viable instrument to protect the losers of a crisis and stabilize the economy. For such countries public works programs remain the only option.

Although they are not specific labor market interventions, targeted cash transfers can be an effective method to compensate losers when labor market adjustments occur primarily via wage reductions. Provided that they have adequate coverage and are sufficiently generous, they have also been found to be very cost-effective options for protecting the most vulnerable, especially in low-income countries (LICs), as they have low administrative costs and do not distort prices. Unlike *conditional* cash transfers (CCTs), which are discussed below, unconditional cash transfers do not serve the dual objective of dampening income shocks and promoting investments in human capital. But, as elaborated upon in more detail below, unconditional cash transfers are easier to implement, especially in low institutional capacity settings, and can be rolled out more quickly. In general, in-kind transfers are less desirable than cash transfers, because they have higher administrative costs and limit the recipient's choices. "Near-cash" instruments (for example food stamps) represent a middle ground, but their administrative costs tend also to be significantly higher than cash transfers. A potential drawback of cash transfers is that political pressures may make it difficult to reverse these programs once the crisis is over.

Policies to Accelerate Recovery and Promote Growth

Policies that aim to accelerate recovery and promote growth can be classified as focusing on creating jobs, facilitating matching and reducing frictions, or as attempting to increase labor productivity by promoting employability.

Creating Jobs and Facilitating "Matching" of Jobs and Workers. The literature on the impact of the investment climate on firm performance during more stable times provides empirical support for the view that market imperfections hamper growth and affect the quality of job creation. [Hallward-Driemeier \(2009\)](#), for example, shows that red tape, corruption, cronyism, and weak property rights may undermine the Schumpeterian process of creative destruction by attenuating the link between productivity and exit. Policies that affect the ease with which business can enter and exit, and how costly it is to hire or fire workers, obviously also have a major impact on how crises impact on labor demand. [Gallego and Tessada \(2009\)](#) analyze job flows in Latin America in response to sudden stops and find a negative correlation between firing and dismissal costs, and labor destruction.

The evidence on the effectiveness of job search assistance programs and sanctions for failing to search during crisis times is also limited. While such

interventions generally have favorable impacts during normal times (Card, Kluge, and Weber 2009), a review by Betcherman, Olivas, and Dar (2004) suggests that they are unlikely to be useful during times of mass unemployment. Credit market intervention policies have received relatively more attention in the literature. Of particular relevance to the developing world are microcredit schemes, which are likely to be especially important in countries characterized by high levels of informality and a high prevalence of self-employment. These will be reviewed more extensively below.

Promoting Employability. Evaluations of **training programs** during less volatile economic times suggest that their impacts are highly heterogeneous and strongly dependent on context and implementation (Auer, Efendioglu, and Leschke 2005). While they have been utilized in a variety of forms during past crises, the fragmented evidence reviewed in table A2 suggests that, on average, the usefulness of training programs is limited. More specifically, the net impact of training policies implemented in response to crises on re-employment rates is in the range of 10 to 20 percent (see table A2). However, in a meta-analysis of active labor market programs, Card, Kluge, and Weber (2009) demonstrate that many programs that exhibit insignificant or even negative impacts after only a year have significantly positive impacts after two or three years, indicating that the impacts may increase with time. A plausible explanation for this finding is that the gains from skills development may take a while to materialize and may manifest only after the crisis is over. Thus training programs might be conducive to long-run growth, yet fail to yield substantial short-term gains.

Since human capital formation is a cumulative process, training is likely to benefit the most able workers most, making it a weak tool for protecting the most vulnerable. Moreover training seems to be most effective when used in conjunction with other policies—providing further evidence for the contention that comprehensive policy packages are likely to be more effective than policies implemented in isolation.

Self-employment assistance programs usually have high deadweight and displacement effects and only help a selected subset of the vulnerable population. During “normal” times, businesses created under self-employment policies have failure rates that often exceed 50 percent (see Abrahart, Kaur, and Tzannatos 2000). Subsidies for self-employment initiatives normally reach less than 5 percent of the unemployed and take-up is concentrated amongst individuals with entrepreneurial skills, many of whom would have started up their own enterprise regardless of the introduction of self-employment support (Abrahart, Kaur, and Tzannatos 2000; Betcherman, Olivas, and Dar 2004). For instance Almeida and Galasso (2007) find that only a very small subset of former welfare beneficiaries from the Jefes y Jefas program—those who were younger, more educated, and

with previous self-employment experience—were attracted to *Micro-emprendimientos Productivos*, a self-employment assistance program in Argentina. However, these interventions are somewhat more promising when targeted at particular groups—such as women as well as older and better educated workers. (Abrahart, Kaur, and Tzannatos 2000; Auer, Efendioglu, and Leschke 2005). Nevertheless, their implementation may entail a tradeoff between promoting the creation of new firms and protecting the profitability of incumbent firms (Auer, Efendioglu, and Leschke 2005).

Win–Win Policies

Win–win policies are designed to be beneficial both in the short and the longer term. Whether they are in practice depends on their design and implementation. We have already reviewed public works programs, which can be designed to be win–win, and we focus here on CCTs and credit market interventions.

Conditional Cash Transfers (CCTs). Conditional transfer programs may improve on the performance of unconditional cash transfers by channeling help to the most vulnerable and nurturing human capital accumulation, which is likely to be beneficial in the long run. In countries where CCTs are already established, raising benefits or expanding coverage may be an effective crisis response.

Evidence from Mexico’s *Oportunidades* and Indonesia’s scholarship program *Jaring Pengamanan Sosial* shows CCTs can protect poor children’s school enrollment against shocks (Cameron 2002; de Janvry, Finan, and Sadoulet 2006). However, where cash transfer programs are not already in place, as is the case in many LICs, CCTs will take longer to set up than unconditional schemes. They also demand significantly more institutional capacity to run and administer, as conditionality must be carefully assessed. Poorly designed schemes may actually exclude the most vulnerable, such as those who do not have access to the public services upon which transfers are conditioned. As a rapid crisis response, targeted unconditional cash transfers may therefore yield better results, especially in LICs.

Credit Market Policies. Policies to rectify failures in the credit market may pay handsome dividends during crises. The importance of such policies is illustrated by the different recovery paths of Mexico and Chile after the 1980s debt crisis. While both countries suffered severe economic shocks and had broadly similar initial conditions, Chile recovered much faster than Mexico. Bergoing and others (2002) argue that this was because of credit market regulation: “The crucial differences between Mexico and Chile were in banking and bankruptcy laws; Chile was willing to pay the costs of reforming its banking system and of letting inefficient firms go bankrupt; Mexico was not” (p. 169).

Facilitating access to credit—for example by facilitating access to trade finance—can prevent otherwise viable firms from going out of business due to cash-flow problems. However, in order to prevent long-term damage to growth prospects, the interventions need to be carefully designed in order not to encourage moral hazard or the bailing out of firms that are not viable. Short-term fixes such as loan forgiveness, subsidized lending, or interest caps may also negatively affect long-term access to financial services. Thus they could serve as another example of an intervention which might create potential tensions between achieving short-term goals and preserving long-run efficiency (McGuire and Conroy 1998). The evidence, summarized in table A4, points to the importance of the careful design of credit extension schemes. When facilitating sustainable access to credit, the devil is in the details.

The experience with the Korean credit guarantee policies towards small and medium-sized enterprises (SMEs) instituted in response to the Asian crisis provides an illustrative example. Credit was disproportionately provided to relatively unproductive SMEs, which undermined the effectiveness of the creative destruction process for small firms (Oh and others 2009). However, Borensztein and Lee (2002) find that, within larger firms, banks reallocated credit from conglomerate (*chaebol*) firms to relatively more efficient firms, thereby paving the way for long-run recovery.

The importance of careful design of credit extension policies is also underlined by the Japanese banking crisis during the 1990s when banks levied additional credit to the weakest firms in order to avoid balance sheet losses (Peek and Rosengren 2005; Okada and Horioka 2008). While they helped to minimize the short-term impact of the crisis, these practices also stifled recovery. These results are a plausible explanation for the finding that relatively efficient firms were driven out of business during the Japanese banking crisis, as already discussed (see Nishimura, Nakajima, and Kiyota 2005). Rather than facilitating “cleansing,” the crisis exacerbated credit market imperfections, which hampered the creative destruction process. The Japanese experience thus supports the argument that myopic policies to protect firms in the short run can be disadvantageous in the longer run.

Microcredit. A review of the studies evaluating the performance of microcredit schemes during previous crises, summarized in table A4, shows that they have performed relatively well. For example, while many large banks suffered major problems, microfinance institutions (MFIs) in Indonesia were remarkably resilient to the East Asian crisis (Patten, Rosengard, and Johnston 2001) because of their unique design features, including tailoring loans to firms’ cash-flow requirements and targeting entrepreneurs with a high willingness to pay for continued access to credit.

In Bolivia too some microfinance institutions appear to have been remarkably resilient to crises. For example the microfinance branch of the Caja Los Andes

Bank was not significantly impacted on by the 1998 crisis, unlike other branches. However, [Marconi and Mosley \(2006\)](#) contend that the performance of this micro-credit branch was a positive outlier and point out that other Bolivian banks and microfinance institutions were forced to reduce their lending. They argue that the pro-cyclical nature of lending by microfinance institutions might in fact have exacerbated the crisis. Furthermore the ability of microfinance credit schemes to mitigate downturns may be hampered by credit market interventions. During the East Asian crisis for example, rural MFIs were adversely affected by governments' reluctance to extend rural credit guarantees ([McGuire and Conroy 1998](#); [Patten, Rosengard, and Johnston 2001](#)).

Designing an Effective Policy Package: Navigating Thorny Tradeoffs

Moving from the broad categories of policies discussed in the previous section to a more detailed list of interventions that could comprise an effective crisis response is a complex matter that requires careful country-level diagnostics. Which policies yield the highest return in terms of minimizing short-term impacts and maximizing growth prospects depends among other things on (i) the available fiscal space; (ii) the nature of the shock and the prevailing labor market transmission mechanism; and (iii) the existing institutional capacity and political economy conditions,—for example, programs that are already in place and can be built on, expanded quickly, or both.

Fiscal Constraints

Unless governments have prepared for crises by accumulating reserves, the scope for financing additional interventions is likely to be limited. Government budgets typically come under strain during economic downturns as tax revenues decline and borrowing constraints bind. For example, on average, public debt rose by over 86 percent during the post-war financial crises ([Reinhart and Rogoff 2009](#)). Thus in many cases the relevant question might be which policies and safety nets are to be protected, rather than which additional interventions should be undertaken.

The social protection system has the potential to act as an automatic stabilizer because demand for safety nets increases as incomes fall and spending on safety nets should rise when the economy contracts. A well-designed safety nets system that meets these demands would be countercyclical, but empirical evidence suggests that it is typically pro-cyclical ([De Ferranti and others 2000](#); [Braun and Di Gresia 2003](#); [Grosch and others 2008](#), p. 55). This is because even pro-poor

governments are typically unable to protect social spending during downturns (see for example [Hicks and Wodon 2001](#)). Thus, the best option to finance safety net programs during crises is to pre-fund them ([Grosh and others 2008](#)). Countries can also try to reallocate expenditures to more effective programs, and such budget reallocations can have a pro-poor distributional impact. A good example is given by Jamaica, which eliminated general food subsidies in 1984 and used a share of the resulting savings to fund its Food Stamp Program ([Grosh and others 2008](#), p. 56), with a positive impact on poverty reduction ([Ezemenari and Subbarao 1999](#)).

Nature of the Shock and the Prevailing Labor Market Adjustment Mechanism

The **nature of the shock** is also important in determining which policies are optimal in the long run. When dealing with short-lived downturns associated with the business cycle, countercyclical fiscal policy aimed at increasing spending on temporary mitigation measures is a commendable strategy. However, when crises are more structural in nature, priority should be given to policies that facilitate recovery, and short-term mitigation measures should be kept to a minimum as they might distort adjustment and lead to increases in public debt. Competitiveness might also be undermined by artificial appreciation (or a lack of depreciation) of the exchange rate, as a result of increased public spending, leading to further deterioration in growth and recovery prospects.

The **labor market adjustment mechanism** also matters in determining the relative effectiveness of different policy levers since it determines who shoulders the burden of the crisis. In broad terms, labor market adjustment can occur through two main channels: (i) via a reduction in the number of people employed or in the number of hours worked per person (quantity adjustment); or (ii) via wage declines (price adjustment). Of course, it is important to recognize that the typical labor demand schedule is downward sloping and thus imposes a tradeoff between the two, making it difficult to protect both simultaneously. Wage adjustment can be accomplished by an across the board reduction in wages—a shift of the wage distribution to the left—or by a change in the composition of employment toward less well-paid jobs (see [Fallon and Lucas 2002](#)).

Identifying the labor market channels through which the economic downturn is transmitted is a precondition for effective targeting of policy interventions. If first-round labor market adjustments are concentrated in specific jobs, sectors, or geographic areas, targeted employment interventions to protect those most immediately affected may yield handsome payoffs. If most of the adjustment occurs through generalized wage declines, policies aimed at helping the chronically poor and those most vulnerable may yield relatively higher returns. These are the policies highlighted in the bottom part of figure 1.

A complicating factor in addressing these tradeoffs in targeting is the fact that impacts will vary over time as the effects of the initial shock reverberate through the economy. Indeed evidence from previous crises suggests that those who ultimately suffer the largest welfare losses may not be the ones who are initially the most affected. Financial downturns, such as the 1994 Tequila crisis or the 1997 East Asia crisis, have rapidly spread from the directly affected sectors—typically urban-based exporters, construction, and manufacturing—to other parts of the economy via reduced demand and a reallocation of labor (Manning 2000; McKenzie 2002). Thus even those not immediately impacted by a crisis are likely to suffer substantial earnings losses as increased entry of workers into such sectors erodes earnings and profitability.

Institutional Capacity and Political Economy Conditions

Crisis-response programs need to be quick. Hence implementation capacity and existing programs will constrain both the choice of programs and their impact. Whether or not governments can respond promptly and effectively in a crisis largely hinges on their capacity to target. This in turn depends on the availability of reliable and timely information. When targeting workers, policymakers in low-income settings often lack up-to-date information on household incomes and consumption. The characteristics of those most impacted by the crisis (the newly poor) may be very different from those of the “structurally” poor. Consequently decisions on the policy response and who to target are often made against a backdrop of extreme uncertainty, on the basis of very partial and often outdated information. For instance data may track formal sector wages only, even though the vast majority of the workforce is employed in the informal sector. Governments will often have to find a compromise between quality of targeting and design on the one hand and speed and scale of implementation on the other (Grosh and others 2008).

In addition, mechanisms which are mainly designed to identify the structurally poor—like proxy means testing or categorical targeting—may fail to identify the temporarily poor in a crisis context. Self-targeting mechanisms, such as public works, and possibly community-based targeting, are likely to work better (Skoufias 2003). Moreover empirical research also suggests that too fine targeting can undermine political support for redistributive programs (Gelbach and Pritchett 2002; Kanbur 2009). On the other hand, evidence from Brazil suggests that targeting is often considered fair and is electorally rewarded (de Janvry, Finan, and Sadoulet 2009).

Targeting firms is perhaps even more difficult, since it involves picking “winners” and discriminating in their favor, although, in certain scenarios, sector-wide protection policies may be advisable. Arguably the costs of targeting errors may also be higher for policies protecting firms since they may give

uncompetitive firms an advantage and thereby lead to growth losses. For example, in Latin America, import substitution policies instituted in response to the 1930s crisis have often been blamed for stifling its subsequent growth (see for example [Robinson 2009](#)).

The ability of countries to cope with shocks increases considerably when appropriate safety nets are in place before a crisis hits. This is because expanding existing programs is typically more effective than implementing new and untested ones ([Ferreira, Prenzushi, and Ravallion 1999](#); [Grosh and others 2008](#); [World Bank 2008](#)). In fact, in reviewing the performance of safety nets during crises in Latin America and East Asia, [Blomquist and others \(2001\)](#) observe that, given the time required to set up systems from scratch, spending on safety set programs ended up being pro-cyclical rather than countercyclical.

[Alderman and Haque \(2006\)](#) provide similar arguments as to how, in financially constrained low income settings, public safety nets that target the chronically poor can be scaled up with external support to serve an insurance function. The usefulness of permanent, countercyclical safety net is also illustrated by the performance of the Russian social safety net during the 1998 crisis, which helped to provide protection against poverty, although it fell short of fully protecting living standards ([Lokshin and Ravallion 2000](#)).

While responding adequately is no substitute for having a systematic safety net system in place, some believe that crises provide a window of opportunity to reform unwieldy institutions and make political decisions that would in “normal” times be unfeasible ([Robinson 2009](#)). The experience of Mexico in the aftermath of the Tequila Crisis demonstrates that stabilizers and safety nets set up under emergency conditions can in turn serve as a stepping stone for the development of more permanent income support systems (see [Grosh and others 2008](#)). However, whether or not crises indeed catalyze reform is an open empirical question ([Drazen and Grilli 1993](#); [Drazen and Easterly 2001](#); [Robinson 2009](#)).

Summary

Crises are a recurring phenomenon in the developing world. As has become painfully evident over the last two years, developing countries remain largely unprepared to deal effectively with labor market volatility. This is unfortunate not only because of the immediate increase in the incidence and depth of poverty which is associated with sudden drops in earnings, but also because the costs in terms of loss of potential for growth and poverty reduction tend to be particularly high in poor countries. In the presence of market failures and imperfections, even a temporary loss of employment or reduction in earnings can significantly reduce the quality of the current and future labor supply. A crisis can also reduce long-term

labor demand and productive efficiency through the “over-churning” of workers and firms. As a result, short-term fluctuations in employment opportunities can leave deep and long-lasting scars on labor productivity, growth, and poverty reduction.

Imperfect markets are common in developing economies where labor markets tend to be highly fragmented (Fields 2007) and access to credit limited, especially for the most vulnerable segments of the population and for small enterprises. Therefore in developing countries the potential “cleansing” effect of crises is likely to be heavily outweighed by their negative long-term impact. This calls for effective action to minimize volatility in the first place, and for prompt interventions to mitigate the impact of a downturn when it is unavoidable.

In this paper we have proposed a taxonomy of possible interventions, distinguishing between those designed to offset short-term impacts and those aimed at fostering long-run recovery. A further distinction between policies that operate on the demand for labor by firms and those that focus on earnings and employability of workers has also been drawn. The taxonomy is not rigid, but serves to highlight how tradeoffs between different objectives might arise and helps policymakers to identify win–win policies that avoid such intertemporal tradeoffs. Using this basic taxonomy, we have reviewed past experiences with commonly used crises responses. Our analysis points to a number of basic principles that could guide policymakers in navigating the challenges of crafting effective and comprehensive packages to limit earnings volatility and promote long-run growth.

The first and arguably most important conclusion is that being prepared pays off. Countries with prudent fiscal management and effective stabilizers in place tend to suffer comparatively less. Moreover, the depth and duration of shocks is lower if credit and labor market policies are sound. That is they should be designed to facilitate efficiency-enhancing adjustments such as allowing the exit of unsustainable firms, sustaining those that are viable in the long run, and nurturing human capital investments by vulnerable workers. In addition, setting up safety nets during times of crisis is difficult and time-consuming and the speed with which programs need to be implemented often requires compromises in terms of design and effectiveness. This could seriously limit the effectiveness of such interventions.

Second, the policy taxonomy helps to highlight how designing an effective crisis-response package requires careful consideration of the policy objectives in terms of deciding how to value the welfare of future and current generations. It also requires judicious selection, timing, and sequencing of individual reforms. Policies that minimize short-term impacts, such as wage subsidies and increasing severance pay, can provide short-term relief, yet they may exacerbate frictions and thus prove counterproductive in the long run. On the other hand, reckless implementation of policies conducive to long-term growth may cause excessive short-run damage. On the

bright side, complementarities between different interventions often exist and win-win policies capitalize on these. Successful policy packages tend to be coherent and comprehensive because policies that are carefully coordinated typically outperform piecemeal responses.

Third, evaluations of the effectiveness of individual policy responses suggest that common elements of effective interventions are feasibility, flexibility (for example capacity for scaling up and down), and incentive compatibility. Starting with feasibility, it is important that the choice of interventions is tailored to country circumstances and the characteristics of the shock. While certain policy options may be theoretically superior, they may not be practically feasible given certain fiscal, administrative, and political constraints. For example, conditional cash transfers can in principle improve upon the performance of unconditional cash transfers, yet successful implementation of such schemes requires substantial administrative capacity, and in settings where this is absent, unconditional transfers may be more efficient. Flexibility pays off. Given the enormous uncertainty that typifies crisis situations, being able to scale up programs quickly (and perhaps equally importantly being able to scale them down quickly) enables governments to respond quickly and efficiently.

Finally, in designing policies, it is important to get incentives right. This minimizes leakages and ensures market imperfections are not aggravated. Setting low wages in public work projects, for example, ensures that only those willing to work for very low wages, which are likely those most in need, will benefit; smart targeting enhances effectiveness.

A standard “fit-for-all” policy package that is optimal under all circumstances simply does not exist, since the particular policy that yields the highest return in terms of minimizing short-term impacts and maximizing growth prospects is highly country- and crisis-specific. However, most effective packages will need to combine measures to stimulate growth by reducing market imperfections with efforts to protect workers and firms.

In summary, the analytical arguments and empirical evidence advanced in this paper suggests the need to go beyond myopic and isolated policy responses which may be costly and counterproductive. We advocate instead a more comprehensive approach aimed at delivering a coordinated and coherent policy package. This would focus on reducing market imperfections and building institutions to mitigate the impact of downturns on both the supply-side and the demand-side of the labor market in the short and the long run.

Table A1. Wage Subsidies/Payroll Tax Subsidies

| <i>Crisis and context</i> | <i>Authors</i> | <i>Methodology</i> | <i>Main findings</i> |
|--|--------------------------------------|--|---|
| Korea (1997–2001) Employment stabilization program | Phang and Kim (2001) | Annual Economically Active Population Survey (1995–2000) from the National Statistical Office are used in combination with statistics provided by the Ministry of Labor and Korea Labor Institute. Net employment effect calculated as: net employment effect = gross effect – deadweight loss – substitution effect – displacement effect. | Net employment effect of the employment stabilization program was 2.2.5% on average, implying a high deadweight loss. The effectiveness of wage subsidies varied with firm size as well as sector. More capital intensive sectors benefited less while small firms benefited more. |
| Czech Republic and Hungary (1990–2005) Wage subsidies to help the long-term unemployed | Fretwell, Bensus, and O’Leary (1999) | Matching in combination with regression methods. | Employment impact was an increase of 10 percent in the Czech Republic and 12 percent in Hungary. |
| OECD and Post-Soviet transition countries (1982–99) Mix of wage subsidies studied | Dar and others (1999) | Literature review: An analysis of 18 interventions in developed and developing countries: 1 experimental, 11 quasi-experimental, and 6 non-scientific. | <ul style="list-style-type: none"> • Additionality is typically in the order of magnitude of 20–35%; • Deadweight effects range between 20–70%; • Substitution effects range between 10–80%. |

Table A2. Training and Self-employment Assistance

| <i>Crisis and Context</i> | <i>Authors</i> | <i>Methodology</i> | <i>Main findings</i> | <i>Comments</i> |
|---|------------------------|---|---|-----------------|
| Korea (began October 2007) Training programs for the unemployed | Kang and others (2001) | (Descriptive) comparison of participants and nonparticipants to determine effect of training on the unemployed and unemployment duration analysis using a hazard model. | <p>Re-employment rate: No significant differences between the two groups: 49.6% of participants vs. 53% of nonparticipants have been re-employed and 38% of participants vs. 40% of nonparticipants were employed at time of study.</p> <ul style="list-style-type: none"> • Performance after active job search: Training participants were more successful in finding jobs: one-third was re-employed within a month, 54.3% within the first three months, and 23.4% found re-employment after seven months (compared to rates of 21 and 60% for nonparticipants). • Participants spent on average 4.3 months before re-employment compared to an average of 8.6 months for nonparticipants. • After completing training, higher percentage of participants held full-time wage employment compared to nonparticipants, while a larger percentage of nonparticipants held part-time jobs. • Training increases the probability of re-employment by 28% and the impact was particularly significant for women; training participation increases the probability of re-employment (63% higher). | |

Continued

Table A2. Continued

| <i>Crisis and Context</i> | <i>Authors</i> | <i>Methodology</i> | <i>Main findings</i> | <i>Comments</i> |
|--|----------------------------|---|--|-----------------|
| China (1998–2000) Retraining programs for laid-off workers in the cities of Shenyang and Wuhan | Bidani and others (2003) | Propensity score matching in conjunction with regression methods. The training and comparison groups were constructed using official 1998 census data. The final sample was administered in 2000. | <ul style="list-style-type: none"> • Positive impact on employment in Wuhan. Little impact in Shenyang. • Participation higher for unemployed younger females, previously working in nonstate owned manufacturing who had visited an employment service center in the past (indicating targeting was effective). | |
| Argentina (1994) Programa Joven | Aedo and others (2004) | Data for individuals who registered and qualified for training programs (March 1996–December 1997). Propensity scores matching estimators and cost–benefit analysis. | <ul style="list-style-type: none"> • Impact on earnings statistically significant but only for young males and adult females. • Impact on employment only statistically significant for adult females. • Statistically significant impacts not sensitive to different specification but cost–benefit analysis indicates it takes nine years for the net present value to become positive. • For all of the beneficiaries 12 years are required for the program to have a positive net present value. | |
| Argentina (1994) Programa Joven | Almeida and Galasso (2007) | Difference-in-difference methodology to participants with non-participants before and after the intervention. A baseline household survey was administered to 309 participants and 244 nonparticipants. | <ul style="list-style-type: none"> • Those with entrepreneurial skills, female household heads and more educated individuals are most likely to take up self-employment. • No evidence of average income gains to participants and their households in the short run. | |

Mexico (1984)
PROBECAT (Programa de Becas de Capacitación para Trabajadores)

Revenga,
Riboud and
Tan (1994)

Comparison group analysis with quarterly National Urban Employment Survey administered to the 1990 cohort of PROBECAT participants with the nonparticipants comprised of unemployed individuals. Heckman's Two Stage Selectivity Correction Procedure is used to correct for selectivity into the program. Cox Proportional Hazards Model of unemployment duration on the pooled trainee and comparison group samples.

- PROBECAT fairly effective in shortening the duration of unemployment but only for trainees with prior work experience.
- It also improved the likelihood of employment over the longer run.
- It raised post-training earnings of men but not women; the effects were greater for males with seven to nine years of schooling.
- For both men and women, training induced an increase in the number of hours worked per week.
- The study confirms that program evaluation results can be sensitive to the way in which training effects are measured. A key source of bias is that arising from nonrandom selection of participants into the training program.

Continued

Table A2. Continued

| <i>Crisis and Context</i> | <i>Authors</i> | <i>Methodology</i> | <i>Main findings</i> | <i>Comments</i> |
|---|--------------------------------|--|--|---|
| <p>Mexico (1982) PROBECAT (Programa de Becas de Capacitación para Trabajadores)</p> | <p>Wodon and Minowa (2001)</p> | <p>The availability of PROBECAT at the state level is used as an instrumental variable to control for endogeneity of program placement to compare a sample of PROBECAT participants and a sample of unemployed individuals from Mexico's urban employment survey. Heckman's Sample Selection Model is used to estimate the impact of PROBECAT while correcting on monthly earnings for selection into the program. Cox Proportional Hazard Models are estimated to assess the impact of training on the time necessary to find employment.</p> | <ul style="list-style-type: none"> • No impact on employment and wages found. | <p>This result contrasts with earlier evaluations; this study concludes that the positive results in the past evaluations were obtained because limited attention was given to sample selection bias.</p> |

Table A3. Public works

| <i>Crisis and context</i> | <i>Authors</i> | <i>Methodology</i> | <i>Main findings</i> |
|--|--|--|--|
| Indonesia (1997–2000) Two social safety net programs: the Jaring Pengaman Sosial) and a rice subsidy program | Pritchett, Sumarto, and Suryahadi (2003) | Dynamic benefit incidence analysis using representative household panel data. | <ul style="list-style-type: none"> • The job creation program was much better at targeting the most affected than the rice subsidy program; • The rice program was better at targeting the poorest. |
| Argentina (1994–2003) Jefas Y Jefas program | Galasso and Ravallion (2004) | Matched subsets of applicants who are not yet accepted into the program are used as a control group using matching methods to control for selection on observables. Matched double-differenced estimates of program impact are used to minimize bias due to selection on unobservables, but estimates are imprecise, rendering the matched single-differenced estimates the preferred estimation method. | <ul style="list-style-type: none"> • Program reduced unemployment by 2.5% and had a small impact on poverty rate, but a large impact on the number of people in extreme poverty which would have been 10% without the program. • The impact could have been higher if the program had been better targeted, since the program attracted many inactive people into the workforce. |
| Argentina (1994–2003) Jefas Y Jefas program | Iturriza, Bedi, and Sparrow (2008) | Comparison of probability of exiting unemployment of participants and nonparticipants using logit and multinomial logit models, single-differenced and double-differenced matching estimators. | <ul style="list-style-type: none"> • Participation is associated with a 12–19% lower probability of transitioning to employment; • Women are especially less likely to exit the program. |

Table A4. Access to Credit

| <i>Crisis and context</i> | <i>Authors</i> | <i>Methodology</i> | <i>Main findings</i> | <i>Comments</i> |
|----------------------------|---------------------------|---|---|--|
| Korea (2000–03) | Oh and others (2009) | Analysis of the impact of the Korean credit guarantee policy (implemented in response to the East Asian crisis) on SMEs' productivity, sales, employment, investment, R&D, wage growth, and firm survival using propensity score matching of firms in the Korean Mining and Manufacturing Survey, which is a census covering all manufacturing plants with more than five employees. | The scheme had a positive impact on firms' employment and sales growth, but a limited impact on their R&D and investment spending. There was adverse selection; firms with relatively low levels of productivity were receiving guarantees, suggesting that the schemes may have hampered the creative destruction process. | |
| Bolivia (1998–2004) | Marconi and Mosley (2006) | (Descriptive) comparative analysis of banks and microfinance institutions + simulation exercise. Focus on the value of the outstanding portfolio and arrears rates. Simulation analysis based on a structural macromodel that endogenizes the microcredit sector calibrated by means of OLS regressions estimated using a sample of 48 observations drawn from 8 microfinance institutions (1997–2002). | While banks and microfinance institutions reduced their lending and witnessed increasing arrears, institutions providing savings, training, and quasi-insurance did relatively well. Simulation suggests: (i) microfinance institutions acted as a crisis catalyst; (ii) improvements in the design of microcredit schemes (such as the introduction of complementary insurance and savings schemes) enhance the effectiveness of microcredit institutions. | The simulation relies on strong structural assumptions. In addition, the econometric analysis suffers from small sample and omitted variable bias. |

| | | | | |
|---|---|---|---|---|
| <p>Bolivia (1998) Crisis performance of Caja Los Andes, a registered savings and loan company using information on default and late payments</p> | <p>Vogelgesang (2003)</p> | <p>Bivariate probit model of (i) defaults and (ii) late repayment, correcting for selection bias. Exclusion restrictions: (i) for first-time loans = the amount requested; (ii) for prior loans = the length of prior loans. Sample: 76,000 clients and 28,000 rejected loan applications (May 1992–June 2000).</p> | <p>The crisis had a negative, but insignificant, impact on the probability of repayment.</p> | <p>According to Marconi and Mosley (2006) the performance of Caja Los Andes was a “positive outlier.” Most banks and financial intermediaries witnessed higher arrears and lower values of outstanding loans. Unfortunately, they only present descriptive statistics, making it difficult to assess causality.</p> |
| <p>Indonesia (1997) Performance of different parts of Bank Rakyat Indonesia (BRI) during the Indonesian crisis (1997–2000)</p> | <p>Patten, Rosengard, and Johnston (2001)</p> | <p>(Descriptive) comparative analysis of the performance of different parts of BRI during the East Asian crisis including corporate banking, retail banking, and microbanking.</p> | <p>The microcredit branch of BRI was remarkably resilient to the crisis and which outperformed other parts of RBI.</p> <ul style="list-style-type: none"> • Microcredit repayment rates >97%; • Average growth of microfinance lending = 14% p.a. (1997–99); • Ratio of savings accounts to loan accounts = 1 to 1 (1997–99). | |

Appendix Review of Evidence on Main Policy Interventions

Notes

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1. These include financial restrictions, trade barriers, firm entry costs, inefficient bankruptcy procedures, bureaucratic red tape, tax burden, and labor regulations.

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