

## **Human Development and Economic Uncertainties: Exploring Another Dimension of Development**

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### **Abstract**

*This study makes the case that economic uncertainties—i.e., the extent to which economies face systemic uncertainties—need to be considered another dimension of human development because they render development vulnerable, diminish social welfare, and constrain human capabilities. We propose a methodology for adjusting the human development index (HDI) for economic uncertainties, using the time variability of income changes as a proxy. We construct an adjusted index associated with the income component for the 2011 HDI. Our analysis indicates that such an index contains additional information. The percentage loss in the income component of the HDI seems to reflect the variability in economic indicators arising from the political and economic tribulations experienced by each country. In Pakistan’s case, the results of a time-series analysis of the percentage loss from the uncertainty adjustment appear to closely trace the country’s political and economic upheavals.*

**Keywords:** Human development index, capabilities, human development, economic growth, economic vulnerability, uncertainty, risk.

**JEL classification:** D63, I32, I38.

### **1. Introduction**

The United Nations Development Programme (UNDP)’s human development index (HDI) has been instrumental in focusing on the nexus between human development and economic growth. The index’s simplicity in characterizing development as a composite of achievements in health, education, and income has made it a particularly useful tool for advocacy purposes and in de-emphasizing a *growth-centric* view of development.

The HDI has undergone many revisions since its inception in 1990. UNDP (2010) revised its indicators and functional form, but retained the index’s three-dimensional structure. To address a major criticism that the

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HDI neglected within-country inequality, three additional indices were introduced: the *inequality-adjusted* HDI, the *gender inequality index*, and the *multidimensional poverty index*. According to Klugman, Rodríguez, and Choi (2011): “The 2010 HDR made a significant move away from the idea that the ideal measure of human development must cover only the three core dimensions.” It is in this spirit that we explore a new dimension of human development in this paper.

One dimension that has not received much attention is the extent to which populations face economic uncertainties, rendering development vulnerable. These uncertainties arise from a wide range of risk factors, e.g., natural disasters, systemic political and market failures, external economic shocks, and adverse technological and market changes. The overall impact of economic uncertainties is to *diminish human capabilities* in the sense originally conceived of by Amartya Sen—“development as capability expansion” (Sen, 1985, 1990). The 2010 Human Development Report (HDR) raises the issue of economic vulnerabilities, noting that, “countries and people are vulnerable when their human development is threatened by various risks,” but promises to address it in the following HDR (UNDP, 2010). The 2011 HDR, however, takes it up as an issue of development sustainability in the broader environmental, economic, and social context (UNDP, 2011).

We argue that economic uncertainties need to be explicitly considered as another dimension (negative) of human capabilities, and propose an *uncertainty-adjusted* HDI (U-HDI). Our methodology for constructing such an index takes the time variability of income changes as a proxy for economic vulnerability. This study presents the results of an exploratory exercise in constructing such an index across countries. We also present a detailed analysis for Pakistan in the context of the uncertainties associated with the country’s political and economic environment over time.

## 2. Background

Since its introduction in 1990, the HDI has become a “yardstick of wellbeing” in discussions on development issues. Its basic message, that development is much more than income growth, has forced policymakers and development economists alike to move away from “growth-centric” thinking and focus on other dimensions of development such as health and education. Its prime movers, the late Pakistani economist Mahbub ul Haq

and Nobel laureate Amartya Sen, had sought an alternative to per capita income as the standard measure of development.<sup>1</sup>

The resulting HDI aggregated three basic dimensions into a composite index, motivated by the view that, “Human development is a process of enlarging people’s choices. [...] The three essential ones are for people to lead a long and healthy life, to acquire knowledge and to have access to resources needed for a decent standard of living” (UNDP, 1990, p. 10). The index’s simplicity in characterizing development as a composite of achievements in health, education, and income has made it a particularly useful tool for advocacy purposes and encapsulating a comprehensive view of development.

Until 2010, the HDI was defined as a simple arithmetic average of its sub-indices—health, education, and income—based on normalized indicators of achievements in each of these dimensions. Life expectancy and GDP per capita were used as proxies for health and living standards, respectively, while the literacy ratio and gross enrolment ratio were used to measure education. The sub-indices were then normalized using given upper and lower bounds. The HDI has undergone many revisions since its inception in 1990, and the choice of indicators and definition of sub-indices had varied over time. However, it has retained its basic original structure.

While the HDI is accepted as a measure of development, it has also invited much criticism in two broad categories: (i) its choice of development dimensions, and (ii) its functional form. Critics point out that the HDI excludes other obvious dimensions of wellbeing, such as equity, political freedoms, human rights, sustainability, and happiness. For example, Sagar and Najam (1998) note that the HDI “ignores the environmental dimensions of development, especially the relationships between the performance of countries on the environmental and human development dimensions.” The HDI is also criticized for not capturing all of people’s freedoms and opportunities, for example, Nussbaum (2000) would include personal, social, and political freedoms in her list of ten basic capabilities, and Dasgupta and Weale (1992) would include political and civil liberties.

Partly in response to the criticism regarding the narrowness of the HDI, some studies have advocated multidimensional measures. For example, Alkire and Foster (2011) discuss the strengths and limitations of

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<sup>1</sup> “Any measure that values a gun several hundred times more than a bottle of milk is bound to raise serious questions about its relevance for human progress” (Haq, 1995).

multidimensional poverty measures and provide a “dual cutoff” identification approach that views poverty as the state of being multiply deprived. An earlier study by Alkire (2002) discusses the usefulness and limitations of various dimensions of human development in relation to Sen’s capability approach. She provides a survey of other major *lists* of dimensions developed by various scholars.

In response to various criticisms, the HDI has been revised many times. In the most recently revised HDI (UNDP, 2010),<sup>2</sup> three of the four variables that constitute the index were altered—GDP per capita was replaced by gross national income (GNI) per capita (both valued in terms of US dollar-based purchasing power parity), and literacy and gross enrolment were replaced by mean years of schooling and expected years of schooling, respectively. The method of aggregation was changed from an arithmetic average to a geometric average, and the upper and lower bounds used to normalize the index were redefined, eliminating the practice of capping variables that exceeded the upper bounds. To address a major criticism that the HDI neglected within-country inequality, three additional indices were introduced: (i) the *inequality-adjusted HDI*, (ii) the *gender inequality index*, and (iii) the *multidimensional poverty index*.

The 2010 HDI, however, retains its three-dimensional structure and new dimensions were not introduced on several grounds. Among others, one reason appears to be a continued focus on *opportunity freedoms*—freedoms that give us greater opportunity to achieve the things we value—as opposed to *process freedoms*, i.e., those that ensure that the process through which things happen is fair, based on Sen’s (2002) distinction. However, the 2010 HDR makes a strong case for the consideration of several process freedoms in the discussion on human development, and for “broader dimensions” of human development: empowerment, sustainability and equity. One of the report’s key contentions is that the measurement of human development should be expanded beyond the core dimensions.

The evolution of the HDI shows that the measurement of human development is an ongoing challenge. According to Klugman et al. (2011): “The 2010 HDR made a significant move away from the idea that the ideal measure of human development must cover only the three core dimensions, and presented three new measures that take into account different aspects of the distribution of human development.” The report

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<sup>2</sup> Klugman et al. (2011) and Lustig (2011) explain in detail the rationale for the new HDI, while Ravallion (2010) offers a critical view.

also published on its website a feature that allows users to “build your own development index.”

For Klugman et al. (2011), the position taken by the 2010 HDR constitutes a significant departure from the traditional vision of the index in which the report’s authors would set the weights objectively; instead, the weights and measures used are subject to open public debate. This premise, accordingly, informs our study.

### 3. Inequality-Adjusted HDI

Of particular interest with respect to our study are the innovative inequality-adjusted indices that go beyond the HDI, and are designed to address the key dimensions of inequality and deprivation. Although the HDR has always recognized that inequality in human development is a serious issue, an inequality-based index could not be operationalized earlier due to the nonavailability of data. The inequality-adjusted HDI (IHDI) is a measure of the level of human development of people in a society that accounts for inequality in health, education, and income, and is directly comparable to the HDI across countries.<sup>3</sup>

There are three main steps to computing the IHDI. First, inequality in the underlying distributions is measured. The IHDI builds on the family of inequality measures proposed by Atkinson (1970). In case the aversion parameter  $\varepsilon$  equal to 1, Atkinson’s inequality measure is  $A = 1 - \gamma/\mu$ , where  $\gamma$  is the geometric mean and  $\mu$  the arithmetic mean of the distribution. This can be written as:

$$A_x = 1 - \frac{\sqrt[n]{X_1 \cdots X_n}}{\bar{X}} \quad (1)$$

where  $\{X_1, \dots, X_n\}$  denotes the underlying distribution for the variable of interest.  $A_x$  is obtained for each HDI dimension (life expectancy, years of schooling, and disposable income or consumption per capita) from household survey data and life tables.

The second step is to adjust the mean achievement in a dimension,  $X$ , for inequality as follows:

$$\bar{X}^* = \bar{X}(1 - A_x) = \sqrt[n]{X_1 \cdots X_n} \quad (2)$$

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<sup>3</sup> Alkire and Foster (2011) and Kovacevic (2011) provide details on measuring inequality in the distribution of the HDI indicators.

Thus  $X^*$ , the geometric mean of the distribution, is used to lower the mean according to the degree of inequality in the distribution. The use of the geometric mean emphasizes the lower end of the distribution. The inequality-adjusted dimension indices,  $I_{IX}$ , are obtained from the HDI dimension indices by multiplying them by  $(1 - A_x)$ , where  $A_x$  is the corresponding Atkinson measure:

$$I_{1x} = (1 - A_x) \cdot I_X. \quad (3)$$

The IHDI is then calculated as:

$$IHDI = \sqrt[3]{(1 - A_{Life}) \cdot (1 - A_{Education}) \cdot (1 - A_{Income})} \cdot HDI. \quad (4)$$

#### 4. Economic Uncertainties, Vulnerability, and Resilience

A development dimension that has not received much attention is the extent to which economies face economic uncertainties. These uncertainties can arise from a wide range of risk factors, e.g., natural disasters, systemic political and market failures, external economic shocks, and adverse technological and market changes. Such uncertainties put people's wealth and wellbeing at risk, and render human development vulnerable. The overall impact of economic uncertainties is to *diminish human capabilities* in the sense conceived of by Sen (1985, 1990).

The concepts of *economic vulnerability* and *resilience*, first explored by Briguglio (1995, 2003), have existed in economics literature for some time. A number of empirical studies (see, for example, Briguglio, 2003; Crowards, 2000; Atkins, Mazzi, & Easter, 2000) show that small states, particularly island states, tend to be economically more vulnerable than other countries. An economy's structural characteristics, e.g., a high degree of economic openness and export concentration, lead to higher exposure to exogenous shocks, which can magnify economic fluctuations and risks in economic growth. Cordina (2004a, 2004b) shows that higher variability in the economic growth rate can also adversely affect economic growth itself.

The term '*resilience*' refers to the ability to recover quickly from the effect of an adverse shock to the economy.<sup>4</sup> Briguglio (2003) observes that some small states are able to generate a relatively high GDP per capita despite their higher vulnerability to external economic shocks. He terms

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<sup>4</sup> Merriam-Webster defines resilience as (i) the capability of a strained body to recover its size and shape after deformation caused especially by compressive stress, and (ii) an ability to recover from or adjust easily to misfortune or change; origin, Latin *resilire*, to jump back, recoil.

this phenomenon the “*Singapore Paradox*”—Singapore, although highly exposed to external shocks, has managed to sustain relatively high rates of economic growth and GDP per capita. He explains the paradox in terms of the country’s ability to build its *economic resilience* by structuring the economy so that it can offset the disadvantages associated with its economic vulnerability.

Briguglio (2003, 2004) posits that economic vulnerability reflects an economy’s inherent features that are permanent or quasi-permanent. On the other hand, economic resilience is *nurtured* and associated with “man-made measures, which enable a country to withstand or bounce back from the negative effects of external shocks.” As Briguglio, Cordina, Farrugia, and Vella (2009) note, the term has been used in the literature in at least three senses relating to the ability to (i) recover quickly from a shock—“*shock-counteraction*”, (ii) withstand the effect of a shock—“*shock-absorption*”, and (iii) avoid the adverse impact of shocks—*shock avoidance* as the obverse of economic vulnerability. Briguglio (2004) classifies countries according to their high or low scores in terms of vulnerability and resilience, terming the four possible cases “*best-case*”, “*worst-case*”, “*self-made*”, and “*prodigal son*”. Briguglio et al. (2009) go further and construct vulnerability and resilience indices for 87 countries, and provide ample evidence that countries differ considerably in these dimensions.

Our concept of vulnerability is closely related to the concepts of vulnerability and resilience discussed in the literature. However, we focus on economic vulnerability and resilience in a broader sense than previously used. We aim to assess how overall economic uncertainties are experienced by the populations in different economies along the recognized dimensions of human development. Their recent experience can be used as an indicator of the extent to which human development may be at risk. While earlier empirical research has focused on the determinants of economic vulnerability and resilience, we capture its overall effect in diminishing human wellbeing.

One pervasive theme in the development of human societies has been their endeavor to build social, political, and economic institutions that help reduce the uncertainties faced by individuals, communities, and economies. In the theory of choice under uncertainty, individual utility functions include a risk parameter to reflect risk aversion. In parallel, social welfare functions should also reflect risk aversion on the part of society. At the micro-level, it is argued that a major hurdle to poverty alleviation is the fact that at-risk populations continue to slip back into poverty due to

economic shocks, thus providing one rationale for the need for social safety nets. We suggest that economic vulnerabilities need to be explicitly considered another dimension (negative) of human capabilities, and thus propose a U-HDI.

## 5. A Proposed Measure for Adjusting for Economic Uncertainties

The methodology for constructing a U-HDI uses the time variability of income changes as a proxy for economic vulnerability. Our approach is similar to that used to compute the IHDI following Atkinson (1970). Atkinson's approach, drawing on Dalton (1920), starts with the assertion that any statistical measure of inequality should be based directly on the form of the social welfare function  $U(y)$  and the expected value of the utility function as the primary criterion for ranking income distribution:

$$W = \int_0^{\bar{y}} U(y)f(y)dy \quad (5)$$

Atkinson makes the usual assumptions about the form of the function  $U(y)$ : it is increasing and concave.<sup>5</sup> He draws on the economic theories on decision-making under uncertainty and exploits the parallel to the second-order stochastic dominance criterion:

A distribution  $f(y)$  will be preferred to another distribution  $f^*(y)$  according to criterion (5) for all  $U(y)$  ( $U' > 0, U'' < 0$ ) if and only if

$$\int_0^z [F(y) - F^*(y)]dy \leq 0 \text{ for all } z, 0 \leq z \leq \bar{y} \quad (6)$$

and  $F(y) \neq F^*(y)$  for some  $y$ , where  $F(x) = \int_0^x f(y)dx$ .

Atkinson obtains a measure of inequality by introducing the concept of the *equally distributed equivalent* level of income ( $y_{EDE}$ ), or the level of income per head which, if equally distributed, would yield the same level of social welfare as the present distribution, that is:

$$U(y_{EDE}) \int_0^{\bar{y}} f(y)dy = \int_0^{\bar{y}} U(y)f(y)dy \quad (7)$$

His measure of inequality is 1 minus the ratio of the equally distributed equivalent level of income to the mean of the actual distribution,  $I = 1 - y_{EDE}/\mu$ . Atkinson notes that, "the concept of equally distributed equivalent income is closely related to that of a risk premium or

<sup>5</sup> The assumption that  $U(y)$  is concave is equivalent to assuming that a person is risk-averse.



certainty equivalent in the theory of decision-making under uncertainty.<sup>6</sup>  $Y_{EDE}$  is simply the analogue of the certainty equivalent and  $I$  is equal to the proportional risk premium as defined by Pratt (1964).” This parallel, along with the requirement that inequality measures be invariant to proportional shifts in income—implying *constant (relative) inequality-aversion*—allows Atkinson to develop the following specific measure of inequality:

$$I = 1 - \left[ \sum_i \left( \frac{y_i}{\mu} \right)^{1-\epsilon} f(y_i) \right]^{1/(1-\epsilon)} \quad (8)$$

In the Atkinson measure of inequality,  $I_\epsilon = 1 - \mu_{1-\epsilon}/\mu_1$ ,  $\mu_{1-\epsilon}$  uses a general class of means of order  $\epsilon$ . For  $\epsilon > 0$ , the mean assigns greater weight to the lower part of the distribution; for  $\epsilon = 0$ , it is neutral; and for  $\epsilon < 0$ , it is more sensitive to the upper part. The higher the  $\epsilon$  the more emphasis is on the lower part of the distribution; therefore, the order  $\epsilon$  is interpreted as the degree of aversion toward inequality across persons. The IHDI draws on the Atkinson (1970) family of inequality measures and sets the aversion parameter  $\epsilon$  equal to 1. In this case, the inequality measure is  $A = 1 - \gamma/\mu$ , where  $\gamma$  is the geometric mean and  $\mu$  the arithmetic mean of the distribution.

In constructing a U-HDI, our approach is parallel to that of Atkinson, drawing on the theory on decision making under uncertainty. While Atkinson’s concept of an “equally distributed income equivalent” is based on the certainty equivalent measure, we make direct use of the latter and the risk-based measures associated with it. Whereas the inequality measure is concerned with the distribution of income/wealth across the economy at a point in time, we focus on the distribution of income/wealth in the time series frame. In doing so, we capture the risk dimension associated with a country’s income insofar that the historical distribution may be used as an unbiased estimator of the risk associated with expected income or wealth in the future. We propose that an economy’s risk dimension can be proxied by its expected variability. Following Atkinson, we then propose an index of economic uncertainties as the ratio of the geometric mean to the arithmetic mean of historical time-series of various HDIs.

## 6. An Exploratory Exercise

This section presents an exploratory exercise in constructing a U-HDI. For this initial study, we focus on the income dimension of the HDI since it is easier to measure uncertainties in this dimension than in health

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<sup>6</sup> Drawing on the literature on decision-making under uncertainty, Atkinson shows that the use of this concept is equivalent to condition (6).

or education. We also limit our analysis to the HDI for the year 2011. The data is from the World Development Indicators database and spans the following economic variables for all available countries:

1. GDP growth (annual percent)
2. GDP per capita growth (annual percent)
3. GNI growth (annual percent)
4. GNI per capita growth (annual percent)
5. Household final consumption expenditure (annual percent growth)
6. Household final consumption expenditure per capita (annual percent growth)
7. Household final consumption expenditure, etc. (annual percent growth)

The arithmetic and geometric means are computed for the last ten years (2002–2011) for this series, and then used to construct an uncertainty measure (parallel to the Atkinson measure,  $A$ ):  $U = 1 - \gamma/\mu$ . This is then used to adjust the income component of the HDI for the year 2011. As an illustration, U-HDIs based on household final consumption expenditure per capita are reported in Table A1 in Appendix 1. A summary of the rank changes and percentage losses in the HDI resulting from the adjustment for each economic indicator used is given in Table 1 below.

**Table 1: Summary statistics for adjustments to HDI**

<b>A: Loss or gain in country rankings</b>							
<b>Rank change</b>	<b>A1</b>	<b>A2</b>	<b>A3</b>	<b>A4</b>	<b>A5</b>	<b>A6</b>	<b>A7</b>
Below -20	10	9	7	7	7	7	9
-20 to -15	2	4	4	4	3	3	3
-15 to -10	4	3	4	3	7	5	5
-10 to -5	8	11	6	6	6	8	8
-5 to 0	34	26	27	28	18	19	19
0 to 5	96	101	81	81	46	45	44
5 to 10	11	18	10	11	18	17	27
10 to 15	4	5	2	1	11	11	14
15 to 20	0	0	0	0	1	1	0
Above 20	0	0	0	0	0	0	0
Subtotal	169	177	141	141	117	116	129
No change	17	9	10	10	7	8	9
Total	186	186	151	151	124	124	138
Minimum	-59	-58	-48	-46	-68	-68	-88
Maximum	13	13	11	11	16	16	15
<b>B: Percent loss in HDI due to uncertainty adjustment</b>							
<b>Loss range</b>	<b>A1</b>	<b>A2</b>	<b>A3</b>	<b>A4</b>	<b>A5</b>	<b>A6</b>	<b>A7</b>
0 to 5%	155	154	119	119	80	81	88
5 to 10%	13	14	12	12	17	16	18
10 to 15%	7	8	7	7	6	6	12
15 to 20%	4	3	5	6	9	10	5
Above 20%	7	7	8	7	12	11	15
Total	186	186	151	151	124	124	138
Min. (%)	0.1	0.1	0.1	0.0	0.1	0.1	0.1
Max. (%)	91.0	86.2	53.7	52.3	64.2	60.6	58.7
Average (%)	4.1	4.0	4.7	4.6	7.2	7.1	7.5

Note: Adjustment based on economic variables: A1 = GDP growth (annual percent), A2 = GDP per capita growth (annual percent), A3 = GNI growth (annual percent), A4 = GNI per capita growth (annual percent), A5 = household final consumption expenditure (annual percent growth), A6 = household final consumption expenditure per capita growth (annual percent), A7 = household final consumption expenditure, etc. (annual percent growth).

*Source:* Authors' calculations.

Panel A of Table 1 shows that the uncertainty adjustment leads to extensive changes in countries' ranks corresponding to each of the economic variables used in the adjustment. The number of countries varies from 124 to 186, according to the data available. Only between 7 to 17 out of a sample of 124 to 186 countries did not experience a change in their ranking; thus, the percentage of no change is 9.1 percent at the maximum (17/186) and 4.8 percent at the minimum (9/186), corresponding to the economic variables GDP growth (annual percent) and GDP per capita growth (annual percent), respectively. There is also a wide range in the changes in ranking: seven to ten countries fall by more than 20 positions, while gains in ranks appear to be more moderate but still substantial.

Panel B of Table 1 reports the percent loss in the HDI (income component), computed as  $(1 - \text{adjusted HDI}/\text{HDI})$  percent, for the sample countries for each of the variables (A1–A7) used for adjustment. The average loss resulting from uncertainty adjustment in the HDI ranges between 4 and 7.5 percent, but the experienced loss has a wide range—the maximum loss ranges from 52.3 to 91 percent, with 7 to 15 countries registering a loss greater than 20 percent in the HDI after incorporating the uncertainty dimension.

Figure 1 shows the percent loss in HDI (income component) after adjusting for uncertainty with respect to one economic variable, household final consumption expenditure per capita growth (annual percent). The percent loss is plotted against the HDI and some of the extreme cases are labeled. Pakistan's position is also labeled, which we discuss further in the next section. Appendix 2 includes similar figures with respect to the other adjusting variables. The pattern of the scatter shows that the percent loss does not appear to be related to the level of the HDI. This indicates that the impact of the adjustment for uncertainty captures a different dimension from income.

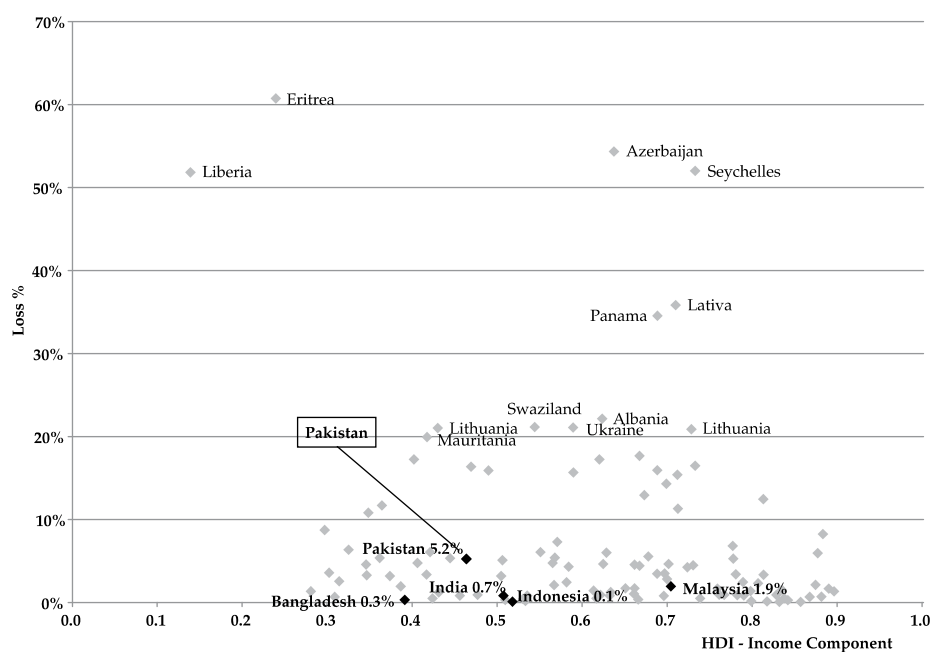
**Figure 1: Percent loss in HDI from adjusting for uncertainty**

Table 2 reports the correlation coefficients for the HDI (income component) and percent loss and change in rank after adjustment based on seven different economic variables. The correlation coefficients are fairly low and insignificant, implying that the adjustment process does add new information to the HDI.

**Table 2: Correlation of HDI with percent loss and rank changes**

Adjustment variable/correlation coefficient	Percent loss	Rank change
GDP growth	-0.1407	-0.0914
GDP per capita growth	-0.1238	-0.0909
GNI growth	-0.1425	-0.1031
GNI per capita growth	-0.1356	-0.1010
Household consumption expenditure	-0.2529	-0.1737
Household final consumption expenditure per capita	-0.2395	-0.1736
Household final consumption expenditure, etc.	-0.2198	-0.1800

*Source:* Authors' calculations.

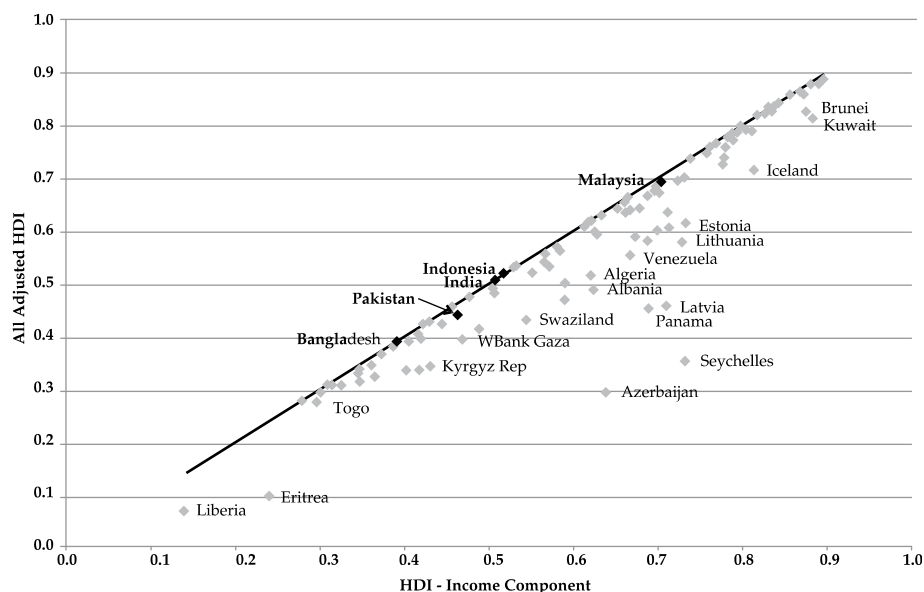
Additionally, the countries with the greatest loss from adjustment (see Table 3) seem to include those that have experienced conflict, extraordinary political and social unrest, and economic hardship following the global financial crisis, greatly affecting people's wellbeing. This association provides intuitive support to the case for considering economic uncertainties a relevant dimension of evaluating human development.

**Table 3: Countries with >20 percent loss from adjustment**

Country	HDI (income)	Adj. HDI (income)	Rank change	Loss from uncertainty (%)
Eritrea	0.240	0.0946	0	60.6
Azerbaijan	0.639	0.2924	-53	54.2
Seychelles	0.733	0.3520	-68	52.0
Liberia	0.140	0.0673	0	51.8
Latvia	0.711	0.4562	-46	35.8
Panama	0.690	0.4515	-39	34.5
Albania	0.624	0.4865	-16	22.0
Ukraine	0.591	0.4658	-12	21.1
Swaziland	0.545	0.4299	-9	21.1
Kyrgyz Republic	0.432	0.3413	-8	20.9
Lithuania	0.729	0.5767	-28	20.9
Mauritania	0.419	0.3349	-6	20.0

*Source:* Authors' calculations.

The HDI and the U-HDI are plotted for the sample countries in Figure 2. Again, the plot is based on adjustment with respect to the economic variable household final consumption expenditure per capita growth. The figure shows that the adjustment procedure affects most of the sample countries, with some registering a substantial decline in the HDI. Again, an obvious observation would be that countries with greater reductions in the HDI seem to be those that have experienced a high degree of variability in their political, social, or economic environment. There is also a degree of positive association between the HDI and the adjusted HDI, which should be expected since one is obtained from the other. Some positive dependence arises arguably because developed and higher-income countries are characterized by a more stable environment due to many factors such as economic size, institutional maturity, and a better capacity for macroeconomic management (or being less vulnerable as well as more resilient).

**Figure 2: Plot of HDI and adjusted HDI**

## 7. The Case of Pakistan

The HDI is an indicator of much interest for Pakistan, which lags behind in human and social development in the region. The HDR groups Pakistan among the countries with “low human development;” according to the 2011 HDR, out of a total of 179 countries, Pakistan is ranked 145, Bangladesh 146, Nepal 157, and Afghanistan 172. In the South Asian region, India and Sri Lanka are grouped as countries with “medium human development” with ranking of 134 and 92, respectively.<sup>7</sup>

When we adjust the income component of the HDI for uncertainty, we find that Pakistan compares less favorably relative to the countries in the region. Table 4 presents the results of this adjustment for a selected group of countries that are typically held out as peers to Pakistan. The percent loss in the HDI-income component for Pakistan is 5.2 percent, which is quite high relative to other countries; for example, it is 0.7 percent for India and 0.3 percent for Bangladesh. The next highest-loss country is Egypt with a loss of 2.1 percent—less than half that of Pakistan.

<sup>7</sup> According to the most recent HDR (UNDP, 2013) the HDI 2012 country rankings are not very different from the previous year; these are: Pakistan at 146, Bangladesh at 146, Nepal at 157, Afghanistan at 175, India at 136, and Sri Lanka at 92.

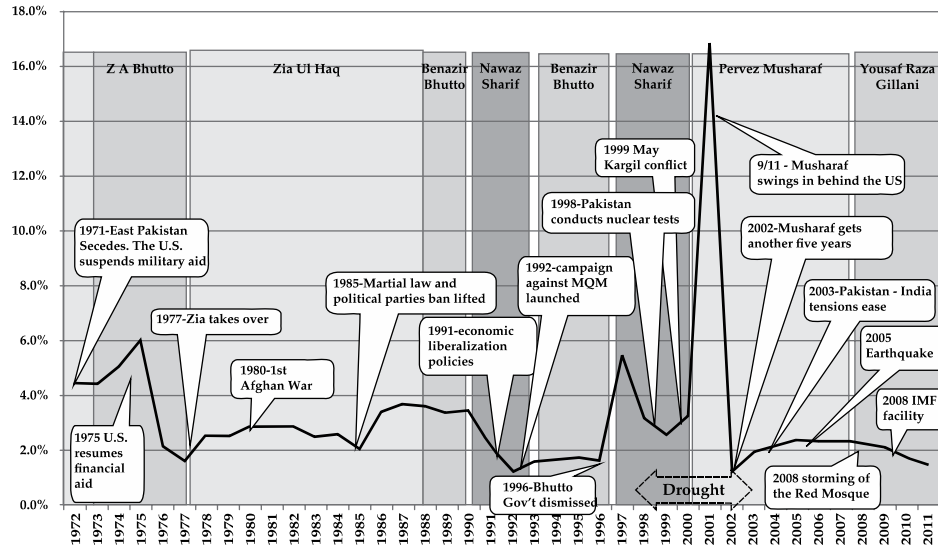
**Table 4: Selected countries in comparison with Pakistan**

Country	HDI (income component)		HDI (income) ranking		Rank change	Percent loss in HDI from adjustment
	HDI before adjustment	HDI after adjustment	Before adjustment	After adjustment		
Thailand	0.622	0.6163	72	59	13	0.9
Egypt	0.568	0.5560	83	72	11	2.1
Indonesia	0.518	0.5172	90	81	9	0.1
Philippines	0.508	0.5073	91	83	8	0.2
India	0.508	0.5041	92	84	8	0.7
Vietnam	0.478	0.4734	96	89	7	0.9
Pakistan	0.464	0.4398	98	94	4	5.2
Bangladesh	0.391	0.3896	109	103	6	0.3
Kenya	0.387	0.3798	110	105	5	1.9

*Source:* Authors' calculations.

In order to better understand how the adjusted HDI might reflect the uncertainties underlying an economy, we trace the percent loss from the uncertainty adjustment over time for Pakistan over the period 1972–2011. We compute the percent loss based on a rolling window of five years, which equals the moving ratio of the geometric mean to the arithmetic mean, using the GNI per capita growth (annual percent) series. The resulting loss indicator series is depicted in Figure 3, each point plotted against the ending year of the moving window, thus reflecting the experience of the previous five years. Major economic and political events are marked on the graph, which also shows the various political regimes that have been in power over this period to bring into relief the country's political and economic climate over time.



**Figure 3: Percent loss in HDI from adjusting for uncertainty over time**

As the figure indicates, the computed percent loss due to uncertainty seems to reflect the uncertainties related to the political and economic environment in various periods. Thus, the increasing values of the loss indicator over 1972–75 captures the political and economic disruption associated with the secession of Bangladesh. After 1975, it declines sharply as the new constitution is enacted. The second half of the Zulfikar Ali Bhutto period, however, sees the indicator rise, reflecting greater uncertainties associated with political unrest, disruptions to economic aid, and the eventual takeover of the government by General Zia-ul-Haq. The indicator remains elevated during Zia's rule and rises further toward the end of the 1980s as the anti-Soviet war in Afghanistan escalates. It declines after the Soviets withdraw in 1989, but is ramped up again as Afghanistan is engulfed in another round of power struggles.

There is a sharp increase in the loss indicator (marked against the year 2001), which captures the political disruptions and economic uncertainties of the preceding years. These include Pakistan conducting nuclear tests (1998), the imposition of economic sanctions, the May 1999 Kargil conflict, the ouster of Nawaz Sharif in the 1999 coup, and finally the events of 9/11. The indicator subsides as the Musharraf government settles down and aligns with the US war on terror, assuring a renewed stream of foreign aid and a period of stable economic growth. Finally, in the more recent period, the loss indicator seems to follow a declining trend.

## **8. Summary and Conclusions**

The 2010 HDR acknowledges that the ideal measure of human development covers more than the three core dimensions currently included. This study has explored such a new dimension of human development, i.e., the extent to which economies face systemic uncertainties, rendering development vulnerable and diminishing human capabilities. We have presented the case that economic uncertainties need to be explicitly considered another dimension of human capabilities, since they directly diminish social welfare and constrain human capabilities.

Our methodology for constructing a U-HDI parallels the approach used by the HDR to construct an IHDI, using the time variability of income changes as a proxy for economic vulnerability instead of intra-country income inequalities.

We have constructed a U-HDI associated with the income component of the HDI for the year 2011 on the suggested lines for a cross-section of countries. Our preliminary analysis indicates that such an index seems to contain additional information beyond the income index. The percent loss in the income component of the HDI appears to reflect the variability in national economic indicators arising from the political and economic tribulations experienced by each country. We have also presented a time-series perspective of the percent loss from the uncertainty adjustment for Pakistan. In this case, the loss indicator closely traces the political and economic upheavals experienced by the country over a 40-year period. Both the cross-sectional and time-series behavior of the adjustment loss indicator thus appears to validate its conceptual foundation.

Our empirical analysis of the proposed measure should, however, be tempered by a number of limitations. First, the use of annual data obviously limits the measure's usefulness as a proxy for underlying economic vulnerabilities. Other higher-frequency time series, if available, might measure the underlying concept more precisely. Second, history is seldom a perfect predictor of the future, and the vulnerability proxy based on historical data obviously ignores any structural shifts and developments in the institutional, regulatory, or governance framework that might otherwise render it invalid as a predictor. Third, the use of aggregate national-level economic indicators hides the uncertainties that are faced by individuals, communities, and regional or sub-national groups.

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## Appendix 1

**Table A1: Uncertainty adjustment to HDI using household final consumption expenditure per capita growth**

Country	HDI rank	HDI (income)	Uncertainty-adjusted HDI	Rank (income HDI)	Rank (adj. HDI)	Rank change	Percent loss from adjustment
Singapore	26	0.897	0.8852	1	1	0	1.3
Luxembourg	25	0.892	0.8770	2	2	0	1.6
Kuwait	63	0.884	0.8114	3	19	-16	8.2
Norway	1	0.883	0.8767	4	3	1	0.7
Brunei Darussalam	33	0.877	0.8256	5	14	-9	5.9
Hong Kong	13	0.874	0.8557	6	6	0	2.1
US	4	0.869	0.8629	7	4	3	0.6
Switzerland	11	0.858	0.8572	8	5	3	0.1
Netherlands	3	0.845	0.8416	9	7	2	0.4
Sweden	10	0.842	0.8390	10	9	1	0.4
Austria	19	0.842	0.8410	11	8	3	0.1
Canada	6	0.840	0.8371	12	11	1	0.3
Germany	9	0.838	0.8376	13	10	3	0.1
Australia	2	0.837	0.8321	14	12	2	0.5
Denmark	16	0.836	0.8241	15	15	0	1.5
Belgium	18	0.832	0.8315	16	13	3	0.1
UK	28	0.832	0.8211	17	16	1	1.3
Finland	22	0.828	0.8208	18	17	1	0.9
France	20	0.819	0.8180	19	18	1	0.1
Iceland	14	0.814	0.7124	20	37	-17	12.5
Ireland	7	0.814	0.7872	21	24	-3	3.3
Rep. of Korea	15	0.808	0.7894	22	21	1	2.3
Spain	23	0.799	0.7889	23	22	1	1.3
Italy	24	0.799	0.7976	24	20	4	0.2
Israel	17	0.796	0.7881	25	23	2	0.9
Slovenia	21	0.790	0.7831	26	25	1	0.9
Cyprus	31	0.790	0.7711	27	27	0	2.4
Greece	29	0.783	0.7580	28	30	-2	3.3
New Zealand	5	0.783	0.7768	29	26	3	0.8
Saudi Arabia	56	0.781	0.7551	30	32	-2	3.3
The Bahamas	53	0.779	0.7382	31	34	-3	5.2
Oman	89	0.778	0.7247	32	36	-4	6.8
Malta	36	0.769	0.7623	33	28	5	0.9
Czech Rep.	27	0.769	0.7619	34	29	5	0.9
Portugal	41	0.763	0.7561	35	31	4	0.9
Slovak Rep.	35	0.759	0.7459	36	33	3	1.7
Poland	39	0.739	0.7361	37	35	2	0.4
Estonia	34	0.734	0.6132	38	61	-23	16.4

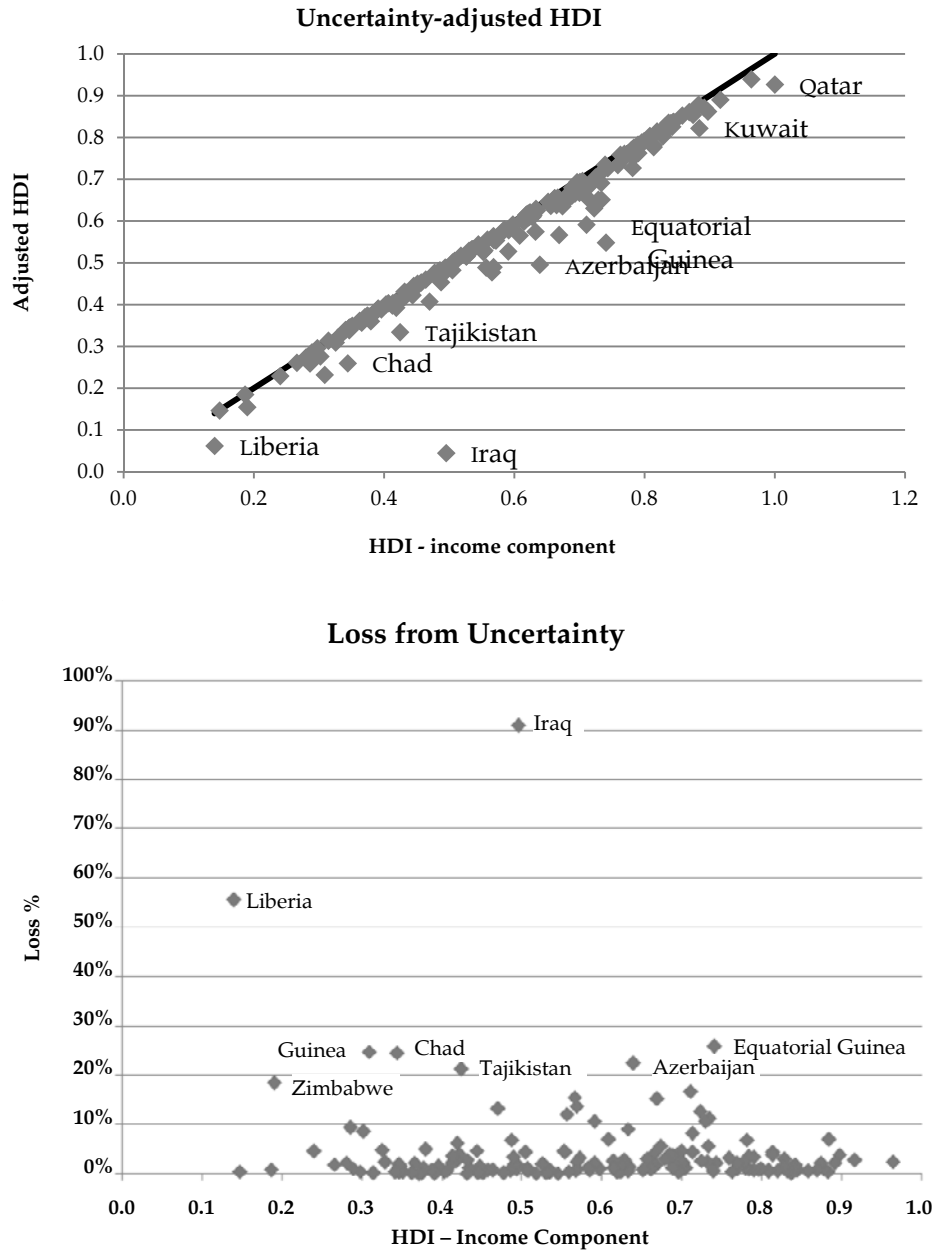
Country	HDI rank	HDI (income)	Uncertainty-adjusted HDI	Rank (income HDI)	Rank (adj. HDI)	Rank change	Percent loss from adjustment
Seychelles	52	0.733	0.3520	39	107	-68	52.0
Hungary	38	0.732	0.6997	40	38	2	4.4
Lithuania	40	0.729	0.5767	41	69	-28	20.9
Croatia	46	0.724	0.6942	42	39	3	4.2
Russian Fed.	66	0.713	0.6035	43	63	-20	15.4
Argentina	45	0.713	0.6331	44	55	-11	11.2
Latvia	43	0.711	0.4562	45	91	-46	35.8
Malaysia	61	0.704	0.6912	46	40	6	1.9
Belarus	65	0.702	0.6694	47	46	1	4.6
Chile	44	0.701	0.6816	48	42	6	2.7
Mexico	57	0.700	0.6801	49	43	6	2.8
Uruguay	48	0.700	0.6000	50	64	-14	14.3
Lebanon	71	0.698	0.6743	51	44	7	3.4
Botswana	118	0.698	0.6736	52	45	7	3.5
Mauritius	77	0.696	0.6912	53	41	12	0.7
Panama	58	0.690	0.4515	54	93	-39	34.5
Gabon	106	0.689	0.5794	55	68	-13	15.9
Turkey	92	0.689	0.6652	56	47	9	3.4
Bulgaria	55	0.678	0.6409	57	52	5	5.5
Romania	50	0.674	0.5871	58	67	-9	12.9
Venezuela	73	0.669	0.5513	59	73	-14	17.5
Kazakhstan	68	0.668	0.6381	60	53	7	4.4
Costa Rica	69	0.667	0.6637	61	48	13	0.4
Serbia	59	0.663	0.6334	62	54	8	4.5
Iran	88	0.662	0.6549	63	49	14	1.1
Brazil	84	0.662	0.6511	64	50	14	1.6
South Africa	123	0.652	0.6413	65	51	14	1.6
Azerbaijan	91	0.639	0.2924	66	119	-53	54.2
Peru	80	0.634	0.6271	67	57	10	1.1
Colombia	87	0.633	0.6286	68	56	12	0.7
Dominican Rep.	98	0.629	0.5913	69	66	3	6.0
Dominica	81	0.626	0.5967	70	65	5	4.6
Albania	70	0.624	0.4865	71	87	-16	22.0
Thailand	103	0.622	0.6163	72	59	13	0.9
Algeria	96	0.621	0.5146	73	82	-9	17.2
Ecuador	83	0.620	0.6172	74	58	16	0.5
China	101	0.618	0.6153	75	60	15	0.4
Tunisia	94	0.614	0.6060	76	62	14	1.3
Namibia	120	0.591	0.4988	77	85	-8	15.6
Ukraine	76	0.591	0.4658	78	90	-12	21.1
El Salvador	105	0.585	0.5599	79	71	8	4.2
Belize	93	0.582	0.5681	80	70	10	2.4
Cuba	51	0.572	0.5301	81	78	3	7.3

Country	HDI rank	HDI (income)	Uncertainty-adjusted HDI	Rank (income HDI)	Rank (adj. HDI)	Rank change	Percent loss from adjustment
Jordan	95	0.569	0.5378	82	75	7	5.4
Egypt	113	0.568	0.5560	83	72	11	2.1
Armenia	86	0.566	0.5390	84	74	10	4.7
Paraguay	107	0.552	0.5191	85	80	5	6.0
Swaziland	140	0.545	0.4299	86	95	-9	21.1
Morocco	130	0.535	0.5309	87	77	10	0.8
Guatemala	131	0.534	0.5334	88	76	12	0.2
Bolivia	108	0.530	0.5285	89	79	10	0.3
Indonesia	124	0.518	0.5172	90	81	9	0.1
Philippines	112	0.508	0.5073	91	83	8	0.2
India	134	0.508	0.5041	92	84	8	0.7
Honduras	121	0.507	0.4815	93	88	5	5.0
Cape Verde	133	0.505	0.4894	94	86	8	3.1
Moldova	111	0.490	0.4122	95	99	-4	15.9
Vietnam	128	0.478	0.4734	96	89	7	0.9
West Bank and Gaza	114	0.470	0.3933	97	102	-5	16.3
Pakistan	145	0.464	0.4398	98	94	4	5.2
Nicaragua	129	0.457	0.4528	99	92	7	0.9
Lao PDR	138	0.445	0.4219	100	98	2	5.3
Kyrgyz Rep.	126	0.432	0.3413	101	109	-8	20.9
Cameroon	150	0.431	0.4258	102	96	6	1.3
Tajikistan	127	0.425	0.4224	103	97	6	0.5
Sudan	169	0.421	0.3957	104	101	3	6.1
Mauritania	159	0.419	0.3349	105	111	-6	20.0
Cambodia	139	0.418	0.4037	106	100	6	3.4
Senegal	155	0.406	0.3872	107	104	3	4.7
Lesotho	160	0.403	0.3338	108	112	-4	17.1
Bangladesh	146	0.391	0.3896	109	103	6	0.3
Kenya	143	0.387	0.3798	110	105	5	1.9
Benin	167	0.374	0.3626	111	106	5	3.1
The Gambia	168	0.365	0.3229	112	114	-2	11.6
Zambia	164	0.362	0.3427	113	108	5	5.4
Burkina Faso	181	0.349	0.3115	114	115	-1	10.7
Uganda	161	0.347	0.3353	115	110	5	3.2
Mali	175	0.346	0.3306	116	113	3	4.6
Ethiopia	174	0.326	0.3052	117	118	-1	6.2
Mozambique	184	0.314	0.3066	118	116	2	2.5
Guinea	178	0.309	0.3064	119	117	2	0.7
Madagascar	151	0.302	0.2913	120	120	0	3.6
Togo	162	0.297	0.2716	121	122	-1	8.7
Central African Rep.	179	0.280	0.2765	122	121	1	1.3
Eritrea	177	0.240	0.0946	123	123	0	60.6
Liberia	182	0.140	0.0673	124	124	0	51.8

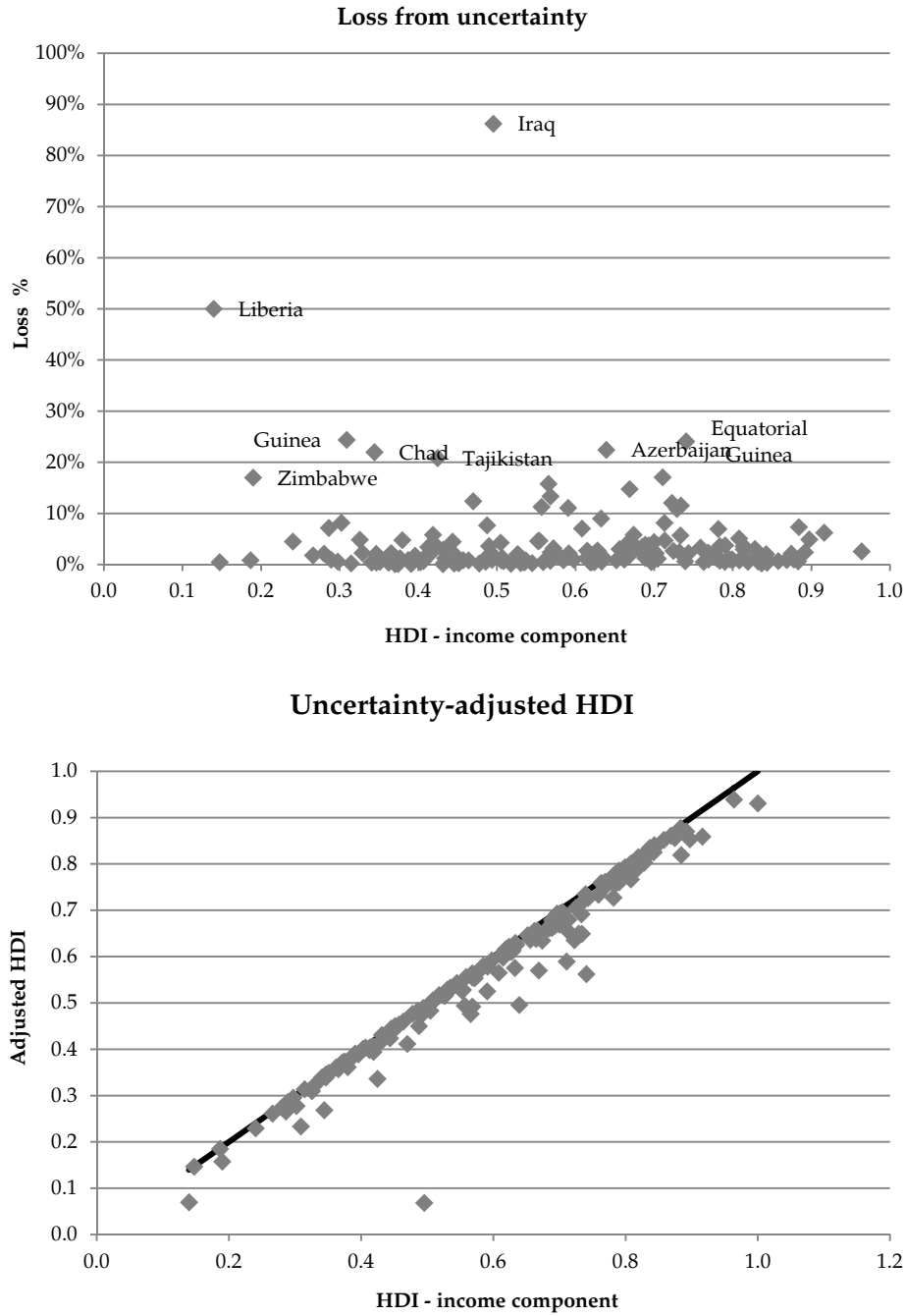


Appendix 2

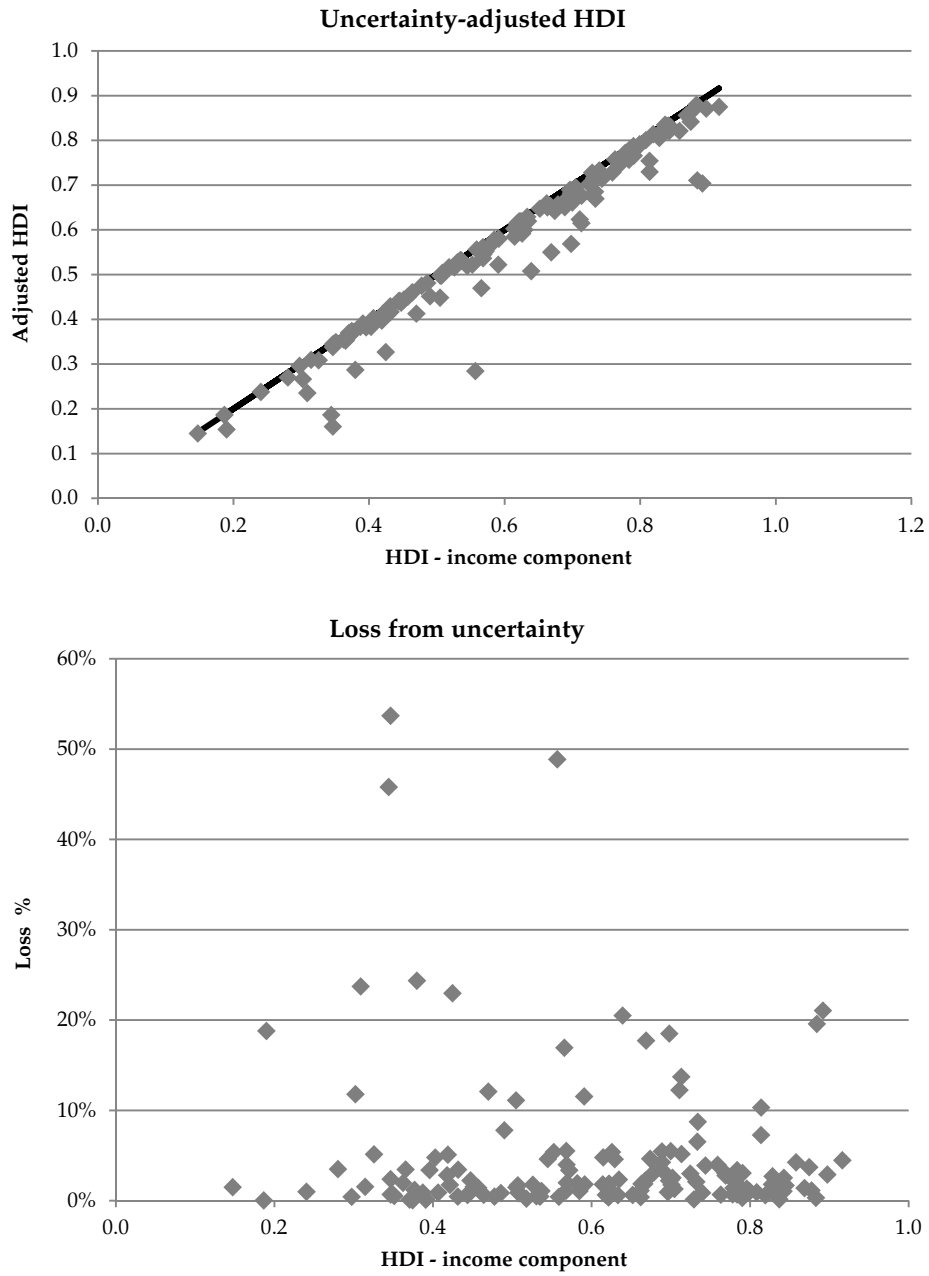
Figure A1: GDP growth  
(annual percent)



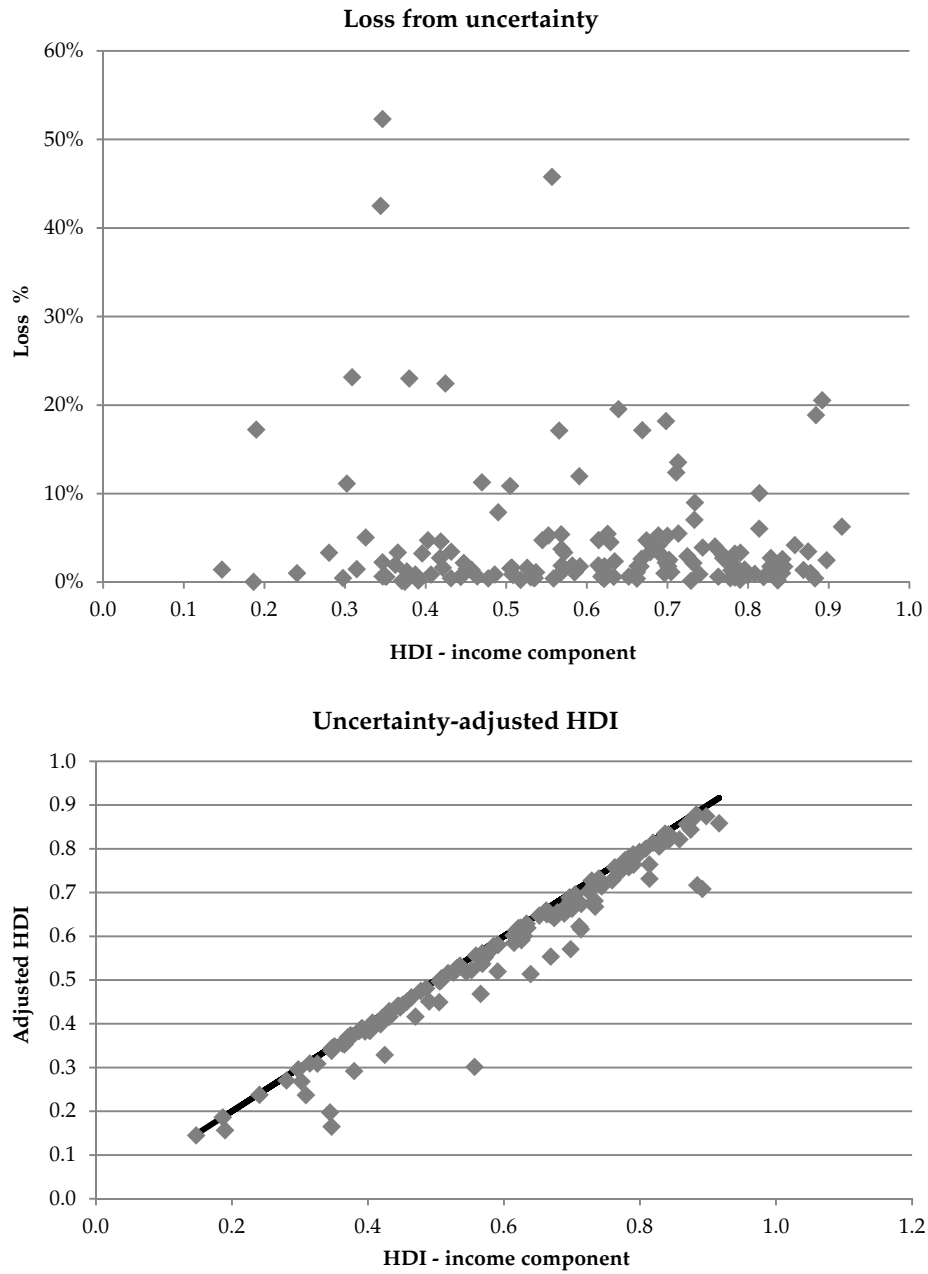
**Figure A2: GDP per capita growth  
(annual percent)**



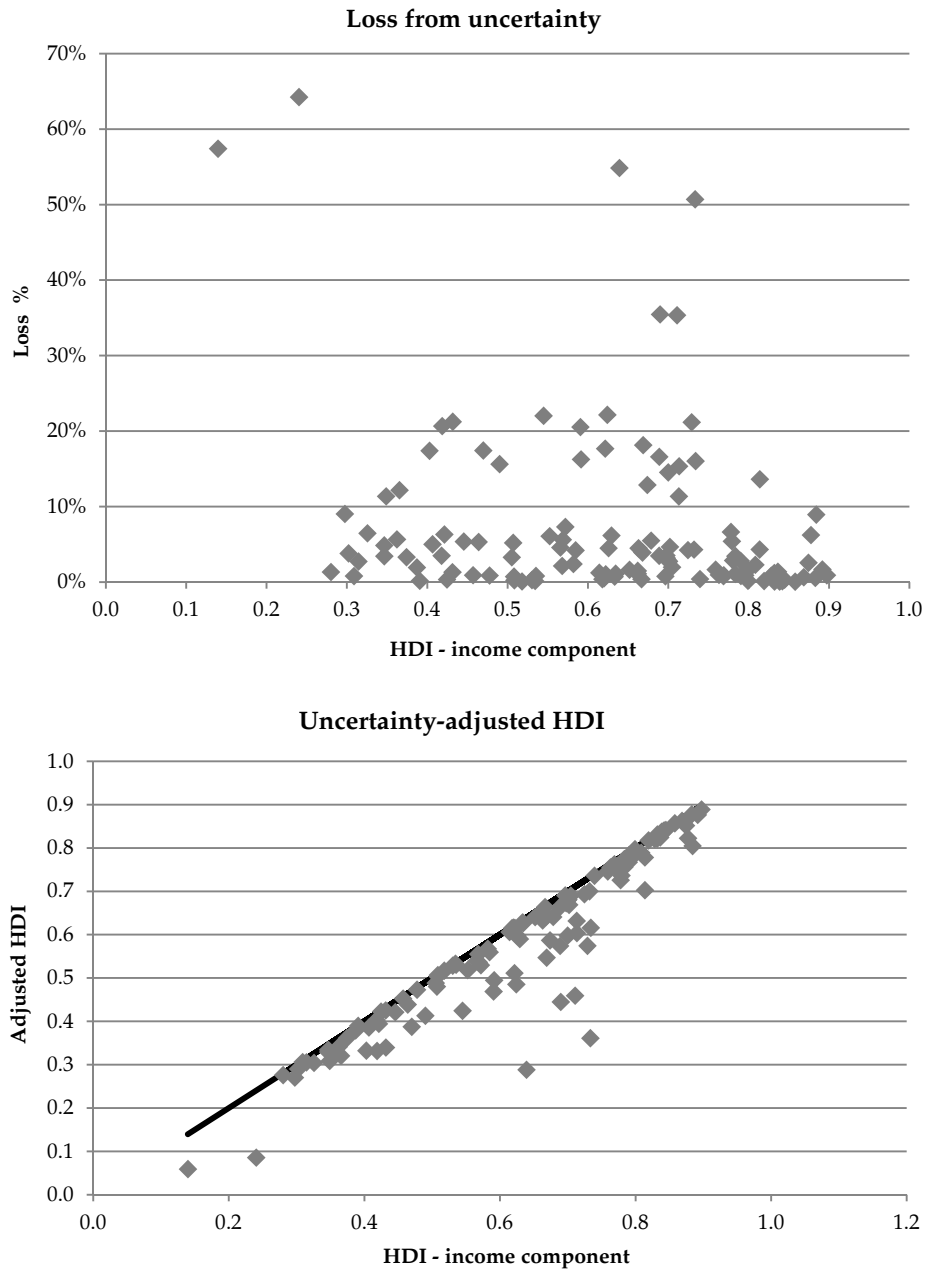
**Figure A3: GNI growth**  
(annual percent)



**Figure A4: GNI per capita growth**  
(annual percent)



**Figure A5: Household final consumption expenditure**  
(annual percent growth)



**Figure A7: Household final consumption expenditure, etc.  
(annual percent growth)**

