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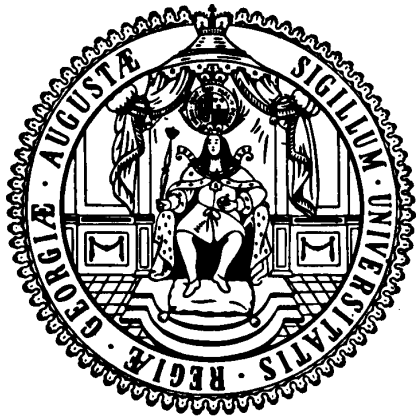

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Reforming the Gender-Related Development Index (GDI) and the Gender Empowerment Measure (GEM): Some Specific Proposals

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Reforming the Gender-Related Development Index (GDI) and the Gender Empowerment Measure (GEM): Some Specific Proposals

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Abstract

In 2005 and 2006, the Human Development Report Office undertook a review of UNDP's gender-related indicators, particularly the Gender-Related Development Index (GDI) and the Gender Empowerment Measure (GEM). Background papers as well as the results of the process were published in 2006 (e.g. Klasen 2006a), and summarized in the Human Development Report 2006. Here we extend this work by adjusting and extending some of the recommendations made there, by making concrete proposals for the two gender-related indicators and by presenting illustrative results for these proposed measures. The most important proposals include the calculation of a male and female HDI, as well as a gender gap index GGI to replace the GDI, that can be interpreted more directly as a measure of gender inequality. Regarding the GEM, the most important changes are different ways to deal with the earned income component and also to replace it with a more straight-forward procedure to calculate the measure. As shown below, the ranking of countries are very different for the new measures proposed here, compared to the current GDI and GEM.

Keywords: Gender inequality measures, GDI, GEM, UNDP

JEL Codes: I31, J16

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1. Introduction

Since 1990, UNDP has developed a suite of measures that seek to measure human development. Based loosely on Amartya Sen's capability approach (Sen, 1998), these measures seek to capture key capabilities, particularly health and longevity, education, as well as access to nutrition, shelter, clothing, and related capabilities. The HDI captures this using a standardized index for life expectancy, literacy and enrolment, and for a logarithmic transformation of per capita incomes. In 1995, the Gender-Related Development Index (GDI) and the Gender Empowerment Measure (GEM) were added to capture the gender dimension of human development. In 1996, two Human Poverty Measures were introduced, to capture poverty in developing and industrialized countries respectively.

While the HDI has been very successful in becoming one of the central indicators to measure development, the gender-related indicators have not nearly been as successful in academic or policy circles or the public in capturing the gender dimensions of human development. This has been due to frequent misunderstandings of the GDI as a measure of gender inequality (which it is not), conceptual problems with the components of both the GDI as well as the GEM, as well as empricial problems relating to data availability. These issues are summarized in several papers in a special issue of the *Journal of Human Development*, in particular Dijkstra (2006), Klasen (2006a, b), and Schüler (2006). Partly as a result, a whole range of other gender-related well-being indicators have been proposed and applied to fill this void, some of which will be discussed below. At the same time, UNDP undertook a review of the gender-related indicators in 2005 and 2006 and part of the special issue of the JHD was dedicated to discussing potential reforms of the two gender-related indicators (e.g. Dijkstra, 2006; Klasen, 2006b).

Here we extend this work by adjusting and extending some of the recommendations made there, making concrete proposals for the two gender-related indicators and by presenting illustrative results for these proposed measures. The most important reforms include the calculation of a male and female HDI, as well as a gender gap index GGI to replace the GDI, that can be interpreted more directly as a measure of gender inequality. Regarding the GEM, the most important changes are different ways to deal with the earned income component and also to replace it with a more straight-forward procedure to calculate the measure. As shown below, the results are quite different for the new measures proposed here, compared to the current GDI and GEM, leading to dramatically different rankings. But we believe that these measures much better capture gender differences in human development

than the currently used measures and we propose that UNDP consider their adoption when reviewing all of the gender-related indicators which is planned for 2010.

This short paper is organized as follows. The next section provides a short literature review of existing aggregate gender-related well-being measures. The third section summarizes the two measures that are suggested to replace the GDI, with the following section presenting results of these changes. The fifth and sixth section proposes methods and results for a reformed GEM, respectively, while the last section concludes.

2. Existing measures of gender sensitive human development, gender inequality, and female empowerment

When proposing the two gender-related indicators, UNDP made two important decisions. The first was to separate gender-related human development from empowerment and relegate them to two separate measures, the GDI and the GEM, respectively. And the second was to refrain from proposing an index of gender inequality in well-being, but instead proposing a measure that would track overall human development considering gender gaps in that human development, i.e. a gender-sensitive measure of human development. Other indicators have made different decisions on both questions, as will be shown below.

a) Gender-Sensitive Measures of Human Development

One of the criticisms brought up about the HDI was that it does not take into account inter-group inequality in a society. The HDI therefore assumes that everyone in the society has reached the average achievement. However, given that there are differences in achievements in the population, such differences should be taken into account if an aversion to inequality exists. There have been some proposals to address this shortcoming (e.g. Hicks, 1997; Grimm et al. 2008) but those did not specifically consider inter-group inequalities by gender.

From this notion, Anand and Sen (1995) developed the GDI. The idea is to "penalize" the HDI if gender inequality exists in any of the three dimensions incorporated in the HDI. The larger the gap between men and women in achievements of life expectancy, education and income earned, the more the GDI differs from the HDI. The gap between the HDI and GDI therefore depends on the difference in achievements between men and women in one of the components of the HDI, and on the penalty given to this gender inequality. The GDI is to be interpreted as the HDI discounted for gender disparities in its components and should not

be interpreted independently of the HDI. The gap between HDI and GDI is to be interpreted as the loss of human development due to gender inequality.

To compute the GDI, firstly, indicators of achievement for men and women are calculated separately. Secondly, based on Atkinson's way of incorporating aversion to inequality (Atkinson, 1970), the "equally distributed index" is calculated for each component of the HDI as follows:

Equally Distributed Index = $\{[\text{female population share}(\text{female index}^{1-\varepsilon})] + [\text{male population share}(\text{male index}^{1-\varepsilon})]\}^{1/1-\varepsilon}$

If ε is equal to zero then the simple arithmetic mean of female and male achievements is calculated. The Human Development Report assumes an ε of 2 indicating a social preference for equality.

The review of the GDI in 2005/06 brought out a number of weaknesses which are discussed in detail in Schüler (2006), Klasen (2006b), Dijkstra (2006), among others. The most important one appeared to be that the GDI is often misunderstood and misinterpreted as a measure of gender inequality (Schüler, 2006; Klasen, 2006a). As just shown, this is incorrect as the GDI merely adjusts the HDI by a welfare penalty for gender inequality and thus is a gender-inequality adjusted measure of overall human development. Moreover, severe conceptual and empirical problems were seen with the earned income component, which accounts by far for the largest difference between the HDI and the GDI and is based on earned incomes of males and females. In particular, it is implausible that gender gaps in earned incomes are very good proxies for gender gaps in consumption at the household level as resources are, at least to some extent, shared at the household level (Bardhan and Klasen, 1999; Klasen, 2006b). Moreover, the empirical assumptions to derive the earned income shares have a very weak empirical base and thus cannot really be seen as a good representation of earned incomes (Bardhan and Klasen, 1999, 2000).

Thus these conceptual and empirical problems as well as the fact that it is a gender-sensitive measure of overall human development rather than a direct measure of gender-inequality has been seen as a major drawback as there evidently is a great need to document gender gaps in human development. This has led to a number of gender-inequality measures trying to fill this apparent void (e.g. Dijkstra, 2002; Social Watch, 2005; World Economic Forum, 2005, Economic Commission for Africa, 2004, OECD, 2009).

b) Gender Inequality Indices

There exists a wide range of literature that proposes measures of gender inequality. One first approach was suggested by Akder (1994), who proposed that the HDI can be disaggregated by groups, including gender. A straightforward assessment of gender inequality would therefore be the difference or the ratio of the female/male HDI. Akder (1994) noted the difficulties of doing this, particularly with the earned income component, where information is typically available at the household level. After the publication of UNDP's GDI, some National Human Development Reports calculate the HDI for men and for women separately, including Turkey in 1996 (UNDP, 1996) and Kazhakstan in 2003 (UNDP, 2003) using earned income as a proxy for sex-specific consumption. We will take up this suggestion below but also point to the difficulties of such an approach.

Others have created a new composite measure of gender inequality that draws on components related to the HDR. For example, Dijkstra and Hanmer (2000) construct the Relative Status of Women (RSW) index, which uses the same indicators as the GDI. The RSW index is calculated as follows:

$$RSW = \frac{1}{3}\left(\frac{E_f}{E_m} + \frac{L_f}{L_m} + \frac{w_f}{w_m}\right)$$

where Ef and Em are male and female educational attainment indexes, Lf and Lm are the male and female life expectancy index, and wf and wm are the male and female rate of return to labor. The indexes for males and females are calculated in exactly the same way as they are for the GDI. While we propose something related below, we want to point to two problems with this measure that we will address differently below. The first is that the quality of data on relative wages is very poor, and indeed one of the problems associated with the earned income component of the GDI. The second issue is that taking an arithmetic mean of ratios has some problematic properties. In particular, doing twice as well in one component (i.e. with the ratio being 2) more than compensates for doing half as well in another component (i.e. with the ratio being ½), clearly a counterintuitive result.

Dijkstra (2002) additionally proposed the closely related Standardized Index of Gender Equality (SIGE) with the aim to avoid some of the methodological limitations of GDI and GEM. The SIGE consists of five indicators: educational attainment, life expectancy, labor market participation, share in higher labor market occupations/positions and share in parliament. Thus it constitutes a combination of components including both well-being and empowerment indcators, in contrast to the separation of these two issues in UNDP's measures Indicators are defined as the relative achievement of females to males for the first three

indicators and as the female share for the last two. For each country and indicator the resulting score is standardized by expressing the score the distrance (in standard deviations) from the mean of scores of all countries. The index is a simple arithmetic average of the standardized scores. We believe that there is some value in separating well-being from empowerment measures and thus will keep these two issues separate below. Also, the standardization ensures that the score of a country depends on the scores of all other countries in a particular year (as well as the sample of included and excluded countries) generating problems of comparability over time and making the measure much less transparent.

Social Watch (2005) developed the GEI as another direct measure of gender equality. The index has three dimensions: education, economic participation and empowerment. Gender equity in the education dimension is measured as the female-to-male ratio in literacy rates and in enrolment rates at the primary, secondary and tertiary level. In the economic participation dimension, the percentage of women in total paid jobs (excluding the agricultural sector) and the ratio of female income to male income are used. Empowerment is measured by the percentage of women in high administrative and management positions, in parliament and in decision-making posts at the ministerial level. The GEI is the simple average of the indicators for the three dimensions. Also this measure mixes well-being with empowerment issues, is based on shaky data on incomes, and suffers from the problem of using an arithmetic mean of ratios.

In 2006 the World Economic Forum introduced the Global Gender Gap Index (GGI). Like the other aforementioned indices the GGI focuses on outcome variables. The following dimensions are included: economic participation and opportunity, educational attainment, political empowerment, and health and survival. The overall index in each category is calculated by converting the data into female/male ratios. Furthermore, all subindices with values higher than 1 are truncated at 1, besides the life expectancy subindex, which is truncated at 1.06. Thus countries which have reached perfect equality are treated the same way as countries where men have lower human development than women. In order to ensure that the each component of the educational subindex, for example, has the same relative impact on the subindex score, a weighted average is computed. A simple average would give more weight to the component with the higher standard deviation. Weights are computed by calculating the standard deviation per one percentage point change of each component and than translating these values into weights. Therefore a country with a large gender gap in primary enrolment (low standard deviation) is penalized harder than a country with a large gender gap in tertiary enrolment (high standard deviation). The GGI is then the simple

average of all four subindices. This measure also mixes well-being and empowerment issues and the large number of components and the complex weighting procedure generates problems of interpretability and comparability over time.

The African Gender and Development Index (UNECA, 2004) aims at assessing the extent of inequality in well-being between men and women in African societies and therefore includes several more categories compared to the above named indices. It consists of two parts, the Gender Status Index (GSI) and the African Progress Scoreboard (AWPS).

The Gender Status Index (GSI) measures the achievement of women relative to that of men in three overall dimensions: social power, economic power, and political power. These dimensions are than broken down further into several subcategories. Firstly, social power is measured in the area of education and health. Educational achievements are measured through enrolment rates, dropout rates, and literacy. The health status is measured in the area of child health with indicators for stunting, underweight, and under-five mortality. Furthermore this subcategory includes the following indicators: life expectancy at birth, new HIV infections, and time spent out of work. Secondly, economic power is measured through wages and other income, time-use, employment, employment in management, and access to resources. With access to resources, access to houses, land and credit is meant. A measure of the freedom to dispose of one's own income is included as well. Thirdly, political power is measurement by employment in the public sector and activities in civil society, like political parties or NGOs. The relative achievement of women compared to men is calculated for each category. Then they are combined through caluculating a simple average without the inclusion of population weights.

The African Progress Scoreboard (AWPS) assesses progress of a government in ratifying conventions regarding women's equal treatment and empowerment. Governments are scored on a scala of zero to two. A two is assigned to a country if an adequate budget or a law or policy commitment has been passed by the government. The AWPS is measured in percentages set to the possible maximum score.

These indices were piloted for 12 sub-Saharan African countries. While they are clearly useful in providing a comprehensive set of data on gender gaps in many dimensions, the combination of these many components into two indices leads to measures that are hard to interpret and difficult to communicate. Also, data quality issues will preclude timely and reliable publication for a large set of countries over time.

Lastly, in 2009 the OECD Development Centre presented a new index of gender inequality called the Social Institutions and Gender Index. The index is based on background

work from Branisa, Klasen, and Ziegler (2009) who proposed a paticular way to constuct the measure which was implemented by the OECD. The innovation of the SIGI is that it is focused on measuring social institutions as they affect gender inequality. Thus it is not focusing on gendered outcomes, but on institutions that affect such outcomes. It combines 12 indicators that are aggregated to five subindices which are labeled Family Code, Physical Integrity, Son Preference, Civil Liberties and Ownership Rights. While this measure is a useful addition to existing gender inequality indicators, it is complementary to measures that track gendered outcomes and female empowerment.

c) Gender Empowerment Measures

As already discussed, some of the measures discussed above already consider empowerment aspects. UNDP's Gender Empowerment Measure is specifically focused on measuring female relative empowerment, which we consider to be a valuable feature of the measure. It contains three components, political representation, representation in senior positions in the economy, and power over economic resources (proxied by earned incomes). Similar to the GDI, it uses the same aversion to inequality procedure that penalizes inequalities in political and economic representation as well as earned incomes. But there are a range of problems associated with the current GEM, which were discussed in detail in Klasen (2006b). The first is that the earned income component considers female and male earned incomes (adjusted by gender gaps) but not the gender gaps themselves. As a result, poor countries can never score high on this component as the earned incomes of males and females are low, even if there is no inequality in these earned incomes. This seems inconsistent with the other two components and also somewhat counterintuitive as relative earnings (rather than levels) should be the only relevant information for female relative empowerment. A second problem is that the complicated aversion to inequality procedure seems redundant in this indicator and one could consider the gaps directly. These are principally the two issues we will address below when proposing a reformed GEM.

This brief review suggests that measures to track gender inequality in outcomes and female relative empowerment remain important unfinished business. UNDP's gender-related measures suffer from a range of flaws and have not been able to fill this gap. Also the other indicators proposed seem to have conceptual or technical drawbacks, mix empowerment and well-being issues, or deal with different issues altogether. Thus a reform of UNDP's measures remains a good way to fill this gap. In line with the overall aims of UNDP, such measures should be clear and easy to interpret, with reliable data available for a large set of

countries, the ability to reliably track performance over time, and the utility of the measures as advocacy tools. We believe that reformed GDI and GEM measures could fulfill this role.

2. Reforming the GDI: Methods[1]

The 2005/06 review of UNDP's measures proposed two ways to address the shortcoming of the GDI. The first one was to calculate a separate HDI for males and females using the components of the HDI and some of the assumptions used for calculation of the GDI. In particular, the male and female HDI would be based on life expectancy and education outcomes for males and females, respectively. Regarding the income component of the HDI, the male and female component would use earned incomes of males and females, as estimated for the GDI, as the respective third component. This male and female HDI thus refrains from generating a gender inequality adjusted HDI but merely reports human development performance of males and females separately. This would be more easily understandable and interpretable. Also, by forming the ratio of the male and female HDI, a measure of gender gaps in human development would readily available.

While such a male and female HDI would already improve upon the GDI, it would continue to use the earned income component and thus would be based on the implausible assumption that earned incomes of males and females are a good proxy for consumption of males and females of human development-related goods (e.g. shelter, food, clothing, nutrition). This has been criticized by many researchers (e.g. Bardhan and Klasen, 1999, 2000; Klasen, 2006b; Dijkstra, 2002). Also, the assumptions used to arrive at figures of earned income are highly debatable thus questioning the reliability of these figures. Given the overwhelming importance of the earned income component for the overall GDI as well as the gap between the male and female HDI, these are serious problems indeed (e.g. Dijkstra, 2002; Klasen, 2006b; Bardhan and Klasen, 1999).

Thus a second proposal was to replace the GDI with a simple gender gap index that would simply average the female-male gaps in human development achievements. In order to circumvent the problems with the earned income component, it was proposed to use a gender gap in labour force participation as the third indicator. Thus the gender gap index would simply be the average of the ratios of female to male achievements in life expectancy,

[1] See also UNDP (2008) which briefly discusses our proposals to reform the GDI and GEM. Please note that our proposals are different in several aspects to the proposals made in Klasen (2006b) and should be considered extensions of those.

education, and labour force participation. For mathematical consistency, it is preferable to not use the arithmetic but the geometric mean of the three components.[2]

Thus the proposed Gender Gap Index is the as follows:

$$GGI = (\frac{LE_f}{LE_M} \times \frac{ED_F}{ED_M} \times \frac{LF_F}{LF_M})^{\frac{1}{3}}$$

where LE, ED, and LF are the life expectancy index, the education index, and labour force participation rates of females and males, respectively.

Note that this formulation of the gender gap index allows, in contrast to the GDI, substitution of advantages and disadvantages for males and females. The GGI could be equal to 1 if males and females each have equal and off-setting disadvantages in one of the components. Whether such substitution should be allowed is an open question and discussed in Klasen (2006b). Clearly it is akin to the substitution allowed in the HDI, where countries can make for low performance in one indicator by higher performance in another.

A practical issue that arises in this context is the GGI can exceed 1. In fact, as shown in Klasen (2006b), there are many countries now (62 in 2003) where women enjoy a life expectancy advantage of more than five years and several where they enjoy an advantage in education as well (33 in 2003). The life expectancy advantage in many cases is, however, more a result of low male life expectancy due to particular issues associated with male behaviour, for example in transition countries where alcohol abuse, accidents, stress- and work-related problems play a large role, than of high female life expectancy and might seem problematic to treat these countries as places where gender equality is particularly high or women are particularly favoured. One way to address this problem is to cap each component of the GGI at 1 before calculating the geometric mean. This is also implemented as an alternative below.[3]

[2] The reason is easily explained. If in one component men do twice as well as women, in the second one they perform equally, and in the third men do half as well as women, the arithmetic average would be 1.17 ((2+1+0.5)/3), i.e. men would appear favoured overall. By just changing the sexes, the opposite result would obtain (i.e. women do half as well in the first component, equal in the second, twice as well in the third, we would get an average of 1.17 now favouring females). Using the geometric mean would yield each time the same correct result that on average, the two sexes fare equally across the three components.

[3] See also Beneria and Permanyer (2009) for a recent related proposal.

3. Reforming the GDI: Results

Table 1 shows the results for the GDI (drawn from the 2006 report and thus based on the years 2004), the female and male HDI, the ratio of the female to male HDI as well as two versions of the GGI, one without capping the components at 1 and the other one capping them at 1. For each of those options, associated rankings are produced.

As is well known, the Scandinavian countries top the list in the GDI, while the bottom 30 countries on the list are from Sub Saharan Africa. When analysing the male and female HDI, we see significant differences in the male and female HDI. This is particularly the case in countries lower down on the list where the female HDI is up to 35% smaller than the male HDI. Overall, the female HDI is about 8% lower than the male HDI, with rather small gaps in industrialized countries.[4]

Compared to the GDI, some rankings do change. Among the countries gaining in rank when the female HDI is considered are Luxembourg, Finland, France, many transition countries, and a few countries in Sub Saharan Africa (including Rwanda, Zimbabwe, and Lesotho). Among those losing positions are Ireland, Netherlands, Switzerland, Japan, many Middle Eastern countries, Bangladesh, and Pakistan. These rank changes appear quite plausible, given what is known about gender gaps in human development in the different regions.

Maybe more instructive than the ranking of the female HDI is the ranking of the ratio of the female to the male HDI. This ranking which is shown in the seventh column of Table 1 can be interpreted as a measure of the gender gap in human development. Now the rankings change dramatically. Now the countries topping the list are all transition countries which all have ratios above 1, with Russia getting the first spot, followed by Latvia, Lithuania, Estonia, and Belarus. Scandinavian and other industrialized countries occupy the next 20-30 ranks, but all have lost significantly in ranks. Ireland stands out as the biggest loser in terms of ranks: it loses 40 positions relative to the female HDI, and 46 spots relative to the GDI (due largely to its low performance in female earned incomes). The reasons for the particularly high ratios in transition countries is related to very low gaps in earned incomes, hardly any gaps (or even gaps favouring females) in education, and large survival advantages for females relative to males. The last point suggests more male disadvantage than female advantage and as such a value of the female to male HDI above 1 should not necessarily be seen as desirable,

[4] These gaps are much larger than those between the HDI and the GDI which are only about 1% on average. See Klasen (2006b) for a discussion.

while a ratio very close to one should be seen as best. In that sense the top 50 countries have ratios quite close to one, suggesting relatively small gender gaps.[5]

Further down the list, there are also dramatic rank changes. Particularly noticeable is that Lesotho, which has rank 113 in the GDI and rank 104 in the female HDI, now occupies rank 38 in the ratio of the female to male HDI. This is largely due to the fact that females have higher literacy rates and slightly higher enrolment rates than males which largely make up for existing gender gaps hurting females in earned incomes and life expectancy. Rwanda (which incidentally is the top performer in Social Watch's Gender Gap Measure), Kenya, and Madagascar similarly improve their ranks considerably (though not as strong as Lesotho).

Among the big losers in the ranking of the female to male HDI in the lower parts of the table are many Middle Eastern countries (e.g. Kuwait, Bahrein, United Arab Emirates, Saudi Arabia) and, to a lesser extent, South American countries (including Mexico, Chile, Costa Rica, and others) and South Asian countries (e.g. India, Pakistan, and Nepal).
Overall it seems that the ratio of the female to the male HDI yields important new insights about gender gaps in human development and are well-worth publishing on a regular basis.

Column 8 shows the (uncapped) Gender Gap Index and the ranking are shown in the next column. Since data on labour force participation rates are more widely available than on earned incomes, it is possible to calculate the GGI for 13 countries more, which is very useful and a definite advantage over the GDI.

Interestingly, the results are relatively close to the ratio of the female to male HDI suggesting that these two ways of calculating gender gaps in human development yield rather similar results. Once again, transition countries top the list (Kazakhstan now tops the list) followed by other industrialized countries; Ireland once again only gets rank 51 and is the biggest lower, compared to the GDI.[6] Further down on the list, quite a number of Sub-Saharan African countries do much better than suggested by the GDI. They not only include Lesotho and Rwanda, but Burundi, Mozambique, Tanzania, and Madagascar. This is due to the relatively high female labour force participation rates in these countries, as well as comparatively small gender gaps in education favouring males. Conversely, Middle Eastern, Latin American and South Asian countries drop dramatically in ranking. Most noticeable is

[5] It might be worth considering capping the ratio of the female HDI to the male HDI at 1 for each component. See the discussion below on the Gender Gap Index.

[6] Particularly noticeable is the relatively poor performance of Luxembourg in the GGI, which only occupies rank 56, despite faring much better in the GDI, the female HDI, and the ratio of the female to male HDI. This difference is due to a particularity in Luxembourg's case. Due to its very high prosperity, male and female earned incomes reach the maximum of $40,000 and thus the earned income index is capped at 1 for both, suggesting perfect equality between the sexes. The GGI, however, considers existing gaps in labor force participation and thus Luxembourg loses considerably in rank.

the fall of Oman, from rank 58 in the GDI to rank 139 in the GGI. At the bottom of the list in terms of the GGI is now Afghanistan, preceded by Yemen.

The last two columns show values and ranks of the GGI if the components are capped at 1. This has a significant impact on values and ranks in the upper part of the table. While transition countries continue to fare well (Lithuania now gets the top spot), Scandinavian countries make up 3 of the top five countries. Further down, transition countries and industrialized countries make up the next 30-40 spots. Further down the list, the changes in ranking are very small.

To conclude, the newly calculated male and female HDI, the ratio of the female to male HDI as well as the GGI give new important insights into gender gaps in human development and it would be well worth replacing the current GDI with some or all of these measures. As far as the GGI is concerned, maybe the capped version is to be preferred as otherwise it is heavily influenced by the male disadvantage in mortality in transition countries which is an undesirable feature of this measure.

4. Reforming the GEM: Methods

As discussed above, the review of the GEM brought out a range of criticisms with particular focus on the problematic treatment of earned incomes and the complicated and somewhat redundant procedure to penalize gender inequalities.

To address these two shortcomings, two revised GEMs are presented here. The first one (GEM2) simply uses income shares by simply using the procedure to calculate the equally distributed equivalent percentage to the earned income shares of males and females. This way only income shares by sex, but not male and female income levels are considered. The second one uses the same components by calculates the geometric mean of the female-male ratios of achievements in the three dimensions.

$$GEM3 = \left(\frac{PR_f}{PR_M} \times \frac{EP_F}{EP_M} \times \frac{IS_F}{IS_M}\right)^{\frac{1}{3}}$$

Where PR, EP, and IS refers to parliamentary representation, economic participation, and income shares, respectively.

A complication arises that the reported underlying data for these indicators are the share of females in parliament, economic positions, and incomes. The shares are, as discussed in Klasen (2006b), also dependent on population shares of males and females. For example, in a country where women would make up 55% of the population, equality should mean 55% of parliamentary representation (and not 50%). To account for this in the case of parliamentary representation, for example, the first component of GEM3 is calculated as follows:

$$\frac{PR_f}{PR_m} = \frac{\frac{FSPA}{FSPOP}}{\frac{MSPA}{MSPOP}}$$

Where FSPA, FSPOP, MSPA, MSPOP are the female share of members of parliament, the female population share, the male share of members of parliament and the male population share. Equivalent calculations are made for the other two components.

A point of note is that the GEM3 will report a value of 0 if any component has a value of 0. In the case of Saudi Arabia and the United Arab Emirates, the component for parliamentary representation is 0 as there is not a single female in parliament. As a result the entire GEM3 will report a value of 0, which has to be borne in mind when interpreting the figures.

Also note that UNDP's GEM and GEM2 will not allow for compensation between gender gaps in empowerment in different directions, while the GEM3 will allow for such compensation. This will have an impact on the results. In some countries females are overrepresented particularly in professional and technical workers and in the GEM3 this can make up for gender gaps hurting females in the other two dimensions. In UNDP's GEM and the one based on income shares, these gender gaps are accumulated across dimensions, regardless of whether males or females are favoured. The advantages and disadvantages of the two approaches are discussed in detail in Klasen (2006b).

5. Reforming the GEM: Results

Table 2 shows the results for GEM as calculated by UNDP and the two revised versions of the GEM (GEM2 and GEM3) together with associated rankings. One weakness of the GEM is unfortunately also apparent for all three formulations. It is available only for

75 countries, thus fewer than half of the countries of the world. This remains a serious problem of this measure.

When comparing the GEM2 (with income shares rather than levels) to UNDP's GEM, a number of important changes take place. While the two are generally closely correlated and there are relatively few changes at the very top and the very bottom of the ranking, significant changes do occur. The single largest winner in the ranking is Tanzania which jumps from rank 37 to rank 8. As a poor country, is was faring badly under UNDP's GEM despite low gender gaps and in GEM2 the low gender gaps in these indicators of empowerment now assure a much better ranking. In addition, New Zealand, Costa Rica, Peru, as well as a number of transition countries move up significantly in ranks. Conversely, the US falls from rank 12 to rank 33, particularly due to its very low female representation in parliaments. Japan, Ireland, and Greece also significantly lose ranks. It appears that the inclusion of the income share is not only more plausible but leads to a number of differences in results.

When considering the GEM3 (the geometric mean of ratios of empowerment achievements) in the last two columns, the results are more similar to GEM2 (with in come shares) than to GEM1. Again not very much happens at the top and bottom. Also, Tanzania is again one of the biggest winners, but is joined by Moldova and the Philippines. The latter two now fare much better as the female advantage in the representation among professional and technical workers can now compensate for disadvantages in other dimensions. The USA continues to lose many ranks as does Ireland, Japan, and Greece.

To conclude, the results here suggest that both ways to correct for the problems of the GEM seem to lead to relatively similar results. Since GEM3 is the easier one among the two, it may be probably be best to use that indicator as the central indicator of gender-related empowerment. The main argument against this would be that this way of framing the index allows for compensating gender gaps in different dimensions which might be seen as problematic by some.

6. Conclusion

In this paper, a few of the proposals to reform the GDI and GEM have been extended and implemented using data for 2004. The results for both indicators generate significant differences to the results of the currently used GDI and GEM measures. We believe that these measures are superior to the current measures as they address some of their conceptual short-comings. We also believe that they yield new insights on gender gaps in well-being and empowerment in the world. These reformulated measures are easy to implement so that it

would indeed be worthwhile to consider switching from the current GDI and GEM to the revised measures.

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Table 1: UNDP's GDI, a Male and Female HDI, and two versions of a Gender Gap Index (2004)

	UNDP's GDI	GDI Rank	Female HDI	Male HDI	Ratio Female/Male HDI	Female HDI Rank	Female/Male HDI Rank	Gender Gap Index	Gender Gap Index Rank	Gender Gap Index (Capped)	Gender Gap Index Rank (Capped)
Norway	0.962	1	0.957	0.968	0.988	1	17	0.963	14	0.958	3
Iceland	0.958	2	0.950	0.967	0.983	3	28	0.959	17	0.950	7
Australia	0.956	3	0.947	0.966	0.980	5	35	0.931	37	0.931	23
Ireland	0.951	4	0.936	0.970	0.965	10	50	0.905	51	0.901	51
Sweden	0.949	5	0.947	0.952	0.995	4	11	0.967	10	0.958	4
Luxembourg	0.949	6	0.953	0.944	1.010	2	8	0.893	56	0.884	58
Canada	0.947	7	0.938	0.958	0.980	8	33	0.951	19	0.945	13
United States	0.946	8	0.939	0.955	0.984	7	27	0.951	18	0.940	18
Netherlands	0.945	9	0.933	0.958	0.975	12	39	0.920	47	0.918	36
Switzerland	0.944	10	0.930	0.960	0.969	14	43	0.930	39	0.927	29
Finland	0.943	11	0.940	0.948	0.992	6	14	0.970	9	0.957	5
Belgium	0.943	12	0.935	0.951	0.983	11	29	0.912	49	0.902	49
Japan	0.942	13	0.926	0.962	0.963	16	53	0.881	61	0.870	67
France	0.940	14	0.937	0.945	0.991	9	15	0.946	24	0.930	25
Denmark	0.940	15	0.932	0.949	0.983	13	30	0.950	23	0.947	10
United Kingdom	0.938	16	0.929	0.948	0.980	15	34	0.936	35	0.929	26
Austria	0.937	17	0.920	0.959	0.959	20	56	0.920	45	0.914	42
Italy	0.934	18	0.921	0.951	0.968	19	46	0.863	68	0.852	76
Spain	0.933	19	0.926	0.944	0.980	17	32	0.891	54	0.872	66
New Zealand	0.932	20	0.924	0.942	0.981	18	31	0.943	31	0.938	19
Germany	0.928	21	0.916	0.943	0.971	21	42	0.923	44	0.918	35
Israel	0.925	22	0.910	0.940	0.968	22	44	0.946	30	0.946	11
Greece	0.917	23	0.905	0.932	0.971	24	41	0.879	63	0.873	64
Slovenia	0.908	24	0.906	0.911	0.994	23	12	0.958	15	0.934	21
Korea, Rep. of	0.905	25	0.885	0.929	0.953	26	61	0.885	60	0.873	65
Macau	0.902	26	0.875	0.934	0.936	28	71	0.900	59	0.900	53
Portugal	0.902	27	0.896	0.909	0.986	25	22	0.947	20	0.930	24

Cyprus	0.900	28	0.883	0.920	0.960	27	55	0.907	52	0.907	46
Czech Republic	0.881	29	0.868	0.897	0.967	32	47	0.927	38	0.918	38
Malta	0.869	30	0.852	0.889	0.958	36	58	0.785	95	0.780	104
Hungary	0.867	31	0.868	0.868	0.999	31	9	0.933	33	0.907	47
Kuwait	0.864	32	0.834	0.889	0.938	40	67	0.792	93	0.789	103
Argentina	0.859	33	0.855	0.866	0.987	35	18	0.915	43	0.890	56
Poland	0.859	34	0.858	0.862	0.996	33	10	0.953	16	0.925	32
Estonia	0.856	35	0.868	0.846	1.027	30	4	0.997	5	0.953	6
Lithuania	0.856	36	0.869	0.845	1.028	29	3	0.998	6	0.988	1
Slovakia	0.853	37	0.849	0.860	0.987	37	19	0.940	27	0.920	34
Chile	0.850	38	0.829	0.878	0.944	41	64	0.807	88	0.802	95
Bahrain	0.849	39	0.808	0.886	0.912	44	79	0.660	122	0.660	137
Uruguay	0.847	40	0.846	0.852	0.994	38	13	0.932	34	0.903	48
Croatia	0.844	41	0.838	0.851	0.985	39	24	0.921	42	0.909	45
Latvia	0.843	42	0.857	0.831	1.031	34	2	0.982	7	0.927	28
Costa Rica	0.831	43	0.812	0.853	0.952	42	62	0.818	86	0.815	86
United Arab Emirates	0.829	44	0.798	0.852	0.937	48	70	0.711	102	0.683	133
Bulgaria	0.814	45	0.807	0.824	0.979	45	36	0.940	32	0.929	27
Mexico	0.812	46	0.786	0.844	0.931	51	76	0.793	96	0.793	99
Tonga	0.809	47	0.785	0.837	0.938	53	69	0.846	80	0.844	79
Panama	0.806	48	0.794	0.821	0.967	49	48	0.863	69	0.858	73
Trinidad and Tobago	0.805	49	0.788	0.825	0.954	50	59	0.858	72	0.852	75
Romania	0.804	50	0.799	0.811	0.985	47	25	0.947	22	0.932	22
Russian Federation	0.795	51	0.811	0.783	1.036	43	1	1.015	2	0.940	17
Malaysia	0.795	52	0.765	0.831	0.919	62	78	0.819	87	0.819	85
Belarus	0.793	53	0.802	0.786	1.021	46	5	1.002	3	0.948	9
Mauritius	0.792	54	0.765	0.825	0.928	60	77	0.805	92	0.795	98
Macedonia, TFYR	0.791	55	0.769	0.817	0.941	58	65	0.854	78	0.854	74
Brazil	0.789	56	0.786	0.795	0.988	52	16	0.920	40	0.896	54
Colombia	0.787	57	0.778	0.799	0.973	56	40	0.925	41	0.916	40
Oman	0.785	58	0.717	0.854	0.839	72	106	0.589	139	0.589	144

Thailand	0.781	59	0.770	0.795	0.968	57	45	0.943	29	0.927	30
Albania	0.780	60	0.765	0.799	0.958	61	57	0.896	57	0.891	55
Venezuela	0.780	61	0.767	0.797	0.962	59	54	0.888	58	0.880	60
Kazakhstan	0.772	62	0.780	0.767	1.017	54	6	1.023	1	0.965	2
Ukraine	0.771	63	0.778	0.770	1.011	55	7	0.997	4	0.936	20
Samoa (Western)	0.770	64	0.752	0.794	0.947	64	63	0.810	85	0.798	96
China	0.765	65	0.739	0.793	0.932	66	74	0.915	50	0.915	41
Armenia	0.765	66	0.761	0.771	0.987	63	20	0.962	12	0.944	15
Philippines	0.761	67	0.748	0.775	0.965	65	49	0.871	67	0.865	71
Peru	0.759	68	0.726	0.798	0.910	69	81	0.874	70	0.873	61
Sri Lanka	0.749	69	0.725	0.777	0.933	70	73	0.765	101	0.763	106
Jordan	0.747	70	0.701	0.800	0.877	74	91	0.674	123	0.674	134
Dominican Republic	0.745	71	0.734	0.761	0.964	67	52	0.846	71	0.823	83
Turkey	0.745	72	0.696	0.804	0.865	76	97	0.671	129	0.671	135
Saudi Arabia	0.744	73	0.675	0.827	0.816	83	112	0.552	142	0.552	148
Tunisia	0.744	74	0.695	0.806	0.862	77	98	0.685	125	0.685	131
Iran, Islamic Rep. of	0.736	75	0.690	0.788	0.876	78	92	0.753	111	0.753	111
Azerbaijan	0.733	76	0.727	0.742	0.979	68	37	0.962	13	0.944	14
El Salvador	0.725	77	0.702	0.753	0.932	73	75	0.853	77	0.847	78
Jamaica	0.721	78	0.718	0.728	0.986	71	21	0.936	28	0.902	50
Cape Verde	0.714	79	0.678	0.764	0.887	82	88	0.749	108	0.742	116
Algeria	0.713	80	0.660	0.778	0.847	86	102	0.703	126	0.703	124
Viet Nam	0.708	81	0.686	0.732	0.938	80	68	0.949	26	0.949	8
Indonesia	0.704	82	0.673	0.741	0.907	84	83	0.820	91	0.820	84
Syrian Arab Republic	0.702	83	0.657	0.759	0.866	89	96	0.723	118	0.723	120
Kyrgyzstan	0.701	84	0.698	0.708	0.986	75	23	0.943	21	0.916	39
Uzbekistan	0.694	85	0.683	0.708	0.965	81	51	0.933	36	0.922	33
Moldova, Rep. of	0.692	86	0.688	0.698	0.985	79	26	0.963	11	0.943	16
Bolivia	0.687	87	0.655	0.725	0.904	90	85	0.873	73	0.873	63
Mongolia	0.685	88	0.672	0.704	0.954	85	60	0.880	62	0.870	70
Nicaragua	0.684	89	0.658	0.721	0.912	87	80	0.751	104	0.749	112

Honduras	0.676	90	0.658	0.700	0.940	88	66	0.844	79	0.836	80
Guatemala	0.659	91	0.624	0.708	0.882	92	90	0.731	110	0.718	122
Tajikistan	0.648	92	0.629	0.672	0.936	91	72	0.902	55	0.900	52
South Africa	0.646	93	0.617	0.681	0.905	93	84	0.806	97	0.806	93
Equatorial Guinea	0.639	94	0.588	0.700	0.841	95	104	0.727	127	0.727	119
Namibia	0.622	95	0.595	0.654	0.909	94	82	0.852	83	0.852	77
Morocco	0.615	96	0.555	0.702	0.792	96	116	0.612	143	0.612	142
India	0.591	97	0.530	0.671	0.790	98	117	0.659	137	0.659	138
Cambodia	0.578	98	0.553	0.614	0.901	97	86	0.941	25	0.918	37
Botswana	0.555	99	0.524	0.602	0.870	99	93	0.749	113	0.743	115
Comoros	0.550	100	0.513	0.596	0.862	100	99	0.808	100	0.808	92
Lao People's Dem. Rep.	0.545	101	0.501	0.600	0.835	101	107	0.798	105	0.798	97
Ghana	0.528	102	0.489	0.573	0.853	102	101	0.870	75	0.870	68
Bangladesh	0.524	103	0.479	0.579	0.826	106	111	0.760	115	0.760	107
Papua New Guinea	0.521	104	0.485	0.559	0.868	103	94	0.887	66	0.887	57
Congo	0.519	105	0.483	0.565	0.855	105	100	0.814	98	0.814	88
Pakistan	0.513	106	0.443	0.612	0.724	113	131	0.592	147	0.592	143
Nepal	0.513	107	0.457	0.592	0.772	109	121	0.728	128	0.728	118
Madagascar	0.507	108	0.479	0.540	0.887	107	89	0.911	53	0.911	44
Uganda	0.498	109	0.458	0.545	0.839	108	105	0.861	81	0.861	72
Cameroon	0.497	110	0.447	0.561	0.797	112	115	0.753	120	0.753	110
Sudan	0.492	111	0.437	0.574	0.761	116	126	0.620	141	0.620	140
Kenya	0.487	112	0.456	0.526	0.867	110	95	0.806	103	0.806	94
Lesotho	0.486	113	0.485	0.497	0.976	104	38	0.852	74	0.810	91
Zimbabwe	0.483	114	0.448	0.531	0.843	111	103	0.748	119	0.748	113
Swaziland	0.479	115	0.439	0.544	0.806	115	113	0.576	148	0.576	145
Mauritania	0.478	116	0.439	0.527	0.833	114	108	0.789	106	0.789	102
Togo	0.476	117	0.421	0.562	0.749	118	128	0.694	132	0.694	128
Yemen	0.462	118	0.392	0.588	0.666	121	136	0.573	149	0.573	146
Senegal	0.451	119	0.408	0.511	0.798	119	114	0.756	117	0.756	108
Rwanda	0.449	120	0.424	0.477	0.889	117	87	0.926	46	0.926	31

Nigeria	0.443	121	0.393	0.510	0.770	120	123	0.705	131	0.705	123
Guinea	0.434	122	0.387	0.503	0.771	123	122	0.747	116	0.747	114
Angola	0.431	123	0.387	0.493	0.784	124	120	0.790	107	0.790	101
Tanzania, U. Rep. of	0.426	124	0.390	0.469	0.832	122	109	0.870	76	0.870	69
Benin	0.412	125	0.358	0.493	0.727	125	130	0.684	138	0.684	132
Côte d'Ivoire	0.401	126	0.340	0.489	0.695	130	133	0.617	146	0.617	141
Zambia	0.396	127	0.350	0.458	0.764	127	125	0.718	130	0.718	121
Malawi	0.394	128	0.352	0.448	0.787	126	118	0.813	99	0.813	89
Mozambique	0.387	129	0.344	0.454	0.757	129	127	0.812	94	0.791	100
Burundi	0.380	130	0.348	0.421	0.826	128	110	0.883	65	0.873	62
Congo, Dem. Rep. of the	0.378	131	0.329	0.449	0.732	131	129	0.739	124	0.739	117
Chad	0.350	132	0.308	0.432	0.714	132	132	0.669	134	0.669	136
Central African Republic	0.336	133	0.287	0.418	0.687	135	134	0.701	133	0.701	125
Burkina Faso	0.335	134	0.300	0.383	0.785	133	119	0.767	112	0.767	105
Mali	0.329	135	0.293	0.381	0.769	134	124	0.756	114	0.756	109
Sierra Leone	0.317	136	0.268	0.396	0.677	136	135	0.687	136	0.687	129
Niger	0.292	137	0.244	0.373	0.655	137	137	0.633	144	0.633	139
Barbados	N.A	N.A	N.A.	N.A.	N.A.	N.A	N.A	0.968	8	0.945	12
Myanmar	N.A	N.A	N.A.	N.A.	N.A.	N.A	N.A	0.918	48	0.912	43
Yugoslavia	N.A	N.A	N.A.	N.A.	N.A.	N.A	N.A	0.881	64	0.881	59
Cuba	N.A	N.A	N.A.	N.A.	N.A.	N.A	N.A	0.835	82	0.835	81
Maldives	N.A	N.A	N.A.	N.A.	N.A.	N.A	N.A	0.826	90	0.825	82
Brunei Darussalam	N.A	N.A	N.A.	N.A.	N.A.	N.A	N.A	0.814	89	0.814	87
Suriname	N.A	N.A	N.A.	N.A.	N.A.	N.A	N.A	0.820	84	0.810	90
Liberia	N.A	N.A	N.A.	N.A.	N.A.	N.A	N.A	0.698	135	0.698	126
Libyan Arab Jamahiriya	N.A	N.A	N.A.	N.A.	N.A.	N.A	N.A	0.695	121	0.695	127
Qatar	N.A	N.A	N.A.	N.A.	N.A.	N.A	N.A	0.695	109	0.685	130
Iraq	N.A	N.A	N.A.	N.A.	N.A.	N.A	N.A	0.570	145	0.570	147
Occupied Palestinian Territory	N.A	N.A	N.A.	N.A.	N.A.	N.A	N.A	0.522	140	0.522	149
Afghanistan	N.A	N.A	N.A.	N.A.	N.A.	N.A	N.A	0.493	150	0.493	150
Average	0.707		0.683	0.740	0.906			0.831		0.822	

Table 2: Three Versions of the GEM (2004)

	UNDP's GEM	Rank	GEM2 (Income Shares)	Rank	GEM3 (Mean)	Rank
Norway	0.932	1	0.781	2	0.682	2
Sweden	0.883	2	0.805	1	0.784	1
Iceland	0.866	3	0.761	7	0.666	4
Denmark	0.861	4	0.764	6	0.664	5
Belgium	0.855	5	0.769	5	0.605	9
Finland	0.853	6	0.773	3	0.672	3
Netherlands	0.844	7	0.751	11	0.588	12
Australia	0.833	8	0.750	12	0.620	7
Germany	0.816	9	0.753	9	0.562	15
Austria	0.815	10	0.729	15	0.492	25
Canada	0.810	11	0.721	16	0.565	14
United States	0.808	12	0.653	33	0.463	31
New Zealand	0.797	13	0.770	4	0.635	6
Switzerland	0.797	14	0.696	19	0.475	28
Spain	0.776	15	0.740	14	0.519	21
United Kingdom	0.755	16	0.670	26	0.449	33
Ireland	0.753	17	0.613	44	0.391	45
Singapore	0.707	18	0.647	37	0.413	38
Argentina	0.697	19	0.749	13	0.599	10
Portugal	0.681	20	0.686	24	0.474	29
Costa Rica	0.675	21	0.751	10	0.541	20
Trinidad & Tobago	0.660	22	0.718	18	0.510	23
Israel	0.656	23	0.622	42	0.431	36
Italy	0.653	24	0.596	49	0.351	55
Lithuania	0.635	25	0.693	20	0.598	11
Namibia	0.623	26	0.721	17	0.555	17
Latvia	0.621	27	0.691	22	0.544	19
Czech Republic	0.615	28	0.622	43	0.396	42
Greece	0.614	29	0.598	46	0.372	49
Poland	0.610	30	0.666	28	0.507	24
Estonia	0.608	31	0.655	31	0.513	22
Slovenia	0.603	32	0.597	47	0.397	41
Croatia	0.602	33	0.666	29	0.479	27
Slovakia	0.599	34	0.643	38	0.471	30
Mexico	0.597	35	0.668	27	0.398	40
Tanzania	0.597	36	0.755	8	0.606	8
Bulgaria	0.595	37	0.692	21	0.549	18
Cyprus	0.584	38	0.564	58	0.352	54
Peru	0.580	39	0.679	25	0.443	34
Panama	0.568	40	0.666	30	0.462	32
Hungary	0.560	41	0.587	50	0.401	39
Japan	0.557	42	0.493	67	0.286	65
Macedonia, TFYR	0.554	43	0.653	34	0.441	35
Moldova, Rep. of	0.544	44	0.690	23	0.574	13
Philippines	0.533	45	0.654	32	0.555	16
Venezuela	0.532	46	0.637	39	0.482	26
Honduras	0.530	47	0.652	35	0.391	44
El Salvador	0.529	48	0.636	40	0.376	48
Ecuador	0.524	49	0.647	36	0.424	37
Uruguay	0.513	50	0.596	48	0.368	50
Colombia	0.506	51	0.607	45	0.377	47

Chile	0.506	52	0.569	55	0.336	58
Korea, Rep. Of	0.502	53	0.499	66	0.292	64
Botswana	0.501	54	0.568	56	0.319	60
Malaysia	0.500	55	0.563	59	0.303	62
Bolivia	0.499	56	0.633	41	0.389	46
Belize	0.495	57	0.585	52	0.348	56
Malta	0.493	58	0.502	65	0.267	67
Romania	0.492	59	0.585	51	0.395	43
Thailand	0.486	60	0.581	53	0.367	51
Brazil	0.486	61	0.579	54	0.353	53
Russian Federation	0.482	62	0.565	57	0.364	52
Ukraine	0.455	63	0.562	60	0.319	59
Georgia	0.407	64	0.524	61	0.314	61
Mongolia	0.388	65	0.522	62	0.347	57
Pakistan	0.377	66	0.479	69	0.248	68
Bangladesh	0.374	67	0.504	64	0.267	66
Cambodia	0.373	68	0.517	63	0.300	63
Sri Lanka	0.372	69	0.479	68	0.235	69
United Arab Em.	0.353	70	0.308	73	0.000	74
Iran, Islamic Rep. of	0.326	71	0.409	70	0.177	70
Turkey	0.289	72	0.368	71	0.163	71
Egypt	0.262	73	0.344	72	0.135	72
Saudi Arabia	0.242	74	0.262	74	0.000	75
Yemen	0.128	75	0.241	75	0.064	73