

THE INSTITUTIONAL BASIS OF GENDER INEQUALITY:
THE SOCIAL INSTITUTIONS AND GENDER INDEX (SIGI)

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ABSTRACT

This paper uses variables from the Organization for Economic Co-operation and Development's (OECD) Gender, Institutions, and Development (GID) database to construct the Social Institutions and Gender Index (SIGI) and its subindices *Family code*, *Civil liberties*, *Physical integrity*, *Son preference*, and *Ownership rights*. Instead of measuring gender inequality in outcomes, SIGI and its subindices measure long-lasting social institutions defined as societal practices and legal norms that frame gender roles. The SIGI combines them into a multidimensional index of women's deprivation caused by gendered social institutions. Inspired by the Foster–Greer–Thorbecke poverty measures, the SIGI offers a new way of aggregating gender inequality by penalizing high inequality in each dimension and allowing only partial compensation between indices. The indices identify countries and dimensions of gendered social institutions that deserve attention. Empirical results confirm that the SIGI complement other gender-related indices.

KEYWORDS

SIGI, Composite index, Gender inequality, Social institutions, OECD Development

Center's GID Database

JEL codes: D63, I39, J16

INTRODUCTION

Despite considerable progress in recent decades, gender inequality in many

dimensions of well-being remains pervasive in many developing countries. This is an intrinsic issue of equity as the affected women are deprived of their basic freedoms (Amartya Sen 1999). But going beyond this intrinsic feature of gender inequality, there is considerable evidence that these discrepancies have high costs for society in the form of lower human capital, worse governance, and lower growth (for example, World Bank 2001, 2011; Ray Rees and Ray Riezman 2012; Stephan Klasen 2002; Stephan Klasen and Francesca Lamanna 2009). The intrinsic and instrumental value of gender equality has been recognized and incorporated in the development agenda, for example in Millennium Development Goal 3: Promote Gender Equality and Empower Womenⁱ, as well as the Convention on the Elimination of Discrimination against Women.

To measure the extent of gender inequality across countries several gender-related indices have been proposed. They include but are not limited to three measures from the United Nations Development Programme (UNDP): the Gender-Related Development Index (GDI) and the Gender Empowerment Measure (GEM) (UNDP 1995) and the recently published Gender Inequality Index (GII) (UNDP 2010), the Global Gender Gap Index from the World Economic Forum (Augusto Lopez-Claros and Saadia Zahidi 2005), and the Gender Equity Index developed by Social Watch (2005) or the African Gender Status Index proposed by the Economic Commission for Africa (2004). These measures focus on gender inequality in well-being or in agency, and they are typically outcome-focused, usually considering gaps in education, health and survival, employment, and political participation. They show that there is a great heterogeneity in levels and trends of such outcome-based measures of gender-inequality as well as in gender gaps in agency.ⁱⁱ

——— While these gender inequality measures have clearly contributed to research and policy in this important field, focusing only on these outcomes neglects the question of the origins of these inequalities. Gender inequality is the result of human

behavior, and institutions influence how people behave and interact. Thus to understand gender inequality beyond outcomes, one needs to study the institutional basis of gender inequality. These institutions include formal institutions such as laws and codes of conduct as well as informal institutions such as norms and values that guide and constrain behavior. From an economics perspective, institutions are the result of collective choices in a society to achieve efficiency, solve collective action dilemmas, and reduce transaction costs (Douglass North 1990). Other social sciences emphasize legitimacy and appropriateness instead of efficiency. Institutions influence the preferences of actors and provide role models that are internalized by them (Peter Hall and Rosemary Taylor 1996; Indra De Soysa and Johannes Jütting 2007).

In the literature, the only other composite index that is closer to our intention here are the gender-specific human rights measures of the CIRI Human Rights Data Project.ⁱⁱⁱ They include the Women's Political Rights index (WOPOL) that focuses on the right of women to vote, petition, and be elected; the Women's Economic Rights index (WECON) that focuses on women's equal rights in the labor market; and the Women's Social Rights index (WOSOC), which focuses on rights in the social sphere (marriage, inheritance, travel, education, etc.). These indices measure on a yearly basis whether a number of internationally recognized rights for women are included in law and whether government enforces them. From the three indices, WOSOC is the most encompassing measure covering social relations and most closely related to our approach (Christian Bjornskov, Axel Dreher, and Justina Fischer 2007). Any of these three indices could be used as a partial proxy for institutions; however, this solution is not without problems as they also cover outcomes of institutions. Moreover, these indices focus on laws and rights (and their enforcement), and therefore neglect more informal institutions that persist in societies. Also, they do not differentiate between what happens within the family and

what happens in public and social life. Furthermore, all three indices can only take four values from zero (no rights) to three (legally guaranteed and enforced rights), thus making it difficult to compare and rank countries as many results only indicate a tie in the data.

Given the lack of measures capturing the institutional basis of gender inequality that go beyond laws and rights, this paper proposes a new measure of *social institutions related to gender inequality, and a related composite index called the Social Institutions and Gender INdex (SIGI)*.^{iv} Social institutions related to gender inequality are long-lasting norms, values, and codes of conduct that find expression in traditions, customs and cultural practices, and informal and formal laws. They influence human behavior as they frame gender-relevant meanings, form the basis of gender roles, and become guiding principles in everyday life. Influencing the distribution of power between men and women in the private sphere of the heterosexual family, in the economic sphere, and in public life, they constrain the opportunities of men and women and their capabilities to live the life they value (Sen 1999). Measuring and understanding these social institutions is necessary to explain gender inequality in outcomes and the deprivation that women experience.

The proposed indicators proxy social institutions related to gender inequality in non-OECD countries based on variables of the OECD Gender, Institutions and Development database (Christian Morrisson and Johannes Jütting 2005; Johannes Jütting, Christian Morrisson, Jeff Dayton-Johnson, and Denis Drechsler 2008). These variables measure particularly extreme forms of inequalities in social institutions relating to gender. Using polychoric principal component analysis, we aggregate these variables into five subindices that each measure one dimension of social institutions related to gender inequality: *Family code*, *Civil liberties*, *Physical integrity*, *Son preference*, and *Ownership rights*. Then, we combine the subindices into the SIGI as a multidimensional measure of deprivation of women. The formula

of the SIGI is inspired by the Foster–Greer–Thorbecke poverty measures (FGT; James Foster, Joel Greer and Erik Thorbecke 1984) and offers a new way of aggregating gender inequality in several dimensions measured by the subindices. It is transparent and easy to understand; it penalizes high inequality in each dimension and allows only for partial compensation of gaps between dimensions.

The SIGI and the subindices are useful tools to compare the societal situation of women in over 100 non-OECD countries from a new perspective, allowing the identification of countries and dimensions of social institutions that deserve policymakers' attention and need to be scrutinized in detail. The SIGI presents a different approach to the measurement of gender inequality by focusing on the institutional drivers of gender inequality, and our empirical results show that the SIGI provides additional information to that of other well-known gender-related indices. Regression analysis shows that the SIGI provides new insights into gender-specific outcomes, even if one controls for region, religion, and level of economic development.^v

THE CONSTRUCTION OF THE INDICES

Building reliable, useful, and internationally comparable indices is generally a tough challenge. In the field of gender analysis, particular problems relate to the lack of gender-disaggregated statistics and the need for more careful interpretation of dimensions where men and women differ for biological reasons (for example: how to interpret indicators of fertility or reproductive health in gender gap analyses).^{vi} And institutions often pose particular challenges, as they cannot often be assessed well in quantitative terms. As a result, any index that attempts to capture gender inequality in social institutions across the world will invariably run up against conceptual and data constraints. For many items, the data are either not available, reliable, or comparable and sometimes the data are hard to interpret. As a result, difficult compromises have

to be made when choosing indicators and scoring them; data availability, coverage, and statistical validity often assume as much importance as conceptual superiority of a particular indicator or scoring approach. It is important, however, to advance this research agenda by putting together data and indicators even in these hard-to-measure dimensions of gender inequality, even if the resulting index can only be seen as a starting point for a more ambitious data gathering and research agenda.

The SIGI is a multidimensional composite index that reflects the deprivation of women caused by social institutions related to gender inequality. The SIGI is composed of five dimensions that are measured by five subindices, *Family code*, *Civil liberties*, *Physical integrity*, *Son preference* and *Ownership rights*. These dimensions were chosen as each represents an important yet distinct aspect of a gender-based institution (see below).

The subindices are built out of variables from the OECD Development Centre's GID Database (Morrisson and Jütting 2005; Jütting et al. 2008). This is a cross-country database covering about 120 non-OECD countries with more than twenty variables measuring social institutions related to gender inequality.^{vii} These variables proxy social institutions through prevalence rates, legal indicators, or indicators of social practices and are all coded from 0 to 1.^{viii} The value 0 means no or very low inequality and the value 1 indicates high inequality. The choice of the variables used for the construction of the social institutions indicators is guided by the informational content they provide, their relevance for a comprehensive measure of social institutions related to gender, and their coverage so that as many countries as possible can be ranked.

The subindices

The subindices each measure one dimension of social institutions related to gender

inequality. Before combining the variables to the respective subindex, we have checked whether these variables measure the same underlying concept estimating the statistical association between them. Then, the variables are combined into a one-dimensional subindex using the method of polychoric principal component analysis (Stanislav Kolenikov and Gustavo Angeles 2009) to extract the common information of the variables.^{ix} We use the first principal component as a proxy for the common information contained by the variables corresponding to the subindices.^x The weight that each variable gets in these linear combinations is obtained by analyzing the correlation structure in the data. As in the case of the variables, the subindices and the SIGI range from 0 to 1 with 0 corresponding to no inequality and the value 1 to complete inequality.

The precise variable lists and coding guidelines are presented in the on-line appendix and will only be summarized here. The *Family code* dimension refers to the private sphere with institutions that influence the decision-making power of women in the household. Family code is measured by the variables *Parental authority* of women during marriage and after divorce, *Inheritance* rights, the prevalence of *Early marriage* among teenage girls and the acceptance or legality of *Polygamy*.^{xi}

The *Civil liberties* dimension captures the social sphere by measuring the freedom of social participation of women, an important pre-condition for their opportunities to participate on an equal footing in public and economic life. It includes the variables *Freedom of movement* of women outside their own household, and *Freedom of dress* measuring the requirement to follow a dress code with leaving the house.

The *Physical integrity* dimension comprises two indicators on violence against women, which measures the institutional basis of women's control over their own bodies. The variable *violence against women* measures existence of laws against

domestic violence, sexual assault or rape, and sexual harassment and *Female genital mutilation* measures the prevalence of the practice

The dimension *Son preference* measures a manifestation of son preference under scarce resources; it encapsulates social institutions (relating to marriage practices, locality of sons and daughters after marriage, and old-age arrangements) that lead parents to prefer sons to daughters as offspring (Stephan Klasen and Claudia Wink 2003). It includes the variable *Missing women* which measures the share of females that have suffered from gender bias in mortality or pre-birth sex selection..^{xii}

The *Ownership rights* dimension covers the economic sphere of social institutions proxied by the access of women to several types of property with three variables referring to access to land, credit, and property other than land, respectively..^{xiii}

See Table 1 in the online appendix for the coding guidelines of all variables. The coding was done by experts using coding manuals, and the actual coding was undertaken by the OECD Development Center as part of the construction of the GID database. While we believe that these indicators and dimensions capture essential elements of social institutions affecting gender inequality, there are clearly some notable limitations. First, some indicators only partially capture the dimension we would like to capture. For example, the violence against women indicator is based on laws only, as comparable data on actual prevalence were not available; similarly, freedom of dress only captures one particular aspect of women's obligations and restrictions when leaving the home. Second, in some dimensions one could think of additional indicators that could capture the inequality in social institutions better. For example, the *Physical integrity* subindex does not include any indicators related to social institutions associated with reproduction. We experiment below with an indicator of abortion rights as one possible dimension and report below on how this

would change the results. Similarly, one could think of expanding the *Ownership rights* dimension by including more specifically rights and institutions in the labor market; the *Son preference* dimension could also include indicators of fertility preference. In both cases, data limitations prevented an extension. Fourth, the scoring is often based on subjective interpretation of available information and can therefore be subject to criticism. Lastly, one may wonder why there are no measures of women's political rights and participation included. This was based on the decision that the measure is meant to focus on social institutions and thus not explicitly consider formal political institutions. Clearly this is another area where one can reasonably disagree.

Thus we want to emphasize that our proposed measure could still be improved if better data on some of the dimensions of social institutions were available. We do, however, see our indicators and the composite index as a good starting point for furthering this important research agenda.

The SIGI

Based on the indicators and subindices discussed above, the SIGI is then an unweighted average of a non-linear function of the subindices. We use equal weights for the subindices, as we see no reason for valuing one of the dimensions more or less than the others. The non-linear function arises because we assume that inequality in gender-related social institutions leads to deprivation experienced by affected women, and that deprivation increases more than proportionally when inequality increases. Thus, high inequality is penalized in every dimension. The non-linearity also means that the SIGI does not allow for total compensation of inequality among subindices, but permits only partial compensation. Partial compensation implies that high inequality in one dimension, that is one subindex, can only be partially compensated with low inequality on another dimension.

For our specific five subindices, the value of the index the SIGI is then calculated as follows:

$$\begin{aligned} \text{SIGI} = & 1/5 (\text{SubindexFamily code})^2 + 1/5 (\text{SubindexCivil liberties})^2 \\ & + 1/5 (\text{SubindexPhysical integrity})^2 + 1/5 (\text{SubindexSon preference})^2 \\ & + 1/5 (\text{SubindexOwnership rights})^2 \end{aligned} \quad (1)$$

Using a more general notation, the formula for the SIGI $I(X)$, where X is the vector containing the values of the subindices x_i with $i= 1, \dots, n$, is derived from the following considerations. For any subindex x_i , we interpret the value 0 as the goal of no inequality to be achieved in every dimension. We define a deprivation function $\phi(x_i, 0)$, with $\phi(x_i, 0) > 0$ if $x_i > 0$ and $\phi(x_i, 0) = 0$ if $x_i = 0$ (for example, SreenivasanSubramanian 2007). Higher values of x_i should lead to a penalization in $I(X)$ that should increase with the distance x_i to zero. In our case the deprivation function is the square of the distance to 0 so that deprivation increases more than proportionally as inequality increases.

$$\text{SIGI} = I(X) = \frac{1}{n} \sum_{i=1}^n \phi(x_i, 0) = \frac{1}{n} \sum_{i=1}^n (x_i - 0)^2 = \frac{1}{n} \sum_{i=1}^n (x_i)^2 \quad (2)$$

This is inspired by the FGT poverty measures, this formula is defined for $y_i \leq z$ as:

$$\text{FGT}(Y, \alpha, z) = \frac{1}{n} \sum_{i=1}^n \left(\frac{z - y_i}{z} \right)^\alpha \quad (3)$$

where Y is the vector containing all incomes, y_i with $i= 1, \dots, n$ is the income of individual i , z is the poverty line, and $\alpha > 0$ is a penalization parameter.

To compute the SIGI, the value 2 is chosen for a as the square function has the advantage of easy interpretation. With $\alpha = 2$ the *transfer principle* is satisfied (FGT 1984). In the case of the SIGI, the transfer principle means that, starting from a situation of equal score in two dimensions, an increase in score (that is, higher

inequality) in one dimension and an equal-sized decrease of the score in the other dimension (that is, lower inequality) will raise the SIGI, thereby signalling higher overall gender inequality.^{xiv}

To highlight the effects of partial compensation as compared to total compensation, we computed the statistical association between the SIGI and a simple arithmetic average of the five subindices that allows for total compensation and compared the country rankings of both measures. The Pearson correlation coefficient between the SIGI and the simple arithmetic average of the five subindices shows a very high and statistically significant correlation between both measures (Table 1). However, when we compare the ranks of the SIGI with those obtained using a simple arithmetic average of the five subindices in Table 2 in the online appendix, we observe that there are noticeable differences in the rankings of the 102 included countries. Examples are China and Nepal. China ranks in position 55 using the simple average, but worsens to place 83 in the SIGI ranking. Nepal has place 84 considering the simple average, and improves to rank 65 using the SIGI. For China, this is due to the high inequality on the subindex *Son preference*, which in the SIGI case cannot be fully compensated with relatively low values for the other subindices. For Nepal, we observe the opposite case as all subindices have values reflecting moderate inequality.

RESULTS

Country rankings and regional patterns

In Table 2 the results for the SIGI and its five subindices are presented. Among the 102 developing countries considered by the SIGI,^{xv} Paraguay, Croatia, Kazakhstan, Argentina, and Costa Rica have the lowest levels of gender inequality related to social institutions. Sudan is the country that occupies the last position, followed by

Afghanistan, Sierra Leone, Mali, and Yemen, which means that gender inequality in social institutions is a major problem there. As can be seen by studying the subindices, most of the top third of performers have no inequality in the *Civil liberties*, no evidence for *Son preference*, and no inequality in *Ownership rights*. Therefore for these countries, the final ranking is heavily influenced by performance in *Family code* and *Physical integrity* where (nearly) all countries show some inequalities. Particularly the acceptance of violence against women plays a rather important role here. At the bottom end of the table, countries generally perform very poorly in the *Family code*, *Physical integrity*, and *Ownership rights*. There is, however, great heterogeneity in the *Civil liberties* and *Son preference* indicator where some countries at the bottom of the table are also scoring well.

In the subindex *Family code*, best performers are China, Jamaica, Croatia, Belarus and Kazakhstan while Worst performers are Mali, Chad, Afghanistan, Mozambique and Zambia. In the dimension *Civil liberties*, the top 2/3 of countries report no inequalities in these forms of gender inequality. Sudan, Saudi Arabia, Afghanistan, Yemen, and Iran occupy the last five positions of high inequality. In the subindex *Physical integrity*. Hong Kong, Bangladesh, Taiwan, Ecuador, El Salvador, Paraguay, and Philippines are at the top of the ranking while Mali, Somalia, Sudan, Egypt, and Sierra Leone are at the bottom. In the dimension *Son preference*, 2/3 of countries report no inequality; the countries that rank worst are China, Afghanistan, Papua New Guinea, Pakistan, India, and Bhutan; for them, poor performance in this indicator has a sizable influence on their ranking in the overall SIGI. Finally, in the subindex *Ownership rights*. 42 countries share position 1 as they have no inequality in this dimension. On the other hand the four worst performing countries are Sudan, Sierra Leone, Chad, and the Democratic Republic of Congo. Thus it is noticeable that, despite some correlation of performance across subindices, there is a great deal of heterogeneity in country performance across indicators, which further justifies

only allowing partial compensation across dimensions. China is most extreme here as it is ranked best in three dimensions (*Family code*, *Civil liberties*, and *Ownership rights*), while it performs abysmally on *Son preference* and also rather poorly on *Physical integrity*. Similarly, there are a number of Sub-Saharan African countries who score perfectly on *Son preference* and *Civil liberties*, but very poorly on the other three, leading to poor rankings overall. Conversely, the countries that are most balanced in their (generally poor) performance across dimensions are from South Asia and the Middle East and North Africa, although there some individual country exceptions.

To find out whether apparent regional patterns in social institutions related to gender inequality are systematic, we divide the countries in quintiles following the scores of the SIGI and its subindices (Table 3). The first quintile includes countries with lowest inequality and the fifth quintile countries with highest in equality. The SIGI does not rank any country in Europe and Central Asia (ECA) or Latin America and the Caribbean (LAC) in the two quintiles that reflect the highest inequality in social institutions related to gender. In contrast, most countries in South Asia (SA), Sub-Saharan Africa (SSA), and Middle East and North Africa (MENA) rank in these two quintiles. Despite this, it is interesting to note that two countries from these regions rank in the first (i.e. best) two quintiles. These are Mauritius (SSA) and Tunisia (MENA). East Asia and Pacific (EAP) has countries in all five quintiles with Philippines, Thailand, Hong Kong, and Singapore in the best quintile and China in the worst quintile. The latter result is heavily influenced by China being the worst performer in the *Son preference* dimension (Klasen and Wink 2003).

Examining the subindices, the patterns are overall similar to the one of the SIGI and are briefly summarized:

- *Family code*: No country in ECA, LAC, or EAP shows high inequality in this dimension. SA, MENA, and SSA remain problematic with most countries having

social institutions related to high gender inequality. Exceptions are Bhutan in SA, Mauritius in SSA, and Tunisia and Israel in MENA.

- *Civil liberties*: Only three groups of countries using the quintile analysis can be generated with the first group including the first three quintiles. In SSA over one-half of the countries are now in the first group. Also in MENA there are some countries with good scores (Israel, Morocco, and Tunisia). No country in SA is found in the first three quintiles of low and moderate inequality.
- *Physical integrity*: Most problematic regions are SSA and MENA. Exceptions in these regions are Botswana, Mauritius, South Africa, and Tanzania (SSA), and Morocco and Tunisia (MENA).
- *Son preference*: Again only three groups of countries can be built by quintile analysis, with the first group including the first three quintiles. As in the case of *Civil liberties* most of the countries in SSA do not show problems. Missing women is mainly an issue in SA and MENA plus in China. But in both regions there are countries that rank in the first group. These are Sri Lanka in SA, and Israel, Lebanon, and Occupied Palestinian Territory in MENA.
- *Ownership rights*: Most problematic regions are SA, SSA, and MENA. Nevertheless, there are cases in these regions that rank in the first quintile. These are Egypt, Israel, Kuwait, and Tunisia (MENA), Bhutan (SA), and Eritrea and Mauritius (SSA).

While these rankings for the SIGI and its subindices generate interesting results for the prevalence and country distribution of social institutions related to gender inequality, one may wonder to what extent these are driven by data limitations, choice of indicators, and dimensions. In particular, we discuss briefly three topics related to the selection of variables and country sample. The first one is that it could be argued that some of the indicators we are using here are mostly relevant to a given region, for example: *Son preference* in South Asia, female genital

mutilation in Sub Saharan Africa, or freedom of dress as an issue for countries with Muslim populations. We investigated this issue in some detail.^{xvi} First, none of the subindices or the individual indicators has a perfect regional correlation in the sense that an indicator inequality only occurs in one region. *Son preference* is an issue affecting all regions, and female genital mutilation is an issue in five of the six regions. Of course, different regions are affected to different degrees, but that is precisely one of the issues this research would hope to uncover. Second, even the converse is (mostly) true, namely that there are hardly any subindices and indicators where an individual region is entirely unaffected in the sense of having perfect equality. The exceptions are that Eastern Europe, Central Asia, Latin America and the Caribbean score perfectly on the *Civil liberties* subindex (and, by implication, on the indicators freedom of movement and dress); and that in Eastern Europe and Central Asia, there is no issue of female genital mutilation. All other indicators and subindices show some inequality in all regions. Third, there is substantial within-region heterogeneity in all indicators and subindices.^{xvii} Lastly, we consider the issue of freedom of dress, an issue that typically affects countries with a significant Muslim population. Even if freedom of dress is mainly an issue for countries with a Muslim majority, the correlation between religion and this variable, which arguably would indicate a social institution that makes it more difficult for women to participate in public life, is not automatic. However, of the forty-one Muslim majority countries, in nineteen there is a perfect score on the *Civil liberties* indicator (meaning no inequality), while only four countries rank highest for this inequality.^{xviii}

As discussed above, one might have considered additional indicators to include in the subindices. For most, data availability was a constraint. We will now briefly discuss the impact of including one additional variable – the legality of abortion – when we have complete data for this factor available. The legality of

abortion variable could arguably be included in the *Physical integrity* subindex. United Nations (2007) provides information on the legal availability of abortion by countries, classifying seven legal reasons for abortion, ranging from "to save the life of the woman" to "available upon request." Based on the approach taken by David Bloom, David Canning, Günther Fink, and Jocelyn Finlay (2009) we use the seven categories to equidistantly code the variable (with "available on request" receiving a score of 0 and "not allowed under any circumstances" a score of 1).

As a robustness exercise, we consider a reformulated SIGI using the same methods but including the abortion rights indicator (scored as just described) as an additional variable in the *Physical integrity* subindex. The results for the countries for which we can compute both the SIGI and the reformulated SIGI are shown in Table 4 in the appendix. Since many Latin American countries have, presumably related to their Catholic heritage, more restrictive abortion policies while many ECA countries, largely due to their socialist heritage, have particularly liberal policies, so including this indicator changes the *Physical integrity* rankings at the top of the SIGI league table. In particular, Croatia now tops the list and 7 ECA countries are among the top 10. Only Argentina and Cuba remain in the top ten while Paraguay, El Salvador, and Ecuador rank a bit lower. But the change in rankings is based on rather small changes in the overall SIGI, and it only has a noticeable impact on rankings of countries in these two regions. At the bottom of the rankings, there are few changes.

While these are useful results, we decided ultimately not to include the abortion rights indicator in the final index for the following two reasons. First, there is the question of the extent to which restrictions on abortions can be seen as gender inequality in *Physical integrity*. While one may agree that abortion restrictions in instances of rape, incest, or when the mother's life or health are endangered are legitimate issues of gender inequality in *Physical integrity*, it is more controversial whether restrictions related to socioeconomic reasons or the health of the fetus are

issues of gender inequality in *Physical integrity*. It is also unclear how to quantitatively treat the different restrictions in the variable scoring. Second, there are also limitations to the data available. As noted in the UN source for the data, in a number of countries where abortions is not legal under any circumstances, it is not clear whether de facto a defence of necessity be allowed to justify an abortion" (2007) thus it is unclear whether a score of 1 in these cases is actually justified.

Lastly, we want to discuss the issue that the SIGI is produced only for non-OECD countries which requires some further discussion. The main problem is that our indicators are not appropriate for an accurate assessment of social institutions related to gender inequality in OECD countries. Using our indicators, the vast majority of OECD member countries (with the exception of Turkey, Mexico, and South Korea) would get a perfect score in the SIGI. This is partly due to the fact that legal discrimination that governs women's economic, social, and public life is largely absent in OECD countries; it is partly also due to the indicators that we use. For example, violence against women continues to be a problem afflicting OECD countries, but our proxy, as discussed above, does not pick up the prevalence (only the legality of it), which again gives all OECD countries a perfect score. Therefore by not including OECD countries we avoid the misleading impression that there are no remaining inequalities in social institutions that affect OECD countries. One way out could be to produce a different SIGI using different indicators for OECD countries, as similarly done with the two version of UNDP's Human Poverty Index (UNDP 1996), or to extend the SIGI to include more dimensions that have greater relevance for OECD countries. Both options are fruitful avenues to pursue this matter further.

Simple correlation with other gender-related indices

The SIGI seeks to understand gender inequality in a new way by focusing on gender

gaps in social institutions that influence the basic functioning of society and explain gender inequality in outcomes. From this perspective, the SIGI contributes to existing gender-related measures irrespective from an empirical redundancy perspective, meaning whether it provides additional empirical information as compared to other measures. Nevertheless, one can also check whether the index is empirically redundant with an empirical analysis of the statistical association between the SIGI and other well-known gender-related indices. Relying on Mark McGillivray and Howard White (1993), we use a correlation coefficient of 0.80 in absolute value as the threshold to separate redundancy from non-redundancy.

We also calculate Kendall tau-b as a measure of rank correlation between the SIGI and each of the following indices: the Gender-related Development Index (GDI) and the Gender Empowerment Measure (GEM) from UNDP (2006), the Global Gender Gap Index (GGG) from Ricardo Hausmann, Laura Tyson, Saadia Zahidi, and Klaus Schwab (2007), and the CIRI Women's Social Rights Index.^{xix} As the GDI and the GEM have been criticized in the literature (for example Stephan Klasen[2006]; Dana Schüler[2006]), we also do the analysis for two alternative measures, the Gender Gap Index Capped (GGI) and a revised Gender Empowerment Measure (GEM revised) based on income shares proposed by Stephan Klasen and Dana Schüler (2011).^{xx} For all the indices considered Kendall tau-b is lower than 0.60 in absolute value and statistically significant (Table 5); and rankings differ substantially (see Table 6).^{xxi} Clearly, the SIGI is related to these gender inequality measures but is non-redundant. This suggests that the SIGI conceptually reflects a different approach to measuring gender inequality, and it also empirically captures different aspects as currently available measures. Interestingly, the highest correlation in absolute value (around 0.50) is found between the SIGI and the GDI and GGI (capped) with both measures combining health, education, and income (or labor force participation). The lowest correlation (around 0.43) is observed for the

two empowerment measures GEM and GEM (revised). The results for GGG and WOSOC are inbetween (around 0.48).^{xxii} Similar results regarding correlations of the SIGI with other gender indices are reported by van Staveren (2011). She finds that the SIGI is actually least correlated when studying the correlations of the SIGI, UNDP's new GII, the GGG, and the Gender Equity Index based on the ISD database, with the Pearson correlation coefficients of the SIGI running from 0.64 to 0.77.

_____ Summarizing these correlations, it is clear that the SIGI is related to outcome-based measures, but this correlation is far from perfect. This is what we would expect. Clearly, gender inequality in social institutions should be an important driver of gender inequality in outcomes; but we would not expect a perfect match. We therefore now turn to investigate to what extent the SIGI and its components can indeed be seen as a driver of gender inequality outcomes.^{xxiii}

Regression analysis

As an illustration of the usefulness of the SIGI for empirical assessments of development, we explore whether the SIGI is associated with gender inequality in development outcomes controlling for other factors. In particular, we run linear regressions with two well-known measures as dependent variables and the SIGI as regressor. We choose the Global Gender Gap Index (GGG) as the first response variable because it is an encompassing measure to reflect gaps in outcome variables related to basic rights such as health, economic participation, and political empowerment. The second response variable is the ratio of GDI to HDI as a composite measure of gender inequality in the dimensions health, education, and income. As the GDI is not really a measure of gender inequality but a measure of human development that penalizes for gender inequality, UNDP recommends using the ratio of GDI to HDI as a proxy for gender inequality.^{xxiv} Additionally, we also use the ratio of the female to male HDI as calculated by Klasen (2006) as another

measure of gender gaps in development outcomes. In all three regressions, we control for the level of economic development using the log of per capita GDP in constant prices (US\$, PPP, base year: 2005; World Bank 2008); for religion using a Muslim majority and a Christian majority dummy, the left-out category being countries that have neither a majority of Muslim nor a majority of Christian population (Central Intelligence Agency 2009); and for geography and other unexplained heterogeneity that might go together with region using region dummies, the left-out category being Sub-Saharan Africa.^{xxv}

The regression results are presented in Table 7. With GGG as a dependent variable, the SIGI is negatively associated with GGG and significant at the 1 percent level. The second regression with the ratio of GDI to HDI as dependent variable, shows that the SIGI is again negatively associated with the response variable and this association is statistically significant at the 1 percent level; the same is true when using the ratio of the female to male HDI where the SIGI has a strong and highly significant negative impact, confirming again that gender inequality in well-being and empowerment is strongly associated with social institutions that shape gender roles.^{xxvi} To check that our findings are not driven by observations that have large residuals and/or high leverage, we also run a range of robustness checks obtaining similar results.^{xxvii}

While these regressions document a significant correlation, one should certainly be careful with any statement about causality as there could be omitted variables, measurement error and reverse causality (Jeffrey Wooldridge 2002). We include control variables in the regressions with the objective to minimize omitted variable bias, but it is not possible to rule out this problem; as the institutions we capture tend to be long-lasting, we also believe that reverse causality is rather unlikely.

In addition, we submit that the SIGI might be a useful measure to tackle

endogeneity in other types of regressions. For example, in regressions examining the impact of gender gaps in education or health on economic growth or other development outcomes, endogeneity is likely to be an issue. To the extent that the SIGI is able to explain these gender gaps and is not directly related to growth or the development outcome examined, it would be a plausible instrument to tackle endogeneity issues in such types of analyses.

Conclusions

In this paper we present a composite index that approaches gender inequality in a way that has been neglected in the literature and by other gender measures that focus mainly on well-being and agency. Instead of measuring gender inequality in well-being or agency outcome dimensions, the proposed measures proxy the underlying social institutions that are mirrored by societal practices and legal norms that might produce inequalities between women and men in developing countries. We construct five subindices each capturing one dimension of social institutions related to gender inequality that we combine into the SIGI, a multidimensional index of deprivation of women caused by social institutions related to gender inequality. The aggregation procedure used for the SIGI has the advantage of penalizing high inequality in each dimension and only allowing for partial compensation among the five dimensions. At the same time, the SIGI is easy to understand and to communicate. The SIGI's composite measures allow for comparison and ranking of the deprivation of women in over 100 developing countries.

Empirical results show that the SIGI is statistically non-redundant and adds new information to other well-known gender-related measures. The SIGI and the five subindices can help policymakers to detect the problems that need to be addressed in certain developing countries and in specific dimensions of social institutions. The SIGI suggests that, regions with highest inequality are South Asia, Sub-Saharan

Africa, and Middle East and North Africa. The composite measures can be valuable instruments to generate public discussion. Moreover, the SIGI and its subindices have the potential to influence current development thinking as they highlight social institutions that affect overall development. As it is shown in the literature (World Bank 2011; Stephen Knowles, Paula Lorgelly and P. Dorian Owen 2002; Stephan Klasen 2002; Klasen and Lamanna 2009) gender inequality in education and employment negatively affects overall development. Economic research investigating these outcome inequalities should consider social institutions related to gender inequality as possible explanatory factors. Results from regression analysis show that the SIGI is related to gender inequality in well-being and empowerment, even after controlling for region, religion, and the level of economic development.

When constructing composite indices, one is always confronted with decisions and trade-offs concerning the choice and treatment of the variables included, the weighting scheme, and the aggregation method. Some limitations of the subindices and the SIGI must be noted. First, a composite index depends on the quality of the data used as input. Social institutions related to gender inequality are hard to measure and the creation of the OECD Development Center's GID database containing several indicators on social institutions is an important step forward (Morrisson and Jütting 2005; Jütting et al. 2008). It is worthwhile to continue this endeavor and invest more resources in the measurement of social institutions related to gender inequality. This includes improving data coverage, coding schemes, and the expansion of and refinement of indicators. It would also be useful to exploit prevalence and perception data available, for example, the Demographic and Health Surveys (DHS) capture women's perceptions on domestic violence. Similarly, more comparable data on fertility preferences, or social institutions involving labor markets would be useful. In some cases, extensions or even new data gathering exercises will be required.

Second, by aggregating variables and subindices, some information is inevitably lost. Figures and rankings according to the SIGI and the subindices should not substitute a careful investigation of the variables from the database. Furthermore, to understand the situation in a given country additional qualitative information could be valuable. Detailed information on each country is available in OECD (2010), which includes a country discussion on the five dimensions of the SIGI.

Third, the SIGI only measures institutions at the country level. For some dimensions, the use of micro data could be useful to generate more disaggregated version of the SIGI; here again, the DHS or other cross-country comparable micro data sets (such as UNICEF's MICS, the World Values Survey, or Gallup World Poll data) would be useful sources.^{xxviii}

Fourth, the omission of OECD countries remains a problem of the measure. While an inclusion in the current formulation of the SIGI is problematic for the reasons discussed above, creating a SIGI specifically for OECD countries or enhancing the indicator suite to make it more sensitive to gender issues in OECD countries would be desirable. Similarly, generating data to develop indicators in currently unmeasured aspects of social institutions could also affect the ranking among developing regions. As our sensitivity analysis with abortion rights shows, inclusion of an additional indicator can affect the ranking of regions. Thus we caution that the good performance of some regions (including Latin America and Eastern Europe and Central Asia) might be partly due to the omission of indicators on gender gaps in social institutions there.

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APPENDIX

Table 1: Pearson Correlation Coefficient (r) between the SIGI and the Simple Average of the Five Subindices

r	0.9593
Number of observations	102
p-value	0.0000

Table 2: Rankings of Countries according to the SIGI and its Subindices

Country	SIGI		Family code		Civil liberties		Physical integrity		Son preference		Ownership rights	
	Ranking	Value	Ranking	Value	Ranking	Value	Ranking	Value	Ranking	Value	Ranking	Value
Paraguay	1	0.00248	19	0.06890	1	0	3	0.08757	1	0	1	0
Croatia	2	0.00333	3	0.00811	1	0	9	0.12878	1	0	1	0
Kazakhstan	3	0.00348	5	0.02837	1	0	9	0.12878	1	0	1	0
Argentina	4	0.00379	13	0.04864	1	0	9	0.12878	1	0	1	0
Costa Rica	5	0.00709	23	0.08106	1	0	15	0.16999	1	0	1	0
Russian Federation	6	0.00725	35	0.14028	1	0	9	0.12878	1	0	1	0
Philippines	7	0.00788	8	0.04053	1	0	3	0.08757	1	0	53	0.17351
El Salvador	8	0.00826	17	0.06485	1	0	3	0.08757	1	0	43	0.17151
Ecuador	9	0.00914	24	0.08917	1	0	3	0.08757	1	0	53	0.17351
Ukraine	10	0.00969	8	0.04053	1	0	23	0.21635	1	0	1	0
Mauritius	11	0.00976	11	0.04458	1	0	23	0.21635	1	0	1	0
Moldova	12	0.00980	12	0.04701	1	0	23	0.21635	1	0	1	0
Bolivia	13	0.00983	13	0.04864	1	0	23	0.21635	1	0	1	0
Uruguay	14	0.00992	15	0.05269	1	0	23	0.21635	1	0	1	0
Venezuela, RB	15	0.01043	21	0.07295	1	0	23	0.21635	1	0	1	0
Thailand	16	0.01068	41	0.15649	1	0	15	0.16999	1	0	1	0
Peru	17	0.01213	15	0.05269	1	0	33	0.24059	1	0	1	0
Colombia	18	0.01273	21	0.07295	1	0	15	0.16999	1	0	43	0.17151
Belarus	19	0.01339	4	0.02432	1	0	34	0.25756	1	0	1	0
Hong Kong, China	20	0.01465	26	0.10380	1	0	1	0	89	0.25	1	0
Singapore	21	0.01526	25	0.09975	1	0	34	0.25756	1	0	1	0

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Country	SIGI		Family code		Civil liberties		Physical integrity		Son preference		Ownership rights	
	Ranking	Value	Ranking	Value	Ranking	Value	Ranking	Value	Ranking	Value	Ranking	Value
Cuba	22	0.01603	28	0.11754	1	0	34	0.25756	1	0	1	0
Macedonia, FYR	23	0.01787	39	0.15169	1	0	34	0.25756	1	0	1	0
Brazil	24	0.01880	19	0.06890	1	0	48	0.29877	1	0	1	0
Tunisia	25	0.01906	32	0.12738	1	0	9	0.12878	89	0.25	1	0
Chile	26	0.01951	34	0.13909	1	0	23	0.21635	1	0	56	0.17723
Cambodia	27	0.02202	38	0.14433	1	0	48	0.29877	1	0	1	0
Nicaragua	28	0.02251	33	0.12970	1	0	34	0.25756	1	0	43	0.17151
Trinidad and Tobago	29	0.02288	39	0.15169	1	0	15	0.16999	89	0.25	1	0
Kyrgyz Republic	30	0.02924	42	0.15980	1	0	48	0.29877	1	0	56	0.17723
Viet Nam	31	0.03006	6	0.03242	1	0	60	0.38634	1	0	1	0
Armenia	32	0.03012	7	0.03648	1	0	60	0.38634	1	0	1	0
Georgia	33	0.03069	17	0.06485	1	0	60	0.38634	1	0	1	0
Guatemala	34	0.03193	27	0.10538	1	0	54	0.34513	1	0	43	0.17151
Tajikistan	35	0.03262	47	0.25955	1	0	34	0.25756	1	0	43	0.17151
Honduras	36	0.03316	44	0.21610	1	0	54	0.34513	1	0	1	0
Azerbaijan	37	0.03395	37	0.14314	1	0	60	0.38634	1	0	1	0
Lao PDR	38	0.03597	51	0.32034	1	0	23	0.21635	1	0	43	0.17151
Mongolia	39	0.03912	30	0.12001	1	0	48	0.29877	89	0.25	43	0.17151
Dominican Republic	40	0.03984	28	0.11754	1	0	34	0.25756	1	0	58	0.34502
Myanmar	41	0.04629	35	0.14028	1	0	60	0.38634	89	0.25	1	0
Jamaica	42	0.04843	1	0.00405	1	0	54	0.34513	1	0	76	0.35074
Morocco	43	0.05344	48	0.26279	1	0	9	0.12878	89	0.25	58	0.34502
Fiji	44	0.05490	8	0.04053	1	0	60	0.38634	1	0	66	0.34874
Sri Lanka	45	0.05914	46	0.23404	98	0.30069	15	0.16999	1	0	66	0.34874

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Country	SIGI		Family code		Civil liberties		Physical integrity		Son preference		Ownership rights	
	Ranking	Value	Ranking	Value	Ranking	Value	Ranking	Value	Ranking	Value	Ranking	Value
Madagascar	46	0.06958	70	0.41138	1	0	60	0.38634	1	0	43	0.17151
Namibia	47	0.07502	58	0.35307	1	0	34	0.25756	89	0.25	66	0.34874
Botswana	48	0.08102	53	0.32163	1	0	15	0.16999	1	0	79	0.52225
South Africa	49	0.08677	73	0.42326	84	0.29808	23	0.21635	1	0	58	0.34502
Burundi	50	0.10691	57	0.33545	1	0	60	0.38634	1	0	79	0.52225
Albania	51	0.10720	31	0.12288	1	0	60	0.38634	101	0.5	66	0.34874
Senegal	52	0.11041	99	0.60250	1	0	45	0.26455	1	0	58	0.34502
Tanzania	53	0.11244	81	0.49886	1	0	22	0.20151	1	0	79	0.52225
Ghana	54	0.11269	61	0.36621	1	0	80	0.39575	1	0	79	0.52225
Indonesia	55	0.12776	59	0.35405	103	0.59876	79	0.39362	1	0	1	0
Eritrea	56	0.13645	76	0.45538	1	0	106	0.68910	1	0	1	0
Kenya	57	0.13704	63	0.37027	1	0	46	0.28152	1	0	111	0.68473
Cote d'Ivoire	58	0.13712	79	0.49012	1	0	85	0.43455	1	0	77	0.50650
Syrian Arab Republic	59	0.13811	68	0.40269	98	0.30069	34	0.25756	101	0.5	66	0.34874
Malawi	60	0.14323	60	0.36087	84	0.29808	88	0.47362	1	0	79	0.52225
Mauritania	61	0.14970	71	0.42056	98	0.30069	103	0.60183	1	0	58	0.34502
Swaziland	62	0.15655	86	0.52144	84	0.29808	60	0.38634	1	0	79	0.52225
Burkina Faso	63	0.16161	88	0.53939	1	0	104	0.63092	1	0	58	0.34502
Bhutan	64	0.16251	43	0.20513	84	0.29808	54	0.34513	118	0.75	1	0
Nepal	65	0.16723	62	0.36779	84	0.29808	48	0.29877	101	0.5	79	0.52225
Rwanda	66	0.16859	56	0.32974	1	0	91	0.51512	1	0	111	0.68473
Niger	67	0.17559	104	0.64882	1	0	99	0.52482	89	0.25	58	0.34502
Equatorial Guinea	68	0.17597	82	0.50291	84	0.29808	91	0.51512	1	0	79	0.52225
Gambia, The	69	0.17830	103	0.64303	1	0	102	0.59698	1	0	66	0.34874

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Country	SIGI		Family code		Civil liberties		Physical integrity		Son preference		Ownership rights	
	Ranking	Value	Ranking	Value	Ranking	Value	Ranking	Value	Ranking	Value	Ranking	Value
Central African Republic	70	0.18440	92	0.55902	1	0	101	0.58029	1	0	79	0.52225
Kuwait	71	0.18602	83	0.50523	103	0.59876	34	0.25756	101	0.5	1	0
Zimbabwe	72	0.18700	80	0.49075	84	0.29808	59	0.36937	1	0	111	0.68473
Uganda	73	0.18718	102	0.63697	84	0.29808	81	0.41058	1	0	79	0.52225
Benin	74	0.18899	84	0.50633	1	0	87	0.46877	1	0	111	0.68473
Algeria	75	0.19024	69	0.40501	103	0.59876	60	0.38634	101	0.5	43	0.17151
Bahrain	76	0.19655	52	0.32147	103	0.59876	60	0.38634	101	0.5	66	0.34874
Mozambique	77	0.19954	109	0.69776	84	0.29808	60	0.38634	1	0	79	0.52225
Togo	78	0.20252	96	0.58833	1	0	86	0.44452	1	0	111	0.68473
Congo, Dem. Rep.	79	0.20448	66	0.39038	1	0	81	0.41058	1	0	119	0.83752
Papua New Guinea	80	0.20936	50	0.27697	1	0	60	0.38634	118	0.75	78	0.50825
Cameroon	81	0.21651	89	0.54344	84	0.29808	90	0.48332	1	0	109	0.68175
Egypt, Arab Rep.	82	0.21766	49	0.26647	98	0.30069	111	0.82273	101	0.5	1	0
China	83	0.21786	1	0.00405	1	0	48	0.29877	122	1	1	0
Gabon	84	0.21892	107	0.68387	84	0.29808	91	0.51512	1	0	79	0.52225
Zambia	85	0.21939	108	0.69197	1	0	60	0.38634	1	0	111	0.68473
Nigeria	86	0.21991	71	0.42056	103	0.59876	89	0.47847	89	0.25	79	0.52225
Liberia	87	0.22651	87	0.53470	1	0	107	0.75756	1	0	79	0.52225
Guinea	88	0.22803	105	0.67140	1	0	105	0.64546	1	0	79	0.52225
Ethiopia	89	0.23325	55	0.32726	1	0	109	0.77424	1	0	108	0.67801
Bangladesh	90	0.24465	95	0.58334	103	0.59876	2	0.04121	101	0.5	79	0.52225
Libya	91	0.26019	67	0.39285	103	0.59876	91	0.51512	101	0.5	79	0.52225
United Arab Emirates	92	0.26575	93	0.56197	103	0.59876	100	0.53180	101	0.5	66	0.34874
Iraq	93	0.27524	77	0.47391	103	0.59876	98	0.51997	101	0.5	79	0.52225

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Country	SIGI		Family code		Civil liberties		Physical integrity		Son preference		Ownership rights	
	Ranking	Value	Ranking	Value	Ranking	Value	Ranking	Value	Ranking	Value	Ranking	Value
Pakistan	94	0.28324	64	0.37821	103	0.59876	47	0.28180	118	0.75	79	0.52225
Iran, Islamic Rep.	95	0.30436	91	0.55792	119	0.78099	91	0.51512	89	0.25	79	0.52225
India	96	0.31811	100	0.60655	103	0.59876	15	0.16999	118	0.75	79	0.52225
Chad	97	0.32258	111	0.79330	98	0.30069	84	0.43212	1	0	120	0.84049
Yemen	98	0.32705	97	0.59439	119	0.78099	60	0.38634	101	0.5	79	0.52225
Mali	99	0.33949	112	0.79735	1	0	114	0.97091	1	0	58	0.34502
Sierra Leone	100	0.34245	98	0.60159	1	0	110	0.79849	1	0	121	0.84424
Afghanistan	101	0.58230	110	0.71598	121	0.81777	91	0.51512	122	1	109	0.68175
Sudan	102	0.67781	106	0.67981	122	1	111	0.82273	101	0.5	122	1
Angola		NA	89	0.54344	1	0		NA	89	0.25	79	0.52225
Bosnia and Herzegovina		NA		NA	1	0	34	0.25756	1	0	1	0
Taiwan		NA		NA	1	0	3	0.08757	101	0.5	1	0
Congo, Rep.		NA	101	0.62450	1	0		NA	1	0	79	0.52225
Guinea-Bissau		NA		NA		NA	107	0.75756	1	0	111	0.68473
Haiti		NA	65	0.37837	1	0	54	0.34513	1	0		NA
Israel		NA	45	0.22712	1	0		NA	1	0	1	0
Jordan		NA	85	0.51739	103	0.59876		NA	101	0.5	79	0.52225
Korea, Dem. Rep.		NA		NA	84	0.29808	91	0.51512	1	0	1	0
Lebanon		NA		NA	103	0.59876	60	0.38634	1	0	53	0.17351
Lesotho		NA	94	0.57149	84	0.29808		NA	1	0	79	0.52225
Malaysia		NA	53	0.32163	103	0.59876		NA	1	0	1	0
Occupied Palestinian Territory		NA	78	0.48607	103	0.59876		NA	1	0	66	0.34874
Oman		NA	74	0.45364	84	0.29808		NA	101	0.5	66	0.34874
Panama		NA		NA	1	0	8	0.11181	1	0	1	0

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Country	SIGI		Family code		Civil liberties		Physical integrity		Son preference		Ownership rights	
	Ranking	Value	Ranking	Value	Ranking	Value	Ranking	Value	Ranking	Value	Ranking	Value
Puerto Rico		NA		NA	1	0	23	0.21635	1	0		NA
Saudi Arabia		NA	74	0.45364	122	1		NA	101	0.5	79	0.52225
Serbia and Montenegro		NA		NA	1	0		NA		NA	43	0.17151
Somalia		NA		NA	103	0.59876	113	0.84213	1	0	111	0.68473
Timor-Leste		NA		NA	1	0	83	0.42755	89	0.25	79	0.52225
Turkmenistan		NA		NA	1	0	60	0.38634	1	0	79	0.52225
Uzbekistan		NA		NA	1	0	60	0.38634	1	0	1	0

Source: own calculations based on GID Database.

Table 3: Regional Pattern of the SIGI and Subindices

	ECA	LAC	EAP	SA	SSA	MENA	Total
SIGI							
Quintile 1	6	10	4	0	1	0	21
Quintile 2	6	8	5	0	0	1	20
Quintile 3	1	1	2	1	14	2	21
Quintile 4	0	0	1	2	13	4	20
Quintile 5	0	0	1	4	10	5	20
Total	13	19	13	7	38	12	102
Family Code							
Quintile 1	7	11	4	0	1	0	23
Quintile 2	5	8	6	1	0	2	22
Quintile 3	1	1	4	3	9	5	23
Quintile 4	0	0	0	0	15	7	22
Quintile 5	0	0	0	3	16	3	22
Total	13	20	14	7	41	17	112
Civil Liberties							
Quintile 1, 2, 3	17	22	14	0	27	3	83
Quintile 4	0	0	1	3	12	3	19
Quintile 5	0	0	2	4	3	12	21
Total	17	22	17	7	42	18	123
Physical Integrity							
Quintile 1	5	13	5	3	4	2	32
Quintile 2	4	4	1	0	3	2	14
Quintile 3	7	5	7	3	6	4	32
Quintile 4	0	0	3	1	13	2	19
Quintile 5	0	0	0	0	14	3	17
Total	16	22	16	7	40	13	114
Son Preference							
Quintile 1, 2, 3	15	21	10	1	38	3	88
Quintile 4	0	1	4	0	4	3	12
Quintile 5	1	0	3	6	1	12	23
Total	16	22	17	7	43	18	123
Ownership Rights							
Quintile 1	12	12	11	1	2	4	42
Quintile 2	2	4	2	0	1	1	10
Quintile 3	2	3	2	1	8	7	23
Quintile 4	1	1	2	4	18	6	32
Quintile 5	0	0	0	1	14	0	15
Total	17	20	17	7	43	18	122

Source: own calculations.

ECA stands for Europe and Central Asia, LAC for Latin America and the Caribbean, EAP for East Asia and Pacific, SSA for Sub-Saharan Africa, and MENA for Middle East and North Africa.

Table 4: Comparison of the SIGI and the reformulated SIGI including the abortion rights indicator in the Subindex Physical integrity

Country	SIGI		Reformulated SIGI		Reformulated SIGI Rank minus SIGI rank
	Ranking	Value	Ranking	Value	
Paraguay	1	.0024832	16	.0130984	15
Croatia	2	.00333	1	.0015562	-1
Kazakhstan	3	.0034778	2	.001704	-1
Argentina	4	.0037899	7	.0067192	3
Costa Rica	5	.0070934	15	.0125667	10
Russian Federation	6	.0072524	5	.0054786	-1
Philippines	7	.0078831	25	.0184983	18
El Salvador	8	.0082581	32	.0292857	24
Ecuador	9	.0091447	13	.0120282	4
Ukraine	10	.00969	3	.0046835	-7
Mauritius	11	.009759	27	.0227487	16
Moldova	12	.0098035	4	.0047971	-8
Bolivia	13	.0098346	11	.0116548	-2
Uruguay	14	.0099167	12	.0117369	-2
Venezuela, RB	15	.0104259	28	.0234157	13
Thailand	16	.010677	17	.0132887	1
Peru	17	.0121323	22	.01708	5
Colombia	18	.012727	18	.0136476	0
Belarus	19	.0133856	6	.0062903	-13
Singapore	20	.0152573	8	.008162	-12
Cuba	21	.0160304	9	.0089351	-12
Macedonia, FYR	22	.0178696	10	.0107743	-12
Brazil	23	.0188021	30	.0255639	7
Tunisia	24	.0190618	23	.017288	-1
Chile	25	.0195128	37	.0460561	12
Cambodia	26	.0220188	14	.0124714	-12
Nicaragua	27	.0225149	40	.050074	13
Trinidad and Tobago	28	.0228815	31	.0283548	3
Kyrgyz Republic	29	.0292419	26	.0196945	-3
Viet Nam	30	.0300619	19	.0140974	-11
Armenia	31	.0301177	20	.0141533	-11
Georgia	32	.0306926	21	.0147282	-11
Guatemala	33	.0319271	34	.0437438	1
Tajikistan	34	.0326237	29	.0255284	-5
Honduras	35	.0331625	36	.0449791	1

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Table 4 – continued from previous page

Country	SIGI		Reformulated SIGI		Reformulated SIGI Rank minus SIGI rank
	Ranking	Value	Ranking	Value	
Azerbaijan	36	.0339496	24	.0179851	-12
Lao PDR	37	.0357687	35	.0437653	-2
Mongolia	38	.0391165	33	.029569	-5
Dominican Republic	39	.0398379	41	.0528382	2
Myanmar	40	.0462871	42	.0569791	2
Jamaica	41	.0484293	39	.0500468	-2
Morocco	42	.0534361	43	.058863	1
Fiji	43	.0545044	38	.0494889	-5
Sri Lanka	44	.059141	44	.0716846	0
Madagascar	45	.0695815	46	.0802735	1
Namibia	46	.0750237	45	.0735425	-1
Botswana	47	.0810172	48	.0819378	1
South Africa	48	.0867689	47	.0817624	-1
Burundi	49	.1069056	51	.1066622	2
Albania	50	.1071956	49	.0912312	-1
Senegal	51	.1104056	54	.1251181	3
Tanzania	52	.1124419	52	.1183621	0
Ghana	53	.112694	50	.1052269	-3
Indonesia	54	.1277609	56	.1389811	2
Eritrea	55	.1364469	53	.1204684	-2
Kenya	56	.1370416	57	.1429693	1
Cote d'Ivoire	57	.1371181	58	.1497392	1
Syrian Arab Republic	58	.1381059	59	.1511063	1
Malawi	59	.1432271	61	.1518833	2
Mauritania	60	.1497032	62	.155864	2
Swaziland	61	.1565499	60	.1515344	-1
Burkina Faso	62	.1616069	55	.1380899	-7
Bhutan	63	.162508	66	.1679368	3
Nepal	64	.1672252	63	.1576778	-1
Rwanda	65	.1685859	64	.1601858	-1
Niger	66	.1755873	69	.180021	3
Equatorial Guinea	67	.1759719	65	.1675719	-2
Gambia, The	68	.1782978	67	.169225	-1
Central African Republic	69	.1843973	75	.1888697	6
Kuwait	70	.1860213	74	.186752	4
Zimbabwe	71	.1869958	71	.183226	0
Uganda	72	.1871794	73	.1860078	1
Benin	73	.1889945	68	.1760802	-5
Algeria	74	.190244	76	.1900006	2

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Table 4 – continued from previous page

Country	SIGI		Reformulated SIGI		Reformulated SIGI Rank minus SIGI rank
	Ranking	Value	Ranking	Value	
Bahrain	75	.1965476	70	.1805831	-5
Mozambique	76	.1995442	78	.1993008	2
Togo	77	.202518	79	.1998853	2
Congo, Dem. Rep.	78	.2044817	85	.2147335	7
Papua New Guinea	79	.2093579	83	.2091145	4
Cameroon	80	.2165121	81	.2062414	1
Egypt, Arab Rep.	81	.2176608	80	.2056881	-1
China	82	.2178559	82	.2083084	0
Gabon	83	.2189224	88	.2237584	5
Zambia	84	.2193876	84	.2113943	0
Nigeria	85	.2199123	87	.2156295	2
Liberia	86	.2265095	72	.1848595	-14
Guinea	87	.2280293	86	.2154953	-1
Ethiopia	88	.2332508	77	.1923895	-11
Bangladesh	89	.2446482	89	.25354	0
Libya	90	.260187	90	.265023	0
United Arab Emirates	91	.2657521	91	.2723574	0
Iraq	92	.2752427	92	.2798794	0
Pakistan	93	.2832434	93	.2872753	0
Iran, Islamic Rep.	94	.3043608	95	.3091968	1
India	95	.318112	97	.3181828	2
Chad	96	.3225771	98	.3223899	2
Yemen	97	.3270495	99	.3377415	2
Mali	98	.339493	94	.2949676	-4
Sierra Leone	99	.3424468	96	.3133231	-3
Afghanistan	100	.5823044	100	.5871404	0
Sudan	101	.6778067	101	.653676	0

The data are sorted according to the value of the SIGI.

Table 5: Comparison with other Gender-related Indices
 Statistical Association between the SIGI and other Gender-related Measures

	Kendall tau-b	p-value	Number obs.
GDI	-0.501	0.000	79
GGI (capped)	-0.509	0.000	85
GEM	-0.425	0.001	33
GEM (revised)	-0.440	0.000	33
GGG	-0.474	0.000	73
WOSOC	-0.486	0.000	99

Data for the Gender-related development Index (GDI) and the Gender Empowerment Measure (GEM) are from United Nations Development Programme (2006) and are based on the year 2004. The Gender Gap Index (GGI) capped and the revised Gender Empowerment Measure (GEM revised) are taken from Klasen and Schüler(2009)based on the year 2004. Data for the Global Gender Gap Index (GGG) are fromHausmann, Tyson, and Zahidi(2007). The Women's Social Rights Index (WOSOC) data correspond to the year 2007 and are obtained from <http://ciri.binghamton.edu/>. The p-values correspond to the null hypothesis that the SIGI and the corresponding measure are independent.

Table 6: Comparison of Ranks: the SIGI and other Gender-related Indices

Country	SIGI	GDI	GGI (capped)	GEM	GEM (revised)	GGG	WOSOC
Paraguay	1					32	19
Croatia	2	6	16	6	7	3	19
Kazakhstan	3	18	1			10	19
Argentina	4	2	21	2	3	11	3
Costa Rica	5	7	40	3	2	8	3
Russian Federation	6	10	6	22	22	18	19
Philippines	7	22	30	10	8	1	19
El Salvador	8	29	35	13	14	20	19
Ecuador	9			14	11	17	19
Ukraine	10	19	7	23	23	25	19
Mauritius	11	12	46			44	3
Moldova	12						
Bolivia	13	35	24	19	15	41	3
Uruguay	14	5	17	15	17	39	19
Venezuela, RB	15	17	23	11	13	24	
Thailand	16	16	8	20	18	22	19
Peru	17	23	24	8	6	37	3
Colombia	18	15	11	16	16	7	3
Belarus	19	11	3			6	3
Hong Kong, China	20						
Singapore	21			1	11	38	19
Cuba	22		37			5	1
Macedonia, FYR	23	13	32	9	9	13	19
Brazil	24	14	20	20	19	36	3
Tunisia	25	26	72			55	64
Chile	26	3	44	16	20	45	3
Cambodia	27	45	10	28	26	52	3
Nicaragua	28	37	56			49	19
Trinidad and Tobago	29	9	33	4	5	19	1
Kyrgyz Republic	30	34	11			33	19
Viet Nam	31	31	2			15	19
Armenia	32	20	4			34	19
Georgia	33			24	24	30	19
Guatemala	34	39	64			58	19
Tajikistan	35	40	19			40	19
Honduras	36	38	36	12	10	31	19

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Table 6 – continued from previous page

Country	SIGI	GDI	GGI	GEM	GEM	GGG	WOSOC
			(capped)		(revised)		
Azerbaijan	37	28	4			26	19
Lao PDR	38	47	45				3
Mongolia	39	36	27	25	25	27	3
Dominican Republic	40	25	38			29	19
Myanmar	41		14				64
Jamaica	42	30	18			14	3
Morocco	43						19
Fiji	44						3
Sri Lanka	45	24	51	29	28	2	19
Madagascar	46	53	15			48	19
Namibia	47	43	33	5	4	9	19
Botswana	48	46	59	18	21	23	64
South Africa	49	41	42			4	19
Burundi	50	72	24				64
Albania	51						19
Senegal	52						64
Tanzania	53	66	27	7	1	12	19
Ghana	54	48	27			28	19
Indonesia	55	32	39			42	19
Eritrea	56						19
Kenya	57	57	42			43	64
Cote d'Ivoire	58	68	80				64
Syrian Arab Republic	59	33	63			56	64
Malawi	60	70	41			46	19
Mauritania	61	60	48			60	64
Swaziland	62	59	82				64
Burkina Faso	63	76	50			66	64
Bhutan	64						3
Nepal	65	51	61			70	64
Rwanda	66	63	9				3
Niger	67	79	78				19
Equatorial Guinea	68	42	62				19
Gambia, The	69					50	19
Central African Republic	70	75	67				19
Kuwait	71	1	48			51	64
Zimbabwe	72	58	57			47	19
Uganda	73	54	31			21	19
Benin	74	67	73			69	64
Algeria	75						64

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Table 6 – continued from previous page

Country	SIGI	GDI	GGI		GEM		GGG	WOSOC
			(capped)	(revised)	(revised)	(revised)		
Bahrain	76	4	76				64	64
Mozambique	77	71	47				16	64
Togo	78	61	70					64
Congo, Dem. Rep.	79	73	60					64
Papua New Guinea	80	50	22					19
Cameroon	81	55	54				65	64
Egypt, Arab Rep.	82			32	31	68		64
China	83	20	13			35		64
Gabon	84							64
Zambia	85	69	64			54		64
Nigeria	86	64	66			59		64
Liberia	87		68					19
Guinea	88	65	58					19
Ethiopia	89					62		64
Bangladesh	90	49	52	27	27	53		64
Libya	91		69					64
United Arab Emirates	92	8	74	30	32	57		64
Iraq	93		84					64
Pakistan	94	51	81	26	28	71		64
Iran, Islamic Rep.	95	27	54	31	30	67		64
India	96	44	77			63		19
Chad	97	74	75			72		64
Yemen	98	62	83	33	33	73		64
Mali	99	77	53			61		19
Sierra Leone	100	78	71					64
Afghanistan	101		85					19
Sudan	102	56	79					64
Number of obs.	102	79	85	33	33	73		99

Data for the Gender-related development Index (GDI) and the Gender Empowerment Measure (GEM) are from UNDP (2006) and are based on the year 2004. The Gender Gap Index (GGI) capped and the revised Gender Empowerment Measure (GEM revised) are taken from Klasen and Schüler(2009)based on the year 2004. Data for the Global Gender Gap Index (GGG) are from Hausmann, Tyson, and Zahidi(2007). The Women's Social Rights Index (WOSOC) data correspond to the year 2007and are obtained from <http://ciri.binghamton.edu/>.

RESULTS FROM REGRESSION ANALYSIS

Table 7: Linear Regressions with Dependent Variables GGG, Ratio of GDI to HDI, and Ratio of female to male HDI

	GGG	Ratio of GDI to HDI	Ratio of female to male HDI
	coef/se	coef/se	coef/se
SIGI	-0.282*** (0.090)	-0.053*** (0.017)	-0.212** (0.084)
Log GDP	0.014* (0.008)	0.004 (0.003)	0.045*** (0.008)
SA	-0.006 (0.032)	-0.001 (0.008)	0.006 (0.025)
ECA	-0.012 (0.018)	0.007 (0.005)	0.110*** (0.019)
LAC	-0.040** (0.017)	-0.000 (0.005)	0.052*** (0.018)
MENA	-0.044 (0.028)	0.000 (0.011)	0.010 (0.028)
EAP	0.004 (0.023)	0.009** (0.005)	0.069*** (0.018)
Muslim	-0.001 (0.018)	-0.002 (0.006)	-0.005 (0.018)
Christian	0.026 (0.017)	0.002 (0.005)	0.007 (0.017)
constant	0.567*** (0.064)	0.959*** (0.020)	0.503*** (0.070)
Number of obs.	72	78	78
Adjusted R2	0.615	0.431	0.785
Prob> F	0.000	0.000	0.000

Note: *** p<0.01, ** p<0.05, * p<0.1
HC robust standard errors in brackets.

Data for the Global Gender Gap Index (GGG) are from Hausmann, Tyson, and Zahidi(2007). Data for the Human Development Index (HDI) and for Gender-related Development Index (GDI) are from UNDP(2006)and are based on the year 2004. The ratio of the female to male HDI is the one calculated by Klasen (2006) based on the year 2004.

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ⁱSee <http://www.un.org/millenniumgoals/>(accessed July 2013)for information on the Millennium Development Goals.

ⁱⁱFor a detailed review of these and other measures, see Irene van Staveren (2011); A Geske Dijkstra (2006) and Stephan Klasen and Dana Schüler (2011).

ⁱⁱⁱInformation is available on the webpage of the project <http://ciri.binghamton.edu/> (date of access: April 16, 2010).

^{iv} Please note that this paper discusses variables and aggregation procedure the the 2009 formulation of the SIGI. In 2012, a new version of the SIGI was presented by the OECD Development Center which uses a very similar coding and aggregation procedure but slightly different variables that also

tend to refer to a later period. For more innovations see <http://www.genderindex.org/data> (accessed July 2013)

For further analyses that use the SIGI or its subindices as explanatory or as dependent variables, see Boris Branisa, Stephan Klasen, and Maria Ziegler (2013); Boris Branisa and Maria Ziegler (2010); Johannes Jütting, Angela Luci, and Christian Morrisson (2012); Niklas Potrafke and Heinrich Ursprung (2011); Seo-Young Cho (2010); Nicola Jones, Caroline Harper, and Carol Watson (2010).

^{vi}See Stephan Klasen (2007) for a discussion.

^{vii}The data are available at the web-pages supported by OECD Development Centre <http://www.wikigender.org> and <http://www.oecd.org/dev/gender/gid> (accessed April 16 2010).

^{viii}Two of the variables (*early marriage* and *female genital mutilation*) are continuous. The other indicators measure social institutions on an ordinal categorical scale.

^{ix}Usual Principal component analysis (PCA) is only valid for normally distributed variables (Ian Jolliffe 1986). This assumption is violated in this case, as the data include variables that are ordinal, and hence the Pearson correlation coefficient used for PCA is not appropriate. Following Kolenikov and Angeles (2009) we use polychoric PCA, which relies on polychoric and polyserial correlations. These correlations are estimated with maximum likelihood, assuming that there are latent normally distributed variables that underlie the ordinal categorical data.

^xThe first principal component is the weighted sum of the standardized original variables that captures as much of the variance in the data as possible. The proportion of explained variance by the first principal component is 70 percent for *Family code*, 93 percent for *Civil liberties*, 60 percent for *Physical integrity* and 87 percent for *Ownership rights*. The standardization of the original variables is done as follows: In the case of continuous variables, one subtracts the mean and then divides by the standard deviation. In the case of ordinal categorical variables, the standardization uses results of an ordered probit model.

^{xi}Acceptance of polygamy in the population might proxy actual practices better than the formal indicator legality of polygamy and, moreover, laws might be changed faster than practices.

Therefore, the acceptance variable is the first choice for the subindex *Family code*. The reason for using legality when acceptance is missing is to increase the number of countries included.

^{xii}Originally, missing women was part of the dimension *Physical integrity*, but we argue that missing women reflects another dimension of gender inequality. The two components of *Physical integrity*, *violence against women* and *female genital mutilation*, focus on freedom from bodily harm, while *missing women* is a more general proxy for *Son preference* that results in skewed fertility strategies and allocation decisions favoring sons. It also turns out that the statistical association between the two indicators of *Physical integrity* and *Son preference* is rather weak, suggesting that it is measuring a different concept

^{xiii}Not that these indicators are based on legal rights, not actual prevalence. See Cheryl Doss, Caren Grown, and Carmen Deere (2008) for a careful discussion of how to generate micro-based indicators of asset ownership by gender.

^{xiv}Some differences between the SIGI and the FGT measures must be highlighted. In the case of the SIGI, we are aggregating across dimensions and not over individuals. Moreover, in contrast to the income case, a lower value of x_i is preferred, and the normalization achieved when dividing by the poverty line z is not necessary as $0 \leq x_i \leq 1$, $i = 1, \dots, n$.

^{xv}The subindices are computed *only* for countries that have no missing values on the relevant input variables. In the case of the SIGI only countries that have values for every sub-index are considered.

^{xvi}Most of the results we report here can be deduced from the Tables with the country rankings. We did not report separate tables for this analysis but they are available on request.

^{xvii}The only exception here is that in the Middle East and North Africa where *inheritance rights* uniformly score a 0.5.

^{xviii}Moreover, from a statistical point of view, the rank correlation coefficient Kendall Tau-b between the other variable in the sub-index, namely *freedom of movement*, and *Civil liberties* as it is defined here is close to 0.9. This suggests that excluding the variable *freedom of dress*, and having *freedom of movement* as the only variable capturing the freedom of social participation of women would not lead to a major change in the ranking of countries according to this sub-index.

^{xi}Data obtained from CIRI Human Rights Data Project, see <http://ciri.binghamton.edu/>, accessed April 2010.

^{xx}The GGI is a geometric mean of the ratios of female to male achievements in the dimensions health, education and labor force participation. Capped means that every component is capped at one before calculating the geometric mean. This is done to ensure that that only gaps hurting women are considered. GGI can be more directly interpreted as a measure of gender inequality while the GDI measures human development penalizing gender inequality. The GEM has three components, political representation, representation in senior positions in the economy, and power over economic re-sources. The most problematic component is power over economic resources proxied by earned incomes. This component measures female and male earned incomes using income levels adjusted by gender gaps; it is empirically largely driven by income levels, not gender gaps. To avoid this problem the revised GEM only uses income shares of males and females in this component.

^{xxi}We have also computed the Pearson correlation coefficient between SIGI and all the measures. The Pearson correlation coefficient is lower than 0.80 for all correlations.

^{xxii}It must be noted that the samples used for computing the rank correlation are different from case to case ranging from 33 countries (GEM) to 99 (WOSOC).

^{xxiii}See Branisa, Klasen, and Ziegler (2013); Branisa and Ziegler (2010) for more detailed assessments of the empirical relevance of the SIGI and its subindices in explaining development outcomes.

^{xxiv}See UNDP http://hdr.undp.org/en/statistics/indices/gdi_gem/ (accessed April 2010).

^{xxv}As the number of observations is lower than 100, we use HC3 robust standard errors proposed by Russell Davidson and James MacKinnon (1993) to account for possible heteroscedasticity in our data.

^{xxvi}Using the difference between the HDI and the GDI, another possible measure of gender inequality, the impact of the SIGI is similarly significant.

^{xxvii}Results are available upon request. The type of robust regression we perform uses iteratively reweighted least squares and is described in Lawrence Hamilton (1992). A regression is run with

ordinary least squares, then case weights based on absolute residuals are calculated, and a new regression is performed using these weights. The iterations continue as long as the maximum change in weights remains above a specified value.

^{xxviii}See Doss, Grown, and Deere (2008) for suggestions regarding developing micro data on gender inequality in asset holdings.