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The Construction of a New Twin Set of Indices on Women's Empowerment and Gender Equality

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ABSTRACT

This technical paper proposes two new indices that measure gender equality and women's empowerment. The first focuses on the status of women relative to men through measuring gender gaps in four dimensions of gender equality (the Global Gender Parity Index or GGPI). The second focuses on women's empowerment in the same four dimensions as well as the added dimension of freedom from violence (the Women's Empowerment Index or WEI). The paper begins with a discussion of the conceptual and methodological considerations, then outlines a measurement framework for these 'twin indices', before presenting the empirical results and concluding with an evaluation of the measures. For a subsample of countries, we present a quintile-disaggregated WEI (QD-WEI), which illustrates how aggregate figures conceal the diverse realities of women and girls, in particular, those facing intersecting forms of inequalities based on income or wealth. The paper then provides an assessment of these two composite measures in relation to already existing and established ones. Finally, the paper outlines future considerations for the multidimensional measurement of gender equality and women's empowerment on social norms but also climate and technological justice, before providing some concluding remarks.

Measuring global gender inequalities through composite indicators

Since the launch of the *Human Development Report* in 1990, it has become accepted that development extends beyond a simple economic measure such as gross domestic product (GDP) and should incorporate aspects of human flourishing such as literacy or life expectancy. Sen's capability approach (1984, 1993) introduced a novel way in which to discuss and evaluate key aspects of a good human life. The Human Development Report Office later introduced the Human Development Index (HDI), which would become one of the most well-known composite indicators; it is now routinely cited in all circles, including in policymaking, academia and classrooms around the globe. The HDI consists of three dimensions combined into a single score: long and healthy life (measured through life expectancy at birth), knowledge (measured through expected years of schooling and mean years of schooling) and a decent standard of living (measured through gross national income per capita in purchasing power parity dollars).

Gender indices were pioneered in 1995 by the Human Development Research Office with the publication of the Gender-Related Development Index (GDI) and the Gender Empowerment Measure (GEM). These two gender indices, as with other human development indices, are meant to capture progress in "people realizing their potential, increasing their choices and enjoying the freedom to lead lives they value"—equally for women and men. Their development proliferated in the wake of the 1995 Fourth World Conference on Women, Peace and Development and the associated need to monitor progress under the 12 critical areas of the Beijing Platform for Action, which provides a global referent for a new and progressive vision of gender equality and women's empowerment (Humbert and Hubert 2021). Although the Beijing Platform for Action was instrumental in demonstrating the need for measurement and accountability, calling for improved sex-disaggregated data and gender statistics/indicators, it stopped short of providing concrete guidance on targets and indicators, and its full potential was not realized (Azcona and Bhatt 2020).

The commitment to the measurement of gender inequalities at the global level instead evolved towards the adoption of the Millennium Development Goals (MDGs), a much reduced set of dimensions and indicators compared to the 50 strategic objectives of the Beijing Platform for Action. An added problem was that the MDGs rendered gender invisible in most goals and siloed gender-related issues within one goal. The MDGs were somewhat, but not fully, expanded within the 2030 Agenda for Sustainable Development adopted in 2015, with, for example, the recognition that realizing gender equality and the empowerment of women and girls is crucial for successful implementation. This gender outlook is mainstreamed across a number of goals, targets and indicators but not all. Out of 231 indicators selected for monitoring the 2030 Agenda's 17 Sustainable Development Goals (SDGs), only 52 are gender-specific, meaning that they are targeted to women and girls, explicitly call for disaggregation by sex or refer to gender equality as the underlying objective (Bhatt et al 2024).

Criticisms of the first gender indices arose in that these did not represent direct measures of gender gaps but rather gender-sensitive development (Klasen and Schuler 2011)—they were measures of overall achievement adjusted for gender inequalities rather than measures that focused solely on gender inequalities (Anand and Sen 1995). These gender indices were also seen as reductionist and not sufficiently comprehensive to measure gender equality as a multidimensional concept. As a response, other institutions and scholars proposed various measures that expanded on these first composite gender equality indices, notably the World Economic Forum's Global Gender Gap Index (GGGI) in 2006 and the Organisation for Economic Co-operation and Development's (OECD) Social Institution and Gender Index (SIGI) in 2009, among others (for a comprehensive review of the main features of composite gender indices, see also Buvinic et al. 2020). Even more comprehensive measures have been able to further expand the scope of measurement thanks to their focus on specific contexts, such as the European Institute for Gender Equality's (EIGE) Gender Equality Index (2013) or the United Nations Economic Commission for Africa's African Gender and Development Index (2004) (Hsu and Kovacevic 2015), although their ability to address the criticisms of their predecessors have been limited, usually by practical considerations.

UNDP's gender indices have themselves undergone various revisions over the years, including the introduction of the Gender Inequality Index (GII) in 2010 and the new Gender Development Index (new GDI) in 2014. These advancements underscore the fact that the conceptual and methodological challenges and choice of indicators related to the measurement of gender equality and women's empowerment need to be periodically addressed. As the *2019 Human Development Report* highlighted, even though girls and women have been catching up on the basics, such as primary education, the targets have shifted and the enhanced capabilities that lead to strategic empowerment all too often elude them.

To this end, UN Women and UNDP have joined forces to review and improve gender-related composite indices to help measure both gender equality and women's empowerment, as well as to suggest ways to better align this measurement with the 2030 Agenda and the SDGs to strengthen policy and advocacy relevance. In this paper, we therefore propose a measurement framework with a twin indices approach that differentiates between the need to separate women's relative position to men from women's overall level of empowerment.[1] These two indices are meant as complementary measures, each addressing a different set of questions, and providing a more complete picture when used together. Furthermore, wherever possible, disaggregation and intersectional analysis[2] based on demographic or socioeconomic categories should be considered and implemented. In this paper, we have attempted to take a more

[1] Kabeer (1999) defines empowerment as the ability of people to expand their choices in life, particularly where this ability has been previously limited or denied. The WEI, similarly, defines empowerment as the expansion of women's voice, choices and opportunities. It focuses on dimensions where women and girls have historically faced—and continue to face—discrimination, which impedes enjoyment of their fundamental freedoms and human rights.

[2] McCall (2005) distinguishes between three approaches to intersectionality that are particularly relevant to quantitative measurement of an issue such as gender equality. The first approach is intracategorical and typically focuses on statistical description and comparison of different categories. This is the approach adopted in this paper. The second approach is intercategorical and focuses on the norms and power relations that exist among different groups. The third and final approach is anti-categorical and engages with how different groups—and the boundaries between them—are arbitrarily constructed, and thereby construct and reify power relations and hierarchies.

intersectional perspective, despite the numerous constraints involved, by showing how results might be different when wealth and income are taken into account.

This paper presents the conceptual and methodological considerations behind the development and proposal of a twin set of new global composite measures of gender equality and women's empowerment. We then outline the proposed dimensions of the Global Gender Parity Index (GGPI) and the Women's Empowerment Index (WEI) and their measurement frameworks. This is followed by a more detailed account of both measures and how they are operationalized. We also provide relevant comparisons to existing measures, and discuss future considerations on how to widen the frame for further measurements of gender equality and women's empowerment through indices. Finally, we provide some concluding remarks.

Conceptual considerations

The starting point of any gender-related index is to ensure that the dimensions it covers are sufficiently broad conceptually to capture key elements of gender equality as a multidimensional concept. For the purpose of creating updated measures of gender inequalities at the global level, the conceptual models start from a position of mapping what ought to be measured within the context of the global gender equality agenda. In doing so, they build on previous reviews of international policy and theoretical frameworks (e.g., Berik 2022; EIGE 2013), with updates in relation to key developments, particularly since 2015 and the launch of the SDGs.

This work draws on understanding gender equality through the lens of the capability approach,[3] which underpins much of the human development paradigm and finds resonance in the policy frameworks of the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW), the Beijing Platform for Action and the 2030 Agenda for Sustainable Development. Gender equality is a multidimensional concept (Nussbaum 2003), and its operationalization into an index thus needs to be captured through different dimensions.

CEDAW remains one of the most important human rights frameworks in relation to gender equality globally. Its articles cover a breadth of issues, including women's participation in the labour market, economic empowerment and the eradication of poverty (see Article XI on employment or Article XIII on economic and social benefits), education (Article X on education), representation and decision-making (Article VII on political and public life or Article VIII on representation) and health (Article XII on health).

[3] There are different elements involved in the capability approach. Capabilities describe what allows well-being and ought to be differentiated from functionings, which are actual outcomes. Indicators measure functionings, but it is reasonable to assume that inequalities in functionings are appropriate proxies for inequalities in capabilities (Berik 2022; Robeyns 2003). Inequalities in capabilities derive from inequalities in resources, which are themselves shaped by unequal power relations in terms of gender and other grounds. Further, since capabilities cannot be measured ex ante but rather ex post through functionings (outcomes), any measure invariably follows a pragmatic rather than a philosophical approach in its implementation (Thorbecke 2007).

CEDAW also makes direct references to violence against women (Article III on the guarantee of basic human rights and fundamental freedoms, Article V on sex role stereotyping and Article VI on prostitution). Finally, the perspective of intersectionality is referred to throughout the convention, although not explicitly.

The Beijing Platform for Action can also guide the choice of dimensions to be adopted. Its 12 critical areas cover several aspects, such as inequality in access to the labour market and eradication of poverty (Area A on women and poverty and Area F on women and the economy), education (Area B on education and training of women), decision-making (Area G on women in power and decision-making) and health (Area C on women and health). The Beijing Platform for Action also makes strong provisions to tackle gender-based violence against women (Area D on violence against women). Finally, the platform can be used as a human rights framework for further work in relation to emerging areas not yet comprehensively captured by existing gender indices, such as digitalization (Area J on women in the media) or the environment (Area K on women and the environment).

The 2030 Agenda for Sustainable Development recognizes that gender equality and the empowerment of women and girls is essential to progress across all SDGs and targets, and that the systematic mainstreaming of a gender perspective in the implementation of all goals and indicators is crucial. It argues that the achievement of full human potential and sustainable development is not possible if one half of humanity continues to be denied its human rights and opportunities, and that the goals under which these are realized are interrelated. Further, it states that women and girls must enjoy equal access to quality education, economic resources and political participation as well as equal opportunities with men and boys for employment, leadership and decision-making at all levels. Finally, it recognizes that all forms of discrimination and violence against women and girls are to be eliminated, including through the engagement of men and boys (United Nations 2015). Engaging men and boys can involve challenging harmful social norms, stereotypes, traditional practices, privileges, and dismantling patriarchal power structures that perpetuate systemic gender inequalities worldwide.

The capability approach has been followed and adapted in the majority of gender indices (for a recent review, see Schmid 2022). For example, the first edition of EIGE's Gender Equality Index provided a comprehensive mapping of its dimensions against various theoretical frameworks (see Annex 7 in EIGE 2013). The conceptual frameworks and dimensions of selected gender indices show a great deal of overlap, despite differences in the types of indicators considered (e.g., output versus process) or the breadth of policy issues (Table 1).

Table 1: Dimensions of selected gender indices

World Economic Forum's Global Gender Gap Index	European Institute for Gender Equality's Gender Equality Index	United Nations Development Programme's Gender Development Index	Organisation for Economic Co-operation and Development's Social Institutions and Gender Index	United Nations Development Programme's Gender Inequality Index
Economic participation and opportunity	Work (participation, segregation, quality of work)			Labour market
	Money (poverty, pay, resources)	Standard of living	Restricted access to productive and financial resources	
Educational attainment	Knowledge (attainment, segregation, lifelong learning)	Knowledge		Empowerment (educational attainment)
Political empowerment	Power (political, social, economic)		Restricted civil liberties	Empowerment (political)
	Time (care, social)			
Health and survival	Health (status, behaviour, access)	Long and healthy life		Health (reproductive health)
	Violence (gender-based violence, norms, attitudes and stereotypes)		Restricted physical integrity	
			Discrimination in the family	

Several main criticisms of the dimensions and indicators selected by previous gender indices have been made. First, most tend to miss two essential dimensions of gender equality – gender-based violence against women and social reproduction through unpaid care and domestic work (Folbre 2006; Schmid 2022). Second, they have an elitist focus and lack an emphasis on poorer and marginalized women (Berik 2022; Beteta 2006; Klasen 2006b); this is related not so much to conceptual oversight as to constraints on data availability. UNDP's GEM, for example, focused on women's empowerment in terms of high-level economic and political positions but did not include information on women's participation in local decision-making or progress on women's access to decent work. Advancements in the production of gender statistics, including global data on women's participation in local government, offer an opportunity to improve the composition of gender indices. At the same time, the principle of 'leaving no one behind' set out by the 2030 Agenda for Sustainable Development has placed greater attention on the need to go beyond national data to evaluate progress at the subnational level.

There has been a call for distinguishing between basic and enhanced capabilities[4] as the shift to the 2030 Agenda means that it might be more relevant to look at women's ability to vote (basic capability) versus women's full participation as political leaders at all levels (enhanced capability) (UNDP 2019). This distinction between basic and enhanced capabilities offers parallels to the distinction made between practical and strategic needs (Moser 1989). Addressing practical needs entails ensuring the removal of obstacles in women's lives, but without addressing strategic needs there cannot be a shift in social norms or relations of power that shape gender roles and gender relations. Such a shift is necessary within the scope of a transformative agenda.

A new framework that better distinguishes between gender equality and women's empowerment has also been called for. Attempts have been made to track the progress of women's empowerment but these are relatively rare. UNDP's GEM, for example, included indicators measuring four different outcomes (parliamentary seats; legislators, senior officials and managers; professional and technical positions; and earned income) for an equal distribution across women and men. Another example is UNDP's GII, which includes women-specific indicators (maternal mortality ratio, adolescent birth rate) and other non-women specific indicators (e.g., labour force participation, educational attainment, parliamentary representation); however, this is problematic in that it conflates indicators that measure relative and absolute achievements. Combining these two types of indicators means that the interpretation of the GII is difficult,

[4] The 2019 Human Development Report (United Nations Development Programme 2019, p. 6) provides a useful description of the distinction made between basic and enhanced capabilities: "Capabilities evolve with circumstances as well as with values and with people's changing demands and aspirations. Today, having a set of basic capabilities—those associated with the absence of extreme deprivations—is not enough. Enhanced capabilities are becoming crucial for people to own the "narrative of their lives." Enhanced capabilities bring greater agency along people's lives. Given that some capabilities build over a person's life, achieving a basic set—such as surviving to age 5 or learning to read—provides initial stepping stones to forming enhanced capabilities later in life. A similar evolution from basic to enhanced capabilities is reflected in the use of technology or in the ability to cope with environmental shocks, from frequent but low-impact hazards to large and unpredictable events. The distinction is also important when it comes to understanding inequalities across groups, such as the progression from women being able to vote in elections (a basic capability) to participating in politics as national leaders (an enhanced capability). The evolution in ambition from basic to enhanced capabilities mirrors the evolution from the Millennium Development Goals to the Sustainable Development Goals."

as it is neither a measure of gender equality nor a measure of women's empowerment (Anand 2018; Permanyer 2013). The creation of a set of twin indices helps distinguish between the two logics and allows us to capture new and emerging gender equality and women's empowerment issues with more gender-sensitive indicators and increasingly available data (Berik 2022).

Methodological considerations

Before translating the theoretical and conceptual underpinnings of gender indices into a measurement framework, it is necessary to give due consideration to methodological constraints. These issues are interrelated with gender equality issues and need to be discussed in that context, since they can reflect different perspectives on how to operationalize the measurement of gender equality. Gender indices necessarily only provide a limited representation of gender equality as a multidimensional concept, and transparency is needed on the implicit trade-offs involved in choices of methods (Klasen 2006a). Throughout the paper, we will use the following notation. When working with a given outcome indicator (say, education, income or health), the values for women will be denoted with the letter f and those of men with m.[5]

Measuring women's empowerment typically looks at the distribution of women's outcomes across countries or, in other words, their levels of achievement. Another approach is to examine gaps between women's and men's outcomes. In the gaps approach, their relative position is considered (i.e., whether gender gaps benefit women or men). Generally, a gender gap is a difference in outcomes between women and men, $d_x = X_f - X_m$, where X_f and X_m refer to the corresponding outcomes for women and men, with this gap sometimes incorrectly referred to as an absolute gap. The absolute gap $|d_x| = |X_f - X_m|$ is not a directional gap because it does not indicate which group is doing better. The relative gap is the gap between outcomes for women and men expressed as the proportion (or the percentage) of the outcome for men, $g_x = (X_f - X_m)/X_m = (X_f/X_m) - 1$. The sign of the relative gap indicates which group is doing better. The ratio $r_x = X_f/X_m$ is the disparity ratio between the outcomes for women and men. Each of these measures describes and quantifies a specific type of difference in outcomes.[6]

[5] We rely on statistics disaggregated by sex, hence, the use of female and male, but consider that these are proxies for the related categories of women and men. We recognize the limitations of adopting a binary approach and the lack of visibility given in this work to further genders. Currently, no international standard for collecting and measuring gender identity data exists. A number of countries, however, including Australia, Bangladesh, Canada, India, Nepal, New Zealand, Pakistan, the United Kingdom and the United States of America, are currently developing and testing different approaches. We nonetheless carry out this analysis from a gender perspective, in which our aim is to measure and analyse gender equality from a feminist perspective, where addressing power relations between different groups is central. Our hope is that this work will contribute to wider work that can transform these power relations.

[6] Another gap measure is reported in the literature—the adjusted relative gap, which is applicable when an indicator is expressed as a share of the population with some characteristic, $\boldsymbol{X_f}$ and $\boldsymbol{X_m}$. The adjusted relative index also takes into consideration the ratio of the complementary shares $\mathbf{100} - \boldsymbol{X_f}$ and $\mathbf{100} - \boldsymbol{X_m}$ and is defined as $\boldsymbol{adj\_r_x} = \frac{\boldsymbol{X_f}}{\mathbf{100}-\boldsymbol{X_f}} / \frac{\boldsymbol{X_m}}{\mathbf{100}-\boldsymbol{X_m}}$. Because it is difficult to interpret it in the context of the multidimensional composite index, where one indicator is not expressed as a share, the adjusted relative gap is not further explored in this document.

The gender gap simply shows the difference in outcomes expressed in the units of the original variable (indicator). It can be normalized or calculated from the normalized values of the original indicators. In such a case, the gap is expressed in score points. Its sign, positive or negative, indicates who is doing better; if negative, men are doing better, if positive, women are doing better. An important feature is that the gap is not distribution sensitive, that is, $d_x = d$, whenever $X_f = X_m + d$, independently of where X_f, or X_m are in their respective distributions. The fact that the gap can take on negative values implies that the aggregation of the gaps from two or more indicators into a composite index cannot be done by the geometric or the harmonic mean. Gaps across several indicators must be aggregated by the arithmetic mean.

The relative gender gap g_x quantifies the proportion of women's achievements in comparison to those of men. If the relative gender gap is positive, women achieve more compared to men, but if it is negative, women's achievement falls below the achievement of men. The sign of the relative gap and the gap is the same. Because the relative gender gap g_x has men's achievement X_m in the denominator, for the same gap d_x, the relative gap will be smaller if X_m is larger, and vice versa. A negligible difference between the achievements of women and men at a higher level of achievement results in a negligible relative gap, but the same small difference can result with the considerably larger relative gap at a lower level of achievement.

Instead of using relative gender gaps, the disparity ratio $r_x = X_f/X_m$ is sufficient in practice. It directly measures the status of women relative to men in achievements. It can be expressed as a percentage, in which case it indicates the achievement of women as a percentage of men's achievement. It always takes on non-negative values. Who is doing better is recognized by observing if r_x is greater than 1 (women are doing better) or less than 1 (men are doing better). The disparity ratio takes account of both the difference in achievements and the level of achievement at which such a difference occurred. The relative gap (and so the disparity ratio) has a higher differentiation power than the gap (a simple difference). Two hypothetical countries with achievement vectors (0.1, 0.2) and (0.8, 0.9) would be ranked identically by the gap (equals -0.1), but the disparity ratio (equals 1/2 and 8/9, respectively) respects the levels at which differences occurred and ranks them differently. Aggregating the disparity ratios from two or more indicators can be done by any aggregation method, although to be aggregated by the geometric or the harmonic mean, the assumption is that none of the disparity ratios is equal to zero. The aggregated disparity ratio is interpreted as the disparity ratio of achievements between women and men combined across several indicators.

To circumvent the problem of how to account for women's overall disadvantage relative to men, it is necessary to rely closely on the theoretical framework to guide the selection of indicators. In this case, the framework is the comprehensive agenda for gender equality and women's empowerment articulated in CEDAW, the Beijing Platform for Action and the SDGs (Berik 2022). Under a fit-for-purpose principle, indicators selected focus on areas and issues that are well established in the literature and among intended constituents of the measure to be major constraints to women's well-being and empowerment (Nardo et

al. 2008). When this approach is followed, gaps will generally run in the same direction, favouring one sex disproportionately over the other, so there is less risk of cancellation.

Another route, taken by the World Economic Forum's GGGI, first converts all indicators to women/men ratios and then caps the result when women come ahead of men. This is an approach that is suitable where a women's empowerment approach is adopted. The downside of the capping approach is that a lot of potentially relevant information is lost. Systematically ignoring gender gaps in favour of women can potentially lead to misguided policies that do not take into consideration an important part of the story. The question of symmetry also raises the extent to which critical masculinities issues ought to be captured in a composite gender measure of inequalities. These recognize gender-related issues pertinent to men's lives in a context where hegemonic masculinity (Connell and Messerschmidt 2005) has receded, leaving room for the emergence of other forms of masculinities where men are freer to adopt more 'caring' behaviours (Anderson 2009; O'Neill 2015). This is all the more relevant given that in some countries and some dimensions—notably, education and health—gender gaps have been largely eradicated or reversed in favour of women.

An issue that has implicitly or explicitly surfaced in the debate on the measurement of gender equality is the inability of pure inequality measures to distinguish between equality at the top and equality at the bottom. For an indicator bound between 0 and 100 (e.g., a percentage), pure inequality measures or gender gap ratios give the same score when judging the amount of inequality, where (x_1,y_1) = (5,5) and where (x_2,y_2) = (95,95). In both cases, we have perfect equality between women and men. However, in the first case, both women and men have equally low scores, while in the second, their achievements are equally high.

It is possible to illustrate how this approach can be problematic by looking at some well-known perplexing rankings in a measure such as the GGGI. Between the 2014 and 2022 editions of the index, Rwanda featured among the top 10 countries, although by the 2024 edition, the country had dropped significantly to the thirty-ninth position. In the 2022 edition (World Economic Forum 2022), Rwanda ranked as 6 out of 146 countries, with a score of 0.811 out of 1 (Table 2). However, breaking the ranking down based on the scores on each of the four dimensions shows more nuances. The country does not perform well in relation to health and survival and education, at least in relative terms. This is because the vast majority of countries have largely closed gender gaps in the areas measured by these two dimensions, and they therefore provide little discriminatory ability when it comes to establishing rankings among countries. Rwanda's high overall rank is achieved due to the dimension of political empowerment, where it ranks seventh with a score of 0.563. Overall, its high score is largely driven by a single indicator that captures a unique aspect of the country—the very high representation of women in Parliament following the introduction of quotas in its 2003 Constitution and a drive to ensure a gender-inclusive reconstruction in the aftermath of the genocide (UN Women 2018a).

Focusing on gender gaps alone can hide some important issues, but other approaches that combine gender gap indicators with absolute status indicators are difficult to interpret. In the case of Rwanda, for example, a low rank of 93 out of 170 on UNDP's 2021 GII is largely attributed to relatively high maternal mortality rather than large gender gaps in education (11.4 and 16.3 percent for women and men, respectively) or labour force participation (82.5 and 82.2 percent for women and men, respectively) (Klasen 2018; UNDP 2022). The creation of a twin set of indices can address these problems, allowing a comparative scoring of countries across the two measures. Comprehensive gender equality and women's empowerment can thus be understood to be best reached when a country achieves not only low gender gaps but also high levels of women's empowerment.

Table 2: Selected scores from the Global Gender Gap Index 2022

Dimension	Rwanda's rank (out of 146)	Rwanda's score	Minimum score	Maximum score
Global Gender Gap Index	6	0.811	0.435	0.908
Economic participation and opportunity	33	0.747	0.176	0.883
Educational attainment	108	0.960	0.482	1.000
Health and survival	59	0.974	0.937	0.980
Political empowerment	7	0.563	0.000	0.874

Metrics should consider whether to focus solely on gender gaps or whether to also take into consideration differences in achievements in different countries. There has been a long-standing debate in the literature in this regard, with calls not to confuse the two approaches. The positive correlation of scores with GDP has also been highlighted as problematic (Dijkstra and Hanmer 2000). More recently, Permanyer (2015) has argued that EIGE's Gender Equality Index is not a measure of gender equality as it disproportionately measures differences across countries as opposed to gender gaps within countries.

In an attempt to generate a new metric that takes into consideration not only gender gaps but also the corresponding average level of achievement, the EIGE's Gender Equality Index introduced the so-called 'correcting coefficients' for the gender equality measure. The main objective was to ensure that the higher scores of the metric would only be reached when equality is achieved at the top but not at the bottom (EIGE 2013). Correcting gender inequality by overall achievement levels comes at a cost, though. As argued in Permanyer (2015), attempts to correct for levels results in complicated underlying metrics that sometimes are difficult to interpret and communicate. Whenever an indicator attempts to measure many things at the same time (e.g., equality and efficiency in outcomes), it can end up mismeasuring all of them and thus be misinterpreted.

Humbert and Hubert (2021) have counterargued that this is not a methodological weakness but instead reflects wider structural inequalities across countries. In fact, taking into account different levels of achievements—in the global context, related to different levels of development—is fully aligned with the principle of gender mainstreaming, which seeks to ensure that women and men's achievements are equally considered in the course of improving situations within different policy areas.

These debates show the importance of explicitly setting out what gender equality is and how it is measured. If gender inequalities are equated with gender gaps, then implementation in a measurement is relatively simple. However, this can also miss important aspects, such as where women and men fare equally—but in fact, equally badly. Another case is where gender gaps are reduced by a levelling down, as observed in the disproportionate drop in employment rates for men in the aftermath of the 2008 financial crisis. Taking into consideration levels of achievements is closer to the objectives of the policy process, ensuring increased capabilities in a gender-inclusive manner. By adopting an approach that relies on twin indices, respectively focused on gender gaps and women's empowerment, this proposal aims at addressing these criticisms.

Proposed dimensions for the Global Gender Parity Index and Women's Empowerment Index

A starting point in the creation of the twin indices is to build on feminist writings on the capability approach, given its links to the wider human development work developed by UNDP and because it can provide potential dimensions of gender equality and women's empowerment to consider in an index (for a recent review, see Berik 2022). For the new gender equality and women's empowerment measurement framework, five dimensions have been selected: life and good health; education, skill-building and knowledge; labour and financial inclusion; participation in decision-making and freedom from violence. The first four are common to the twin indices, while the last is only used within the WEI. We now examine their relevance as well as their links to freedoms, rights and capabilities.

LIFE AND GOOD HEALTH

Determinants of women's and men's health are distinct, complex and in some cases gender-specific. Assessing this dimension from a gender perspective requires considering both social and biological differences between women and men. Our proposal aims to address the broader state of health, in terms of physical, mental and social well-being, and to reflect the ability and freedom of all individuals to enjoy life, good health and bodily integrity. While the length of an individual's life is important for human development, the quality of those years is equally crucial, and it is essential to evaluate if those years are lived in good health. The proposal is to keep women-specific and relative measures separate. The relative measures (fraction of life expectancy at birth spent in good health) will be included in the GGPI and the women-specific indicators of health and bodily integrity in the WEI (adolescent birth rate and women of reproductive age whose need for family planning is satisfied with modern methods). The second improvement is that the GGPI aims to move from basic (e.g., physical survival) to enhanced capabilities, or the right not only to life and physical survival but also to a healthy life, with a need for indicators to reflect this shift (United Nations 2000). From a capabilities perspective, this dimension responds to the ability and freedom of individuals to enjoy physical survival, good health and bodily integrity.

EDUCATION, SKILL-BUILDING AND KNOWLEDGE

The dimension of education, skill-building and knowledge needs to focus on current attainment because it better captures the future abilities of women and men to improve their capabilities in other dimensions. Educational attainment in many countries has greatly increased in past decades, and gender gaps have been reduced or even reversed in some parts of the world. However, a large degree of variation across countries remains, including in the quality of education, and therefore, monitoring and closing gender gaps remains an important priority. This dimension focuses on the gender gap in upper-secondary school attainment and above. This represents an advancement from earlier gender indices that only considered those with some secondary education but who did not necessarily complete it. Further, enrolment is different from meeting actual learning outcomes, which are better captured through attainment. The percentage of youth who are not in education, employment or training (NEET) is also included to capture broader learning and skill-building than just formal education. This recognizes that education and skills are acquired through various means besides formal education, such as through training or work experience. Women are now globally outpacing men when it comes to formal education but are also more likely to be overrepresented among those with NEET status and to remain longer there (ILO 2019b).

LABOUR AND FINANCIAL INCLUSION

The dimension of labour and financial inclusion considers that the labour force participation rate, on its own, is not a sufficient measure of progress in living standards. Importantly, existing gender indices (Folbre 2006; Schmid 2022) continue to miss the important link between inequalities in unpaid care work at home and inequalities in paid work outside the home due to data unavailability. Unpaid care work can of course involve childcare but also the care of others, including elderly adults. To remedy this gap in measuring unpaid care work, it is possible to focus on how labour force participation might be constrained by inequalities within the home, and particularly the unequal division of unpaid care and domestic work, by considering households composed of couples (aged 25–54) with children. In addition, because one can have access to a resource without necessarily having control over it, it is equally important to look at women's control over assets and resources (captured through the indicator on the proportion of women's account ownership at a financial institution or with a mobile-money service provider). Control is seen as key to reaching gender equality and women's empowerment as well as other development goals, including but not limited to poverty reduction or the welfare of children. It is thus important to work towards ensuring women's equal access to financial and economic resources and opportunities (UNDESA 2009), particularly financial instruments.

PARTICIPATION IN DECISION-MAKING

Women's participation in decision-making is highly relevant not only for women's empowerment but as a fundamental capability, enabling them to have a say in and control over their environment. In international human rights treaties and frameworks, women's engagement and participation in political decision-making is viewed as a potential means to reduce gender inequalities. CEDAW Articles VII and VIII entrust States

with ensuring equality between women and men in political and public life and in representation in governments. More recently, SDG target 5.5 calls on nations to ensure women's full and equal participation in leadership positions in political, economic and public life. Women's equal access to power (included in the index through seats held in national parliament and local government, and women in management positions) benefits society as a whole, particularly as nominal representation is a necessary precursor to substantial representation, through which women have a greater ability to enact measures or policies that consider quality education, adequate housing, access to health services and social justice more generally.

FREEDOM FROM VIOLENCE

In developing the WEI, we expand on previous gender indices by positioning gender-based violence against women as a stand-alone dimension, since it can be regarded as one of the most serious forms of capability deprivation, affecting and sustaining other forms of capabilities and functionings in other dimensions. Awareness of its prevalence can be seen through movements such as #MeToo or #NiUnaMenos. Gender-based violence has serious consequences by depriving women of the ability to achieve educational opportunities, access decent work and make a living, or realize bodily integrity and good health. Gender-based violence can take many forms (including economic, physical, sexual and psychological violence and harassment) and involve different types of perpetrators (such as a known person, with an intimate partner notably the most common type). It can take place in different contexts (e.g., at home, work or school, in the public sphere or the digital domain). Recent data expansion efforts by the Inter-Agency Working Group on the estimation of violence against women data allow for the inclusion of intimate partner violence in the index (WHO 2021a).

Proposed measurement framework for the Global Gender Parity Index and Women's Empowerment Index

The conceptual framework underpinning a gender index needs to be satisfactorily transposed into a measurement framework that provides a comprehensive and easily interpretable account of gender inequalities, and allows for meaningful comparisons over space and time. Achieving both a sound conceptual framework and a sound measurement framework is, however, fraught with difficulties. While conceptual breadth is needed to capture the complexity of gender equality as a concept, in practice, indicators are often lacking or of insufficient quality and/or country coverage. This said, a wide and comprehensive conceptual framework can play an important role in highlighting gender data gaps, shining a light on what ought to be measured even where data are unavailable. Not doing so and only focusing on what can be measured entails exposure to the risk of 'shrinking' the meaning of gender equality (Lombardo et al. 2009) and poses challenges to policy monitoring, development and evaluation.

This has to be weighed against the requirement to adopt a simple and streamlined measurement framework, particularly so when measurement is done at the global rather than a regional level. This is

because a gender index needs to rely on indicators with universal interpretations (e.g., primary education attainment is less relevant as an issue in European Union countries than in other regions; see Permanyer 2013) and that are easily interpretable across different contexts. Not all indicators can be included, as in the case of indicators moving in different directions, which affects interpretation. For example, indicators measuring gender segregation in education or the labour market in the European Union are often negatively correlated with educational attainment and labour market participation, respectively (EIGE 2013). Global gender indices that master the trade-offs among conceptual dimensions and indicators are likely to do better from a communications or political standpoint than those that are equally good at measuring gender equality but are more complicated to unpack (Nardo et al. 2008).

SELECTION OF INDICATORS

Based on the dimensions proposed for inclusion in the twin indices (Berik 2022), an exhaustive repository of available indicators that capture the five dimensions of the GGPI and the WEI was created. Selecting indicators began with the gender-specific and gender-related indicators in the SDG indicators database (UN Women 2020, pp. 21–23) as well as sex-disaggregated indicators included in the *2020 Human Development Report* gender annex tables and dashboards. The repository was then enriched by additional SDG-related indicators produced by United Nations organizations and/or independent research/academic bodies. Moreover, the authors selected some additional indicators to bring visibility to enhanced capabilities, intersectionality and social norms. The main purpose of this exercise was to create an exhaustive database of indicators that could be relevant to the dimensions chosen for the indices.

Ultimately, the selection of indicators for the twin indices relied on the following criteria and previous approaches used by the Human Development Report Office in developing the GII (Gaye et al. 2010) as well as additional criteria highlighted in the literature (Saisana and Tarantola 2002):

1. Conceptual relevance: ensuring that the indicators measure what they are supposed to measure, i.e., that they are well suited to capture women's relative status to men and/or women's empowerment.

2. Non-ambiguity: ensuring that indicators are simple to interpret and are monotonic, and that there is consistency in the direction of indicators where lower (higher) values systematically refer to worse (better) outcomes.

3. Reliability: ensuring that indicators are comparable and harmonized across countries, regularly updated and with the greatest possible country coverage.

4. Value added: ensuring that each indicator provides new information not already captured by other selected indicators, i.e., avoiding redundancies.

5. Power of discrimination: ensuring that, together, the selected indicators allow for sufficient differentiation in the distribution of values across countries.

6. Political and policy relevance: ensuring that indicators carry political or policy relevance, i.e., are useful for political discourse and informative in driving policy action.

In addition to these criteria, the selection attempts to make use of advances in gender data in recent years, particularly after the adoption of the 2030 Agenda and including core areas of gender equality missing from previous indices, namely, indicators that capture the paid/unpaid work nexus as well as those of relevance to women and violence. Where possible, attention was paid to the possibility of upgrading previous indicators that capture basic capabilities with those linked more to enhanced capabilities (e.g., in the indicator selection for education and health); this criterion, however, was difficult to meet as data gaps remain large. Guiding the choice of indicators is also the availability of disaggregation by income/wealth quintiles as this allows a more nuanced analysis of women's level of empowerment among the poorest compared to the richest.

PROPOSED INDICATORS

From a list of 160 indicators, 11 indicators were chosen (Table 3). Eight of the 11 indicators are SDG indicators. Data for them were extracted from the SDG indicator database or official databases of respective custodian agencies. In some cases, databases were supplemented with other comparable databases to expand country coverage. The most updated data were used for each indicator (2022 in most cases). Where data from 2022 were not available, the most recent data were used (2012 or later). Some indicators were further disaggregated by wealth/income. Health indicators disaggregated by wealth/income were sourced from the World Health Organization (WHO) HEAT database, although it includes tabulations from Demographic and Health Survey (DHS) and Multiple Indicator Cluster Survey (MICS), which only cover low- and middle-income countries. To further increase data coverage and to have a balanced sample of countries by income group, additional data sources were identified. These include the European Union Statistics on Income and Living Conditions Survey, the Generations and Gender Survey by the United Nations Economic Commission for Europe, the United States National Survey of Family Growth and the Reproductive Health Surveys.

Table 3: Measurement framework of the Global Gender Parity Index and Women's Empowerment Index

Dimensions	GGPI	WEI		Indicator	Source
Life and good health	x		HALE/ LE	Fraction of life expectancy at birth spent in good health (percentage), by sex = (Healthy life expectancy at birth (years), by sex/ Life expectancy at birth (years), by sex)	UNDP and UN Women, based on WHO
		x	MMC	Women of reproductive age whose need for family planning is satisfied with modern methods (percentage aged 15–49)	United Nations Department of Economic and Social Affairs
		x	ABR	Adolescent birth rate (births per 1,000 women aged 15–19)	United Nations Department of Economic and Social Affairs
Education, skill-building and knowledge	x	x	CSE	Population with completed secondary education or higher (percentage aged 25 and older), by sex	Barro and Lee, DHS, OECD, UNESCO Institute for Statistics and MICS
	x	x	NEET	Youth not in education, employment or training (percentage aged 15–24), by sex	International Labour Organization (ILO)
Labour and financial inclusion	x	x	LFPRCW	Labour force participation rate among prime-working-age individuals who are living in a household comprising a couple and at least one child under age 6 (percentage aged 25–54), by sex	ILO
	x	x	FINACNT	Account ownership at a financial institution or with a mobile-money service provider (percentage of population aged 15 and older), by sex	World Bank
Participation in decision-making	x	x	PR	Share of seats held in parliament (percentage), by sex	Inter-Parliamentary Union
	x	x	LG	Share of seats held in local government (percentage), by sex	UN Women
	x	x	TMNG	Share of managerial positions held (percentage), by sex	UNDP and UN Women based on ILO
Freedom from violence		x	IPV	Ever-partnered women and girls subjected to physical and/or sexual violence by a current or former intimate partner in the previous 12 months (percentage aged 15–49)	WHO

LIFE AND GOOD HEALTH INDICATORS

The creation of a twin set of indices allows the inclusion of relative status indicators in the GGPI and women-specific indicators in the WEI, providing complementary information. For the GGPI, this new proposal focuses on the achievement women experience in this dimension relative to men, and assesses whether women's longer life expectancy with respect to men conceals poor health by examining the gender-specific fractions of life expectancy at birth spent in good health. Formally, this is defined as

$$H_f = \frac{HALE_f}{LE_f}, H_m = \frac{HALE_m}{LE_m}$$

where HALE is an indicator of 'healthy life expectancy' (measuring the number of years individuals are expected to live in good health under current mortality and morbidity conditions) and LE is the standard indicator of 'life expectancy' (measuring the number of years individuals are expected to live under current mortality conditions). Whenever women and men spend most of their lifetimes in good health, the corresponding H_f and H_m ratios will approach the upper bound of 1.

Assessing women's and men's health is complex as various distinct contributing factors are involved. It requires considering both social and biological differences between women and men. After much deliberation, the approach suggested in this paper is to look at the fraction of life expectancy spent in good health as it is very simple to understand and communicate, and sidesteps some of the aforementioned problems. The only remaining issue with the gender gap in the fraction of life expectancy spent in good health is that it shows very little variability across countries. Yet this indicator still succeeds in bringing some visibility to gender health gaps that are often concealed when focusing on life expectancy alone. The sustained increases in life expectancy observed in the world and its regions—particularly during the second half of the twentieth century (Oeppen and Vaupel 2002; Riley 2001, 2005; Wilson 2001, 2011)—have led some scholars to ponder whether the extra years of longevity enjoyed by the average individual were also spent in good health. For that reason, traditional life expectancy indicators were complemented with measures of 'healthy life expectancy', i.e., indices counting the average number of years individuals are expected to live in good health assuming that current mortality and morbidity conditions prevail over time.

Since the late 1970s and early 1980s, an important debate has centred on the relationship between life expectancy and healthy life expectancy. The three main competing theories that have emerged (and that continue to dominate the debate) are the so-called 'morbidity compression' (Fries 1980), 'morbidity expansion' (Gruenberg 1977) and 'dynamic equilibrium' hypotheses (Manton 1982), even though the compact expression 'compression versus expansion of morbidity debate' is often used as shorthand. The sex-specific ratios $HALE/LE$ included in the GGPI are crucial to assess whether and to what extent the increases in longevity

worldwide are simultaneously accompanied by improvements in good health, and whether women's longer life expectancy with respect to men conceals their poor health.

For the WEI, this dimension incorporates indicators specific to women's life, good health and bodily integrity. The first indicator, MMC (modern methods of contraception), captures the demand for family planning satisfied by modern methods of contraception. It reflects the fact that access to modern contraception is an essential aspect of women's health and choice in matters of reproduction, allowing them to realize their capabilities fully. The second indicator, ABR (adolescent birth rate), looks at freedom from adolescent births. Such births are linked to health risks from early pregnancy; further, early motherhood impedes the realization of capabilities in other dimensions of gender equality, such as participation in the labour force, access to decent work and education, the alleviation of poverty or freedom from gender-based violence by being economically independent.

EDUCATION, SKILL-BUILDING AND KNOWLEDGE INDICATORS

The new proposal adopts the perspective of education and skills attainment, keeping in sync with the argument that a new generation of enhanced capabilities is becoming more important for people to thrive in the digital age (UNDP 2019). Education and skills are necessary to achieve capabilities, although they do not ensure capabilities. The ability to obtain an adequate education and acquire skills, including through non-formal education and training, provides further opportunities in other dimensions, e.g., in the labour market through access to decent work and a good standard of living. In the context of enhanced capabilities, it is necessary to go beyond primary education completion and include the many forms of learning and skill-building. We therefore propose to measure completed secondary education or higher among those aged 25 or over, by sex (CSE). In determining indicator selection, data coverage and availability gaps prevented the inclusion of tertiary/higher education. Indicators covering information and communications technology (ICT) skills and quality of education were also considered but not included due to issues with data quality and availability.

Beyond formal education alone, there is evidence that gender gaps are widest among those excluded from learning and skill-building opportunities, including exclusion from digital and communications technologies. Enrolment in tertiary education tends to be higher among young women than among young men. But among those considered NEET, young women outnumber young men two to one. We therefore propose to include the NEET indicator, which is also part of the SDG monitoring framework, in the index as the percentage of youth aged 15–24 who are not in employment, education or training ($NEET$). From a gender perspective, a high NEET rate among young women has been linked to substantial engagement in household chores and/or strong institutional barriers that limit their participation in schooling and labour markets. Research in this area points to marriage as a key moment of separation for young women, where they exit education and become NEET. Moreover, women are more likely than men to see their NEET status become permanent rather than a

temporary period in their lives (ILO 2019a). An analysis of NEET rates among young women shows that women with disabilities tend to have the highest rates of exclusion (UN Women 2018b).

In light of technological advances, access to higher education is more necessary than ever. Women's access to such opportunities is a prerequisite for attaining capabilities in other dimensions in their lives, which besides economic empowerment encompass living a rich and meaningful life. This is because women should be able to use the senses; to imagine, think and reason; and to do these things in a 'truly human' way. This should be cultivated by an adequate education, including, but by no means limited to, literacy and basic mathematical and scientific training. Further learning needs to be seen as a prerequisite for empowerment, agency and voice. These indicators also provide an additional perspective when disaggregated by income as there is an important rich/poor divide. Past decades have seen the successful rise of educational levels among girls but not all have benefited equally. On the whole, gender gaps have been closing, but these gains are not evenly distributed. For poorer girls and especially so in poor rural areas or among marginalized groups, there has been little progress. In some cases, the gap has increased (UN Women 2018b).

LABOUR AND FINANCIAL INCLUSION INDICATORS

Labour force participation rates on their own are not a sufficient measure of progress in living standards, not least because the measure by itself says nothing about remuneration or the conditions under which the work is performed. Being in the labour force does not necessarily mean an individual is earning a decent income; they may be unemployed (seeking and available for employment), underpaid, underemployed, working part-time or working as an unpaid labourer in a family enterprise or farm. Additionally, women in the labour force may work few hours, for low wages, often under poor working conditions, compared to men. The indicator on its own may not be able to properly assess the gender gaps in capabilities to earn an income. When disaggregated by sex, household composition and the presence of young children, labour force participation rates for prime-age individuals can serve a different purpose, namely, as a good proxy for how the unequal distribution of domestic and care responsibility within households contributes to unequal access to opportunities outside households, specifically in the labour market.[7] Thus, indicators included in this dimension are the sex-specific versions of the labour force participation rate among prime working-age individuals who are living in a household comprising a couple and at least one child under age 6 ($LFPRCW$).

The second indicator included in this dimension captures women's and men's equal ability to access resources and finance ($FINACNT$) through looking at account ownership at a financial institution or with a mobile-

[7] The authors have access to data from 42 countries where information for both variables (i.e., the share of time spent in unpaid care and domestic work and the labour force participation rate for individuals aged 25–54 living in a household comprising a couple with at least one child under age 6) was available. Based on this sample, the relationship between both variables is clear and goes as expected. There is a negative relation suggesting a clear trade-off: The more time women tend to spend in unpaid care and domestic work (compared to men), the lower their relative labour force participation. The correlation coefficient is $r = -0.57$.

money service provider as a percentage of the population aged 15 and older, by sex. It measures the ability of women and men to control their material environment and be economically independent. Women's rights to financial assets have been long recognized and advocated by gender advocates. Article 13 of CEDAW, for example, makes explicit reference to "the right to bank loans, mortgages and other forms of financial credit." The Beijing Platform for Action similarly highlights women's lack of access to economic resources, including credit, land ownership and inheritance as critical areas of gender inequality that need to be urgently addressed. Financial inclusion is essential for women's economic well-being and empowerment. Access to a bank account, for instance, gives women the ability to store their money safely and build savings for the future, and is an entry point for accessing and using other financial services. Access to a bank account has also been found to directly impact women's labour force participation rates. The equal right to control assets has a demonstrated impact on bargaining power within the home. Yet in many countries, women are restricted from having a bank account, borrowing money, signing a contract or registering a business under their own name. These sorts of discriminatory laws are slowly being repealed but women are still less likely than men to hold an account at a financial institution.

PARTICIPATION IN DECISION-MAKING INDICATORS

This dimension considers the political representation of women in politics, both at the parliamentary level (PR) and within local governments (LG). The addition of 'local government' responds to previous criticisms that only capturing 'parliamentary representation' might be too elitist. In general, women's higher levels of poverty, more limited access to finance, greater share of care duties and challenges in realizing their sexual and reproductive health and rights, combined with exclusionary institutional rules and procedures, limit their full participation in the political sphere. These barriers may make it harder for women with political aspirations to move up the ladder, from local representation in village or city politics to national prominence. Moreover, while data are scarce, it is likely that women from poor, marginalized communities face even greater barriers and thus have even less access to national positions compared to local ones.

While trend data are not available for local governments, the data that are available indicate a relatively higher representation of women in local government. Globally, in 2015–2022, 36 percent of members elected at the local level were women. This compares to women comprising 26 percent of members of national parliaments in 2023. Women make up 50 per cent or more of local government officials in only two countries with data available. For a few countries, information is available on the local and national representation of women from marginalized groups. For example, in the United States of America, Black women make up 4.7 percent of members of Congress and 6 percent of mayors.[8] In Canada, 4.4 percent of seats in the House of Commons are occupied by visible minority women and 0.9 percent by Indigenous women. Women are also underrepresented in Indigenous local governments but their shares are higher; Indigenous women represented 30.5 percent of

[8] See the Represent Women's Demographic Divide website at: https://www.representwomen.org/demographic_divide#race.

councillors in First Nations of Canada band councils and are approximately 17 percent of band chiefs in First Nations communities (Vecchio 2019).

In addition to the political sphere, it is also important to look at the participation of women in decision-making in the private sector. Thus, an indicator on the percentage of women in 'total management positions' $(TMNG)$, covering junior, middle and senior management, is included. This recognizes the lack of progress that women can experience in formal workplaces, where they may be held back by working patterns, difficulties in integrating paid and unpaid work, and stereotypes about ideal workers, among other factors. The representation of women in top management positions can also be important for potential diffusion effects, as this may be a catalyst of greater gender equality at all levels of organizations, such as in relation to pay equality or in tackling job segregation.

FREEDOM FROM VIOLENCE INDICATORS

To be secure against gender-based violence, including physical and sexual violence but also other forms, is a central requirement of life. Gender-based violence against women is both a cause and consequences of gender inequalities and thus ought to be made more visible, notably through measurement. Yet harmonized and comparable data in this area are only starting to emerge as part of wider international frameworks for combating all forms of gender-based violence (Merry 2016). The WEI adopts an indicator measuring freedom from intimate partner violence (IPV), the complement of the proportion of ever-partnered women and girls subjected to physical and/or sexual violence by a current or former intimate partner in the previous 12 months. It is nevertheless acknowledged that measuring gender-based violence against women ought to go beyond simply measuring intimate partner violence. It should consider other forms by different perpetrators and within different contexts. To date, this cannot be operationalized due to a dearth of suitable indicators but should be seen as a starting point to call for further measurement of gender-based violence against women, not least within the remit of global gender indices. This could build bridges with existing work, such as on human security, which looks at individuals' ability to respond to shocks arising from interpersonal violence (e.g., in conflict situations) or climate change events (UNDP 2019, 2020a).

EXPLORING FURTHER DISAGGREGATION: LIFE CYCLE/INTERSECTING INEQUALITIES

In constructing the new indices, we have explored potentially interesting decompositions to better understand how gender inequalities are distributed across populations. More specifically, we have considered options for introducing the perspectives of 'intersectionality' and 'the life cycle approach'.

Attempts to introduce an intersectional perspective in the GGPI (i.e., to disaggregate key indicators not only for women and men but also across socioeconomic groups relevant to individual identity, such as social class, ethnicity, religion and so on) have not been successful for several reasons. In many cases, the groupings that can be potentially considered are very relevant in some countries but irrelevant in many others (this is one of

the main challenges when constructing indices that aim to be meaningful across all countries). One obvious candidate that could potentially work worldwide is the level of income or wealth (e.g., separating populations by income/wealth quintiles). After pondering this possibility and experimenting with several indicators, we decided not to go in that direction. If all indicators included in the gender gap measure are broken down by income/wealth quantiles, there is a high risk that the corresponding indicator ends up being very difficult (if impossible) to interpret. In all likelihood, gender and income gaps across and within dimensions running in concordant or discordant directions would muddy the waters and generate a confusing index. Instead, we decided to introduce the intersectionality perspective in the WEI index. Because it is a women-centred indicator, the intersectionality perspective is much easier to interpret.

Another perspective we have considered is the life cycle approach[9] and how to work with indicators that can be meaningfully adapted to individuals' broad life stages—youth, adulthood or late adulthood. Here, we have experimented with several indicators and explored the possibility of operationalizing the approach. But in the end, we decided not to go in that direction either. One of the main obstacles we encountered is the difficulty in squaring several constraints simultaneously (e.g., adequate data coverage, inclusion of novel and interesting indicators, data quality where some variables were heavily modelled and gave implausible results that precluded their use in a gender inequality index, and so on). Attempts to fully implement the life cycle approach might have resulted in the choice of very basic indicators that would not be agenda-setting nor catch the attention of a global audience. Simple candidates would be the well-trodden indicators of life expectancy at certain ages or mean years of schooling for specific age groups, which have been in the market of indices for many years, since the first *Human Development Report* in 1990. Thus, the constraint imposed by the need to find indicators that are potentially relevant across all ages proved too strong and precluded the use of very interesting indicators that otherwise are only meaningful for specific age ranges (e.g., time spent on unpaid care activities, years lived in disability and so on).

DATA LIMITATIONS AND GENDER DATA GAPS

The availability of sex-disaggregated indicators is greater in mainstream areas of gender equality such as the labour market (Verloo and van der Vleuten 2009). The requirements of a composite index are necessarily more demanding, compared to, for example, the compilation of a dashboard of gender-related indicators. The

[9] The term 'life cycle' is distinct from 'life course' The life course is concerned with life events and roles enacted by individuals over time. Unlike the life cycle approach, these events do not take place in any prescribed order. The life course approach focuses both on individual experiences, particularly in relation to life transitions (e.g., the transition to parenthood), but relates it to the family and community in which it takes place (e.g., linked lives), and considers both the time and space in which life events occur. The life cycle approach delineates simpler phases in life, in a determined sequence, through which individuals are expected to pass, based on measurable events such as age, education, marriage or parenthood. For this reason, it is a much easier approach to implement through a statistical approach, since age categories alone can provide a reasonable proxy for the different life cycle stages women and men go through. In this paper, we adopt the life cycle perspective.

possibilities to analyse and visualize global gender equality and women's empowerment, however, despite limitations in the availability of relevant indicators, justify the development of composite indices.

Data on time use, although needed to measure social reproduction, are collected too infrequently. Their use in the global monitoring of inequality in unpaid care and domestic work or work outside the market economy is further hindered by challenges related to quality and harmonization. Similarly, although indicators on decision-making within the home are relevant and needed, they cannot be considered as data gaps are too large. To some extent, we are able to capture power relations and inequalities within the home indirectly through indicators looking at labour force participation for couples with children. Recent attempts by UN Women and ILO to disaggregate labour market indicators by household type and the presence of children to bring visibility to the links between unpaid care and domestic work and women's labour market participation have further enriched the data available for the labour dimension (Azcona et al. 2020).

In other areas, such as violence against women, harmonized and comparable data on a global level are starting to emerge (Merry 2016), providing another measure of power relations and inequalities within the home. For intimate partner violence, recent efforts by the Violence Against Women Inter-Agency Group on Estimation and Data have led to the release of the first internationally comparable prevalence estimates for intimate partner violence against women and global and regional estimates for non-partner sexual violence against women (WHO 2021b). Nonetheless, data gaps remain in other dimensions of violence against women, including on psychological or economic violence.

Intersectional perspectives, despite their importance, are often too difficult to operationalize due to a lack of disaggregation and harmonized global categories for it (e.g., ethnicity). Within this paper, only disaggregation by wealth quintiles could be incorporated within the WEI, and not across all indicators and countries. Finally, new gender data gaps exist in measuring emerging issues such as social norms, digitalization and the environment, leaving in turn a serious gap in any composite measure of gender equality. When areas remain unmeasured, they are rendered invisible and shortfalls remain unchallenged.

Nonetheless, it is important to note positive developments. Efforts and investments in the new millennium have seen the introduction of new and better data, which in time can provide better measurements. The role that indices have played in highlighting and thus filling these gender data gaps is significant. For now, while waiting for broader data coverage, complementing gender indices with dashboards of additional indicators can offer a fruitful middle step in measuring gender as a multidimensional concept. For example, the Women's Empowerment dashboard (UNDP 2019, pp. 333–337) presents women-specific indicators, such as on violence against women and girls, women's access to STEM occupations (science, technology, engineering and math) or mandatory paid maternity leave. It reports on the number of missing values across countries and thus informs possible future inclusion in composite measures of gender equality (Berik 2022). As the *2019 Human Development Report* argues, gender data gaps call for "a revolution in metrics, as good policies start with good

measurement, and a new generation of inequalities requires a new generation of measurement" (UNDP 2019, pp. 3–4). Global programs on gender statistics, such as UN Women's Women Count initiative, play a crucial role in developing, utilizing and promoting gender-specific indicators, but these and other efforts must be scaled up and extended. Despite recent improvements in data coverage, nearly half (45 percent) of the data points needed to track progress on SDG 5 are currently unavailable (Cookson et al. forthcoming).

Empirical results

GLOBAL GENDER PARITY INDEX

Construction of the Global Gender Parity Index

The new proposed GGPI compares the average performance of women relative to men in the four dimensions discussed above. The choice of the aggregation metric is partially determined by theoretical and practical considerations. For instance, in the presence of gender gaps running in opposite directions, one might consider the possibility of capping those in favour of women and consider only the ones in favour of men. To investigate whether this is the case, Table 4 shows some basic statistics on corresponding gender gap ratios.

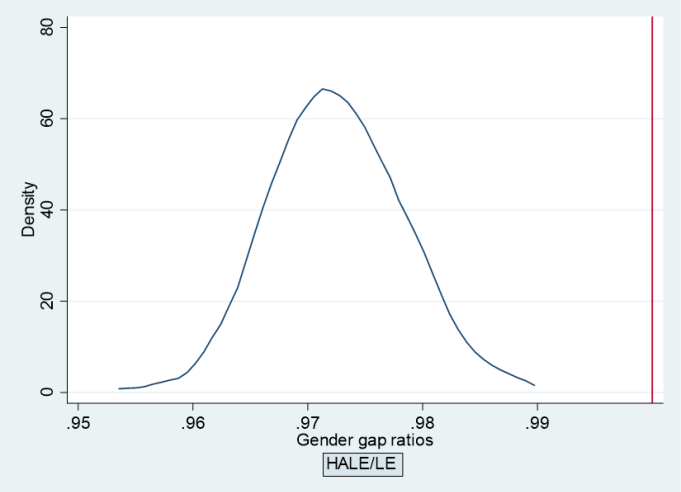
Table 4: Descriptive statistics for gender gaps in the indicators included in the Global Gender Parity Index

Indicators	Number of countries	Mean	Standard deviation	Min	Max
HALE/LE	183	.97	.005	.95	.99
CSE	174	.90	.25	.23	1.94
NEET	174	.89	.13	.32	1.24
LFPRCW	154	.64	.20	.07	.97
FINACNT	158	.86	.16	.15	1.18
PR	193	.38	.25	.002	1.21
LG	141	.41	.27	.008	2.00
TMNG	163	.54	.31	.04	2.34

In all cases, the means of the gender gap ratios are below the equality value of 1 (i.e., on average, gender gaps are always in favour of men). Yet some gender gap ratios are much more widely distributed than others (in relative terms, gender gaps in the health indicator exhibit the lowest levels of variability).

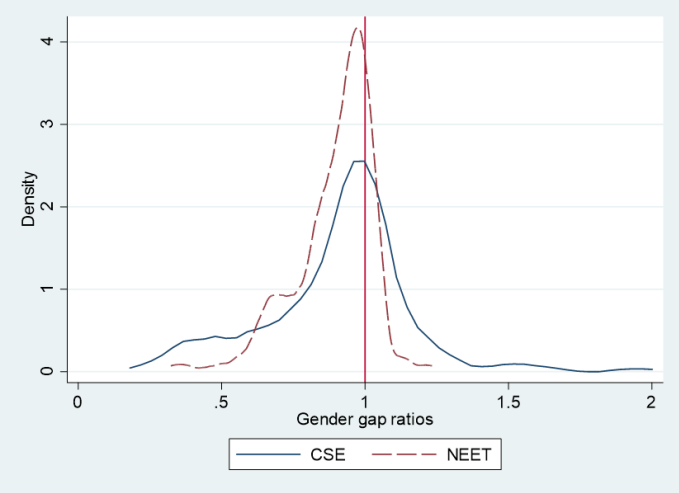
To go beyond these summary statistics, the following graphs plot the entire distribution of the gender gap ratios in the index's eight selected indicators across all countries in the database. Starting with the life and good health dimension (Figure 1), we see that all gender gap ratios are below 1, thus indicating a worse state of affairs in terms of health for women than for men across all countries included in the analysis.

Figure 1: Kernel density of gender gap ratios in the life and good health dimension (n = 183 countries)



For the indicators included in the dimension measuring education, skill-building and knowledge, results are shown in Figure 2. Most gender gap ratios here favour men, except for the indicator measuring the completion of secondary education where the ratio is a bit more symmetrical.

Figure 2: Kernel density of gender gap ratios in the education, skill-building and knowledge dimension (n = 174 countries, respectively)



In

Figure 3, we show the results for the indicators included in the dimension of labour and financial inclusion. The gender gap ratios for labour force participation rates among couples with children below age 6 are mostly below 1 (i.e., worse outcomes for women) and exhibit large variability. The ratios for the account ownership indicator tend to be below 1 but a non-negligible share of countries exhibits gender gaps above that value.

Figure 3: Kernel density of the gender gap ratios in the labour and financial inclusion dimension (n = 154 and 158 countries, respectively)

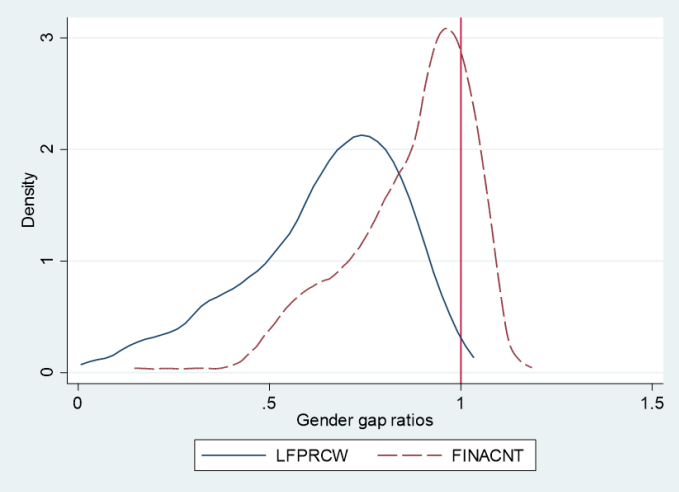
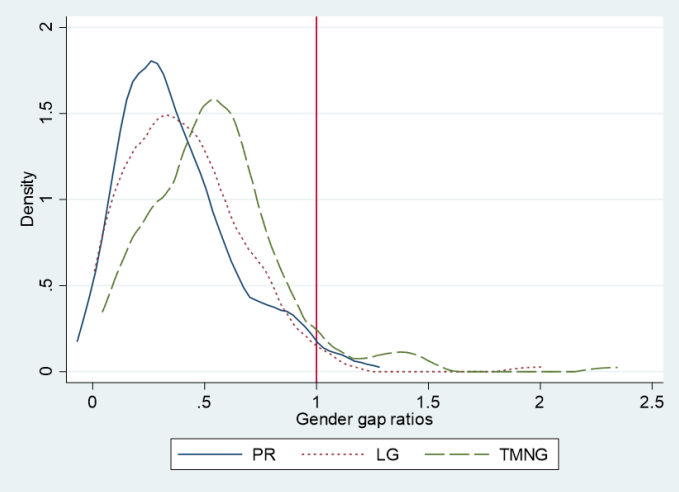


Figure 4 shows the distribution of the gender gap ratios in the dimension measuring participation in decision-making within parliaments, local governments and management. The three distributions are clearly skewed to the left, indicating the concentration of gender gaps at the bottom of the distribution (the majority of ratios are below 0.5).

Figure 4: Kernel density of the gender gap ratios in the participation in decision-making dimension (n = 193, 141 and 163 countries, respectively)



Inspecting these figures, we conclude that the potential cancellation effects of gender gaps running in opposite directions should not be very pronounced. Thus, the simplest way to measure the relative performance of women relative to men across the aforementioned indicators is to take an average of the corresponding gender gap ratios. For that purpose, we use the geometric mean, which has limited substitutability between indicators

and dimensions and has been used extensively in the suite of recent *Human Development Report* indicators (e.g., the HDI, Inequality-Adjusted HDI, GII and the new GDI).

The GGPI is constructed in two steps. First, we calculate four dimension indices ('life and good health', 'education, skill-building and knowledge', 'labour and financial inclusion' and 'participation in decision-making' dimensions[10]). These are defined as follows:

$$I_{Health} = \left(\frac{\frac{HALE_f}{LE_f}}{\frac{HALE_m}{LE_m}} \right)$$

$$I_{Education} = \left(\frac{CSE_f}{CSE_m} \cdot \frac{(100 - NEET_f)}{(100 - NEET_m)} \right)^{1/2}$$

$$I_{Inclusion} = \left(\frac{LFPRCW_f}{LFPRCW_m} \cdot \frac{FINACNT_f}{FINACNT_m} \right)^{1/2}$$

$$I_{Decisionmaking} = \left(\frac{PR_f}{PR_m} \cdot \frac{LG_f}{LG_m} \cdot \frac{TMNG_f}{TMNG_m} \right)^{1/3}$$

Subsequently, the GGPI is calculated as the geometric mean of these four subindices, that is:

$$GGPI = (I_{Health} \cdot I_{Education} \cdot I_{Inclusion} \cdot I_{Decisionmaking})^{1/4}$$

The interpretation of this index is straightforward. Whenever values of the GGPI are above 1, we can say that, on average, women perform better than men in the four dimensions we have selected. The opposite conclusion is reached whenever the values are below the equality value of 1. With current data, we have been able to generate estimates of the GGPI across 114 countries.

Internal consistency and correlation structure of the Global Gender Parity Index

The correlation structure of the GGPI was examined (Table 5). The correlation coefficients between the GGPI and its dimensions are positive and relatively strong, with the exception of the dimension of life and good health ($r = 0.31$). Within dimensions, the correlation structure is adequate as gender gaps in respective indicators positively correlate to associated dimensions, with only limited cross-loadings (e.g., $r = 0.72$ between the dimension of inclusion and gender gaps in NEET). The correlations among indicators are on the whole positive, but in general, they are not very high (except for the gender gap ratios between $NEET$ and $LFPRCW$, and between PR and LG, r = 0.61 and $r = 0.74$, respectively).

[10] There are 27 countries with no elected deliberative local government bodies. The value for the share of seats held by women in parliament was used for the share of seats held by women in local government in calculating the GGPI.

Table 5: Correlation structure between gender gaps in respective indicators, dimensions and the Global Gender Parity Index

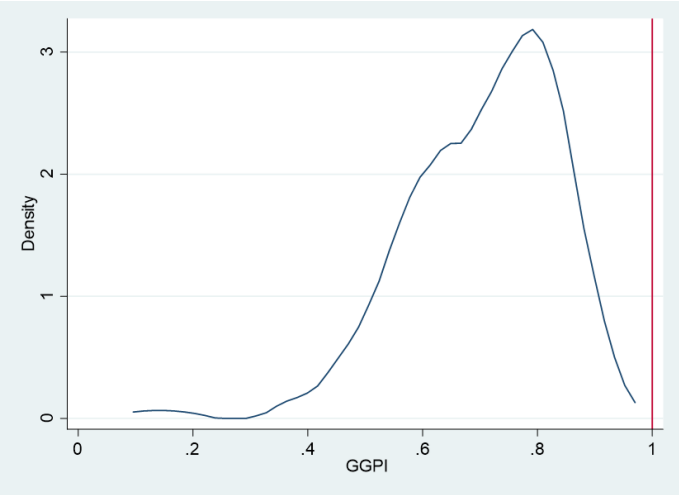
	I_HALE/LE	I_CSE	I_NONNEET	I_LFPRCW	I_FINACNT	I_PR	I_LG	I_TMNG	I_HEALTH	I_EDUCATION	I_LABOUR	I_DECISIONMAKING	GGPI
I_HALE/LE	1.00												
I_CSE	0.08	1.00											
I_NONNEET	0.33	0.28	1.00										
I_LFPRCW	0.23	-0.10	0.61	1.00									
I_FINACNT	0.28	0.36	0.64	0.43	1.00								
I_PR	0.03	0.06	0.28	0.31	0.28	1.00							
I_LG	0.05	0.15	0.21	0.11	0.30	0.74	1.00						
I_TMNG	0.16	0.01	0.13	0.28	0.09	-0.03	-0.07	1.00					
I_HEALTH	1.00	0.08	0.33	0.23	0.28	0.03	0.05	0.16	1.00				
I_EDUCATION	0.21	0.90	0.67	0.20	0.58	0.18	0.22	0.06	0.21	1.00			
I_LABOUR	0.30	0.07	0.72	0.94	0.71	0.35	0.21	0.24	0.30	0.38	1.00		
I_DECISIONMAKING	0.17	0.20	0.36	0.37	0.40	0.86	0.81	0.32	0.17	0.32	0.45	1.00	
GGPI	0.31	0.37	0.67	0.63	0.69	0.69	0.63	0.32	0.31	0.60	0.77	0.87	1.00

Note: In this table, the abridged names of the dimensions have been used. I_HEALTH refers to life and good health, I_EDUCATION to education, skill-building and knowledge, I_LABOUR to labour and financial inclusion, and I_DECISIONMAKING to participation in decision-making.

Scores of the Global Gender Parity Index

In this section, we briefly describe the distribution of the new GGPI and its relationship with well-known socioeconomic development indicators. As shown in Figure 5, all values of the index are below 1, thus indicating a worse state of affairs for women. The majority of values are concentrated between 0.6 and 0.8, but for some countries, women's disadvantage relative to men is substantially larger.

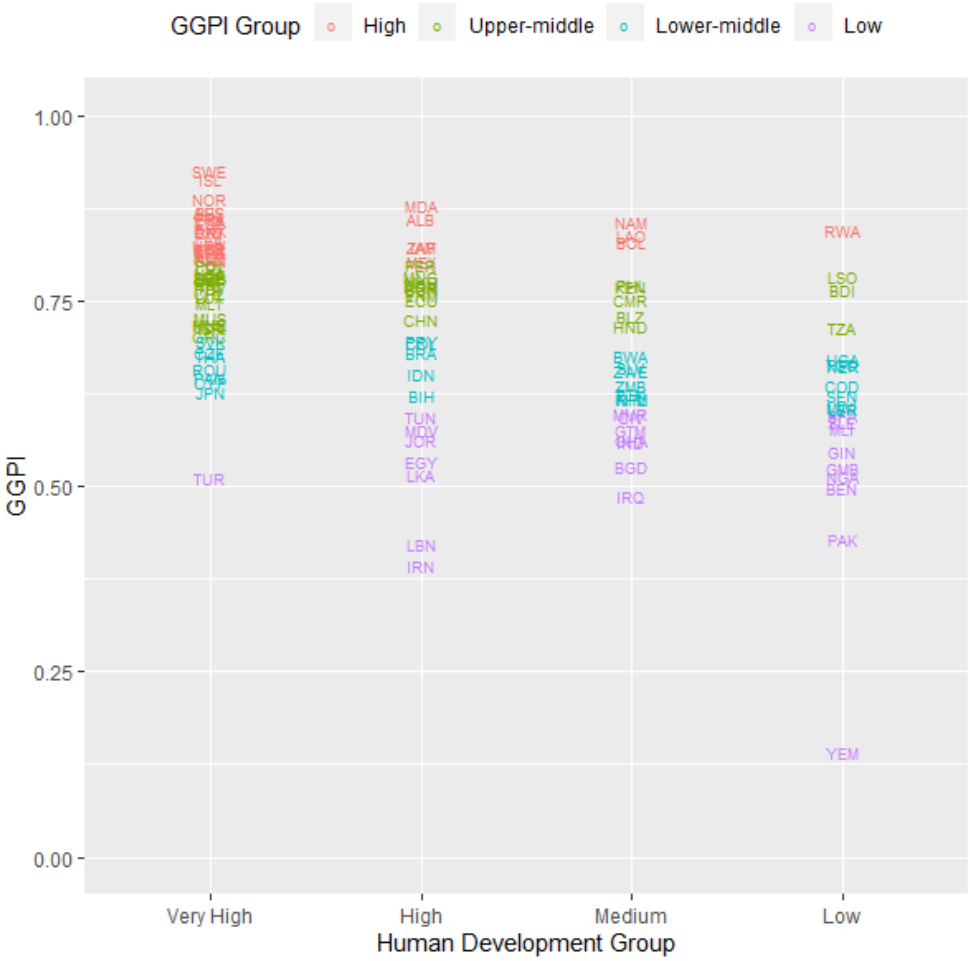
Figure 5: Kernel density of the Global Gender Parity Index across countries (n = 114 countries)



How do countries' GGPI scores vary across human development groups (i.e., low, medium, high and very high human development)? The results are shown in

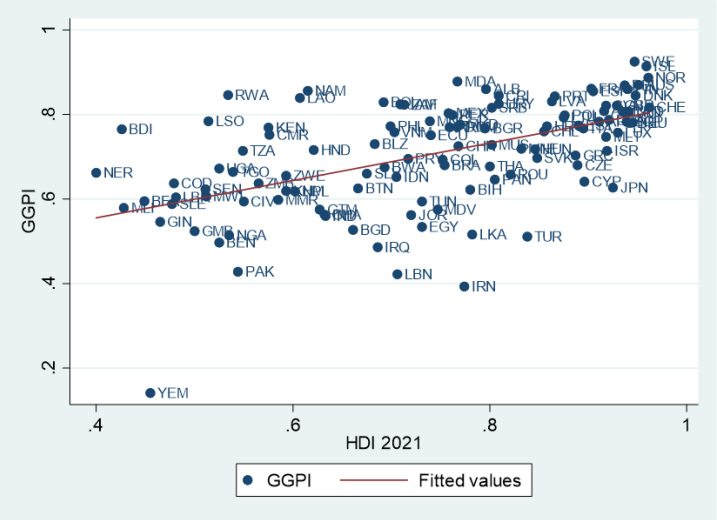
Figure 6. As can be seen, countries in higher human development groups tend to score higher on the GGPI, but there is a great deal of variability. Gender gaps exist in countries with high and low levels of development. For instance, some highly developed countries have very low GGPI scores, while some countries in the low human development group perform relatively high on the GGPI (such as Rwanda and Lesotho, which are in the high and upper-middle GGPI groups, respectively).

Figure 6: Countries' Global Gender Parity Index grouping by human development group



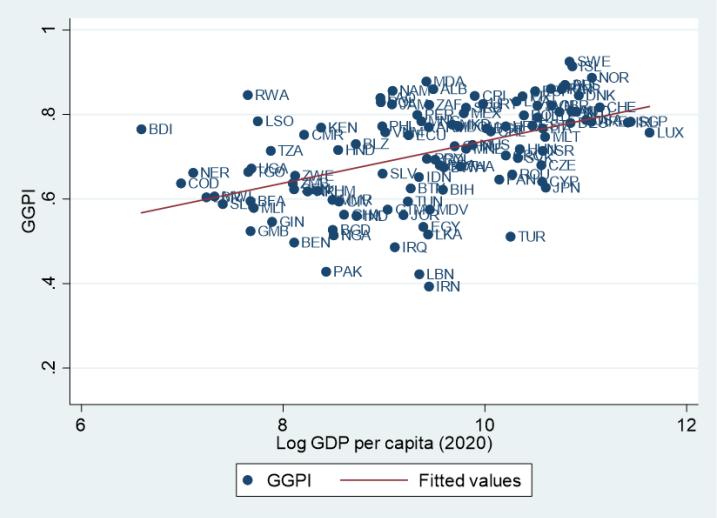
To explore the previous relationship in more detail, Figure 7 compares the values of the GGPI against the values of the 2021 HDI. In general, higher HDI levels are associated with lower gender gaps. We obtain a more nuanced picture where the performance of different countries can be identified. Thus, we observe low gender inequality and high human development countries, countries with low human development and large or small gender gaps, and quite a lot of variability (the relationship is not very tight). The correlation coefficient between both indices is 0.54; the corresponding rank correlation as measured by the Kendall's tau equals 0.4.

Figure 7: Comparing the values of the Global Gender Parity Index against those of the 2021 Human Development Index



Lastly, in Figure 8, we compare the new GGPI with the logged GDP per capita in 2020. The results are relatively similar, with a positive relationship (i.e., higher-income countries tend to have lower gender gaps as measured by the GGPI), but one that is not extremely tight (indeed, the correlation coefficient is not very large with r = 0.48). A positive but not very tight relationship with GDP is a desirable property, as it suggests that the new index adds intrinsic value and that policies based on GDP alone would be missing an important part of the story. Among other things, the relationship between these measures indicates that countries with low levels of human development and/or GDP do not necessarily have high gender gaps and that countries with higher GDP are not always using these resources to close such gaps.

Figure 8: Comparing the values of the Global Gender Parity Index against those of logged gross domestic product per capita, 2020



Summary and added value of the Global Gender Parity Index

The GGPI compares the relative performance of women and men in four dimensions of capabilities. In general, the average performance of women across the different indicators is substantially lower than that of men. Averaging the GGPI values across the 114 countries for which the index is computed, we obtain a global gender gap ratio of 0.721. This suggests that women achieve, on average, only 72.1 percent of what men achieve across key human development dimensions—meaning that the average gender gap is almost 28 percent. Overall, women lag behind men in all countries included in the analysis, since the values of the GGPI are systematically below the equality value of 1. While countries with higher levels of human development tend to have lower gender gaps, complete equality at the top of the distribution is not yet observed in any country.

The GGPI makes an important move forward in the measurement of gender inequality. The index includes a range of indicators that, until recently, were only available for a restricted number of countries. For example, we depart from a long tradition of using life expectancy at birth as the flagship indicator to assess the health level of populations. As suggested in the *2019 Human Development Report*, we are observing worldwide convergence in some basic capabilities (e.g., overall survival) in tandem with increasing inequalities in the so-called enhanced capabilities (e.g., surviving beyond certain age thresholds in good health). Incorporating the expected fraction of life spent in good health, we hope to throw more light on the so-called 'health survival paradox', according to which women tend to live longer despite experiencing more medical conditions and disabilities during their lives (Luy and Minagawa 2014).

Further, for the first time in a global gender index, we incorporate a proxy for the time spent on unpaid care activities such as raising children: the gender gap ratio in labour force participation rates among couples living with young children. Exploratory analyses conducted on a database of countries with time use data indicates a strong and negative correlation between the female-to-male ratio of time spent on unpaid care and domestic work and the female-to-male ratio in the labour force participation rate among couples with children. In other words, when women tend to spend more time on unpaid care and domestic work compared to men, this lowers their relative labour force participation rates. We have also added a new indicator measuring the share of seats held by women and men in local governments, thus going beyond traditional parliamentary representation indicators criticized for their elitist bias.

WOMEN'S EMPOWERMENT INDEX

The methodological steps involved in computing this new measure are presented, followed by empirical results. Further disaggregation by income status (richest and poorest quintiles) is presented to provide a more nuanced and intersectional account of women's empowerment globally. The section concludes with some remarks about the added value of the WEI.

Construction of the Women's Empowerment Index

The WEI is constructed by averaging the achievements of women across the indicators shown in Table 3. Table 6 shows some basic descriptive statistics for each of them.

Table 6: Descriptive statistics for the indicators included in the Women's Empowerment Index

Indicators	Number of countries	Mean	Standard deviation	Min	Max
MMC	195	66.3	17.73	7.6	92.5
ABR	195	43.7	37.88	1.57	168.0
CSE	174	48.1	28.45	3.2	96.9
NEET	175	26.3	14.72	3.76	81.25
LFPRCW	154	60	19.14	6.6	94
FINACNT	158	60.4	29.72	1.7	100.0
PR	193	25.4	12.3	0.29	54.7
LG	141	26.9	12.6	0.8	66.7
TMNG	163	33.2	11.94	4.1	70.1
IPV	193	12.5	7.89	2.0	36.0

To go beyond averages and show the entire distribution, Figures 9 to 13 plot the density functions associated with each of the indicators in the WEI. Very often, the distributions tend to be asymmetrical (i.e., with different skewness levels, which can be positive or negative depending on the distribution). All exhibit 'reasonable' levels of variability; that is, all span a considerable range of the theoretically possible values of the distribution.

Figure 9: Kernel density of indicators in the life and good health dimension (n = 195 countries, respectively)

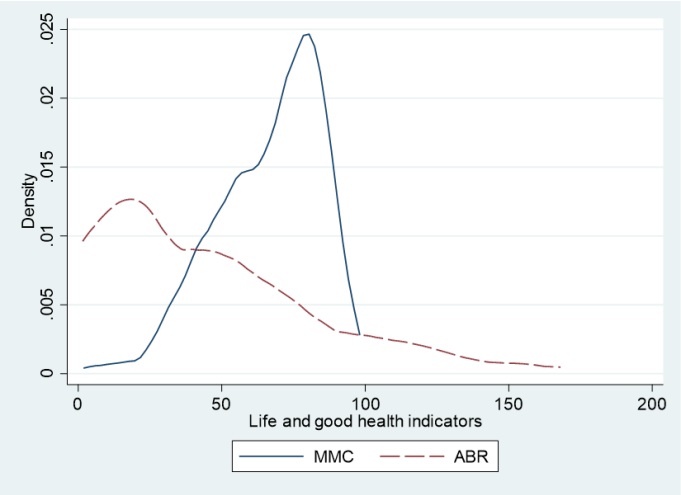


Figure 10: Kernel density of indicators in the education, skill-building and knowledge dimension (n = 174 and 175 countries, respectively)

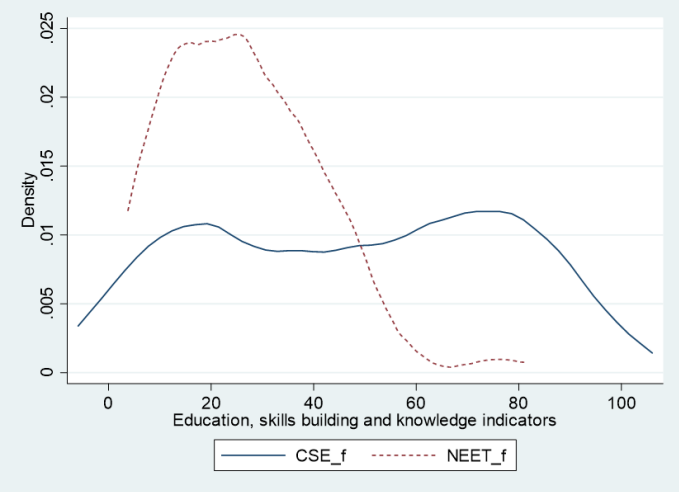


Figure 11: Kernel density of indicators in the labour and financial inclusion dimension (n = 154 and 158 countries, respectively)

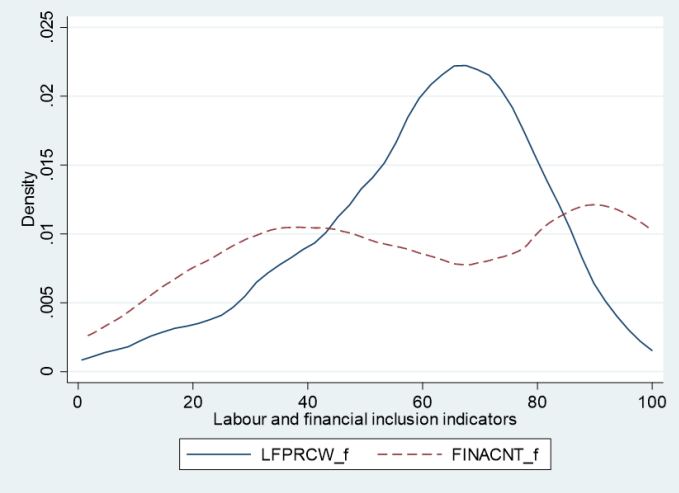


Figure 12: Kernel density of indicators in the participation in decision-making dimension (n = 193, 141 and 163 countries, respectively)

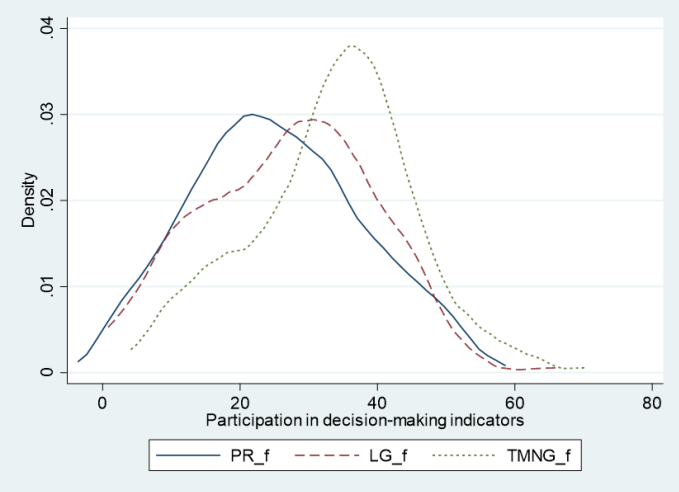
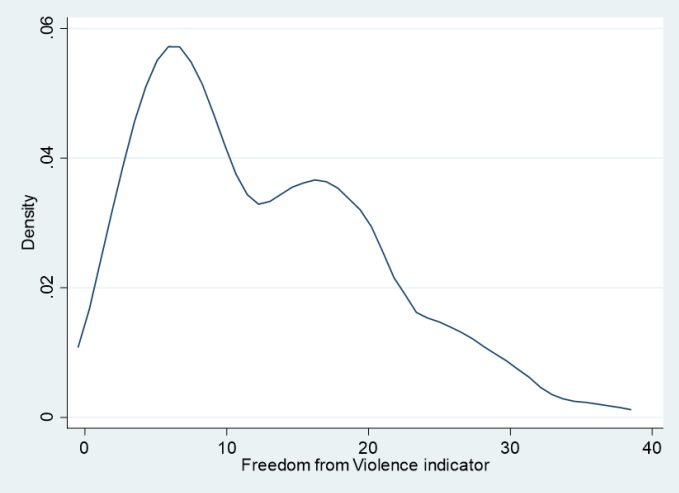


Figure 13: Kernel density of the indicator in the freedom from violence dimension (n = 193 countries)



The WEI is constructed in three steps: normalization, dimension index construction and aggregation. In the normalization step, all indicators are rescaled using a min-max process where necessary so that they take values between 0 and 1 and point towards the same (normatively desirable) direction.

Below, we show the different normalization formulas for each of the indicators included in the WEI:

$$I_{MMC} = \frac{MMC}{100}$$

$$I_{ABR} = \frac{ABR^{max} - ABR}{ABR^{max}}$$

$$I_{CSE_f} = \frac{CSE_f}{100}$$

$$I_{NEET_f} = \frac{NEET_f^{max} - NEET_f}{NEET_f^{max}}$$

$$I_{LFPRCW_f} = \frac{LFPRCW_f}{100}$$

$$I_{FINACNT_f} = \frac{FINACNT_f}{100}$$

$$I_{PR_f} = \frac{PR_f}{PR_f^{max}}$$

$$I_{LG_f} = \frac{LG_f}{LG_f^{max}}$$

$$I_{TMNG_f} = \frac{TMNG_f}{TMNG_f^{max}}$$

$$I_{Violence} = \frac{IPV^{max} - IPV}{IPV^{max}}$$

The goalposts for these indicators are in Table 7.

Table 7: Goalposts for the Women's Empowerment Index

Dimension	Indicator	Maximum
Life and good health	MMC	100
	ABR	200
Education, skill-building and knowledge	CSE_f	100
	NEET_f	85
Labour and financial inclusion	LFPRCW_f	100
	FINACNT_f	100
Participation in decision-making	PR_f	75
	LG_f	75
	TMNG_f	75
Freedom from violence	IPV	60

After normalization, we proceed to create the dimension indices by aggregating using the arithmetic mean.

For the life and good health dimension:

$$I_{Health} = \frac{1}{2}\left(I_{MMC} + I_{ABR}\right)$$

For the education, skill-building and knowledge dimension:

$$I_{Education} = \frac{1}{2}\left(I_{CSE_f} + I_{NEET_f}\right)$$

For the labour and financial inclusion dimension:

$$I_{Inclusion} = \frac{1}{2}\left(I_{LFPRCW_f} + I_{FINACNT_f}\right)$$

For the participation in decision-making dimension:[11]

$$I_{Decisionmaking} = \frac{1}{3}\left(I_{PR_f} + I_{LG_f} + I_{TMNG_f}\right)$$

For the freedom from violence dimension:

$$I_{Violence\ again\ women} = I_{IPV}$$

Lastly, in the third step we aggregate the dimension indices into an overall measure using the geometric mean.

$$WEI = \left(I_{Health} \cdot\ I_{Education} \cdot I_{Inclusion} \cdot I_{Decisionmaking} \cdot I_{Violence\ against\ women}\right)^{1/5}$$

The arithmetic mean is used to average indicators within dimensions, but the geometric mean is used to average across them. In this way, we allow for a higher degree of compensation among the indicators included within dimensions than between those dimensions. This is motivated by the relative similarity of indicators within the same dimension and the desire to reward attainments that are similarly distributed across dimensions (or, stated otherwise, to penalize unbalanced distributions with very high scores in some dimensions but very low in others). The use of arithmetic means within dimensions also helps to avoid having to deal with zeroes in the distribution. In the presence of zeroes, the overall score of the composite index shrinks to zero when using geometric means, irrespective of attainments on other indicators—an issue that can be potentially problematic and that was encountered in previous versions of this paper. Lastly, the use of

[11] There are 27 countries with no elected deliberative local government bodies. In these cases, the value for the share of seats held by women in parliament was used for the share of seats held by women in local government in calculating WEI values.

the geometric mean to average attainments across dimensions is aligned with common practice in the suite of composite indices published by the Human Development Report Office.

Internal consistency and correlation structure of the Women's Empowerment Index

The statistical consistency of the WEI is high, with a positive correlation well above $r = 0.5$ for all indicators and dimensions except I_TMNG_f (Table 8). Furthermore, within dimensions, correlations are also high with respective indicators, combined with no evidence of cross-loadings. Among indicators, some levels of women's empowerment are strongly positively correlated, such as PR and LG ($r = 0.73$). Most indicators correlate positively to other indicators in their dimensions, with some cross-loadings that indicate that some are heavily related to other gender equality issues (e.g., $FINACNT$ is positively correlated to ABR, CSE and $NEET$, with $r = 0.68$, $r = 0.76$ and $r = 0.73$, respectively).

Table 8: Correlation structure between gender gaps in respective indicators, dimensions and the Women's Empowerment Index

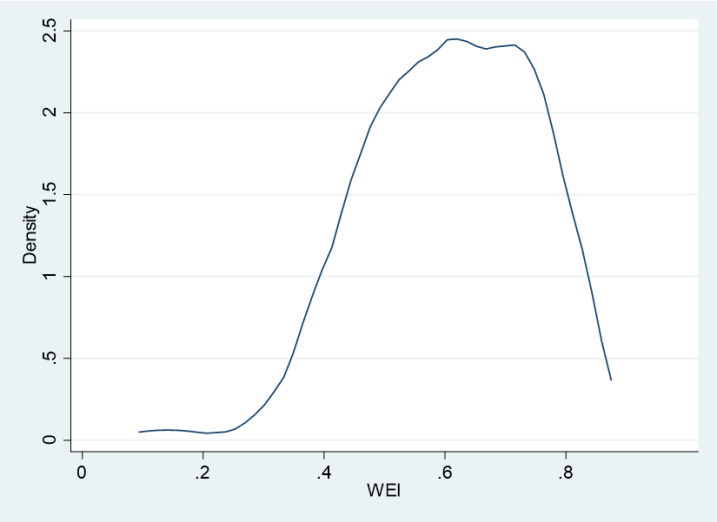
	I_MMC	I_NONABR	I_CSE_f	I_NONNEET_f	I_LFPRCW_f	I_FINACNT_f	I_PR_f	I_LG_f	I_TMNG_f	I_NONIPV	I_HEALTH	I_EDUCATION	I_LABOUR	I_DECISIONMAKING	I_VIOLENCE	WEI
I_MMC	1.00															
I_NONABR	0.38	1.00														
I_CSE_f	0.39	0.74	1.00													
I_NONNEET_f	0.41	0.68	0.68	1.00												
I_LFPRCW_f	0.12	0.05	0.14	0.53	1.00											
I_FINACNT_f	0.50	0.68	0.76	0.73	0.35	1.00										
I_PR_f	0.27	0.20	0.28	0.38	0.34	0.32	1.00									
I_LG_f	0.23	0.33	0.25	0.31	0.15	0.33	0.73	1.00								
I_TMNG_f	0.15	-0.14	0.06	0.13	0.33	0.08	0.09	0.04	1.00							
I_NONIPV	0.35	0.70	0.68	0.57	0.23	0.60	0.20	0.26	0.05	1.00						
I_HEALTH	0.81	0.85	0.69	0.66	0.10	0.71	0.28	0.34	0.00	0.65	1.00					
I_EDUCATION	0.43	0.78	0.95	0.87	0.32	0.81	0.35	0.30	0.10	0.69	0.74	1.00				
I_LABOUR	0.42	0.52	0.62	0.78	0.73	0.89	0.39	0.31	0.22	0.54	0.57	0.74	1.00			
I_DECISIONMAKING	0.30	0.18	0.27	0.38	0.38	0.34	0.84	0.82	0.52	0.23	0.29	0.34	0.42	1.00		
I_VIOLENCE	0.35	0.70	0.68	0.57	0.23	0.60	0.20	0.26	0.05	1.00	0.65	0.69	0.54	0.23	1.00	
WEI	0.56	0.72	0.80	0.87	0.51	0.86	0.55	0.52	0.27	0.71	0.78	0.90	0.87	0.62	0.71	1.00

Note: In this table, the abridged names of the dimensions have been used. I_HEALTH refers to life and good health, I_EDUCATION to education, skill-building and knowledge, I_LABOUR to labour and financial inclusion, I_DECISIONMAKING to participation in decision-making, and I_VIOLENCE to freedom from violence.

Scores of the Women's Empowerment Index

Figure 14 shows the distribution of WEI values across the 114 countries for which data were available for all indicators. The global mean of WEI values approaches 0.6, and the distribution is relatively symmetrical.

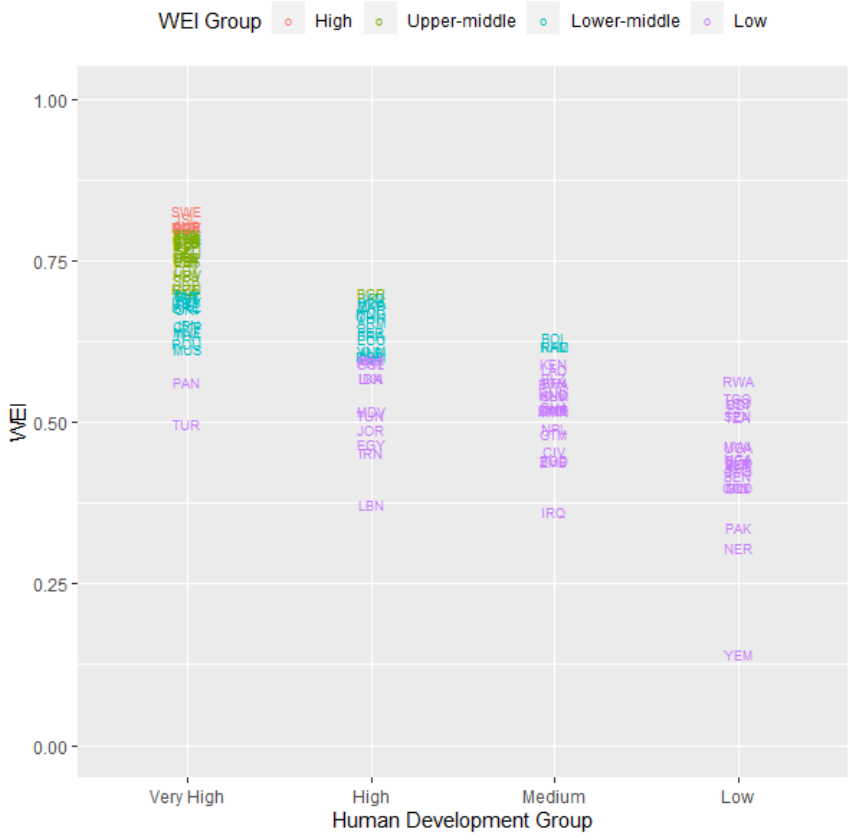
Figure 14: Kernel density of the Women's Empowerment Index distribution across 114 countries



How do countries' WEI scores vary across human development groups (low, medium, high and very high)? The results are shown in

Figure 15. As can be seen, there is a direct positive relationship between countries' human development levels and the WEI, although there is substantial variability within each of the four groups. Thus, belonging to the very high human development group does not automatically imply that the corresponding level of women's empowerment will necessarily be very high. Indeed, there is quite some overlap among the four distributions, meaning that some countries in the very high human development group score much lower on the WEI than some countries in the medium or low human development groups.

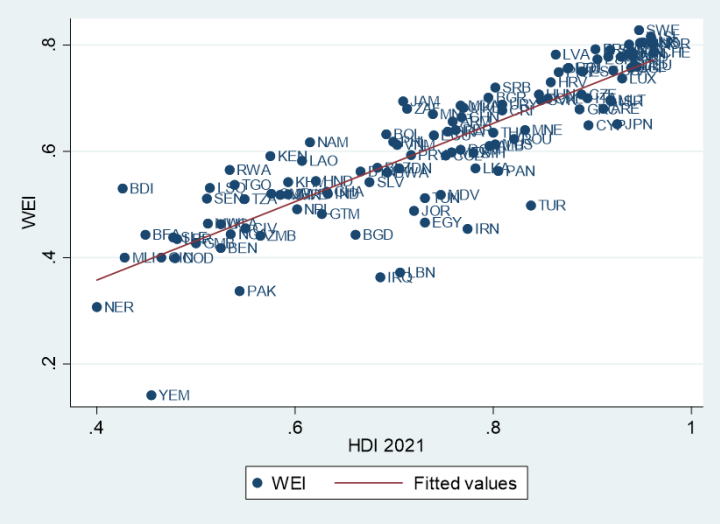
Figure 15: Countries' Women's Empowerment Index grouping by human development group



To explore the previous relationship in more detail, the next scatterplot compares the values of the WEI against the values of the 2021 HDI (

Figure 16). As expected, we observe a clear positive relationship between both indicators (i.e., higher levels on the WEI are associated with higher levels on the HDI). The correlation coefficient between both indicators is 0.86, and the corresponding rank correlation measured by the Kendall's tau equals 0.71. In general, there is more variability in the values of the WEI at the lower end of the human development distribution. Interestingly, a cluster of countries at the bottom right corner of the scatterplot (including Iran, Iraq, Lebanon and Türkiye) deviates from the general relationship observed between both variables. These countries exhibit relatively high human development but much lower levels of women's empowerment.

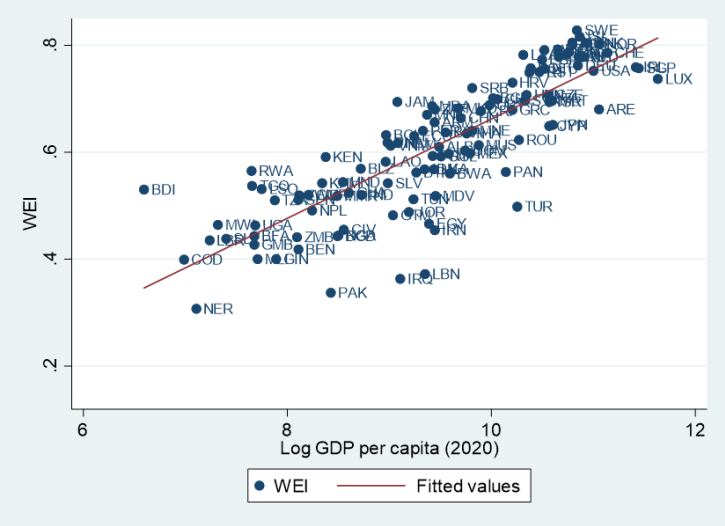
Figure 16: Comparing values of the Women's Empowerment Index and 2021 Human Development Index



In Figure 17, we compare the WEI with the logged GDP per capita in 2020. The results are relatively similar, with a positive relationship between both indicators. The correlation coefficient equals 0.83, and the rank correlation measured by Kendall's tau equals 0.67. As in the previous case, we observe a small cluster of three countries (Iraq, Lebanon and Türkiye) with high levels of income but relatively low WEI values that deviate from the overall relationship observed between both indicators.

Further disaggregation by income quintiles is presented in Box 1 to provide a more nuanced and intersectional account of women's empowerment globally.

Figure 17: Comparing the values of the Women's Empowerment Index against logged gross domestic product per capita in 2020



Box 1: The Quintile-Disaggregated Women's Empowerment Index

For a subset of indicators and a subsample of countries, data by sex and wealth/income are available and can be used to shed light on how the situation of women and girls from the poorest households differs from the national average and from the situation of women and girls in the richest households. Using available data, including survey data, we computed a Quintile-Disaggregated Women's Empowerment Index (QD-WEI). The QD-WEI is produced using the same aggregation methodology and dimensions of the WEI but differs with respect to the indicator used to capture education attainment. This is because the data source for the education attainment indicator used in the WEI is not available by quintile. This means that WEI and QD-WEI scores are not defined exactly in the same way. While losing some country coverage, the QD-WEI indicator allows us to measure and compare women's empowerment across socioeconomic strata.

The QD-WEI is computed for a subsample of 110 countries for which wealth/income quintile data were available for a subset of indicators (4 out of 10) used in the WEI. In the case of the life and good health dimension, both indicators for contraceptive demand satisfied by modern methods and the adolescent birth rate aged 15–19 are disaggregated by quintile.[12] In the education, skill-building and knowledge dimension, a

[12] The WHO HEAT database contains tabulations produced from nationally representative surveys such as the DHS, MICS and Reproductive Health Surveys, which only cover low- and middle-income countries. To further increase data coverage and to have a balanced sample of countries by income groups, additional data sources have been identified. These include the European Union Statistics on Income and Living Conditions Surveys, the Generations and Gender Survey by the United Nations Economic Commission for Europe and the United Nations National Survey of Family Growth. For these additional surveys, the respective health indicator or its best available proxy (demand satisfied for family planning/unmet need for contraception is not available in the European Union Statistics on Income and Living Conditions Surveys, so unmet need for health examination was used as a proxy) were tabulated from the microdata by income quintile for each country. The quintile inequality distribution obtained from

proxy indicator, namely, the percentage of people aged 20–29 years who have completed upper-secondary education, is available by quintile and included in the QD-WEI. This indicator differs in the reference population (aged 20–29 instead of 25-plus) and includes only those who completed upper-secondary education, not higher levels of schooling (the correlation between the proxy and the original education indicator used in the WEI is very high, r = 0.9).

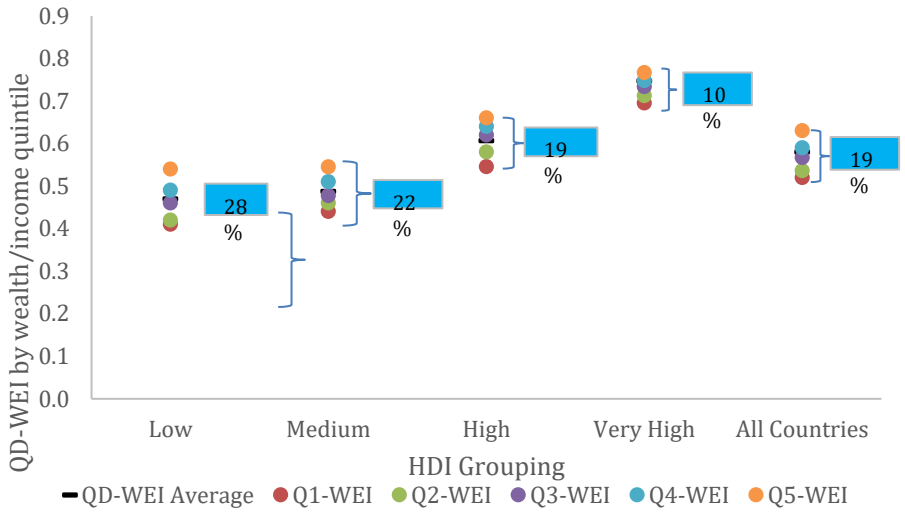
In the labour and financial inclusion dimension, one of the two indicators, namely, account ownership at a financial institution or with a mobile-money service provider, is available by income group: the lower 40 percent and the upper 60 percent. Data for all five quintiles separately are not available.[13] For the freedom from violence dimension, no disaggregation by income/wealth quintiles is reported given the limited country and/or sample size of current violence against women surveys, which makes multilevel disaggregation challenging. Similarly, for the participation in decision-making dimension, no quintile data are presented. The fact that we cannot break down all our indicators by quintiles means that our results underestimate the true extent of inequality in empowerment, across socioeconomic strata.

The analysis of the QD-WEI by HDI groupings shows some clear patterns (Figure 18). Across the sample of 110 countries, the average achievement in empowerment levels is 0.58, but among the richest (Q5) it is 0.63 and among the poorest (Q1) it is 0.52. Averaging across countries and indicators, a gradient can be observed, i.e., the QD-WEI score is highest for the richest women within each HDI group, with the score progressively decreasing by quintile. For example, in the low HDI group, the QD-WEI for the richest women is 0.54, falling to 0.41 among the poorest. Across all HDI groupings, women and girls from the poorest quintile (Q1) fare worse, but the disparity between the richest and poorest is largest in low HDI countries; the gap in QD-WEI scores is 28 per cent or 13 index points (i.e., 0.54 for the richest and 0.41 for the poorest).

these surveys was then applied to national estimates reported by the United Nations Department of Economic and Social Affairs to determine the quintile-specific estimates for the respective indicator and country. The key assumption is that the country's inequality dynamics as captured by surveys for the respective health indicator can be applied to the national estimates. For further details, see the technical note on constructing the QD-WEI data set, available upon request.

[13] The World Bank Findex database provides the proportion of people (AHt), proportion of females (AHf), poorest 40 percent (AHp) and richest 60 percent (AHr), aged 15 years and older, with an account at a bank or other financial institution or with a mobile-money service provider. The indicators (AHp) and (AHr) are not disaggregated by sex in the database. For a subsample of 24 DHS countries where data on women who have a bank account and men who have a bank account are available, we find that when comparing the estimates for the highest and lowest quintiles for men and women, respectively, the correlation between the differences for men and women, respectively, is 0.56. Thus, using the assumption that the inequality distribution in access to a bank account applies similarly to men and women and the variables (AHt), (AHf), (AHp) and (AHr), we create two new imputed variables: the proportion of the poorest 40 percent of women ($AHpf$), aged 15 years and older, with an account at a bank or other financial institution or with a mobile-money service provider, and the same indicator for the richest 60 percent of women ($AHrf$). The imputation equations are: $AHpf = (AHf * AHp)/AHt$ and $AHrf = (AHf * AHr)/AHt$, respectively. For further details, see the technical note on the construction of the QD-WEI data set, available upon request.

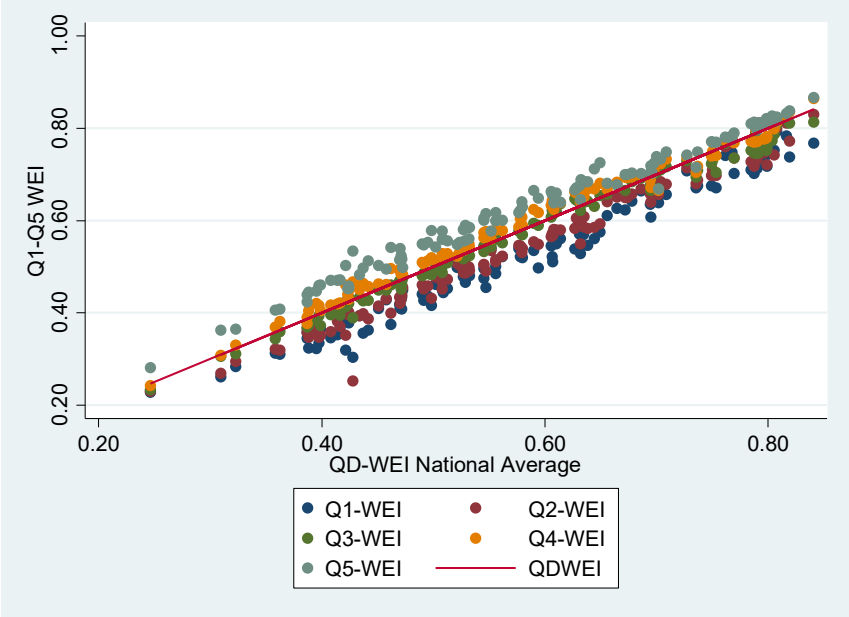
Figure 18: Women's Empowerment Index average score by quintile and Human Development Index grouping



Note: Q1 refers to the poorest quintile and Q5 to the wealthiest quintile. The average value across all countries is based on a sample of 110 countries with survey-based data disaggregated by wealth or income quintile. The percentages in the blue text boxes are the proportion of disparities between the top and bottom quintiles with respect to the overall value—that is (Q5WEI – Q1WEI) / QD-WEI.

When further disaggregating at the country level, additional patterns are revealed (Figure 19). In countries with very low QD-WEI national average scores, not much inequality is observed across quintiles—empowerment levels are low for women who are rich and poor alike. In Afghanistan, for example, the QD-WEI national score is 0.25 and the scores of the poorest and richest quintiles are between 0.23 and 0.28. In other countries, empowerment levels vary widely by quintile. For instance, in Brazil, a high human development country with a national QD-WEI value of 0.63, the gap in empowerment between the richest and poorest quartiles of women is 0.11 (0.68 for the richest quintile and 0.57 for the poorest quintile). Empowerment in key dimensions is high: 88 percent of married women of reproductive age have access to modern contraception, and 70 percent of women aged 20–29 have completed upper secondary education. But disaggregated data show that 94.8 percent of women in the richest households have completed higher-secondary education compared with only 39.4 percent in the poorest households, well below the national average.

Figure 19: Comparing Quintile-Disaggregated Women's Empowerment Index national averages against the corresponding quintile-specific indicators in 110 countries



Note: The national average value is based on a sample of 110 countries with survey-based data disaggregated by wealth or income quintile. These values should not be compared with the Women's Empowerment Index values presented earlier, which are based on a larger sample of countries for which national averages are reported by custodian organizations and official sources.

This analysis illustrates how aggregate figures conceal the diverse realities of women and girls, in particular, those facing intersecting forms of discrimination based on gender, income or class. Importantly, we would like to conclude this section by highlighting that the QD-WEI is *not* an inequality-sensitive empowerment indicator. That is, the QD-WEI is *not* meant to measure women's empowerment at the national level correcting by the extent of inequality that might exist across socioeconomic strata. The QD-WEI is computed for each income quintile separately, and the comparison of its values allows us to determine the extent of the variability that might exist among them.

Summary and added value of the Women's Empowerment Index

Despite the limitations associated with data and methods, the new measure conveys clear policy messages. First, empowerment must reach all women and leave none of them behind. Second, empowerment should advance on all fronts simultaneously (i.e., inequalities across different dimensions of gender inequalities need to be taken into account; it is not sufficient to have high achievements in a subset of dimensions).

This proposed measure is innovative in that it introduces important new elements. For the first time, it incorporates dimensions in relation to gender-based violence against women (although a current limitation is that measurement is restricted to intimate partner violence due to gender data gaps for other forms). This

dimension is important since it can be regarded as a missing aspect in gender equality and women's empowerment measures. In addition, using the geometric mean to aggregate across indicators, the index is sensitive to unbalanced distributions, where progress is only made in some dimensions but not others. Progress should occur on different fronts simultaneously and unbalanced distributions penalized. The development of the WEI and QD-WEI makes an important contribution in this regard. Lastly, the QD-WEI shows how women's empowerment can be very unequally distributed across income quintiles. This overcomes criticisms directed against the GEM, which treated women as a homogeneous group. Empowerment should include all women, in all their diversity, and the QD-WEI represents an important step towards more granularity in gender indices.

Comparisons of the new measures with existing measures

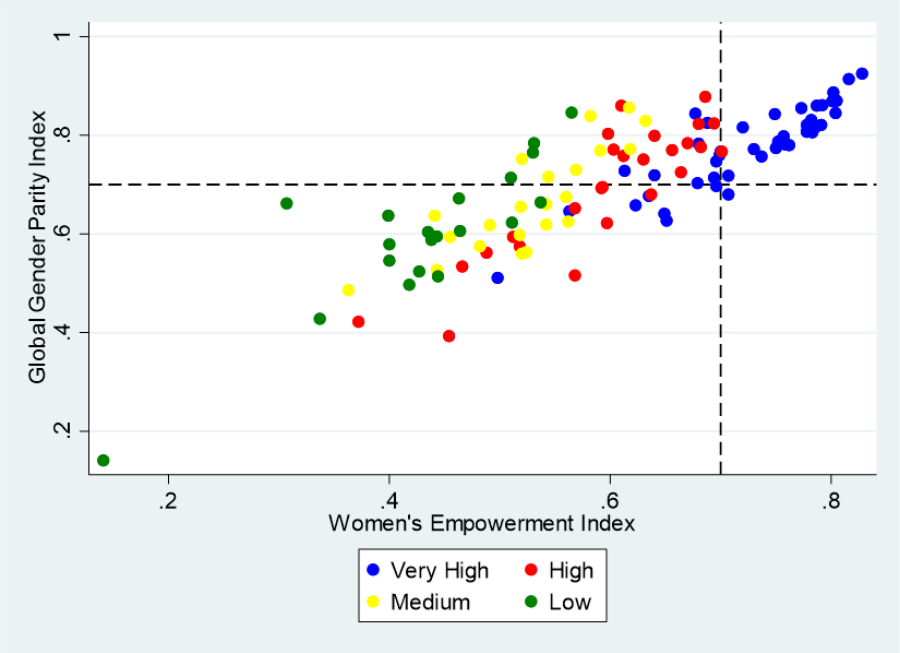
How do the new measures proposed in this paper relate with each other and with the recent gender inequality measures proposed by UNDP? We start by exploring the relationship between the GGPI and WEI indices. In Figure 20, we show a scatterplot, with the values of the WEI and GGPI indicated on the horizontal and vertical axes, respectively, and colouring countries depending on their human development group. While the two indices measure a priori very different things, they are highly correlated (r = 0.84). In general, countries belonging to the same human development group tend to have relatively similar scores on both indicators but with notable exceptions. For instance, among countries with very high levels of human development, Türkiye scores much lower than the rest on both indicators simultaneously.

Showing the values of the WEI and GGPI at the same time, it is possible to identify whether the equality that might exist between women and men in a given country occurs at the top or bottom of the distribution—an important issue that can render the interpretation of traditional gender gap measures problematic. For instance, let us consider the cases of Cameroon and Luxembourg. Both countries score 0.75 on the GGPI, approximately, thus suggesting that the performance of women in both countries is at 75 percent of the performance of the corresponding men in each country. Inspecting the WEI levels, though, Cameroon and Luxembourg score 0.520 and 0.737, respectively, thus showing that the same relative position of women relative to men can be the result of very different attainment distributions.

To further investigate the relationship between the WEI and GGPI, we have split the scatterplot in Figure 20 in four quadrants. The vertical and horizontal dashed lines separate the WEI and GGPI distributions in two sections corresponding to low and high scores. For instance, countries in the bottom-left quadrant have low scores on both indices simultaneously, so they have low women's empowerment levels *and* low levels of gender equality. In the upper-left quadrant, countries have high levels of gender equality *but* low levels of women's empowerment. These are examples of countries where relatively high levels of equality are attained

at the bottom of the distribution; that is, women and men perform similarly badly. Next to them, we have countries scoring high on both dimensions simultaneously, i.e., where the attainments of women and men are similarly high. Interestingly, there are few countries in the bottom-right quadrant. This suggests that high women's empowerment does not coexist with a larger gender gap. This is one of the key contributions of the new twin indices approach, which reveals information that cannot be inferred from any two components separately. Showing that women's and girls' empowerment will remain elusive until gender gaps are eliminated underlines a call for action to reduce gender gaps and, in doing so, to empower women.

Figure 20: Comparing the values of the Women's Empowerment Index and Global Gender Parity Index by human development group



To complement information provided in the previous tables, the next scatterplot (

Figure 21) and correlation matrix (Table 9) show the relationship between the aforementioned indices for all countries with available data. As expected, the GII is negatively related with all other indices. Interestingly, the GGPI and GDI have the same functional form (they are a geometric mean of gender gap ratios), but the correlation coefficient between them is moderate (r = 0.75). The more highly correlated indices (in absolute terms) are the GII and WEI (r = -0.9). This is in line with previous analyses suggesting that the values of the GII were largely driven by women-specific indicators, such as the adolescent birth rate and maternal mortality ratio (Permanyer 2013).

Figure 21: Comparing the new indices with the Gender Inequality Index and new Gender Development Index

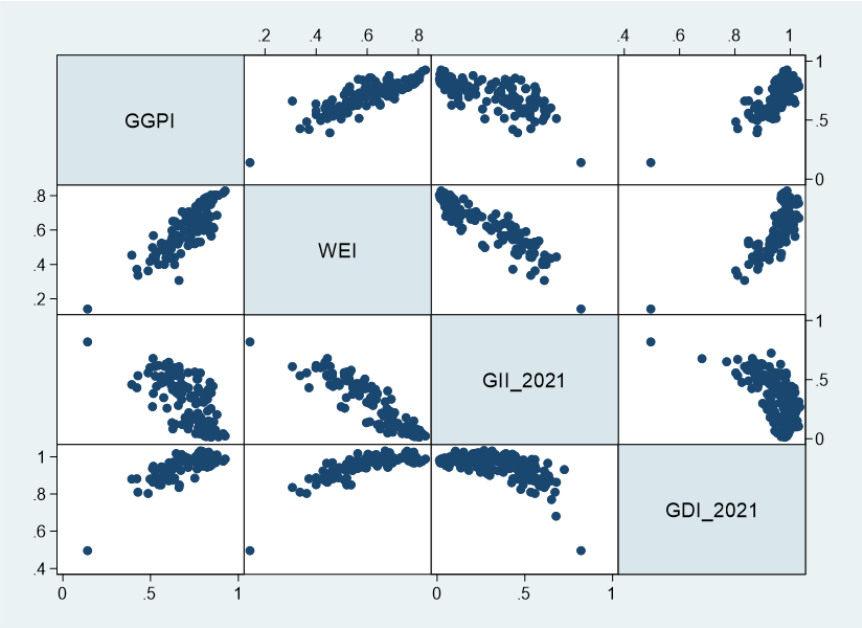


Table 9: Correlation matrix for the Global Gender Parity Index, Women's Empowerment Index, Gender Inequality Index and new Gender Development Index

	GGPI	WEI	GII 2021	GDI 2021
GGPI	1			
WEI	0.83	1		
GII 2021	-0.66	-0.9	1	
GDI 2021	0.75	0.76	-0.63	1

To complement the previous analysis, we also show the corresponding rank correlation/Kendall's tau for all pairs of indicators (

Table 10). The latter is an interesting ordinal association parameter that looks at the number of country pairs that are consistently (and inconsistently) ranked by the corresponding indicators. Intuitively, the Kendall correlation between two variables will be high (close to 1) when observations have a similar rank between the two indicators, and low (close to –1) when observations have a dissimilar rank between the two indicators. As can be seen, Kendall tau coefficients are even smaller than the standard correlations, but the signs all go in the same direction.

Table 10: Kendall's tau for the Global Gender Parity Index, Women's Empowerment Index, Gender Inequality Index and new Gender Development Index

	GGPI	WEI	GII 2021	GDI 2021
GGPI	1			
WEI	0.63	1		
GII 201	-0.48	-0.74	1	
GDI 2021	0.46	0.51	-0.42	1

Widening the frame: future considerations in measuring global gender inequalities

In producing these twin indices, there have been practical limitations linked to data availability that have prevented the development of new areas. In this section, we nonetheless want to note areas that are important to continue to consider in widening the frame of measurement of gender equality and women's empowerment by indices.

SOCIAL NORMS: TOWARDS MEASURING ATTITUDES TO GENDER ROLES

Inequalities across the dimensions measured by the twin indices are shaped by wider expectations about gender roles, including gender stereotypes. Expectations about gender roles can limit capabilities, as can widely held attitudes in society that some roles and positions are for one sex and not the other. Social gender norms (and other institutional mechanisms such as legal and policy frameworks), in turn, influence the relationships among resources, capabilities and functionings. Specific indicators exist for these norms and have been compiled into an index, the Gender Social Norms Index or GSNI, which focuses on gender beliefs and how they might hinder gender equality in different dimensions, such as politics, work or education (UNDP 2020b). But limited data coverage does not allow us to present them alongside much less incorporate them into the framework of the GGPI and WEI. The possibility of including attitudes on women's ability as political or business leaders, right to a job to make a living and become economically empowered, or right to be free from violence under any circumstances needs to be considered in the future. This will ensure that women can become freer from the need to conform to gender normative roles and stereotypes, and will challenge both hegemonic masculine norms and the devaluation of feminine roles. In doing so, it would bring visibility to how biased gender norms perpetuate unequal power relations between women and men.

HUMAN WELL-BEING AND PERSONAL DEVELOPMENT: TOWARDS SOCIAL JUSTICE

The development of human well-being cannot be achieved without a renewed focus on social justice, particularly to redress socioeconomic inequalities within and across countries, as well as within and across

social groups. Development has long focused on alleviating poverty and ensuring decent work and a living income for all. These inequalities can be extremely pronounced. As the *2019 Human Development Report* (UNDP 2019, p. 1) illustrates, in some developed countries, gaps in life expectancy at age 40 between the top 1 percent of the income distribution and the bottom 1 percent have been estimated to be as high as 15 years for men and 10 years for women. This current proposal for the measurement of global gender inequalities has gone some way in starting to consider these aspects but more will be needed in the future.

ENVIRONMENTAL CHANGES AND SUSTAINABILITY: TOWARDS CLIMATE JUSTICE

Momentum is finally gathering behind the urgency of tackling the climate emergency but without a consistently explicit reference to how this crisis is gendered, the disproportionate effects it has on women and men in different parts of the world, and the roles that women and men can play in responding to it (Robinson 2019). Indicators that could incorporate this aspect into a global gender inequalities measurement are currently unavailable, making this another clear area where gender data gaps need to be addressed. Climate justice is a central aspect of the capability approach, where humans, women and men, ought to live a full and meaningful life alongside animals, plants and nature (Nussbaum 2003). Furthermore, climate justice has been explicitly added to international frameworks in relation to gender, both in the Beijing Platform for Action and the 2030 Agenda. The climate crisis will have wide-reaching consequences for women and men, and a better gender measurement of its implications is badly needed.

DIGITAL TRANSFORMATION: TOWARDS TECHNOLOGICAL JUSTICE

The technological revolution and transformation of our societies towards a new digital era are not without implications for the measurement of global gender inequalities. The topic of technological injustice is prompting debates about the gendered aspects of the use of algorithms, and their propensity not only to reify existing biases but in fact to multiply them and perpetuate gender inequalities (D'Ignazio and Klein 2020). Adaptations to COVID-19 intensified these patterns, forcing us to live more of our lives online rather than in the real world. The effects are gendered, for example, in relation to the distribution of care within households when many have been working from home; differences in who and which occupations, under what conditions, had to remain on the front line; and an increase in violence both from intimate partners within the home and online via cyberharassment. So far, despite much interest by policymakers and statisticians alike, measurements and indicators incorporating these perspectives are lacking.

Concluding remarks

The use of indices as advocacy tools for gender equality needs to be reiterated. Many have been developed since the innovative ones first made available by UNDP in 1995 (for a review, see Buvinic et al. 2020). In this technical paper, we have proposed two new measures: the GGPI and the WEI. The first measure is a relative one, comparing the relative status of women and men across different dimensions of inequalities of relevance at the global level within the framework of international development and sustainability. The second measure is a women-centric one and focuses on the level of empowerment. Combining these two new gender indices shows the relevance of not only focusing on women's relative achievement to that of men's but also to ensuring that women experience the full scope of life capabilities, basic and enhanced, that underpin their well-being.

These two measures do not stop there. They have also considered how intersectional perspectives could be better integrated into global comparative measurements. Women and men are not homogeneous groups, and differences exist along many axes, which can include demographic characteristics but also other socioeconomic factors. In this technical note, we have explored such differences by breaking down the WEI by income quintiles. This allows us to produce a measure sensitive to the situation of different groups of women and girls, distinguishing between the poorest and richest. Other intersectional measurements have been considered; however, to date, the availability of harmonized data continues to be a challenge. In the near future, further efforts could focus on building measures broken down by age groups, thereby providing a measure that is more informative in relation to women (and men) along different phases of the life cycle. At this point, other grounds of diversity, such as ethnicity or origin, remain too difficult to operationalize. We nonetheless call for the development of better disaggregation of data and indicators as well as of nomenclatures that allow for meaningful categorization on a global level in order to meet this goal in the years to come.

The twin indices that we propose are part of a wider framework and are meant as support tools for agendas such as leaving no one behind, the central, transformative promise of the 2030 Agenda for Sustainable Development and the SDGs. This means tackling (gender) inequalities but in an inclusive manner by also focusing on the eradication of poverty, discrimination and exclusion, and the vulnerabilities and inequalities that can leave people behind. Aligned with the capability approach at the heart of the work presented in this paper, the GGPI and the WEI have been created to measure and work towards the full realization of the potential of individuals and humanity collectively.

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