Multidimensional measurement of women's empowerment in West African Economic and Monetary Union (WAEMU)

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Abstract

Empowering women is a priority of the Sustainable Development Goals. As a result, it is increasingly integrated into various development policies and programs. However, despite its recognition, understanding women's empowerment and assessing the progress made is limited by various factors, including the lack of a standard measurement tool. Using DHS data from seven WAEMU countries (Benin, Burkina Faso, Côte d'Ivoire, Mali, Niger, Senegal and Togo), this work aims to construct a women's empowerment index. Using exploratory and confirmatory factor analysis on a set of 32 identified indicators, a four-dimensional model of women's empowerment is proposed. These domains include attitude toward violence, participation in decision-making, access to healthcare, and education and media exposure. The women's empowerment measure derived from this analysis provides a tool that can be used to assess progress in enhancing women's status, particularly in domestic and social spheres.

Keywords**: **Women's empowerment, Factor analysis, WAEMU

Introduction

Women's empowerment is a key objective of development policy (Alkire et al., 2013). It is fundamental and essential to the realization of democratic and human rights, and its integration into poverty reduction, democratic governance and sustainable development is crucial to the development of societies (Kazembe, 2020). It contributes, to women's personal and family well-being, not only, but also it promotes the well-being of the whole community (Sharaunga et al., 2018; Asaolu et al., 2018). As a result, women's empowerment represents both an intrinsic and an instrumental goal; it is valued as an end in itself but also as an instrument for achieving other development objectives (Duflo, 2012; Alsop et al., 2006; Kabeer, 2005; 1999). Its importance is further justified by its inclusion as a priority in the Sustainable Development Goals (SDGs), particularly SDG 5, which explicitly aims to achieve gender equality and empower all women and girls (United Nations, 2015).

This has prompted governments, particularly in Africa, to commit to the promotion of gender equality and women's empowerment. Among actions, the ratification by almost all countries of the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW), the ratification by more than half of all countries of the African Union (AU) Protocol on the Rights of Women in Africa, and the proclamation by the African Union of 2010-2020 as African Women's Decade[1]. In West Africa, regional organizations such as the Economic Community of West African States (ECOWAS), the West African Economic and Monetary Union (UEMOA), the Permanent Inter-State Council for Drought Control in the Sahel (CILSS) and the African Union have all adopted gender policies and are increasingly integrating gender issues into various policy sectors[2]. But despite these efforts, there are still persistent gaps between men and women persist in many spheres, including access to basic social services, property rights and outcomes on the labor market. This prevent women to become economically and socially active.

For example, according to the Sahel and West Africa Club Secretariat (SWAC, 2017), women in West Africa are under-represented in the political sphere, where they account for just 16.1% of all West African legislators, a rate below the global average (23.3%). The sub-region also ranks among the parts of the world with the highest rate of child marriage (in Niger, for example, 03 out of 04 girls marry before the age of 18). Female genital mutilation

[1] https://www.unwomen.org/en/where-we-are/africa accessed on 06/16/2021.

[2] https://www.unwomen.org/en/where-we-are/africa accessed on 06/16/2021.

is also an issue, with proportions ranging from 2% to 97% depending on the country (SWAC, 2016). These inequalities are also reflected in the law. In some countries, a distinction is made between men and women in terms of property ownership (in Guinea-Bissau for example) or inheritance rights (in Senegal, for example). As for participation in the labor market, in half of EU countries, the law does not require equal pay for women and men for equal work, and women still have unequal access to decent, quality formal jobs (IMF, 2019).

These gender gaps affect women's ability to make decisions and contribute to the well-being of their household and their community (Sraboni et al., 2014). Yet, there is agreement that women's voice in decision-making and access to productive resources strengthens their negotiation and bargaining power and contributes to reducing the gender gaps and their effects (Obayelu and Chime, 2020). It is therefore necessary to support women with appropriate policies, understand the dimensions and drivers of women's empowerment and define tools that can assess progress towards gender equality and improving women's status (Obayelu and Chime, 2020; Asaolu et al., 2018).

However, as empowerment is not intuitively an easy concept to understand, there is a lack of consensus in the literature on which elements of empowerment matter most and how to measure women's empowerment (Miedema et al., 2018). This difficulty is essentially linked to the abstract nature of the empowerment process (Narayan, 2005), its complex and multidimensional nature, and the variability of its different dimensions according to different contexts (Bayissa et al., 2018). Proposed global gender indicators do not allow sub-national or sub-group comparisons (Miedema et al., 2018; Ewerling et al., 2017). Other measures of women's empowerment, based on Demographic and Health Survey (DHS) data, are subject to several shortcomings, including the subjective application of weights, the non-integration of multidimensional indicators or the failure to use appropriate validation methods that scientifically corroborate the proposed measures (Asaolu et al., 2018; Ewerling et al., 2017).

The aim of this work is to construct a measure of women's empowerment in the WAEMU. We use DHS survey data from seven UEMOA countries, namely Benin, Burkina-Faso, Côte-d'Ivoire, Mali, Niger, Senegal and Togo, on which we apply a factor analysis based on the common factor model (Abreha et al., 2020; Asaolu et al., 2018; Miedema et al., 2018; Yount et al., 2016). This method is preferred as it is more aligned with scale construction (Watkins, 2018; Fagrigar and Wegener, 2012). The application of methods such as Principal Component Analysis (PCA) can limit the validity of proposed measures (Asaolu et al., 2018); on the other hand, in addition to establishing the underlying dimensions between

measured variables and latent constructs (Fabrigar et al., 1999), factor analysis also provides evidence of the validity of proposed constructs (Williams et al., 2012) and allows measurement errors to be taken into account (Worthington and Whittaker, 2006).

In the following, an overview of the concepts associated with women's empowerment, the main challenges related to its measurement and a brief review on existing measures of women's empowerment are presented. The methodology and data used are then described, along with results.

I. Overview of women's empowerment: definition and measurement

When measuring empowerment, it is important to draw on a clear definition of the concept and to specify a framework that links empowerment to development outcomes and identifies its determinants (Narayan, 2005). Thus, this section outlines some definitions of empowerment commonly adopted and which serve as a basis for conceptualizing women's empowerment. The section then addresses the difficulties involved in measuring women's empowerment, and reviews some quantitative measures and correlates of women's empowerment, particularly in developing countries.

1.1. Defining and conceptualizing women's empowerment

Each individual has a unique definition of what it means to be "empowered" that, is a function of their life experiences, personality and aspirations, but is also shaped by the context and culture in which they are embedded (Alkire et al., 2013). As a result, there is considerable diversity in the priorities, agendas and terminologies used to address women's empowerment (Narayan, 2005). Throughout the literature, multitude of definitions highlight different experiences and perspectives of empowerment, associated with a wide range of terminologies, most commonly referring to choice, power, options, control (Malhotra et al., 2002). Although there is no single definition of empowerment, it is variously conceptualized as a process or an outcome, an end state or a means to an end, a capability (Alsop et al., 2006; Malhotra et al., 2002; Kabeer, 1999). Among the definitions frequently cited, those of Kabeer (1999), Alsop et al. (2006) and Narayan (2004) serve as good reference points for conceptualizing and measuring women's empowerment.

Kabeer (1999) defines empowerment as "the expansion of people's capacity to make strategic life choices in a context where this capacity was previously denied". According to Kabeer, the ability to exercise choice is based on three interdependent dimensions: agency (the ability to define one's goals and act accordingly, including the processes of decision-

making and negotiation, and resistance to deception and manipulation), resources (which refer to the material, human and social endowments that enhance the ability to make choices) and achievements (the set of outcomes, including improved well-being, that result from the combination of resources and agency). Resources and agency represent what Sen (1985) refers to as "capabilities"; representing an individual's potential to live the life they want and to achieve valued ways of being and doing.

Another common definition by Alsop et al, (2006) refers to empowerment as "the ability of a group or individual to make effective choices, i.e. to make choices and then transform those choices into desired actions and outcomes". In this definition, the ability to make effective choices is influenced by two main factors. The first is linked to the concept of agency, which, similar to Kabeer's framework, is defined as the ability of an actor or group to make wise choices, that is to deliberately consider and select options. However, unlike the previous framework, this model suggests that resources are indicators of agency, characterized as psychological, informational, organizational, material, social, financial or human assets. The second factor relates to the institutional environment, which includes the institutions (formal and informal) that govern people's behavior and influence the success or failure of the choices they make. It thus refers to the broader institutional, social and political context of formal and informal rules and norms within which actors pursue their interests (Samman and Santos, 2009). These rules determine who has access to resources and who can use them. The ability to make a choice and the context in which this choice is made are then assumed to be determinants of the degree of empowerment of the individual (Alsop et al., 2006). The interaction between these elements gives rise to different degrees of empowerment, and is assumed to have mutually reinforcing effects on development outcomes.

Narayan (2004) describes empowerment as "increasing the assets and capabilities of poor people, with the aim of enabling them to better participate in, negotiate with, influence, control and hold accountable the institutions that affect their lives". This broader definition includes the relationship between people and institutions. Assets are material goods (physical or financial) that enable people to withstand difficult situations and widen their range of choices. Capabilities, on the other hand, enable people to use their assets in different ways to enhance their well-being. Empowerment here is supported by four synergistic elements: access to information, inclusion and participation, accountability and local organizational capacity.

In a broader sense, women's empowerment therefore implies the expansion of their freedom of choice and action, and greater control over the resources and decisions that influence their own lives (Narayan, 2004). It is pertinent to emphasize that women's empowerment is distinct from that of other disadvantaged or socially excluded groups because, not only, do women represent a category that straddles all other groups; their disempowerment thus transcends that of other groups, but also, women's disempowerment is sustained and maintained by household and interfamily dynamics (Malhotra, 2003), as well as power relations between men and women (Mosedale, 2005). In line with the latter, empowerment is a process of increasing power (Samman et Santos, 2009); power being understood here as "control" or "real ability to effect change" (Ibrahim and Alkire, 2007). For example, Sen describes women's empowerment as "the modification of power relations... that restrict women's options and autonomy, and undermine health and well-being" (Sen, 1993). Based on Rowlands' (1997) categorization of power, Ibrahim and Alkire (2007) list different types of empowerment gains: resistance to manipulation (power over), creation of new opportunities (power to), ability to act in groups (power with) and improved self-respect and self-acceptance (inner power). In this framework, empowerment is therefore the process by which the powerless gain greater control over their lives, acquiring power not over others but to achieve goals and ends (Kishor et Gupta, 2004). This conception of empowerment distinguishes it from the general concept of "power" as exercised by dominant individuals or groups (Malhotra et al., 2002).

From the foregoing, women's empowerment means the possibility for them to have greater life options and choices, to acquire greater control over their lives and generally achieve the ability to live the life they want to live (Mahmud et al., 2012). The above definitions highlight the fact that women's empowerment is a process that involves changing from a condition or state of powerlessness and denial of choice to a condition of empowerment (Kabeer, 1999), but it also implies that women themselves must be important actors (agents) in this process of change" (Malhotra et al., 2002). Several elements are common to the different conceptualizations of empowerment, the main ones being agency and access to and control over resources (material, human and social). These resources define the foundations that support or hinder women's ability to act as agents, and determine the outcome of the empowerment process. Another important element is the context that characterizes a woman's life circumstances (such as marriage, living conditions, household wealth and the characteristics of influential family members) and shapes the opportunities and choices

available to her (Mahmud et al., 2012). All these elements are important in measuring women's empowerment.

1.1. Challenges in measuring women's empowerment

Empowerment remains a multifaceted process, the measurement of which presents a number of issues to be considered. Firstly, empowerment is a latent phenomenon that cannot be directly observed. Its aggregate results or effects may be visible, but its internal dynamics are difficult to examine. As a result, empowerment is often only partially perceived, and most observed behaviors are indicators of the underlying phenomenon. Consequently, empowerment can only be approximated by proxies or indicators. For example, the initial resources on which women can draw, and which are considered prerequisites for exercising choice, are usually indicated by paid employment, education, media exposure, etc., but there is no guarantee that these will necessarily translate into action (Mahmud et al., 2012). Similarly, the ability to exercise a choice can only be observed up to a point, as the motivations and objectives of that choice are not obvious. In general, the measurement of agency is based on observable actions such as participation in decision-making, freedom of movement, financial autonomy and so on. However, agency can also take forms that lend themselves to measurement, such as bargaining and negotiation, cognitive processes of reflection and analysis (Kabeer, 1999). Laszlow and Grantham, (2017) in their review identified a diversity of approaches to defining and measuring women's empowerment. Based on this review and referring to Kabeer's (1999) and Sen's (1989, 1999) conceptualization of women's empowerment, they distinguish two types of indicators. The first type of indicators, called "indirect" indicators, are those relate to the outcomes resulting from the empowerment process rather than the mechanism itself, and the second type, called "direct" indicators, capture women's subjective experiences of empowerment (Laszlow et al., 2017).

Secondly, empowerment is a multidimensional process. Gender inequality is a phenomenon that occurs across several dimensions (economic, social, psychological, political, etc.). Therefore, the fact that a woman is empowered in one aspect of life does not necessarily imply empowerment in other areas (Malhotra and Schuler, 2005). For example, greater power or control in the family sphere may be achieved without any change in the community. On the other hand, greater control over material resources may increase women's participation in household decision-making. Empowerment indicators therefore need to be

specified and measured across different dimensions. Thirdly, empowerment is highly contextual. Social, cultural, political and economic conditions vary from one society to another and over time. Empowerment also depends on the characteristics of the groups that compose the population.

Behaviors and attributes that give meaning to empowerment in one context may have different meanings elsewhere (IEG, 2017), and even within the same context, not all women may experience empowerment in the same dimensions (Mahmud et al., 2012). In addition, although empowerment as a value and phenomenon is universal, the indicators used to measure it can be either universal or context-specific. For example, an indicator of freedom of mobility may in one context reflect an increase in freedom, while in another context where women's mobility is a norm, this indicator will be less relevant.

Finally, Richardson (2018) identified a number of elements that affect the measurement of empowerment. These include: the failure to take theory into account in conceptualizations of empowerment and the selection of indicators, the use of analytical methods that can lead to inaccurate or biased measurement models, and the use of information that is too narrowly focused to capture empowerment. He adds that the different ways of operationalizing and measuring women's empowerment make it difficult to compare results between studies. All these difficulties explain why, despite the existence of multiple indicators and indices, there are as yet no universally recognized measures or indicators of women's empowerment.

1.1. Existing measures of women's empowerment

Several indicators have been proposed to measure women's empowerment, bringing together information aggregated at country level. One example is the Global Gender Gap Index introduced by the World Economic Forum, which ranks countries on the basis of the gap between men and women in five dimensions: (1) economic participation, (2) economic opportunity, (3) political empowerment, (4) educational attainment and (5) health and well-being. Two other indices are the Gender Development Index (GDI) and the Gender Inequality Index (GII), both introduced by the United Nations Development Programme (UNDP). The former measures gender gaps in human development achievements, taking into account disparities between women and men in three fundamental dimensions of human development: health, knowledge and living standards[3]. The second reflects inequalities between women and men in terms of reproductive health, empowerment and the labor

[3] http://hdr.undp.org/en/content/gender-development-index-gdi accessed 01/22/2021

market[4]. But these indices have been widely criticized as a measure of women's empowerment, as they are better suited to measuring gender gaps across several domains. Other methodological limitations include the fact that they are based on indirect indicators and aggregate data, making it impossible to analyze population subgroups (Malapit et al., 2019; Yount et al., 2016; Alkire et al., 2013).

In order to measure the effectiveness of its programs addressing women's empowerment processes, Oxfam has developed an index that measures women's empowerment outcomes at the individual level in five domains composed of a set of variables that cover most areas (Bishop and Bowman, 2014). However, the use of this index is limited as the information needed to construct it are not available in all surveys.

Alkire et al, (2013) have also proposed an indicator, the Women's Empowerment in Agriculture Index (WEAI) that measures women's empowerment and inclusion in the agricultural sector. The index is constructed using a robust multidimensional methodology, proposed by Alkire and Foster (2011). It measures women's empowerment at the individual level in five areas, including decisions about agricultural production, access to and decision-making power over productive resources, control over the use of income, leadership in the community, and time allocation. It also measures parity in the form of the relative gap between women and men in their agricultural households. However, although the WEAI is a well-constructed indicator, it focuses solely on the agricultural domain and not on aspects of women's daily lives (Phan, 2015).

Ewerling et al, (2017) proposed The Survey-based Women EmpowERment index (SWPER) using survey data, specifically Demographic and Health Surveys (DHS). To enable comparisons on different scales, they include data from several countries. Data from a sample of 34 African countries are used to identify elements related to women's empowerment. The principal component analysis (PCA) used to construct the index revealed three dimensions of women's empowerment namely attitude to violence, social independence and decision-making. However, despite the authors' considerable efforts to evolve the literature on measuring women's empowerment this index has some limitations noted by Miedema et al. (2018) which include the selection of available ad 'hoc items, the authors' inability to demonstrate measurement invariance across countries and the possibility that items relating to women's empowerment may prove incomparable across countries.

[4] http://hdr.undp.org/en/composite/GII accessed 01/22/2021

Miedema et al, (2018) and Asaolu et al, (2018) also attempted to identify potential indicators of women's empowerment specific to several countries. Factor analysis performed on the data enabled them to identify multi-domain latent patterns of women's empowerment common to the countries. The method they used is useful for identifying a set of valid measures of multidimensional concepts (Malapit et al., 2019).

II. Methodological approach to measuring women's empowerment

To construct the women's empowerment index, we perform a factor analysis. There are two main factor analysis techniques: Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). Based on the work of Asaolu et al. (2018) and Miedema et al. (2018), we use a combination of both techniques in this study.

2.1. The classic factor analysis model

Following Harman (1976) and Cudeck (2000), the classic factor analysis model is as defined as:

$$x_j = a_{j1}f_1 + a_{j2}f_2 + \cdots + a_{jm}f_m + e_j \qquad (j = 1,2,\dots,n) \qquad (1)$$

Where n denotes the number of observed variables $(x_1, x_2, \dots, x_n)$ and m $(m < n)$ is the number of underlying factors $(f_1, f_2, \dots, f_m)$. The model assumes that each observed variable x_j is a linear function of m common factors and a single factor. The common factors explain the correlation between the variables, while each single factor explains the rest of the variance, including the variable's error. The coefficients $a_{j1}, a_{j2}, \dots, a_{jm}$ represent the factor loadings, i.e. the contribution of the variables to the factors. This means that a_{jm} is the factor loading of the j^{th} variable on factor m. e_j represents the single factor. Thus, for the j^{th} variable observed on individual, the model can be written as follows:

$$x_{ji} = \sum_{p=1}^{m} a_{jp}f_{pi} + e_{ji} \qquad (i = 1,2,\dots.N)\ ;(j = 1,2,\dots.n) \qquad (2)$$

In this expression, F_{pi} represents the value of the common factor p for individual i. It is assumed that the common and unique factors have zero means ($E(f_j) = 0$ and $E(e_j) = 0$) and are uncorrelated $(Cov(e_j, f_j) = 0)$, and that, the common factors have unit variance $Var\,(f_j) = 1$. In addition, single factors are also assumed to be uncorrelated with each other $(Cov(e_i, e_j) = 0, i \neq j)$. The matrix form of the model is specified as follows:

$$X = \Lambda F + E \qquad (3)$$

X is the matrix of observed variables, Λ, the factors loading matrix, F is the vector of common factors and E the vector of single factors. The basic statistic used in factor analysis is the correlation coefficient, which determines the relationship between two variables. Once the correlation matrix has been calculated, the factor loadings are then analyzed to see which variables load on which factors. In its matrix form, the correlation structure of the model is:

$$R = \Lambda\Psi\Lambda' + \Theta \quad (4)$$

Where R is the correlation matrix between observed variables, Λ is the factor loading matrix (Λ' the transpose) which represents the strength and direction of the linear influence of common factors on measured variables, Ψ is the correlation matrix between common factors and Θ is the covariance matrix between the single factors. Due to the assumption that the regression residuals are uncorrelated, Θ is considered to be a diagonal matrix.

The variance of each observed variable is partitioned into a common variance or communality noted h^2 which is shared with other observed variables, and a single variance noted u^2, which is both a random error and a specific variance not shared with other observed variables.

$$h_j^2 = a_{j1}^2 + a_{j2}^2 + \cdots + a_{jm}^2 \quad (5)$$

$$u^2 = 1 - h^2 \quad (6)$$

The total variance in the factor analysis is represented by:

$$Variance_{totaL} = Variance_{common} + Variance_{specific} + Variance_{error} \quad (7)$$

The aim of factor analysis is therefore to extract factors that explain as much of the total variance as possible.

2.1. Exploratory Factor Analysis (EFA)

Exploratory factor analysis is used to explore data to determine the number or nature of factors explaining covariation between variables when there is insufficient a priori evidence to form a hypothesis about the number of factors underlying the data (Stapleton, 1997). It is appropriate when the items intended to reflect a construct have not been widely validated (Bandalos and Finney, 2010). It therefore makes it possible to identify the underlying factor structure of observed variables without imposing a preconceived structure on the result (Child, 1990).

2.1.1. Exploratory factor analysis procedure

Once the variables relating to women's empowerment have been identified on the basis of literature and data, exploratory factor analysis is carried out, considering the following methodological issues (Fabrigar et al., 1999):

- ***Data suitability for factorial analysis***

This issue relates to the variables to be included in the analysis and the distributional properties of the data. After identifying the variables and analyzing the distributional properties of the variables likely to affect the correlation structure of the model (Watkins, 2018), the first step is to ensure that the data are suitable for factor analysis. The following tests can be used to check the factorability of the correlation matrix:

- ***Bartlett's sphericity test (1954)****:* tests the null hypothesis that the correlation matrix is an identity matrix (containing ones on the diagonal and zeros off the diagonal) and has therefore been generated by random data (Watkins, 2018). The null hypothesis is rejected when the probability of the chi-square statistic associated with the test is less than 0.05 (Tabachnick and Fidell, 2001; Hair et al., 1995).
- ***Kaiser-Meyer-Olkin test (KMO) (Kaiser, 1974)****:* is used to measure sampling adequacy. This test reflects the extent to which correlations are a function of the variance shared between all variables, rather than the variance shared by particular pairs of variables. The KMO index ranges from 0 to 1, and a value of 0.50 is considered appropriate for factor analysis (Tabachnick and Fidell, 2001; Hair et al., 1995).

- ***Estimation method (factor extraction)***

After checking the suitability of the data for factor analysis, the next step is to estimate (extract) the common factor model so as to reproduce the observed correlation matrix as closely as possible. The choice of extraction method depends on the objective and the fulfillment of the required distribution assumptions (Izquierdo et al., 2014). A commonly used method is maximum likelihood, which aims to minimize residual correlations in the population rather than in the sample, (Bandalos and Finney, 2010). However, the application of the maximum likelihood method is recommended when the multivariate normality assumption is plausible. Otherwise, another recommended method is principal axis factoring. This is a least-squares estimation method that makes no distributional assumptions and whose aim is to find parameter estimates that minimize the squared differences between

the sample correlation matrix and the correlation matrix reproduced on the basis of the parameter estimates (Cudeck, 2000).

- ***Number of factors to retain***

To determine the number of factors to retain, several decision rules are applied:

- ***Kaiser criterion (1960)***: is to retain factors whose eigenvalues are greater than 1.
- ***Cattell's (1966) scree test:*** uses a graph to identify the point at which the eigenvalues appear to balance out. The number of factors to be retained corresponds to the data points above the inflection point on the graph.
- ***Interpretability of factors:*** according to Worthington and Whittaker (2006), factors should only be retained if they can be meaningfully interpreted. This means analyzing the elements of each factor to assess the extent to which the elements make sense as a group.

- ***Factor rotation***

Factor rotation is designed to achieve a simpler and theoretically more meaningful solution by rotating the axes in factor space to bring them closer to the location of the variables (Watkins, 2018). An oblique rotation is applied to allow the emergence of possible correlations between factors (Holgado-Tello et al., 2010; Cudeck, 2000; Fabrigar et al., 1999).

2.1.1. Confirmatory factor analysis

After carrying out the EFA, confirmatory factor analysis (CFA) is performed to test the factor structure of the indicators related to women's empowerment, as well as to test the hypothesis of a relationship between the observed indicators and their underlying latent constructs.

- ***Testing model reliability:*** Cronbach's alpha coefficient is used to test the reliability and internal consistency of model indicators. It lies between zero and 1, and the commonly accepted rule of thumb is that an alpha between 0.6-0.7 indicates acceptable reliability, and 0.8 or more indicates good reliability

- ***Quality of model fit***

- ***Bentler's Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI):*** analyze model fit by examining the discrepancy between the data and the proposed model,

while adjusting for intrinsic sample size problems in the chi-square test. These indices are considered very good if values equal or exceed 0.95, good between 0.90 and 0.95, suffering between 0.80 and 0.90 and poor if they are below 0.80.

- ***Root Mean Square Error of Approximation (RMSEA) index and Standardized Root Mean Square Residual (SRMR) Index:*** estimate the ability of model parameters to reproduce population covariances. Values less than or equal to 0.05 indicate a very good fit, a good fit between 0.05 and 0.08, a poor fit between 0.08 and 0.10, and an unacceptable fit above 0.10.

2.2.Description of the data source

The data used relate to women aged 15 to 49, drawn from Demographic and Health Surveys (DHS) in Benin, Burkina-Faso, Côte-d'Ivoire, Mali, Niger, Senegal and Togo. Access to the datasets was granted after submission of a request on the program's website at https://dhsprogram.com/. Table 1 shows the distribution of the sample by country.

Table 1: Sample distribution by country

Country	*Year*	*Round*	*Total sample of women (aged 15 to 49)*	*Selected sample (married or living with a partner)*
Benin	*2018*	*DHS standard VII*	*15.928*	*4.341*
Burkina-Faso	*2010*	*DHS standard VI*	*17.087*	*12.176*
Cote-d'Ivoire	*2012*	*DHS standard VI*	*10.060*	*5.672*
Mali	*2018*	*DHS standard VII*	*10.519*	*6.911*
Niger	*2012*	*DHS standard VI*	*11.160*	*9.111*
Senegal	*2011*	*DHS standard VI*	*15.688*	*10.372*
Togo	*2011*	*DHS standard VI*	*9.480*	*5.606*
Total	*-*		***90.498***	***54.189***

The analysis is limited to women who are married or cohabiting with a partner, as in DHS surveys, measures of women's empowerment are framed within the context of the marital relationship. Consequently, single, widowed, divorced and separated women were excluded. The initial sample was 90,498 women, 66,020 of whom reported being married or with a partner. After listwise deletion of missing values, 54,189 women were included in the analysis.

2.3. Women's empowerment variables

Drawing on Asaolu et al, (2018), Miedema et al, (2018), Ewerling et al, (2017), several other works and the DHS baseline questionnaire, variables likely to reflect women's empowerment were identified and divided into four conceptual domains namely: economic status, influence in household decision-making, gender-related attitudes and beliefs, human and social assets. A total of 31 variables were identified and operationalized to make them eligible for factorial analysis.

- ***Indicators of the economic dimension***

This dimension includes the domains of labor force participation and asset ownership. Labor force participation includes the following indicators: respondent's occupation, type of work income, seasonality of work and the income gap between spouses/partners. The respondent's occupation is coded 1 if she is working, 0 otherwise. The type of occupation is described as follows: 0 if the respondent declares that she does not work or if she works for a family member, and 1 if she works for someone else or on her own account. Income from work was represented by the score 0 for those not working or working without pay and 1 if paid in cash only, cash and kind or kind only. Seasonality of work is represented by 0 if the respondent does not work or works occasionally or seasonally, 1 if she works all year round.

The spousal earnings difference was obtained from the question asking whether the respondent thought the money she earned was more than, less than or about the same as what her husband/partner earned, or didn't know. Responses were coded as follows: 0 if she doesn't work, earns no income or earns less than her husband/partner, 1 if she earns more than her husband/partner or if her earnings are about the same as her husband's or if her husband earns no income. “Don't know” responses have been coded as missing values. Ownership of assets includes two indicators indicating whether or not respondents own land or a house. Responses are coded 0 if the respondent does not own land or a house, 1 if she owns land or a house jointly or alone, or both alone and jointly.

- ***Indicators of the household decision-making dimension***

The items included relate to the questions of who decides: how the respondent's income is used, how the husband/partner's income is used, the respondent's health care, major household purchases. Responses were coded 0 if decisions were made solely by the husband/partner or other person, and 1 if the respondent reported sole or joint decision-making.

- ***Indicators of gender-related attitudes and beliefs***

This dimension includes areas relating to attitudes to violence and beliefs about sexual activity. Women were asked whether they believed a husband was justified in beating his wife if: she burned food, went out without telling him, neglected the children, argued with him and refused to have sex with him. Responses were reverse coded, so that a woman would score 1 if she answered "no", signaling a more equitable gender belief, and 0 if yes. It was further asked whether a woman would be justified in asking her husband to use a condom if she knew he had a sexually transmitted infection, and whether a woman would be justified in refusing sex with her husband if she knew he was having sex with other women. Both indicators were coded 0 for negative responses (no) and 1 for positive responses (yes).

- ***Indicators of the human and social assets dimension***

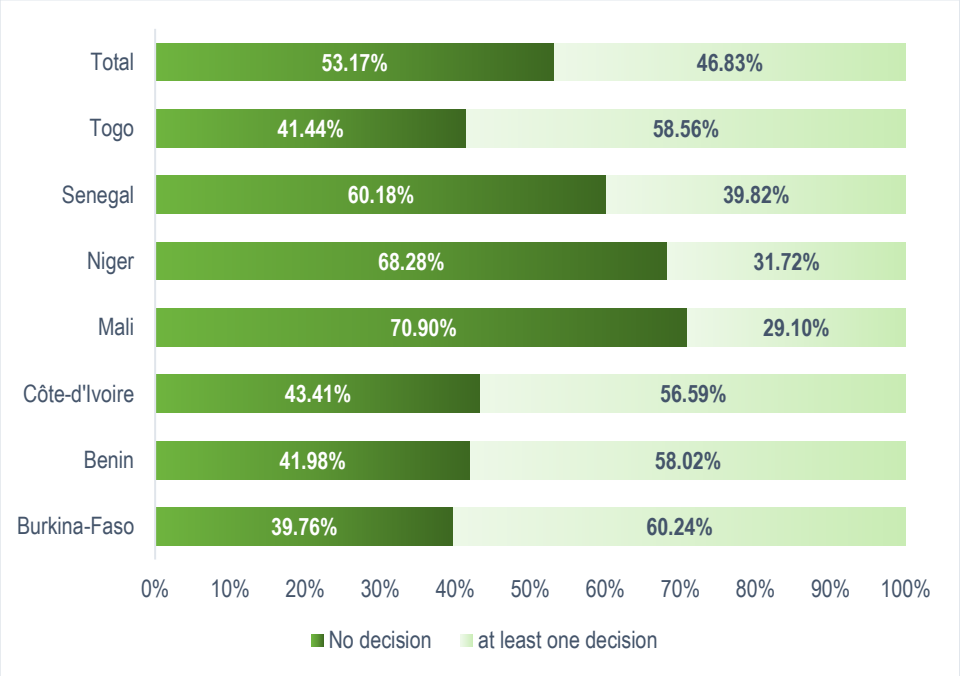
This dimension covers the domains of women's education and life course, access to healthcare and media exposure. Education includes the indicator relating to women's education, coded 0 if the respondent has no education and 1 if she has at least primary education. The literacy indicator is represented by 0 if the respondent can't read at all, 1 if she can read all or part of a sentence. The difference in educational level between spouses/partners was included and measured by comparing the educational level of the respondent and her spouse/partner. The code 0 was assigned to women with a lower level of education than their spouse/partner, and 1 to women whose level of education was higher than or equal to that of their spouse/partner. Life-course indicators relate to pivotal events in the respondents' lives, and concern age at first marriage (or first cohabitation with a partner) and age at first birth; coded 0 if the woman was under 18 years of age, and 1 if over.

Age difference between spouses/partners was also introduced and represented by 0 if the husband/partner is older, 1 if the respondent is the same age as her husband/partner or older. The media exposure domain provides information on how often the woman watches TV, listens to the radio or reads magazines or newspapers. These variables are described as follows: 0 if not at all or less than once a week, and 1 if at least once a week. Access to health care is described by four indicators relating to respondents' difficulties in obtaining medical help, mainly: obtaining permission to receive medical help, obtaining money for medical care, distance between place of residence and health facility, and not wanting to go to the health facility alone. A score of 0 was assigned to women reporting difficulties, and 1 if they did not.

2.4. Sample characteristics

Table A1 (see Appendix) shows the distribution of the sample according to the identified indicators of women's empowerment. In the economic domain, more than half the women in the overall sample were economically active (56.9%). However, the trend is not uniform across the country sub-samples. While over 70% of respondents were economically active in Benin, Burkina-Faso, Côte-d'Ivoire and Togo, less than half were so in Mali (48.6%), Senegal (40.5%) and Niger (23.3%). Less than half were paid for their work in general, and particularly so in Burkina-Faso, Niger and Senegal, and were remunerated either in cash, in kind, or a combination of both. Also, less than half of the respondents were sole or joint owners of a house (30.3%) or land (28.5%), with the lowest proportions observed in Togo, Senegal and Benin.

Figure 1: Sole or joint participation in household decisions

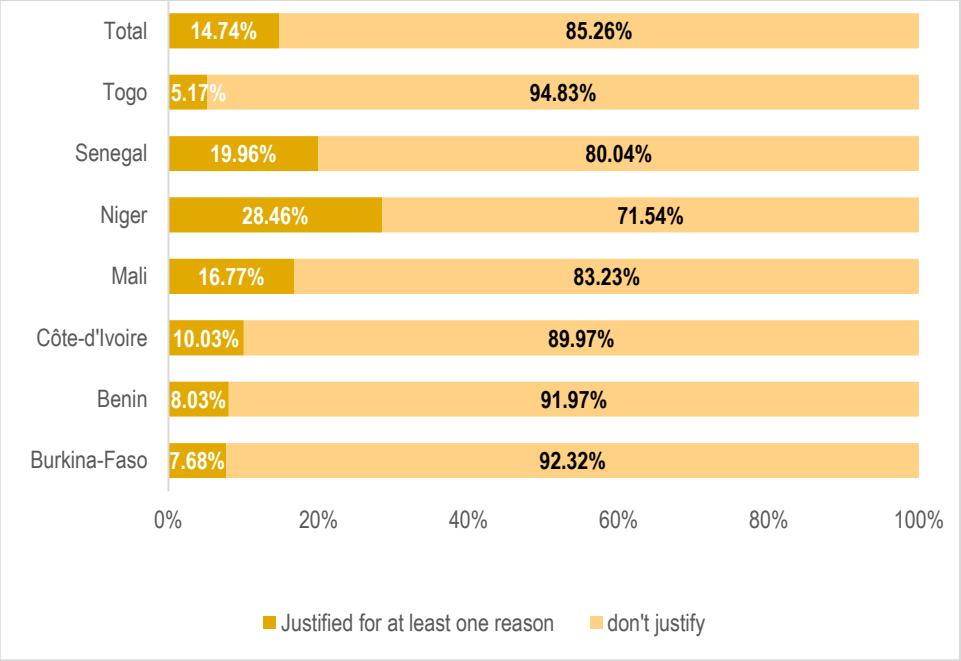


***Type of decision**: 1- Women's health care. 2- Major household purchases. 3- Use of spouse's income*

***Source**: Author based on DHS data*

In the domain of participation in household decision-making, the proportion of female respondents who participate alone or jointly in decisions varies by type of decision (see table A1 in appendix) and by country. Figure 1 shows that, in general, for the three types of decision considered, more than half of women (53.17%) declared that they participate neither alone nor jointly in any decision; the lowest levels of participation being observed in Mali (29.10%), Niger (31.72%) and Senegal (39.82%).

Figure 2: Women's opinion on partner violence

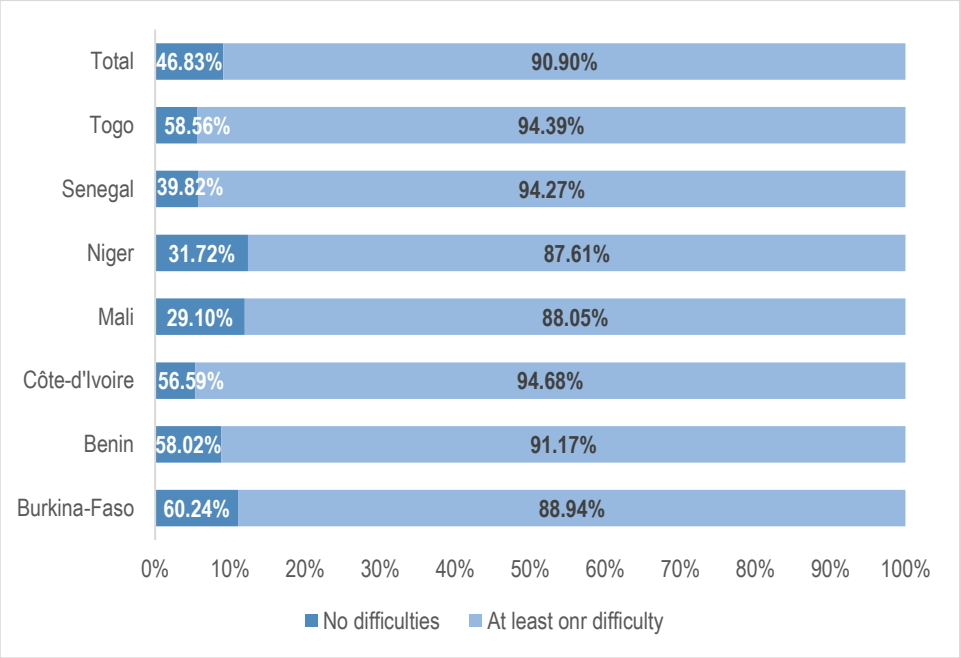


Reasons: *1-argue with him, 2- burn food, 3- neglect children, 4- go out without telling him, 5-refuse sex*

Source: *Author, based on DHS data*

When it comes to women's opinion on intimate partner violence (Figure 2), 14.74% of women in the total sample justified violence perpetrated by the husband/partner on his wife for at least one of the five reasons given.

Figure 3: Women's difficulty in accessing healthcare



Difficulties: 1*-Getting money for care, 2-Getting permission to see a doctor, 3-Distance from the health facility, 4-Getting to the health facility alone*

Source: *Author, based on DHS data*

Of the sub-samples by country, the highest proportion of women justifying violence is found in Niger (28.46%), while in Togo, the majority of women (94.83%) have an unfavorable opinion of violence. With regard to social assets (table A1 in appendix), less than half the respondents (28.90%) had at least primary school education (with the exception of Togo) and were able to read all or part of a sentence (22.11%). Over 40% were aged 18 or over at the time of their first marriage (except in Niger) and first birth. They had little exposure to the media (TV, radio, newspapers/magazines). In terms of access to healthcare (figure 3), 91% of women reported encountering at least one difficulty (out of four considered) in accessing healthcare, with prevalence reaching almost 95% in Togo, Senegal and Côte-d'Ivoire.

III. Résultats de l'analyse des données

Prior to data analysis, the correlation matrix was examined to ensure that the data were suitable for factorial analysis. The Chi-deux statistic of Bartlett's sphericity test (see Table A2, Appendix), is significant with a probability less than 0.05, and the index of the Kaiser-Meyer-Oklin test (0.77) indicate that the correlation between the variables is sufficiently strong for applying factor analysis. Next, with reference to van Prooijen and van der Kloot (2001), the full sample was used for both exploratory and confirmatory factor analysis. Since the variables used are binary, a tetrachoric correlation matrix was used to conduct the exploratory factor analysis (Holgado-Tello et al., 2010).

3.1. Exploratory factor analysis

The exploratory factor analysis was first carried out using, for the sub-samples of each country, all the women's empowerment variables that had been identified in order to determine which indicators clustered in the same latent dimension. The same principles were applied to the sub-samples for all countries. The principal factors method was used to extract the factors, and an oblique rotation (oblimin) was performed to measure the correlation between the factors.

Two variables relating to assets ownership (land and house), identified as inverted variables, were removed from the analysis, as their use is likely to affect the reliability and validity of the results (Woods and Edawrds, 2007; Barnette, 2000). Also, the variable relating to decisions concerning the use of the respondent's income was excluded due to the high rate of missing values (54.66%). The variables relating to type of income, seasonality of work, type of occupation and literacy were also removed for reasons of multi-collinearity.

Table 2: EFA results with oblique rotation

Country	***Bénin (N=4,341)***				***Burkina-Faso (N=12,176)***				***Côte-d'Ivoire (N=5,672)***				***Mali (N=6,911)***			
Variables	*F1*	*F2*	*F3*	*F4*	*F1*	*F2*	*F3*	*F4*	*F1*	*F2*	*F3*	*F4*	*F1*	*F2*	*F3*	*F4*
Going out without telling	*0.926*				*0.880*				*0.908*				*0.847*			
Neglect the children	*0.944*				*0.932*				*0.923*				*0.865*			
Argue with spouse	*0.952*				*0.923*				*0.913*				*0.898*			
Refuse to have sex with spouse	*0.877*				*0.838*				*0.842*				*0.850*			
Burn food	*0.880*				*0.899*				*0.838*				*0.774*			
Get money for health care		*0.808*					*0.635*					*0.779*		*0.915*		
Distance to health care facility		*0.888*					*0.747*					*0.596*		*0.931*		
Go alone to health care facility		*0.796*					*0.898*					*0.553*		*0.889*		
Get permission to see a doctor		*0.786*					*0.911*					*0.763*		*0.871*		
Currently working			*0.669*					*0.411*			*0.436*				*0.350*	
Income difference between spouses			*0.656*					*0.679*			*0.573*				*0.548*	
Respondent's health care decisions			*0.881*					*0.893*			*0.885*				*0.922*	
Decisions about major household purchases			*0.854*					*0.805*			*0.845*				*0.884*	
Decisions regarding use of spouse's income			*0.614*					*0.504*			*0.707*				*0.769*	
Respondent's education				*0.618*		*0.784*				*0.845*						*0.624*
Age at first marriage				*0.668*		*0.684*				*0.397*						*0.378*
Age at first birth				*0.701*		*0.646*				*0.315*						*0.382*
Listen to radio				*0.576*		*0.351*				*0.676*						*0.643*
Read newspapers/magazines				-		*0.851*				*0.930*						-
Watch television				-		*0.637*				*0.622*						-
May refuse sex				*0.378*		-				*0.420*						*0.468*
May ask partner to use condom				*0.484*		-				*0.598*						*0.681*
Eigenvalue	*4.948*	*3.246*	*2.492*	*1.525*	*4.951*	*3.184*	*2.234*	*1.910*	*4.885*	*3.204*	*2.110*	*1.571*	*3.957*	*3.636*	*2.740*	*1.508*
Proportion of variance (%)	*33.92*	*22.25*	*17.09*	*10.45*	*31.72*	*20.40*	*14.31*	*12.24*	*34.10*	*22.37*	*14.73*	*10.97*	*27.25*	*25.05*	*18.88*	*10.39*
Cumulative proportion (%)	*33.92*	*56.17*	*73.26*	*83.71*	*31.72*	*52.12*	*66.43*	*78.67*	*34.10*	*56.47*	*71.20*	*82.17*	*27.25*	*52.30*	*71.17*	*81.56*
Variance ratio (%)	*40.52*	*26.58*	*20.42*	*12.48*	*40.32*	*25.93*	*18.19*	*15.56*	*41.50*	*27.22*	*17.93*	*13.35*	*33.41*	*30.71*	*23.15*	*12.74*
Cronbach's Alpha		*0.779*				*0.740*				*0.726*				*0.741*		

Country	*Niger (N=9,111)*				*Sénégal (N=10,372)*				*Togo (N=5,606)*				*Echantillon total (N=54,189)*			
Variables	*F1*	*F2*	*F3*	*F4*	*F1*	*F2*	*F3*	*F4*	*F1*	*F2*	*F3*	*F4*	*F1*	*F2*	*F3*	*F4*
Going out without telling	*0.927*				*0.901*				*0.907*				*0.905*			
Neglect the children	*0.952*				*0.932*				*0.928*				*0.935*			
Argue with spouse	*0.961*				*0.940*				*0.849*				*0.926*			
Refuse to have sex with spouse	*0.947*				*0.894*				*0.867*				*0.876*			
Burn food	*0.885*				*0.831*				*0.927*				*0.855*			
Get money for health care			*0.787*					*0.740*			*0.649*				*0.752*	
Distance to health care facility			*0.822*					*0.817*			*0.864*				*0.804*	
Go alone to health care facility			*0.803*					*0.715*			*0.732*				*0.792*	
Get permission to see a doctor			*0.884*					*0.748*			-				*0.803*	
Currently working				-			*0.504*					*0.561*		*0.505*		
Income difference between spouses				-			*0.727*					*0.576*		*0.615*		
Respondent's health care decisions				*0.933*			*0.818*					*0.816*		*0.856*		
Decisions about major household purchases				*0.922*			*0.821*					*0.717*		*0.827*		
Decisions regarding use of spouse's income				*0.829*			*0.639*					*0.532*		*0.564*		
Respondent's education		*0.783*				*0.615*				*0.751*						*0.609*
Age at first marriage		*0.739*				*0.778*				-						*0.402*
Age at first birth		*0.611*				*0.774*				-						*0.536*
Listen to radio		*0.423*				-				*0.666*						*0.617*
Read newspapers/magazines		*0.868*				*0.666*				*0.859*						*0.484*
Watch television		*0.688*				*0.378*				*0.700*						*0.673*
May refuse sex		-				-										-
May ask partner to use condom		*0.360*				-										-
Eigenvalue	*4.720*	*3.498*	*2.436*	*2.153*	*5.200*	*2.683*	*2.243*	*1.382*	*4.751*	*2.333*	*2.046*	*1.209*	*4.723*	*2.843*	*2.205*	*1.381*
Proportion of variance (%)	*32.36*	*23.98*	*16.70*	*14.76*	*40.52*	*20.91*	*17.48*	*10.77*	*44.21*	*21.71*	*19.03*	*11.25*	*37.86*	*22.79*	*17.68*	*11.07*
Cumulative proportion (%)	*32.36*	*56.34*	*73.04*	*87.80*	*40.52*	*61.43*	*78.91*	*89.68*	*44.21*	*65.92*	*84.95*	*96.20*	*37.86*	*60.65*	*78.32*	*89.40*
Variance ratio (%)	*36.86*	*27.31*	*19.02*	*16.81*	*45.18*	*23.32*	*19.49*	*12.01*	*45.96*	*22.57*	*19.78*	*11.69*	*42.35*	*25.49*	*19.78*	*12.38*
Cronbach's Alpha		*0.789*				*0.788*				*0.785*				*0.789*		

Of the seven (07) sub-samples, solutions ranging from 1 to 6 factors were sequentially analyzed. Variables not sufficiently represented on any factor, i.e. with factor loadings below |0.3|, and those loaded on more than one factor at a time with a loading above |0.3| were inspected and removed. Finally, based on Kaiser's criterion, Cattell's scree test and the interpretability of the factors, a four (04) factors solution was retained for all countries. As the structure of the factors was similar for all sub-samples, the same exploratory procedure was applied to the overall sample.

Table 2 shows the results of the factor loading matrix of the model derived from the exploratory factor analysis on each sub-sample and on the overall sample. In the model selected for the overall sample, the variables are represented on the factors with factor loadings ranging from 0.35 to 0.96, and present acceptable overall reliability (Cronbach's alpha=0.79). The total variance explained by the four (04) factors in the overall sample is 89.4%, which means the variability in the original variables is explained and their complexity reduced by the model, with a loss of information of 10.6%.

3.2. Confirmatory factor analysis

Once the latent dimensions of women's empowerment had been identified using EFA, confirmatory factor analysis (CFA) was carried out to check the factor structure of the women's empowerment indicators previously identified, and to test the hypothesis that there is a relationship between the observed indicators and their underlying latent constructs. CFA analysis was carried out using a structural equation model (SEM) without asymptotic distribution (ADF), using the four (04) factors and twenty (20) variables identified in the overall sample. In order to better fit the model, correlation between some pairs of error terms (Table A3 in Appendix), considered important on the basis of modification indices, was admitted (Watson et al., 2013)[5].

In terms of model fit, the RMSEA and SRMR values obtained being below 0.05, the CFI and TLI values above 0.90, and the coefficient of determination very close to 1, indicate overall good model fit. This means that the indicators are correctly loaded on the latent factors and that the confirmatory analysis model fits the data well. Table 3 shows the standardized regression weights of the variables included in CFA on their latent variables, as well as the goodness-of-fit indices of the model. We note that of the twenty (20) indicators

[5] According to Watson et al, (2013), for error terms related to items with similar content, it is acceptable for them to covary without threatening the integrity of the hypothesized model.

previously retained, four were excluded (two from factor 2 and two from factor 4) from the confirmatory analysis, as they had loadings below |0.30|.

The final model resulting from the confirmatory analysis represents four (04) domains of women's empowerment, labeled according to the composition of the factors. Factor 1, composed of variables relating to the respondent's opinion of violence, is labeled "Attitude to violence". Factor 2, composed of variables relating to decision-making within the household, is labeled "Participation in decision-making". Factor 3 is composed of items related to women's access to health care, and is labeled "Access to health care". Factor 4 comprise variables relating to education and media exposure (radio, television, newspapers/magazines), and is labeled "Education and media exposure". based on these results, individual scores are calculated for each domain.

Tableau 3 : CFA results

Variables	***F1/ Attitude to violence***	***F2/ Participation in decision-making***	***F3/ Access to health care***	***F4/ Education and media exposure***
Going out without telling your partner	*0,815*			
Neglecting the children	*0,838*			
Arguing with spouse	*0,79*			
Refusing to have sex with spouse	*0,835*			
Burn food	*0,613*			
Decisions regarding respondent's health care		*0,827*		
Decisions about major household purchases		*0,745*		
Decisions about use of spouse's income		*0,453*		
Getting money for health care			*0,547*	
Distance to health care facility			*0,764*	
Getting to health care facility alone			*0,436*	
Obtaining permission to see a doctor			*0,429*	
Respondent's education				*0,553*
Listen to radio				*0,344*
Read newspapers/magazines				*0,42*
Watch television				*0,657*
p-value	*(p<0,001)*	*(p<0,001)*	*(p<0,001)*	*(p<0,001)*
RMSEA	*0,040*			
SRMR	*0,040*			
TLI	*0,926*			
CFI	*0,942*			
CD*	*0,998*			

* *Determination coefficient*

Table 4: Oblique correlation matrix between Women's Empowerment domains

	Attitude to violence	*Participation in decision-making*	*Access to health care*	*Education and media exposure*
Attitude to violence	*1.000*			
Participation in decision-making	*0.053*	*1.000*		
Access to health care	*0.172*	*0.100*	*1.000*	
Education and media exposure	*0.175*	*0.286*	*0.161*	*1.000*

Table 4 shows the correlation matrix between the factors derived from the final confirmatory model. There are positive and significant correlations, albeit weak, between the four domains; the strongest being between the education and media exposure domain and the participation in decision-making domain

3.3. Individual score calculation

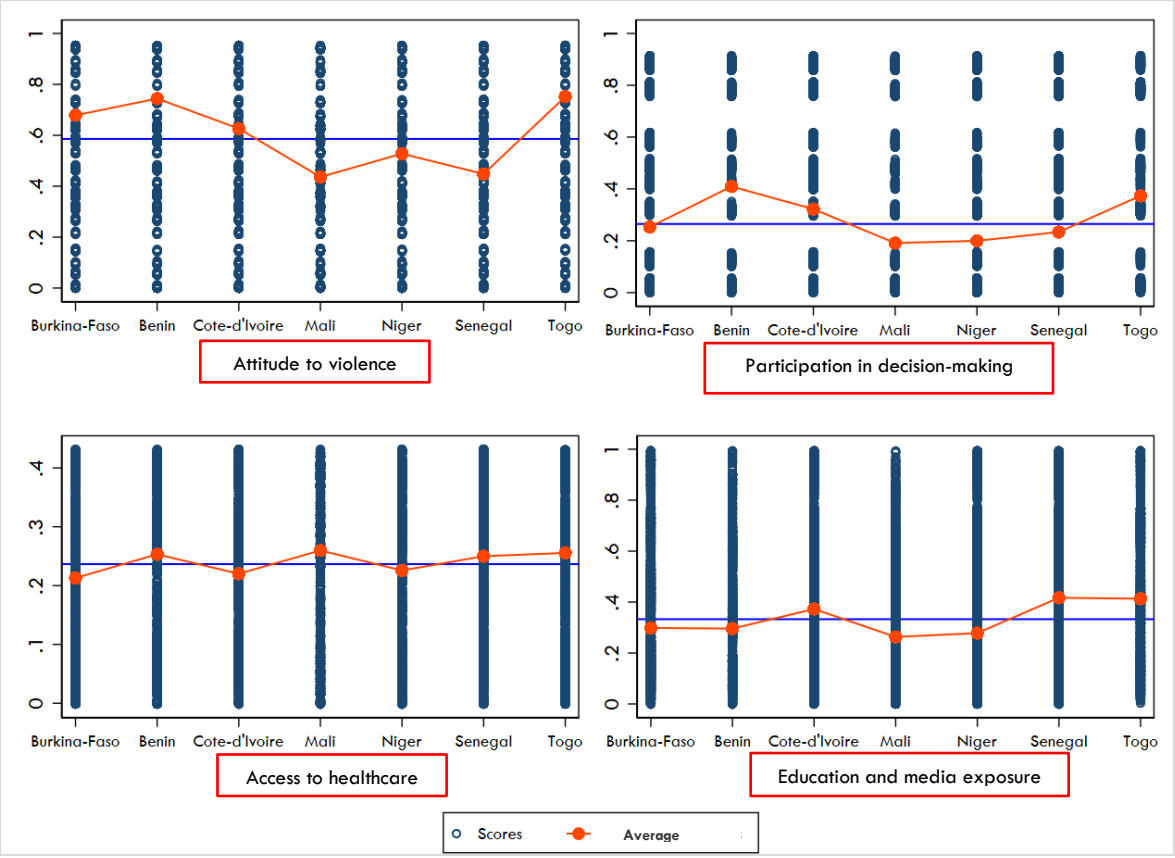
Once the correlation structure between the variables has been identified, individual standardized scores are computed for each domain of women's empowerment. The individual composite scores for each domain measure each individual's level of empowerment for a given domain. As scores are standardized, values range from 0 (indicating very low autonomy) to 1 (indicating high autonomy).

Figure 4 shows the distribution of average women's empowerment scores for the four domains by country. The female empowerment scores range from 0.586, 0.265, 0.237 and 0.333 respectively for the domains of attitude to violence, participation in decision-making, access to healthcare and education and media exposure respectively; suggesting that overall, the women in the sample enjoy a higher status in the first domain (attitude to violence), compared to the other domains.

As for the distribution by country, countries whose averages are above the reference line[6] show a better status of women's empowerment, while countries whose averages are below the reference line show a low status compared to the average for the overall sample. Across all four domains, women's empowerment status is higher compared to the overall average, while lower in Niger. For the other countries, the situation varies from one domain to another.

[6] The reference line (in blue) represents the average empowerment score for the overall sample.

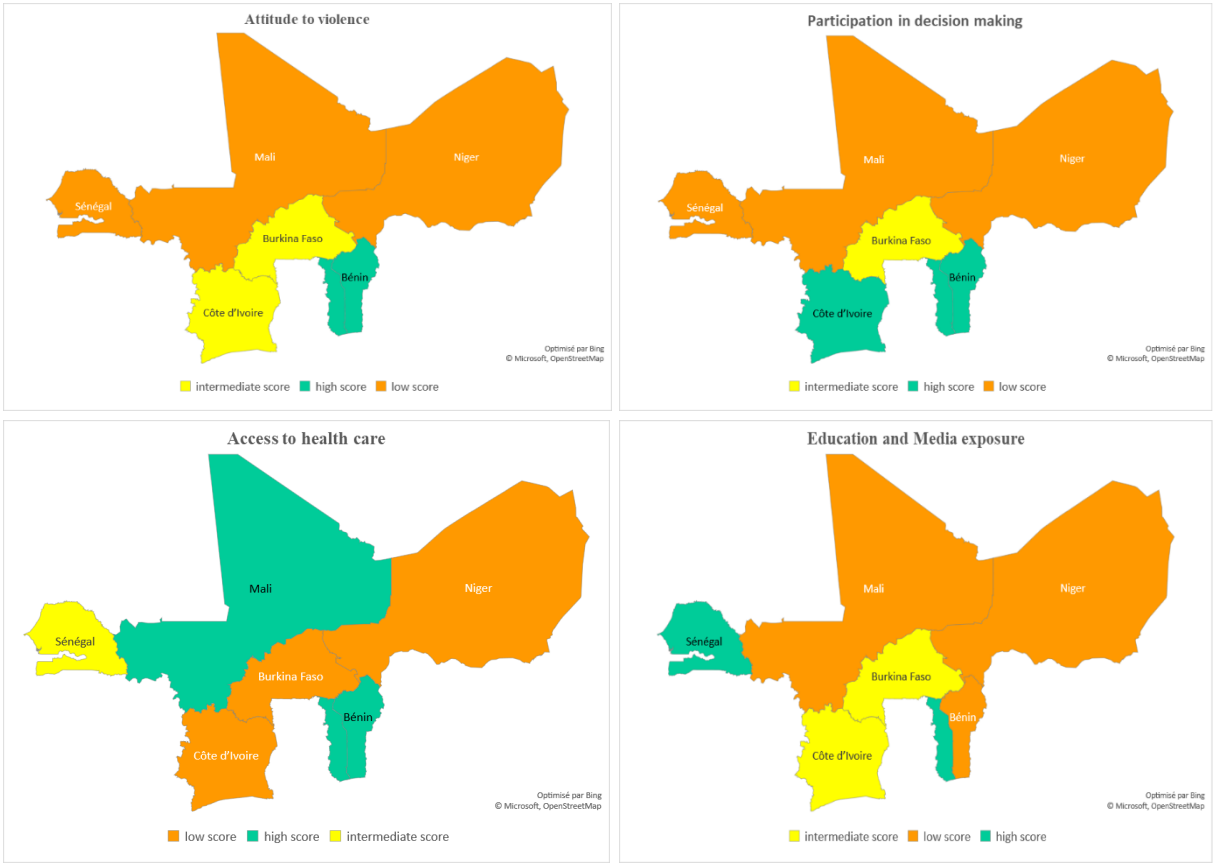
Figure 4: Distribution of average women's empowerment scores by domain and country



Source: *Author, based on DHS data*

Terciles are used to classify countries into three groups according to whether their empowerment score is high, medium or low. The first tercile (orange) represents the countries with the lowest average scores, the second tercile (yellow) represents the intermediate countries and the third tercile (green), the countries with the highest average scores (figures 5). Low scores suggest a low level of empowerment in the domain and country considered, while high scores suggest a high level of empowerment. . In Togo, for example, women generally enjoy a higher status in terms of empowerment. Individual country rankings across the four domains are not homogeneous for all countries (table A5 in Appendix). Mali is ranked last in all domains except access to healthcare, where it is ranked first. Countries ranking by domain of women's empowerment also showed heterogeneity across domains.

Figure 5: Countries scores classification by empowerment domain



Source: *Author, based on DHS data*

3.4. Discussion

These findings confirm the assumption that women's empowerment is a multi-dimensional process which encompass many aspects of women's lives. The domains identified correspond to different aspects as identified by leading theories of women's empowerment (Kabeer, 1999; Alsop et al., 2006) and recent empirical work (Asaolu et al., 2018; Miedema et al., 2018; Ewerling et al., 2017). It is important to note the difference in the number of items considered in the exploratory model and in the final confirmatory model. This difference is certainly linked to the variability in the composition of the factors from the exploratory country analysis, which could influence the results of the confirmatory model. Similarly, the correlations observed between factors support the idea that women's empowerment is multidimensional (Yount et al., 2016), but also corroborate Mason's (2005) findings stressing that women's empowerment is multidimensional, with low correlations between dimensions.

Identifying attitudes to violence as a domain of women's empowerment points out one of the main and most extreme forms of inequality experienced by women; intimate partner violence. A study by Afrobarometer (2019) conducted in 34 African countries reveals that about one out of four African women and even more men justified domestic violence. Such a prevalence of violence justification undoubtedly explains the rate of reproduction of violence against women and girls, observed in several countries and particularly in West Africa (WHO, 2013). This is largely linked to the existence of deeply rooted cultural beliefs about gender roles that influence individual behavior (Guracho and Bifftu, 2018). Such violence has adverse consequences on women's well-being, such as their economic survival, health and education, and on the well-being of their families, and also affects the effectiveness of actions taken to prevent and eradicate violence in all its forms (WHO, 2021; Guracho and Bifftu, 2018; UNICEF, 2000). There is evidence, in instance, that women's tolerant attitude towards domestic violence is a barrier to their access to various forms of essential healthcare, including reproductive healthcare (Khan and Islam, 2018; Shrestha et al., 2022). Furthermore, if we consider women's attitudes towards violence as an indicator of their perception of their status (BDHS, 2016), then opposition to all forms of violence, those perpetrated by the intimate partner in particular, is an expression of a desire to assert their personal rights (Wencheko and Tadesse, 2020).

The above-mentioned effects of domestic violence support the results regarding another identified domain of women's empowerment. That is, access to healthcare. This finding corroborates those of Asaolu et al, (2018) who also identified access to healthcare as a valid indicator of women's empowerment in 19 countries in Central, Southern, East and West Africa. The issue of women's access to healthcare is relevant, given that for many women and girls, gender discrimination compromises their access to healthcare, for reasons that essentially include fewer financial resources and constraints on mobility. In most Sub-Saharan African countries, women continue to be affected by health problems that contribute to maternal morbidity and mortality (Belue et al., 2021). To illustrate, a recent report on global maternal mortality trends indicates that Sub-Saharan Africa alone accounted for around 66% of estimated maternal deaths in 2017 (WHO et al., 2019). The work of Tessema et al, (2022) also indicates that in Sub-Saharan Africa, only 42.6% of women of childbearing age have access to healthcare. It is recognized that better health outcomes for women can help strengthen their agency by enabling them to actively participate in society and markets, take action to advance their own interests, have greater bargaining power and greater control

over resources within the household (WHO, 2012). So, removing barriers to access to healthcare will help enable women to acquire the capacity to access resources through which they can exercise their free will (Asaolu et al., 2018).

The results also identify participation in household decision-making as an important indicator of women's empowerment. The use of participation in decision-making as a valid indicator of women's empowerment is widely supported in the literature (Sariyev et al., 2020; van den Bold et al., 2013; Allendorf, 2012; 2007; Acharya et al., 2010; Garikipati, 2008; Malhotra et al., 2002; Kabeer, 1999). Burman and van der Spuy (1996) rightly define women's empowerment as their ability to make decisions about the personal aspects of their own lives, as well as decisions about the day-to-day running of the family and household. Women's ability to make such decisions derives from their control over resources and their ability to negotiate with other household members (Dunham and Flores-Yeffal, 2019; Mbwezi et al., 2008). Evidence suggests strong associations between women's decision-making and various development outcomes. These outcomes include improved well-being for women, their families and community development, family planning, maternal and child health, nutrition, access to information and paid work, etc. (Taukobong et al., 2016).

The fourth area highlighted by this work relates to education and media exposure. The importance of education for development and the reduction of inequalities is well known. As well as being recognized as a fundamental right, it is acknowledged that education has beneficial effects on a range of individual and socio-economic outcomes, and contributes positively to the promotion of gender equality (Aslam, 2013). For women in particular, the positive welfare impacts of education have been the subject of several studies and include outcomes in terms of health, fertility, nutrition, income, marriage, etc. (Tran et al., 2021; Miller et al., 2017; Weitzman, 2017; Kim, 2016; Jayachandran and Lleras-Muney, 2009; Duflo, 2001). Women's education is a critical condition for women's empowerment, as it promotes the acquisition of knowledge and facilitates greater access to and control over the resources needed to improve their condition and challenge ideologies of discrimination and subordination (Aslam, 2013; Ashraf and Farah, 2007). Education also enables women to become actively involved in growth, empowers them to make meaningful political and life choices, to be happier mothers with stronger marital relationships, and to exercise their rights and responsibilities as active agents in their society (Endiga, 2021).

Media also play an important role in shaping and promoting economic and socio-cultural development, as a means of informing people about policies aimed at improving their living

conditions, as well as a means for them to express themselves (Mbuya et al., 2020). Exposure to the media leads to changes in awareness, knowledge, attitudes, social norms and behaviours that can have a positive impact on well-being (Westoff and Akinrinola, 1997). Thus, for women, media exposure helps accelerate the process of empowerment through awareness of various social phenomena and factors such as gender inequality, health, education, etc. (Bala, 2017). Media exposure has been shown to exert a positive effect on women's status in terms of household decision-making capacity, mobility, financial knowledge and independence, attitude towards violence, maternal and reproductive health, and adoption of healthy lifestyle behaviors (Gashu et al., 2021; Seidu, 2020; Dasgupta, 2019; Zamawe et al.; 2016), etc. If we follow Narayan's (2004) definition of empowerment as "the enhancement of the assets and capabilities of individuals and groups to participate in, negotiate with, influence, control and hold accountable the institutions that affect their lives", then the dimensions highlighted by the current findings can be considered valid indicators of women's empowerment.

Conclusion

Gender equality and women's empowerment are considered crucial to the achievement of all sustainable development goals and targets, and are at the heart of many development policies and programs. A better understanding and promotion of actions aimed at improving opportunities for women must be based on instruments that can effectively guide actions and better monitor results.

The aim of this work was to construct a measure of women's empowerment in WAEMU. Exploratory and confirmatory factor analysis carried out on DHS data from seven countries, including Benin, Burkina-Faso, Côte-d'Ivoire, Mali, Niger, Senegal and Togo, identified a four-dimensional model for measuring women's empowerment that includes the domains of attitude to violence, participation in household decision-making, access to healthcare and education and media exposure. The Women's Empowerment Index based on these four domains provides a tool for assessing and comparing the status of women in terms of autonomy in the domestic and social sphere in UEMOA countries. The individual scores associated with each dimension represent the extent to which each woman has the status and resources to act responsibly and in her own interest.

These results suggest that current and future actions to promote women's empowerment should be consolidated and geared towards measures likely to increase women's capabilities in the areas included in the model proposed here. In terms of implications, these include :

- Changing women's perceptions through education, information and awareness-raising programs, encouraging them to adopt more egalitarian gender beliefs and reject the norms that force them into various forms of subordination, including the acceptance of violence.

- Strengthen women's access to and control over resources (especially economic resources), for example through programs designed to facilitate the development of sustainable income-generating activities. This will increase their bargaining power and decision-making capacity within households.

- Implement measures to facilitate women's access to healthcare services, for example, by removing constraints related to cost and physical accessibility.

- Further promote education and training for women and girls, and use the media effectively in support of policies to communicate the importance and relevance of actions aimed at empowering women.

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APPENDIX

Table A1: *Descriptive statistics by country*

	Burkina-Faso N=12,176	***Benin N=4,341***	***Côte-d'Ivoire N=5,672***	***Mali N=6,911***	***Niger N=9,111***	***Senegal N=10,372***	***Togo N=5,606***	***Total N=54,189***
	%	***%***	***%***	***%***	***%***	***%***	***%***	***%***
Domain : Economic								
Occupation (currently working=1)	*75.90*	*82.40*	*70.30*	*48.60*	*23.30*	*40.50*	*81.00*	*56.90*
Type of occupation								
Not working/working for a family member	*55.70*	*27.90*	*34.50*	*51.40*	*72.70*	*52.60*	*24.50*	*48.80*
Working for someone else/self-employed	*44.30*	*72.10*	*65.50*	*48.60*	*27.30*	*47.40*	*75.50*	*51.20*
Seasonality of work								
Does not work or occasional/seasonal work	*79.90*	*41.20*	*47.90*	*72.80*	*88.60*	*73.40*	*37.90*	*68.40*
Works all year round	*20.10*	*58.80*	*52.10*	*27.20*	*11.40*	*26.60*	*62.10*	*31.60*
Type of work income								
No income	*59.40*	*19.90*	*40.60*	*48.60*	*74.30*	*58.60*	*31.00*	*52.50*
Cash only/Cash and/or in kind	*40.60*	*80.10*	*59.40*	*51.40*	*25.70*	*41.40*	*69.00*	*47.50*
Income difference between spouses/partners								
Income lower than spouse's	*96.90*	*81.70*	*94.00*	*95.50*	*97.30*	*95.00*	*89.80*	*96.40*
Income similar to or higher than spouse's	*3.10*	*12.90*	*6.00*	*4.50*	*2.70*	*5.00*	*10.20*	*5.40*
Possession of land (joint or individual)	*38.10*	*16.50*	*35.80*	*35.10*	*38.30*	*13.50*	*11.80*	*28.50*
Home ownership (joint or individual)	*37.70*	*18.50*	*41.80*	*35.90*	*40.90*	*15.60*	*13.30*	*30.30*
Domain: Influence in household decision-making (single or joint decision)								
Who decides on the respondent's health care?	*24.20*	*46.90*	*33.70*	*19.50*	*20.20*	*29.80*	*40.70*	*28.40*
Who decides on major household purchases	*20.30*	*46.80*	*37.10*	*20.50*	*19.30*	*25.50*	*46.60*	*27.70*
Who decides on the use of husband's/partner's income	*53.60*	*25.70*	*45.60*	*11.70*	*18.20*	*15.80*	*16.90*	*28.30*
Domain: gender-related attitudes and beliefs								
(Husband justified in hitting/beating wife) (1=no. 0=yes/don't know)								
If she goes out without telling her partner	*66.20*	*74.30*	*68.20*	*44.20*	*55.10*	*54.80*	*79.50*	*61.60*
If she neglects the children	*66.90*	*73.60*	*64.00*	*46.20*	*55.90*	*56.10*	*78.40*	*61.80*
If she argues with him	*65.80*	*76.00*	*61.70*	*28.80*	*47.40*	*51.00*	*77.30*	*56.80*
If she refuses to have sex with him	*77.40*	*83.90*	*73.20*	*34.50*	*46.80*	*47.10*	*88.00*	*62.30*
If she burns food	*89.20*	*84.30*	*80.50*	*77.60*	*63.30*	*72.70*	*86.60*	*78.60*
Woman can refuse sex (1=yes. 0=no)	*54.00*	*58.50*	*43.20*	*25.80*	*31.20*	*28.90*	*71.90*	*44.30*
Can ask her husband/partner to use a condom (1=yes. 0=no)	*39.20*	*41.90*	*41.30*	*28.40*	*22.70*	*30.30*	*60.60*	*35.90*
Domain: Human and social assets								
Respondent's education (1=at least primary)	*18.60*	*35.30*	*36.10*	*29.90*	*15.30*	*29.50*	*61.10*	*28.90*
Literacy (1=can read all or part of a sentence)	*15.30*	*24.90*	*27.40*	*23.50*	*9.90*	*25.70*	*43.10*	*22.10*
Difference in education between spouses (same level/more educated)	*86.30*	*67.00*	*64.50*	*80.30*	*86.40*	*83.20*	*50.10*	*77.50*
Age at first marriage (18+)	*42.20*	*70.30*	*53.30*	*53.90*	*18.70*	*50.70*	*65.20*	*46.90*
Age at first birth (18+)	*69.00*	*95.20*	*62.10*	*93.00*	*54.10*	*69.50*	*76.40*	*71.70*
Age difference between spouses/partners (same age/older)	*2.80*	*O.082*	*6.20*	*1.70*	*0.50*	*3.50*	*6.50*	*3.50*
Watch television (at least once a week)	*27.60*	*17.30*	*56.60*	*21.90*	*23.00*	*69.50*	*42.20*	*37.40*
Listens to the radio (at least once a week)	*69.90*	*4.00*	*42.80*	*3.60*	*64.50*	*83.00*	*62.80*	*54.20*
Reads magazines/newspapers (at least once a week)	*6.20*	*21.40*	*12.40*	*23.30*	*2.60*	*14.00*	*9.50*	*11.40*
Gets permission to see a doctor (not a big problem)	*79.40*	*77.00*	*74.20*	*72.10*	*79.00*	*82.90*	*87.90*	*79.20*
Getting money for treatment (not a big problem)	*27.50*	*45.60*	*32.00*	*59.40*	*39.70*	*52.30*	*39.10*	*40.50*
Distance to healthcare facility (not a big problem)	*55.20*	*67.10*	*56.70*	*71.80*	*56.50*	*65.20*	*69.00*	*61.90*
Not wanting to go alone (not a big problem)	*82.50*	*81.80*	*16.10*	*81.10*	*72.90*	*84.70*	*86.60*	*81.60*

Table A2: Results of the factorial analysis sample adequacy test

Bartlett's sphericity test	
Degree of freedom	435
p-value	0.000
Kaiser-Meyer-Oklin Test	
KMO	0.770

Table A3: Accepted correlation between error terms based on modification indices

Correlated error terms	***Correlations***
	-0.344
	-0.440
	0.154
	0.267
	0.200

V1 : Going out without permission

V2 : Neglecting children

V4 : Refusing sex with spouse

V9 : Getting money for health care

V10 : Distance to healthcare facility

V11 : Going to health care facility alone

V12 : get permission to see a doctor

Table A4: *Average score for women's empowerment in the four dimensions*

Country	*Average Scores*			
	Attitude to violence	*Participation in decision-making*	*Access to health care*	*Education and media exposure*
Burkina-Faso	*0.679*	*0.253*	*0.213*	*0.298*
Benin	*0.744*	*0.409*	*0.253*	*0.296*
Côte-d'Ivoire	*0.626*	*0.322*	*0.220*	*0.373*
Mali	*0.436*	*0.191*	*0.260*	*0.263*
Niger	*0.528*	*0.200*	*0.226*	*0.278*
Senegal	*0.448*	*0.234*	*0.250*	*0.417*
Togo	*0.752*	*0.373*	*0.256*	*0.413*
Total sample	***0.586***	***0.265***	***0.237***	***0.333***

Figure A1: Cattell scree test

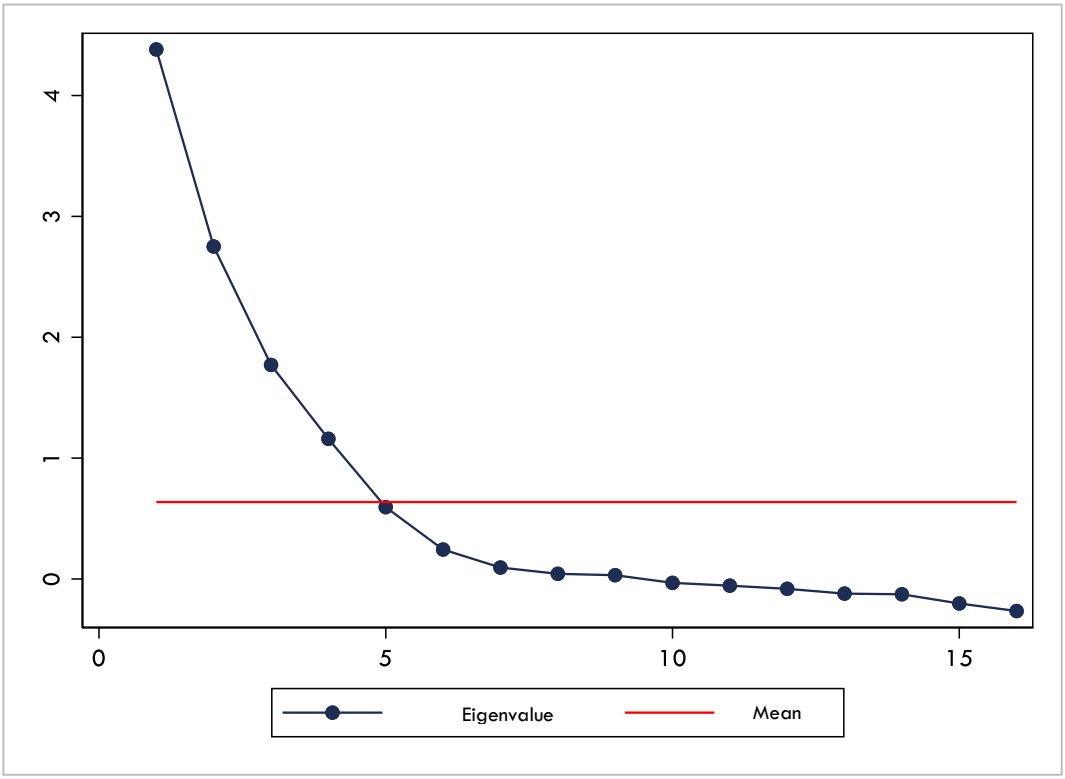

Table A5: Country ranking by women's empowerment domain

Country	***ranking***			
	Attitude to violence	*Participation in decision-making*	*Access to health care*	*Education and media exposure*
Burkina-Faso	*3*	*4*	*7*	*4*
Benin	*2*	*1*	*3*	*5*
Côte-d'Ivoire	*4*	*3*	*6*	*3*
Mali	*7*	*7*	*1*	*7*
Niger	*5*	*6*	*5*	*6*
Senegal	*6*	*5*	*4*	*1*
Togo	*1*	*2*	*2*	*2*