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Family Change and Variation Through the Lens of Family Configurations in Low- and Middle-Income Countries

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We show that the joint examination of family indicators offers new insights to understand family change across low- and middle-income countries. We operationalize this idea through the concept of *family configuration*. A *family configuration* is a confluence of interrelated conditions under which individuals form families. We measure *family configurations* using indicators for different dimensions of families: family forms and stability, gender relations, household structure, reproduction, and the timing of family formation events. We use data from 251 Demographic and Health Surveys disaggregated by urban and rural areas. Multiple Correspondence Analysis and clustering techniques allow us to summarize our 20 indicators into three factorial axes, and our 502 units into six country-area clusters (*family configurations*). We provide an in-depth description of these family *configurations*, how they change over time, and how they distribute across the globe. Our main conclusion is that global family change emerges from a complex interplay between the steadiness of traditional ways of forming families and gender relations, and the rapidly changing dynamics in the realms of fertility, contraception and timing of family formation. In most regions of the world, countries display different *family configurations*, and this diversity is larger among urban areas than rural ones. Together, these results underline the need to conceptualize population dynamics from a systemic perspective, i.e., from a perspective that focuses on the confluence of demographic indicators.

Keywords

Global Family Change, family configurations, family demography

Disciplines

African Studies | Asian Studies | Demography, Population, and Ecology | Eastern European Studies | Family, Life Course, and Society | Inequality and Stratification | International and Area Studies | Latin American Studies | Social and Behavioral Sciences

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We show that the joint examination of family indicators offers new insights to understand family change across low- and middle-income countries. We operationalize this idea through the concept of *family configuration*. A *family configuration* is a confluence of interrelated conditions under which individuals form families. We measure *family configurations* using indicators for different dimensions of families: family forms and stability, gender relations, household structure, reproduction, and the timing of family formation events. We use data from 251 Demographic and Health Surveys disaggregated by urban and rural areas. Multiple Correspondence Analysis and clustering techniques allow us to summarize our 20 indicators into three factorial axes, and our 502 units into six country-area clusters (*family configurations*). We provide an in-depth description of these family *configurations*, how they change over time, and how they distribute across the globe. Our main conclusion is that global family change emerges from a complex interplay between the steadiness of traditional ways of forming families and gender relations, and the rapidly changing dynamics in the realms of fertility, contraception and timing of family formation. In most regions of the world, countries display different *family configurations*, and this diversity is larger among urban areas than rural ones. Together, these results underline the need to conceptualize population dynamics from a systemic perspective, i.e., from a perspective that focuses on the confluence of demographic indicators.

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Introduction

Cross-national studies about family dynamics in low- and middle-income countries (LMICs) often focus on one outcome at a time, e.g., the prevalence of marriage/cohabitation, fertility rates, the timing of first births, or household composition (Seltzer 2019; Seltzer et al. 2005). Even when studies consider several aspects of the family on a large scale, they typically examine family outcomes separately (Pesando and GFC-team 2019). There is a paucity of studies looking at how family indicators relate to one another and how correlations among them generate *family configurations* of interrelated indicators.

In the present paper, we define a *family configuration* as a specific constellation of family indicators that may vary across time and space, capturing a broader pattern of change. Some of these configurations can be confined to discrete geographical regions observed in the demographic literature. For example, in recent decades the combination of relatively low fertility, stable and low mean age at first birth, and high (historical) prevalence of cohabitation has been specific to Latin American and Caribbean countries (Guzmán et al. 2006; Laplante, Castro-Martín, and Cortina 2018). Sub-Saharan African countries are similar to Latin American and Caribbean ones in terms of their mean age at first birth, but their fertility levels are higher. Additionally, the organization of couples and households in these two regions is different too, especially if one considers the prevalence of polygyny (Bongaarts 2017; Whitehouse 2018). Asian countries have equally low fertility levels compared to Latin America (especially the south part of the continent), yet postponement of first births and rigid family forms around formal – and in some countries arranged – marriage make this *family configuration* different (United Nations 2015a). West Asian and Eastern European countries also display rigid family forms, along with high mean ages of transition to family formation, and much lower fertility compared to other Asian countries. It is apparent then, that a particular indicator may be coupled or related to other indicators differently in various regions of the world, suggesting the utility of a more systemic approach to understanding family change.

The concept of *family configurations* is powerful because it considers the confluence of circumstances in which individuals make choices. Conceptualizing decision-making processes within a confluence of circumstances is a much more realistic approach to demographic change than thinking in terms of independent outcomes (Johnson-Hanks et al. 2011). This concept is also flexible because, at least in theory, distinctive family features are part of its definition. For example, more considerable dissimilarities across regions will appear if we consider gender relations as part of the definition of *family configurations*. The main point remains: individuals and families do not make decisions about, for example, fertility and union formation in isolation. Neither they experience the social world as separate spheres of family, fertility, household arrangements, and gender.

However, there is no direct empirical assessment of whether or not the correlation across family indicators is strong enough to constitute distinct *family configurations*, whether or not these *family configurations* cluster within geographical areas, and how family change occurs differently across them. This dearth of analysis has prevented family demography from gaining a systemic understanding of family dynamics. Not having a systemic approach often translates into describing the lack of change as ‘stalled transitions’ (Bongaarts 2017; Casterline 2017), ‘regional exceptionalism’ (Caldwell, Orubuloye, and Caldwell 1992), or ‘paradoxical trends’ (Esteve and Florez-Paredes 2018). More generally, the mismatch between predictions of modernization theories regarding the convergence of family forms towards small, intact, nuclear families, and the actual diversification of family arrangements might also be a consequence of neglecting the systemic connection across the different dimensions of the family (Cherlin 2012, 2016).

The systemic nature of the concept of *family configurations* makes it relevant for understanding differential family change. We believe sociologists and demographers have not fully exploited this potential. If family indicators are indeed strongly correlated, family change ought to be systemic. Moreover, because some aspects of families are more malleable than others, one should expect differential change across *family configurations*. For example, the quantum and timing of fertility are very likely to respond to socio-economic development. There is a vast and rich literature documenting how fertility decline as socioeconomic progress unfold (Myrskylä, Kohler, and Billari 2009; Pesando and GFC-team 2019).

Conversely, marriage, union formation, divorce, and union dissolution practices are less responsive to socioeconomic changes because they are tied to elements of the social structure that are harder to change. These structural features of societies include religious believes, marriage-related-laws/prohibitions, and inheritance rights (Coontz 2014). This is not to say that these aspects of the family have not changed over time, but to argue that predictions based on the modernization theory have overstated the significance of these changes (Cherlin 2016).

A similar case can be made regarding gender relations within the family as well as about household arrangements. Researchers have found evidence to describe gender revolutions in high-income countries as stalled processes, and there are good reasons to believe this is also the case among LMICs (England 2010; Sullivan, Gershuny, and Robinson 2018; Weitzman 2014). As for household arrangements, there is a strong dependence between the demographic structure of a population and the possibilities to observe, for instance, three-generation households (Ruggles 2012).

Our contribution in this paper is to show that empirically-identified *family configurations* provide a more nuanced understanding of the dynamics of stability and change in families across a large sample of LMICs from 1990 to the present. We are not the first to note the coexistence of stability and variation (Landale and Oropesa 2007; Lundh and Kurosu 2014; Raymo et al. 2015). However, we are the first to provide an empirical measure of this connection at a large scale, along with an interpretation of it in terms of systemic relations. We use a large and diverse country-area-level (urban and rural) dataset with information on 4 million women and 20 million household co-residents from 75 LMICs. This large sample of countries and its wide timeframe allow us to provide a comprehensive analysis of *family configurations*, their geographical distribution, and their changes over the last quarter-century.

We focus on five family dimensions that are broadly recognized in the literature, each with multiple indicators. First, the socially-recognized ways of ***forming family units*** and the relative stability of these units over time. Second, ***women's position*** within society and family units. Third, the characteristics of ***generational replacement*** via reproduction. Fourth, the ***household composition*** according to generation and kinship. Fifth, the ***timing of the demographic events*** that precede or accompany reproduction and family formation.

The basis of our analyses is an innovative set of Global Family Change (GFC) indicators that have been developed as part of a GFC project studying changing families across the globe, focusing in particular on LMICs that are often not represented in theories and analyses of family change. For each of the five dimensions, we compute four indicators. We then use these 20 indicators to build *family configurations*. Although we try to be as comprehensive as possible, the selection of indicators is limited, inevitably affecting our results. Besides data availability, the designation of each indicator was premised by two conditions. First, we include family features that have interested scholars in the past. Second, we select family indicators related to individuals' well-being, in particular, women's well-being, given the nature of our data sources (Demographic and Health Surveys).

Families in low- and middle-income countries

There are several studies of the family in LMICs, most of them with a regional focus (e.g., Latin America and the Caribbean, Sub-Saharan Africa, South-Asia). This literature has examined how economic and cultural values are related to changes in various family outcomes (Cherlin 2012; Dorius 2008; Goode 1963; Pesando and GFC-team 2019). Because we include five family dimensions and 75 countries, it is not practical to examine the vast literature related to these topics. Instead, we will confine our examination to articles and books that review and summarize the findings of previous research on the determinants of family change and its interest in locating geographical or county-level contexts where change has been examined in detail.

Our goal in discussing this literature is to convey three related ideas that are consistent with our approach. First, there is substantial variability between countries and in some cases, between urban and rural areas in family indicators. This variability can not be accounted for by a single deductively-defined (*top-down*) model of family change. Second, the correlation across these family dimensions is substantial and complex (e.g., non-linear). Measuring and describing this complexity will enable us to understand family variation and change in a geographical context. Third, the combination of these five dimensions provides a realistic frame for understanding individuals' living conditions that influence their family choices and practices. In other words, the joint study of these five dimensions will provide new descriptive insights on how family change occurs.

*First dimension: family formation and stability (**Family Forms**)*

Over the past three decades, the socially-recognized ways to form family units have diversified across LMICs as new forms have emerged (e.g., cohabitation), and traditional ones have declined, e.g., universal, early, formal, and arranged marriage (Koski, Clark, and Nandi 2017). Likewise, unions are less stable today than they were three decades ago (Clark and Brauner-Otto 2015; Esteve and Liu 2017; Jackson 2015). These two trends have occurred because, since recently (mid-1990), alternative ways to form families have been legally recognized alongside the possibility to dissolve marriages through a divorce (García and de Oliveira 2011). However, traditional forms are still modal (normative) across most of the societies we study (Fussell and Palloni 2004).

Some regional nuances deserve attention. The most obvious one is polygyny, a union arrangement documented mainly in Sub-Saharan Africa (Whitehouse 2018), and some other Central American, South-East, and Middle-East countries. Besides African countries, we found women in polygynous unions in Afghanistan, Cambodia, Guyana, Haiti, India, Myanmar, Timor-Leste, and Yemen. Among these countries, the prevalence of polygynous unions ranges from 0.2% in the urban area of Guyana in 2009 to 16% in the rural areas of Haiti in 2000. Further, formal marriages are more prevalent and stable in Asia compared to Latin America and the Caribbean and Africa. Moreover, arranged marriages are much more prevalent (and explicit) in the former region compared to the two latter (Pesando and Abufhele 2019). Finally, while cohabitation is booming in Africa and, to a lesser degree, among Asian countries, it has strong and distinct historical roots in Latin American societies (Esteve and Lesthaeghe 2016).

*Second dimension: gender relations and the role of women in family units (**Gender Relations**)*

Despite improvements in women's opportunities (e.g., the end of female hypergamy) and increasing societal recognition of the contribution of care-work in economic welfare, gender relations at the societal and couple levels are far from being egalitarian (Mason 2001; Sullivan et al. 2018). This gender inequality is very present in LMICs. Substantial gender discrimination exists in the labor market, access to education, and the division of care work (García and de Oliveira 2011; Weitzman 2014). Although it is still too early to assess the implications for gender egalitarianism of rising female labor force participation and emerging female hypogamy fully, it is nonetheless critical to take account of when and where changes have occurred in the LMICs (Blossfeld 2009; Esteve et al. 2016).

In LMICs, the emotional base of families remains a feminine space, and male-breadwinner models are still normative in many countries. These trends exacerbate in areas where state policies to prevent child poverty have overly relied on the assumption of female altruism toward children. The assumption and concentration on women's altruism for policymaking reinforce traditional conceptions about the role of women in families and societies (Jackson 2015; Liu, Esteve, and Treviño 2017). Macro-level indicators of gender development provide a glimpse of the magnitude of these differences.

According to the 2017 Human Development Report, LMICs have the lowest level in the Gender Development Index (GDI) worldwide. The GDI measures the gap between female and male well-being indicators at the national level. A theoretical context of perfect equality will produce a GDI of one. The average GDI for developing countries is lower than the world average (0.917 vs. 0.941, standard deviation=0.076), with the Arab States and Sub-Saharan African countries at the bottom of the distribution with an average GDI of 0.855 and 0.893, respectively. Latin American and Caribbean countries are at the top of the LMICs' rank with an average of 0.977 (Gaye et al. 2010). This index does not include two crucial dimensions of gender inequality: division of domestic work and gender-based violence. Including these two aspects will probably lower scores of the GDI for LMICs, given the high prevalence of violence against women in these countries (United Nations 2017).

*Third dimension: levels and relative control over biological reproduction (**Reproduction**)*

Fertility decline is one of the most significant demographic transformations of the 20th century in LMICs (Caldwell 2004; van de Kaa 1996; Lee 2003). Despite its widespread character, regional differences across LMICs and within them between urban and rural areas remain (Lerch 2017, 2019), as well as country-level differences within broad geographical regions (Clark 2015; Dorius 2008; McNicoll 1992). Recent assessments have pointed to Human Development as an appropriate scale to measure converging fertility patterns (Pesando and GFC-team 2019).

A key aspect of changes in fertility levels is couples' capacity to exert effective birth control, in particular through modern contraceptive methods. Although the debate between demand- and supply-side explanations of fertility decline is still open (Bongaarts and Sinding 2009, 2011), the transformative aspect of modern contraception for women is undeniable. Research has shown that the demand for modern contraception is proliferating, especially among adolescents women in Latin America, the Caribbean and Sub-Saharan African countries (Sánchez-Páez and Ortega 2018). This growing demand reflects a significant cultural shift among new generations. Overall, there is less demand for children, and modern contraception improves women's capacity to exert control over their reproductive lives. Substantial inequality in access to modern contraception by socioeconomic status is associated with varying levels of unmet need between and within LMICs (Bongaarts and Bruce 1995; Sedgh, Ashford, and Hussain 2016).

*Fourth dimension: family formation schedules (**Timing**)*

The timing of family-formation events is a crucial aspect of the family context because individuals' responsibilities and roles change substantially across different family statuses. Due to its severe and long-lasting implications, child marriage is still a significant concern in some regions of Africa and Asia (Koski et al. 2017). In some Asian societies, the transition to family formation goes along with stringent norms of co-residence: patrilocality or matrilocality. This association further shapes the position of individuals, in particular women, within the household sphere (Esteve and Liu 2017; Jackson 2015).

Increasing diversity in the mean ages of transition to family formation across socioeconomic status and educational groups (Bongaarts, Mensch, and Blanc 2017; Grant and Furstenberg 2007) coexist with the relative stability of family formation schedules at the country level in Asian and Latin American and Caribbean countries (Esteve and Florez-Paredes 2018; Raymo et al. 2015). This paradox arises from socioeconomic inequality, which has been associated, for example, with bimodal patterns in the mean age at first birth in some Latin American countries (Lima et al. 2018; Nathan, Pardo, and Cabella 2016). Less standardized and more diverse patterns of transition to adulthood correlate with unstable economic conditions such as structural unemployment, poverty, and lack of access to formal education, widespread across LMICs (Bozon, Gayet, and Barrientos 2009; Grant and Furstenberg 2007; Juarez and Gayet 2014).

*Fifth dimension: household composition according to generation and kinship (**Household Structure**)*

Households organize in a myriad of ways across LMICs (Bongaarts 2001). Improving mortality conditions has opened the possibility for the co-residence of multiple generations in Asian countries. Also, in these societies, people hold strong expectations about care and support from younger to older generations (Esteve and Liu 2017). Meanwhile, health epidemics such as HIV/AIDS, disproportionally affect Africa's young population, opening space for increasing household complexity as men or women change households after a partner's death (Heuveline 2004). In Latin America and the Caribbean, household complexity comes from colonial rules and prohibitions regarding marriage practices (De Vos 1995). In more recent times, Latin American and Caribbean countries have reached high levels of single-motherhood and the feminization of household headship due to union dissolution and increasing divorce (Liu et al. 2017). By contrast, this pattern is absent in Asian and Eastern European societies.

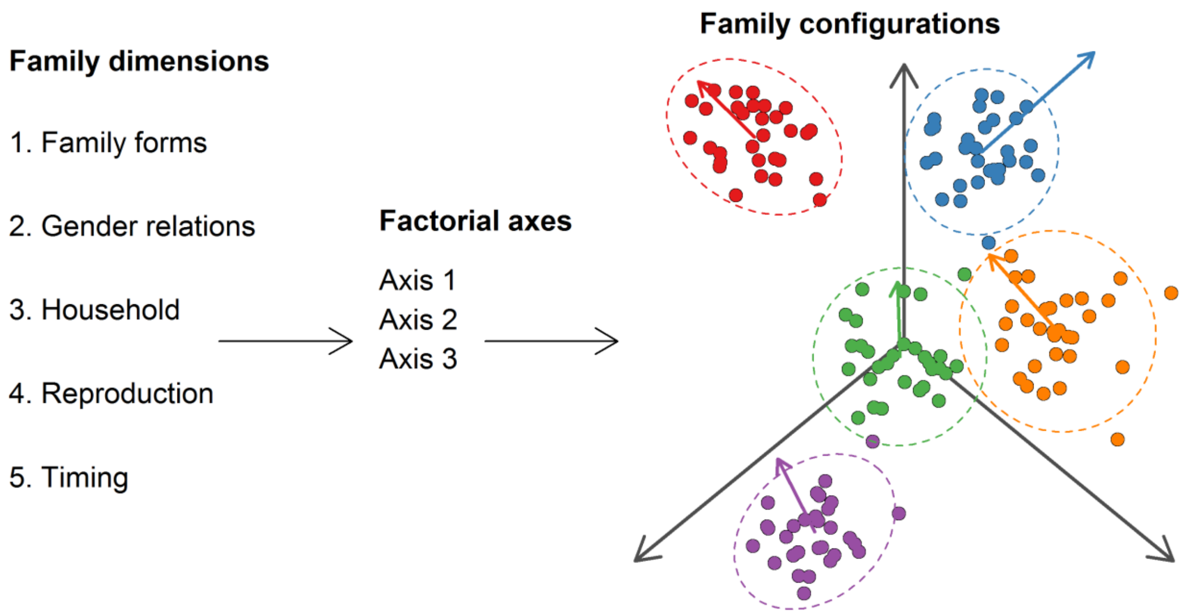
The overall picture suggested in the extant literature for each of the five dimensions is one of increasing heterogeneity and lack of convergence across countries and within them among socioeconomic groups, except perhaps in terms of fertility levels, in particular when convergence is measured over the Human Development Index. Therefore, analyzing these contexts requires a flexible approach, along with statistical methods designed to highlight multiple correlations and heterogeneity. We now turn to our analysis of how these five dimensions of family change are clustered across LMICs.

Analytical Strategy

Our approach differs from previous studies in three inter-related ways. First, we focus on relations among family indicators that pertain to the five family dimensions discussed above. We summarize relationships across family indicators using factorial analysis techniques and describe these summary measures (i.e., factorial axes). Second, we follow an inductive (*bottom-up*) approach, meaning that there is no preconceived theory about how outcomes should (or not) correlate. Third, our unit of analysis is the country-area-year, because we combine multiple surveys per country and disaggregate family indicators by urban and rural areas. This disaggregation allows us to identify more considerable heterogeneity in family forms. Having multiple waves per country enable us to assess changes over time i.e., comparing results for the earliest and the most recent survey waves.

These three analytic decisions allow us to explain how stability (similarity over time) and change (difference over time) in family indicators can coexist. Figure 1 displays a stylized summary of this idea. We start with five family dimensions, measured by 20 indicators. We use factorial analysis techniques to identify the main differentiation factors across families in our sample (i.e., factorial axes). We rely on these factorial axes to cluster our units of analysis into *family configurations* (clusters of points circled within ellipses). Using subsequent waves, we measure the average magnitude and direction of change for each *family configuration*. The length and the angle of each arrow represent the magnitude and direction of change over time, respectively.

Figure 1 – Stylized summary of the analytical approach



Note: This figure does not represent real data. The number of significant factorial dimensions, the distribution of units of analysis, and their clustering were chosen randomly. Arrows represent mean change over time, and confidence ellipses show the relative distinctiveness of *family configurations*. Distance means difference, and proximity means similarity in family indicators.

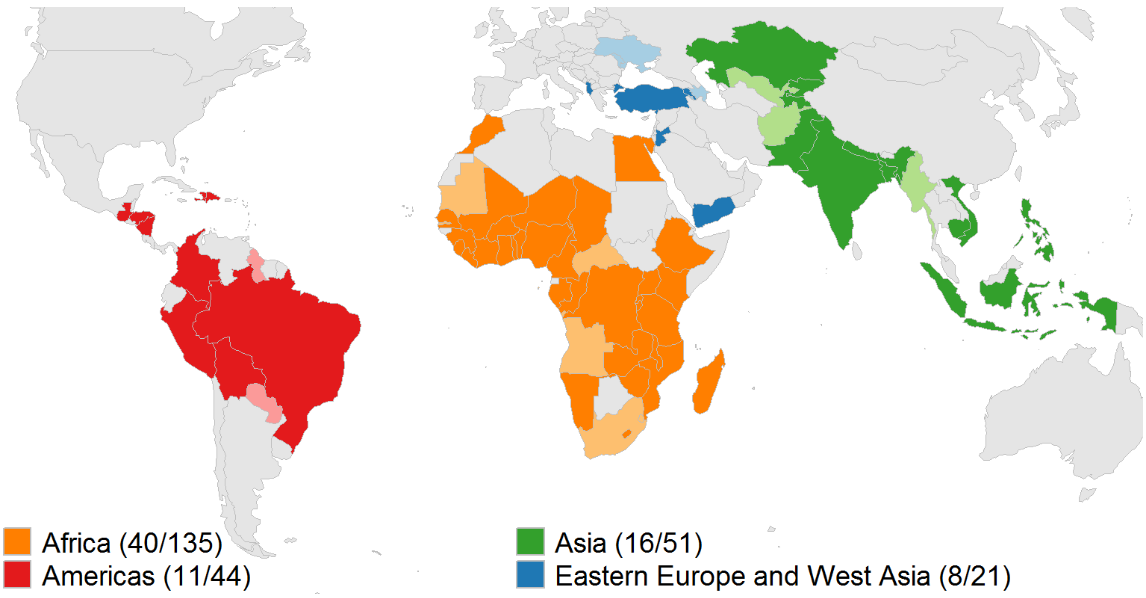
On the one hand, the mutual connections among family indicators might favor stability, i.e., the units of analysis tend to stay within areas represented by confidence ellipses. For example, fertility cannot be highest if biological reproduction only occurs within formal marriage, and formal marriage only happens among financially independent individuals (e.g., Asian countries). Likewise, multigenerational co-residence is only possible if mortality is low because grandparents need to be alive in order to share a dwelling with their grandchildren (Ruggles 2012). Similarly, educational homogamy (a marker of gender egalitarianism) can only be prevalent if women are allowed to attend schools as men (Bianchi 2014; Blossfeld 2009). On the other hand, to the extent that macroeconomic conditions and individual-level opportunity structures differ geographically and among individuals, there may be significant variation in family indicators within limits imposed by these correlations. In other words, *family configurations* may 'move' in specific directions as socioeconomic development unfolds.

We require one crucial assumption: that we can identify meaningful *family configurations* represented by the clustering of units of analysis and family indicators that prevail across time and space. In other words, we assume the clustering of our 20 measures and 502 units of analysis (country-area-year combinations) provides greater parsimony in capturing family change than do the 20 indicators treated separately. We assess the validity of this cluster approach by correlating clusters with measures of women's participation in intra-household decision making, women's labor force participation, Human Development (the index and its three components), and Gender Development (the index).

Data and measures

Our data are drawn from 251 Demographic and Health Surveys (DHS) covering 75 low- and middle-income countries (LMICs). These surveys are nationally representative of women of reproductive age. To maximize comparability, we only use standard DHS surveys collected after 1990 (Rutstein and Rojas 2006). Figure 2 displays the countries in the analysis. Darker colors indicate countries with at least two DHS (59). All the surveys are used in the factorial and cluster analyses (i.e., in the identification of factorial axes and *family configurations*), whereas only countries with at least two surveys are represented in the analysis of changes over time (i.e., the mean length and angle of arrows along factorial dimensions).

Figure 2 – Geographical coverage of the Demographic and Health Surveys, 1990 – 2017



Notes: In parentheses number of countries (total 75) / number of waves (total 251). Dark colors correspond to countries with at least two DHS waves (59). Light colors correspond to countries with only one DHS wave. Countries with only one DHS wave are Afghanistan, Angola, Azerbaijan, Central African Republic, Gambia, Guyana, Maldives, Mauritania, Myanmar, Paraguay, Republic of Moldova, Sao Tome and Principe, South Africa, Swaziland, Ukraine, and Uzbekistan.

DHS data are unique because they can produce nationally representative indicators for women in reproductive ages, living in urban and rural areas. In addition, DHS cover countries from different regions of the world. In our sample, we include 40 countries from Africa, 11 from Latin America and the Caribbean, 16 from Asia, and eight from Eastern Europe and West Asia. These countries span a wide range of the human and gender development spectrum. The Human Development Index ranges from 0.21 (Rwanda, 1992) to 0.79 (Albania, 2017) with quartiles at 0.44, 0.51, and 0.63. The Gender Development Index (only available for 58 countries, 124 country-years) ranges from 0.22 (Niger, 2012) to 1.01 (Lesotho, 2014) with quartiles at 0.85, 0.9 and 0.94.

Using this information, we selected 20 indicators, four per family dimension, across 502 units of analysis (251 surveys by area, urban and rural). Having the same number of indicators per dimension gives equal importance to each of them in the analysis. In the same spirit, we recode each indicator into five categories (lowest, low, medium, high, and highest) using the Jenks natural breaks as cuff-off points (Jenks 1967). These cut-off points are adequate because they preserve the main characteristics of the distribution of the numeric variable and give us reasonable cell-sizes in the five categories for all indicators. We prefer categorical variables instead of continuous because the former are better for capturing non-linear relationships.

All our indicators refer to women in reproductive ages. For example, when looking at household composition indicators, we will not present the proportion of households of a particular typology, but the proportion of women in reproductive ages who live in specific household types (nuclear, three-generations, complex, single). This approach is a more accurate analytical decision to guarantee geographical coverage, proper measurement, and a sensible interpretation of demographic indicators, especially those related to households.

Table 1 displays the five study dimensions and the 20 indicators. A short label is assigned to each indicator to facilitate description. To account for cross-national differences in age structures, all indicators—except "Acceptance of girls," "Childlessness," and "Age at last birth"—are standardized by age, using the 2000 population structure for less developed countries excluding the least developed ones (United Nations 2015b).

Table 1 – Family dimensions and family indicators.

Domain	Indicator	Short label	Method
Family forms	Prevalence of cohabitation	Cohabitation	Age-standardized
	Prevalence of divorce	Divorce	Age-standardized
	Prevalence of marriage	Marriage	Age-standardized
	Prevalence of remarriage	Re-marriage	Age-standardized
Gender relations	Prevalence of hypogamous couples	Hypogamy	Age-standardized
	Female headship (non-single mothers)	Female headship	Age-standardized
	Women without sons / without daughters	Acceptance of girls	Age group [25,50)
	Prevalence of paid work (mothers in a couple)	Paid work	Age-standardized
Household	% of women living in three-g households	Three-g hh.	Age-standardized
	% of women living in single-m. households	Single-mother hh.	Age-standardized
	% of women living in nuclear households	Nuclear hh.	Age-standardized
	% of women living in complex households	Complex hh.	Age-standardized
Reproduction	Prevalence of childlessness	Childlessness	Age group [45,50)
	Met need for contraception	Contraception	Age-standardized
	Net Reproduction Rate	NRR	Age-standardized
	Parity progression from 2 to 3	PPR 2-3	Age-standardized
Timing	Mean age at first birth	Age first birth	SMA- first birth
	Mean age at last birth	Age last birth	Age group [45,50)
	Mean age at first marriage	Age first marriage	Age-standardized
	Mean duration between marriage and first birth	Marriage to birth	Age-standardized

Notes: Short labels are used in graphs. The 'Method' column distinguishes age-specific (cohort) indicators from those that use the information on all women, i.e., 15 to 49 years old. The NRR and the Singulate Mean Age at first birth (SMA) are defined in (Preston et al., 2010).

All these indicators capture period conditions, i.e., a state of circumstances. This is less the case for "Acceptance of girls," "Childlessness," and "Age at last birth" because these indicators pertain to cohorts. However, we could not find a way of producing simple/interpretable period measures that could replace these three.

Family forms: these indicators measure the prevalence of family forms and their relative stability based on women's marital status at the time of the survey. The proportion of married women and the proportion of women living in cohabiting unions capture the prevalence of the two most common and socially recognized forms of family formation.[2] Also, we include the prevalence of divorce and separation to capture the degree of stability of both types of unions and the proportion of women in second and higher-order marriages. This latter indicator tells us the extent to which new families organize after dissolution.

We did not include the prevalence of polygyny in the identification of *family configurations* because of its skewed distribution at the country-level biases the results of the factorial analysis (see details below). However, we examine the prevalence of polygyny across *family configurations* and we conclude that patterns are consistent with our interpretation. There is one *family configuration* where polygynous arrangements are very prevalent. Among the other *family configurations,* the percentage of women in a polygynous arrangement is unimportant (refer to Figure A2).

Gender relations: indicators in this dimension are defined so that higher values indicate more egalitarian conditions for women. To measure women's position within households, we use the proportion of women who are head of the household among those who live with a partner, and the proportion of couples where the woman has higher educational attainment than her partner (female educational hypogamy, hypogamy herein). Household headship is associated with the provision of economic resources for the household, which makes this proportion a good measure of women's economic role.[3] Similarly, high levels of hypogamy are associated with higher

[2] To avoid mechanical correlation between these two indicators, we compute the proportion of women in cohabiting unions only among non-married women.

[3] "The person who is identified as the head of the household has to be someone who usually lives in the household. This person may be acknowledged as the head on the basis of age (older), sex (generally, but not necessarily, male), economic status (main provider), or some other reason. It is up to the respondent to define who heads the household.

bargaining power for women within couples, given the increasing importance of human capital accumulation for labor market outcomes.

As a measure of women's position in society, we use the proportion of women who are currently working and receive payment in cash. This indicator measures the degree of women's involvement in productive activities beyond household and care work. We compute this proportion among women married or in union with children to capture more precisely women's opportunities to work once they form a family.

In addition, we include the ratio of women ages 25 to 49 who have not had a son (women-with-no-son) to women in the same age range who have not had a daughter (women-with-no-daughter). This indicator captures the relative importance of male to female births. If there is no sex preference, the number of women-with-no-son (numerator) should be similar to the number of women-with-no-daughter (denominator). If male births are preferred, there may be fewer women without sons than women without daughters, and then the ratio between these two numbers will be less than one. In contexts where having at least one son is very important, this ratio should be low, i.e., by age 25, very few women would not have sons, whereas a more significant fraction of them would not have daughters. This approach is preferable to standard measures of sex preferences (e.g., the sex ratio at birth) because it does capture the fact that what matters the most is having at least one male birth (preferably the first) rather than a specific sex composition (Héritier 1996; Multiple Authors 2018:9).

Household structure: indicators in this dimension refer to the proportion of women living in one of four household forms.[4] First, when a woman lives uniquely with her partner with or

[4] These indicators are not intended to measure decision to co-reside across members of different generations or kinship relations. Rather, they aim to characterize the context in which women in reproductive ages live.

without children, she is classified as living in a nuclear context—no additional relatives are part of the household.[5] Second, if a woman lives with children and without a partner, she is classified as living as a single mother regardless of the presence of other relatives. These two contexts serve as a basis to identify more complex arrangements, as recommended by Murdock (1949).

Women in the nuclear and single-mother categories are classified as living in a three-generation context (three-g) when a least one member of the household reports a relationship with the household head that indicates the co-residence of three generations. For instance, if one member reports to be the father/mother of the household head in a nuclear context, we assume the children of the couple are the grandchildren of this respondent. A fourth household type occurs when collateral relatives are living in the dwelling. These relatives include aunts, uncles, nephews, and nieces. Note that only the first category (nuclear) is exclusive, i.e., nuclear contexts are pure nuclear units due to the absence of any member besides a unique couple and their children (if any). On the contrary, a household may include a single mother, a grandfather, and an uncle, in which case it will contribute to the numerators for the proportion of women living in these three types of households (single-mother, three-gen., and complex). Appendix B includes a full description of the methodology we followed to identify household types.

Reproduction: This dimension comprises measures of reproduction levels and access to contraception. Measures of reproduction levels include the Net Reproduction Rate (NRR), the prevalence of childlessness among women ages 45 to 49, and the parity progression ratio from the second to the third birth (PPR 2-3).[6] These three indicators capture different aspects of biological reproduction. The NRR measures the overall level of population replacement while

[5] The proportion of households composed uniquely by a couple without children is very small (approx. 3% overall unweight) for which the category of nuclear households corresponds mostly to couples with at least one child.

[6] As recommended by the DHS program, the NRR and the PPR 2-3 are based on births that occurred during the previous 36 months with respect to the date of the survey.

accounting for women's mortality conditions. The prevalence of childlessness incorporates potential differences in infertility across populations and the relative importance of maternity. The PPR 2-3 is the complement of a period measure of stopping childbearing at parity two. Our measure of contraceptive practice is the reciprocal of the proportion of women with unmet need for contraception, as defined by Bongaarts and Bruce (1995). We use the reciprocal to measure access rather than unmet need.

Timing: the fifth and final dimension includes three mean ages and one indicator for the time between the start of a union and the first birth. The mean age at first birth and mean age at first marriage serve us to measure the initiation of family life. Together with the mean age at last birth, these variables provide a sense of the length of the motherhood window, i.e., the proportion of a woman's (in reproductive ages) life that is devoted to childbearing and childrearing. The mean time between marriage and first births provides additional insights on the role of unions for reproduction. Long intervals signal independence between union formation and childbearing, whereas short intervals point to societies where the separation of these two events is less acceptable.

Methods

We perform a Multiple Correspondence Analysis (MCA) to our table of 502 units and 20 categorical indicators. MCA is a factorial analysis technique specially designed for summarizing categorical variables into hierarchically ordered orthogonal axes (Greenacre and Blasius 2006; Lebart, Morineau, and Piron 1997; Le Roux and Rouanet 2004). These axes serve two primary purposes. First, they serve to display dissimilarity across units of analysis and correlations among variables. Second, they summarize relationships among family indicators hierarchically.

In an MCA plot, proximity means a positive correlation (between variables) and resemblance (among units), whereas distance implies negative correlation and discrepancy. Two categories of a variable are close to one another in the space defined by the MCA-axes if, overall, the same subsets of units pertain to them (positive correlation). Two units are close to one another in the MCA-space if, overall, they pertain to the same categories (e.g., low-NRR, high-mean age at first birth, low-prevalence of marriage). For example, if units of 'low fertility' are also units where contraceptive use is high, and the mean age at first birth is low, then the categories 'low fertility,' 'high contraceptive use,' and 'low mean age at first birth' should be close to one another; together with the units pertaining to these categories (potentially urban areas of Latin American and Caribbean countries). The reverse is true for categories with no shared units in them.

MCA-axes are hierarchically ordered because the first axis summarizes the largest amount of variance. In other words, the first axis comprises the main associations among all family indicators. The percent of explained variance decreases among the remaining axes, and the sum of all equals 100%. If few axes summarize a large proportion of the variance, say three or four, one can focus on them to construct *family configurations* via cluster analysis. That is what we do.

We use MCA-axes to cluster units following two steps. First, we use the Ward-method to find groups of units with similar values along the first three MCA-axes (see the justification for this below). The Ward-method minimizes the variance within-cluster by grouping units with similar values in the MCA-axes. This method identifies nested cluster solutions with 2, 3, 4, up to 502 groups. In the second stage, we implement the K-means algorithm to consolidate the cluster solutions of the previous stage. For the sake of parsimony, we compare cluster solutions of 3 to 8 clusters and we focus on a six-category partition (See Kaufman (1990) and Pardo and Del Campo (2007) for the technical details of hierarchical and no-hierarchical clustering).[7]

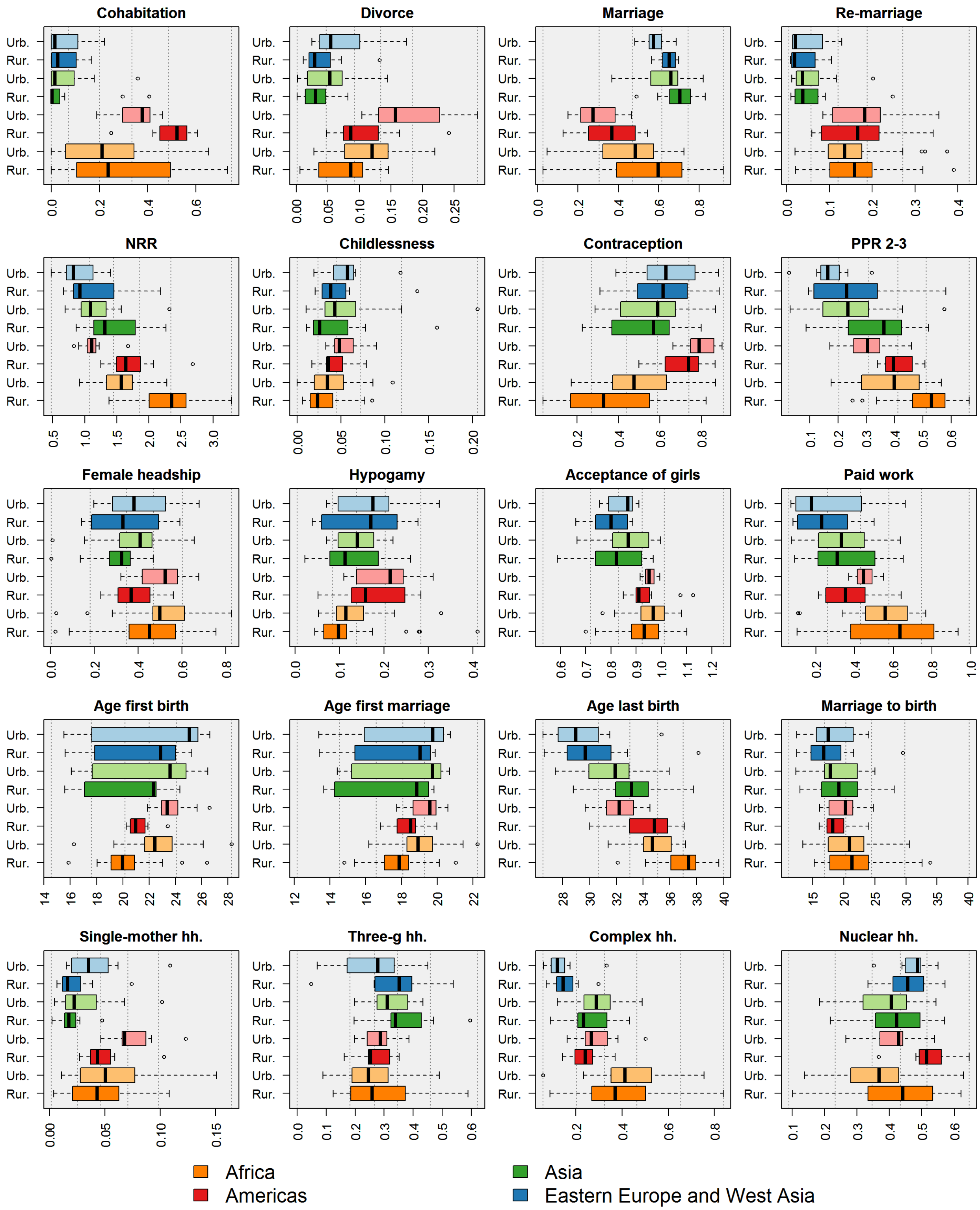
Results

Figure 3 provides descriptive measures for the 20 indicators by sub-region and area (urban vs. rural) for countries' most recent DHS (median survey year = 2013). Background lines indicate the minimum, maximum, and the cut-off points for the lowest, low, medium, high and highest categories.

Figure 3 shows two conflicting aspects. On the one hand, median patterns in Figure 2 are consistent with the geographical differences and trends described in previous sections in terms of family forms, reproduction levels, the timing of family formation, and household composition. The rank of regions aligns with our common demographic knowledge on indicators such as the prevalence of cohabitation, divorce, marriage, and remarriage. For example, Latin American and Caribbean countries stand out with the lowest prevalence of marriage, and the highest prevalence of divorce and remarriage, especially in urban areas. Likewise, all reproduction-related measures are consistent with the higher fertility levels of Sub-Saharan African countries, in particular among rural areas. In these rural areas, the NRR and PPR 2-3 are the highest, and the proportion of women with met-need for contraception and without children the lowest. Median levels of the timing of union formation and first births also align with our descriptions. Transition to family formation occurs earlier in rural populations in all regions, whereas the reverse is valid for the median age at last birth.

[7] In all the analyses, we weight each country-area-year by the product between the inverse of the number of waves per country and the within-country proportion of women living in the area (rural vs. urban). This weighting strategy gives equal weights to each country and higher weight to areas with a more significant proportion of women. The number of samples varies from one (16 countries, weight=1) to 12 (Peru, weight=1/12). The percent of women living in urban areas varies from 6.2% (Rwanda, 1992) to 88.6% (Gabon, 2012).

Figure 3 – Distribution of family indicators by region and area of residence



Notes: vertical lines indicate the Jenks natural breaks of the overall distribution. These breaks define categories: lowest, low, medium, high, and highest. Short labels are defined in Table 1.

The distribution of countries in terms of household composition also aligns with previous research. Single-motherhood is more prevalent in urban than in rural areas, especially in Latin America, the Caribbean, and Africa. This higher prevalence coincides with a high prevalence of complex households that display its highest values in African countries. Instead, three-generation households are more prevalent in Asian countries, followed by Eastern-European and Central Asian nations. In the realm of gender, patterns are much more complicated. There is no clear leading-region or area in terms of gender egalitarianism according to these indicators. Although urban areas from Latin America and the Caribbean rank high in almost all gender indicators, the prevalence of paid work is higher in rural areas of African countries.

On the other hand, Figure 3 also shows how conventional geographical classifications conceal significant heterogeneity in family indicators. Concealed heterogeneity means that by averaging trends at the regional level or across rural and urban areas, we may be losing essential differences. For example, boxes representing African countries are very wide, signaling significant cross-national heterogeneity in both urban and rural areas. In almost all cases, rural areas in Africa spread across at least 2/3 of the entire range of the indicators.

This pattern is not unique to Africa. It is also observed for some indicators in other regions. For example, despite resemblance in the prevalence of cohabitation, Central/Caribbean and South American countries differ substantially in the prevalence of divorce and re-marriage, which produces very wide boxplots for the prevalence of marriage and divorce/separation. Likewise, the timing of the transition to family formation (first birth and marriage) varies very much across countries in Asia and Eastern-Europe. Although part of this heterogeneity may be due to arbitrariness in our definition of these groups, the main point here is that we should avoid averaging across predefined geographical categories. Other geographical groupings such as

North-Africa and Middle-East (MENA), North Africa alone, Former USSR nations, Asia alone, etc. will also produce wide boxes, which will lead us to the same conclusion.

The country-area-year level correlation across family indicators is very strong; consequently, a large proportion of the total variance is accounted for by the first two factorial axes of the MCA: 35.9% and 33.0%, respectively. These first two factorial axes summarize (almost evenly) 68.9% of the total variance across the 20 indicators. The third axis accounts for 8.2% of the total variance, while the remaining axes account for less than 5%. This hierarchical structure allows us to focus on the first three MCA-axes to provide a parsimonious description of family diversity accounting for 77% of the total variance. This percent of explained variance is very high compared to typical R^2 values in country-level regression analyses, more so if one considers that it refers to 20 variables, and not to one single outcome.

As robustness checks, we run the MCA over three different samples: (1) using only surveys collected before 2005 (118 waves, 55 countries), (2) using surveys collected after 2004 (133 waves, 64 countries), and (3) excluding surveys where only married women are in the DHS (210 waves, 68 countries).[8] Results are very similar across these three samples, and they are available upon request.

To understand what these axes mean, Table 2 displays the contribution of each indicator to the variance of the three factorial axes (Contr.), the correlation coefficient between each indicator and each factorial axis (Corr.), and the respective significance level (Sig.). Significance tests were only run for variables with contributions above the median (3.4%). We highlight

[8] Countries with ever married samples are: Afghanistan (2015), Bangladesh (1993-2014), Egypt (1992-2014), India (1992, 1998), Indonesia (1991-2007), Jordan (1990-2017), Maldives (2009), Nepal (1996, 2001), Pakistan (1990-2017), Turkey (1993, 2003), Vietnam (1997, 2002), and Yemen (1991). Note that the DHS waves for India (2015), Indonesia (2017), and Nepal (2016) include all women.

contributions above this median. The second to last row displays the sum of the highlighted contributions to support our interpretation of each factorial axis further.[9]

Table 2 – Percent contribution of variables to the variance of factorial axes and linear correlations between variables and factorial axes.

Domain	Indicator	First axis			Second axis			Third axis		
		Contr.	Corr.	Sig.	Contr.	Corr.	Sig.	Contr.	Corr.	Sig.
Family	Cohabitation	**8.7**	0.65	***	1.3	-0.15		2.7	-0.07	
	Divorce	**11.6**	0.78	***	1.0	0.22		**3.6**	0.12	**
	Marriage	**9.2**	-0.72	***	3.2	-0.31		3.3	-0.12	
	Re-marriage	**8.6**	0.62	***	**4.0**	-0.42	***	1.9	0.09	
Gender	Hypogamy	2.4	0.24		**4.2**	0.45	***	1.8	0.16	
	Female headship	**7.6**	0.63	***	0.2	0.00		1.6	-0.12	
	Acceptance of girls	**8.5**	0.65	***	0.4	-0.12		1.5	0.00	
	Paid work	**4.9**	0.52	***	**4.0**	-0.41	***	2.8	-0.26	
Household	Three-g hh.	1.4	-0.08		0.2	-0.11		**8.7**	0.46	***
	Single-mother hh.	**10.4**	0.65	***	1.5	0.31		**4.7**	-0.26	***
	Nuclear hh.	0.5	-0.04		1.1	0.21		**12.2**	-0.55	***
	Complex hh.	1.4	0.22		**5.5**	-0.54	***	**8.4**	0.42	***
Reproduction	Childlessness	1.3	0.13		**4.5**	0.42	***	1.0	0.11	
	Contraception	1.5	0.15		**9.7**	0.74	***	2.2	0.16	
	NRR	0.1	0.06		**12.9**	-0.83	***	**13.1**	-0.25	***
	PPR 2-3	0.7	0.28		**10.8**	-0.75	***	**11.4**	-0.16	***
Timing	Age first birth	**8.6**	0.57	***	**9.6**	0.37	***	3.2	-0.07	
	Age last birth	1.0	0.25		**11.7**	-0.77	***	**12.1**	-0.20	***
	Age first marriage	**8.8**	0.71	***	**9.9**	0.32	***	1.2	-0.11	
	Marriage to birth	2.9	-0.11		**4.3**	-0.47	***	2.6	0.17	
Sum of contr. above the median		**86.9**			**91.1**			**74.2**		
Total		100.0			100.0			100.0		

Notes: In bold contributions above 3.4% (median contribution). Significance tests were only run for variables with bolded contributions. Significance levels are represented as: + 0.1, * 0.05, ** 0.01 and *** 0.001. An alternative representation of these contributions is displayed graphically in Figure A1 in the Appendix.

[9] The direction of the axes is arbitrary and it does not change the interpretation of results. We choose directions according to trends over time, i.e., the positive side of an axis correspond to the direction in which most of the countries are moving over time.

The first axis is mostly accounted for by indicators of the Family Forms, Gender Relations, and Timing dimensions. Summing across indicators in Table 2, 38%, 23%, and 21% of the variance of this axis is accounted for by measures in these three dimensions, respectively. All correlations of indicators with significant contributions to this factorial axis are above 0.5 in absolute value and are statistically significant. From a theoretical standpoint, this factorial axis distinguishes contexts of highly traditional family forms and gender roles, from less traditional ones. In other words, this factorial axis is a construct related to customs and traditions about how and when women form families and their roles within households and societies. Traditional family forms correspond to places where the relative acceptance of female births is lower than male, the prevalences of early, universal, and stable marriages are high, and women are less likely to be: head of the household, single-mothers, and to participate in economic activities (negative coordinates in the first dimension).

This interpretation is consistent with the correlations between this axis and country-level indicators of human and gender development. This dimension correlates weakly and negatively with the Human Development Index (-0.12, *p-value=0.012*), and relatively strongly with the Gender Development Index (0.36, *p-value=0.000*). These correlations are robust to year and region fixed-effects (Refer to Table A1 in the Appendix).

The second axis summarizes aspects of Reproduction and Timing. About 38% and 35% of the variance of this axis is accounted for by measures in these two dimensions, respectively. This dimension comprises the well-known negative relationships between fertility and contraceptive prevalence, childlessness, and the timing of family formation (first birth and marriage). All variables with substantial contribution to the variance of this dimension correlate significantly with it, although correlations are slightly lower compared to those observed for the first dimension. The absolute value of these correlations ranges between 0.32 (Age at first marriage) and 0.83 (NRR). These correlations are weaker because the relationships between variables and this second axis are not linear (Refer to Figure A1 in the Appendix).

Contrary to the first axis, this second axis correlates strongly with both the Human Development Index and the Gender Development Index, 0.679 and 0.493, respectively (in both cases the *p-value=0.000*). These correlations are consistent with previous research showing that fertility, contraceptive use (met need), and the timing of family formation respond to socioeconomic development. Further, the fact the HDI and GDI correlations with factorial axes are weaker for the first axis than the second suggests that MCA results distinguish characteristics of the family that change differently.

Finally, the third dimension summarizes cross-area differences in the household context of women: 34% of the variance of this dimension is accounted for by Household Structure indicators. This dimension separates areas where household complexity is low (i.e., high prevalence of nuclear households) from areas where household complexity is substantial (i.e., high prevalence of three-g and complex households). Among the four household indicators considered, the one related to single-mother households has the weakest correlation (-0.26), although this correlation is still statistically significant. Note the indicator of the prevalence of single-motherhood has the highest contribution in the first dimension (10.4%) and correlates very strongly with this dimension (0.65). These two results are consistent with the interpretation of the first dimension in terms of traditions and gender-related norms to the extent that single-motherhood is a non-normative family arrangement.

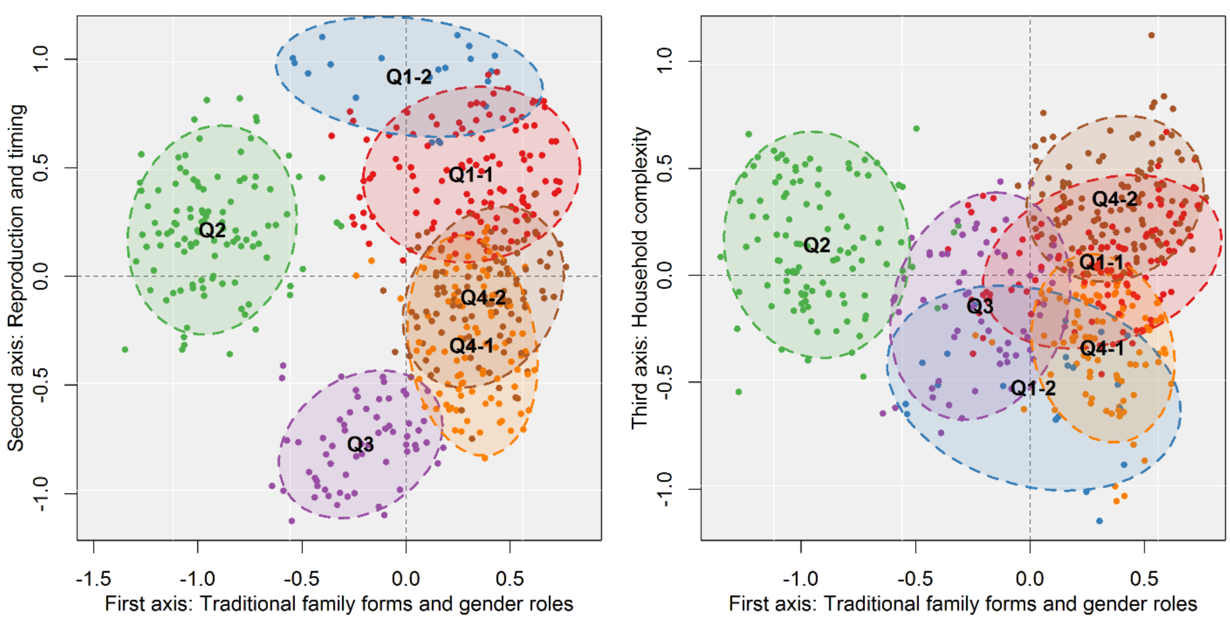
Briefly, our three independent MCA-axes (factorial axes) are summary measures of (1) traditional family forms and gender roles – negative values correspond to more traditional societies, whereas values above zero correspond to less traditional family systems; (2) reproduction levels and timing of transitions to family formation, we set the axis such that positive coordinates correspond to lower fertility, later transitions to family formation and higher prevalence of contraceptive use and childlessness, all with respect to the overall sample means; and (3) household complexity along the lines of generation and kinship. In this latter axis, positive values correspond to units with a high prevalence of complex households (three-g and complex households) and a low prevalence of nuclear households (pure nuclear).

We use the coordinates of all units in these three axes to group them into *family configurations*. The proportion of explained variance by clusters solutions of 3 to 8 groups are: 61%, 68%, 72%, 75%, 78%, and 79%, respectively. These proportions of explained variance suggest that a six-cluster solution is adequate according to two criteria. First, the proportion of explained variance is above 50%. Second, the marginal increase in this proportion decreases after the sixth partition. The proportion of explained variance increases by three percentage points from the 5th to the 6th partition (72-75%), and by two percentage points from the 6th to the 7th (75-78%).

Figure 4 displays the location of these six *family configurations* along the first three MCA-axes. We label the axes in order to facilitate interpretation. The left panel uses the first and the second dimension, and the right panel combines the first and the third. We label *family configurations* according to the quadrant they locate in the left panel as Q1-1, Q1-2, Q2, Q3, Q4-1, and Q4-2. We add an 85% confidence ellipse to depict the relative variability of each cluster.

There are two predominantly-urban *family configurations* (Q1-1 and Q1-2), two predominantly rural (Q3 and Q4-1), and two mixed (Q2 and Q4-2). Q2 has the evenest distribution meaning that for these countries, the rural and urban family contexts are very similar. The other *family configurations* are either predominantly urban or predominantly rural, except for Q4-1 that also has a very mixed distribution of areas (68.2% urban). This latter *family configuration* is very particular because it groups rural and urban areas from different geographical regions (see more details below).

Figure 4 – Country-year areas' distribution across factorial axes, family configurations, and 85% confidence ellipses for clusters in the first two factorial planes



Notes: confidence ellipses are drawn based on the within-cluster covariance of the factorial dimensions. All ellipses include 85% of the country-areas in the cluster

The center of each panel ({0,0} coordinate) corresponds to a theoretical average unit, whereby all our comparisons are relative to this unit. Negative values in the horizontal dimension correspond to traditional family forms and gender roles, and positive values correspond to the opposite. The vertical direction in the left panel corresponds to the second MCA-axis, i.e., from bottom to top, high to low fertility levels, intermediate to delayed transitions to family formation, and from a low to a high prevalence of contraception. The vertical axis in the right panel corresponds to the third MCA-axis and separates country-areas where the prevalence of nuclear households is low (top) from countries where this prevalence is high (bottom).

Overlapping areas among ellipses indicate similarity, and the lack of intersection indicates sharp distinctions among *family configurations*. The most distinct *family configuration* is Q2. Its strong negative coordinate in the first factorial axis implies that family forms and gender roles are very traditional. Fertility levels and the prevalence of contraception are slightly above the average in country-areas of this cluster. The second-most distinct configuration is Q3. In this cluster, family forms are also more traditional than the average (negative coordinate in axis one) but not as much as in Q2. What distinguishes Q3 from Q2 is that country-areas in this cluster have the highest fertility, the lowest prevalence of met-need for contraception, and relatively early ages of transition to family formation, although not as early as in Q2. Also, Q3 groups countries with the highest prevalence of polygyny. Figure A2 in the Appendix displays a full comparison of *family configurations* across the three factorial dimensions, the prevalence of polygyny, and the 20 indicators included in the MCA.

There are two overlapping *family configurations* in the fourth quadrant of the left panel: Q4-1 and Q4-2. Family forms and gender roles are less traditional in these countries meaning that, compared to average levels, marriage is less prevalent and cohabitation, divorce, and re-marriage more prevalent. Also, women living in these country-areas are more likely to be in hypogamous couples and to work for pay. Fertility is higher than average and transition to family formation also occurs earlier compared to mean levels. Although these two configurations appear close to one another in the left panel, they are separated from each other in the right panel, meaning that household arrangements are different between them. Complex households are more prevalent in Q4-2 than Q4-1, and the reverse is true for the prevalence of women living in nuclear arrangements.

The last two *family configurations* (Q1-1 and Q1-2) depict positive coordinates in the first factorial axis, meaning that these two *family configurations* are less traditional than average. Notably, Q1-2 has a slightly lower coordinate in the first axis, meaning that this configuration has some traditional traits. Fertility is considerably lower in these two configurations, and the transition to family formation occurs much later compared to all other clusters, especially in Q1-2. These two configurations are slightly separated from each other in the right panel, meaning that household arrangements are different between them. Complex households are more prevalent in Q1-1 than Q1-2.

Table A2 in the Appendix section validates these results. Table A2 displays clusters characteristics in terms of mean coordinates in the three factorial axes, six indicators of women's participation on decisions within the household, and six country-level indicators provided by the United Nations: Human Development Index, Gender Development Index, Life expectancy index, Education index, Income index, and female labor force participation rate. Cross-cluster patterns in the six women's participation indicators and the six external indices give validity to our cluster solution and support our interpretation of these groups.

We measure change over time by taking the difference between the MCA-coordinates of the earliest and most recent survey among countries with at least two DHS. To account for different inter-survey intervals we standardized change over time to represent change per decade. We calculate these differences for the three axes and we combined these changes in an overall measure of change: the squared root of the sum of squared changes in each axis (arrows' length, as represented in Figure 1).

Further, we measure units' direction of change using the angle between change in the first and second axis. Angles between 0 and 90 degrees indicate change towards less traditional family forms and gender roles, along with decreasing fertility levels, rising contraceptive prevalence, and later transition to family formation overtime. Within this range, angles that are below 45 degrees indicate that change in family forms and gender roles is faster than changes in fertility and the timing of family formation. Angles between 45 and 90 mean that change in reproduction is faster than the change in family forms and gender relations. Table 3 displays all these indicators along with a significance test for Ho: $\mu_i = 0$, where *i* indexes *family configurations*.

Table 3 – Percent of urban units by family configuration and changes over time in country-areas coordinates for countries with at least two DHS waves.

	Family configurations												**Overall**	
	Q1-1		**Q1-2**		**Q2**		**Q3**		**Q4-1**		**Q4-2**			
Percent urban units	73.5	***	90.5	***	44.9	***	12.9	*	19.3	***	68.2	***	50.0	***
Change in MCA-axes														
First	0.12		-0.03		0.17		0.27	*	0.22	+	0.15		0.18	***
Second	0.50	*	0.24		0.48	**	0.34	+	0.61	**	0.44	**	0.47	***
Third	-0.12		-0.05		-0.14		-0.17		0.50	**	-0.11		-0.02	
Overall	0.83	***	0.68		0.81	***	0.81	**	1.05	***	0.73	***	0.83	***
Angle (degrees)	50.3	***	72.4	*	68.2	***	35.6	*	63.1	***	52.9	***	55.1	***
Number of units														
Oldest waves	20		4		24		20		21		29		118	
Most recent	31		6		22		13		23		23		118	

Notes: Significance test were run under Ho: $\mu_i = 0$, where i indexes *family configurations*. Significance levels are represented as: + 0.1, * 0.05, ** 0.01 and *** 0.001. Standard errors are clustered at the country-level

Overall, country-areas are ‘moving’ overtime towards the top-left area of the left panel in Figure 4 (Overall angle = 55 degrees, counterclockwise). Because of the way the MCA is applied, units can switch *family configurations* over time. However, across the 59 countries with at least two DHS, 37 urban areas and 41 rural areas did not change *family configuration* across waves. In other words, 37% and 31% of country-areas switched *family configuration* across waves. These percentages are even smaller is one counts changes at the unit level and not the country-level. There were only 32 changes in *family configurations* across urban units (14%), and 23 changes among rural units (10%). In addition, these changes occur across ‘contiguous’ *family configurations*, e.g., from Q2 to Q3, or from Q4-2 to Q4-1. These results are consistent with the idea of family change being limited by the correlation among family indicators.

The most rapid changes are occurring in the second axis at a pace of 0.47 standard deviations per decade, followed by changes in the first dimension. These later changes are occurring at a very much slower pace: 0.18 standard deviations per decade. The slowest change occurs in the third dimension (-0.02 standard deviations per decade). Notably, the pace of change in the second dimension is almost three times that of the first. These differential paces produce an angle of 55 degrees and an overall pace of change of 0.8 standard deviations per decade. These figures indicate that global family change occurs unequally across MCA-axes being fast for reproduction and timing of family formation (axis 2), and considerably more moderate for the axis summarizing family forms and gender norms (axis 1).

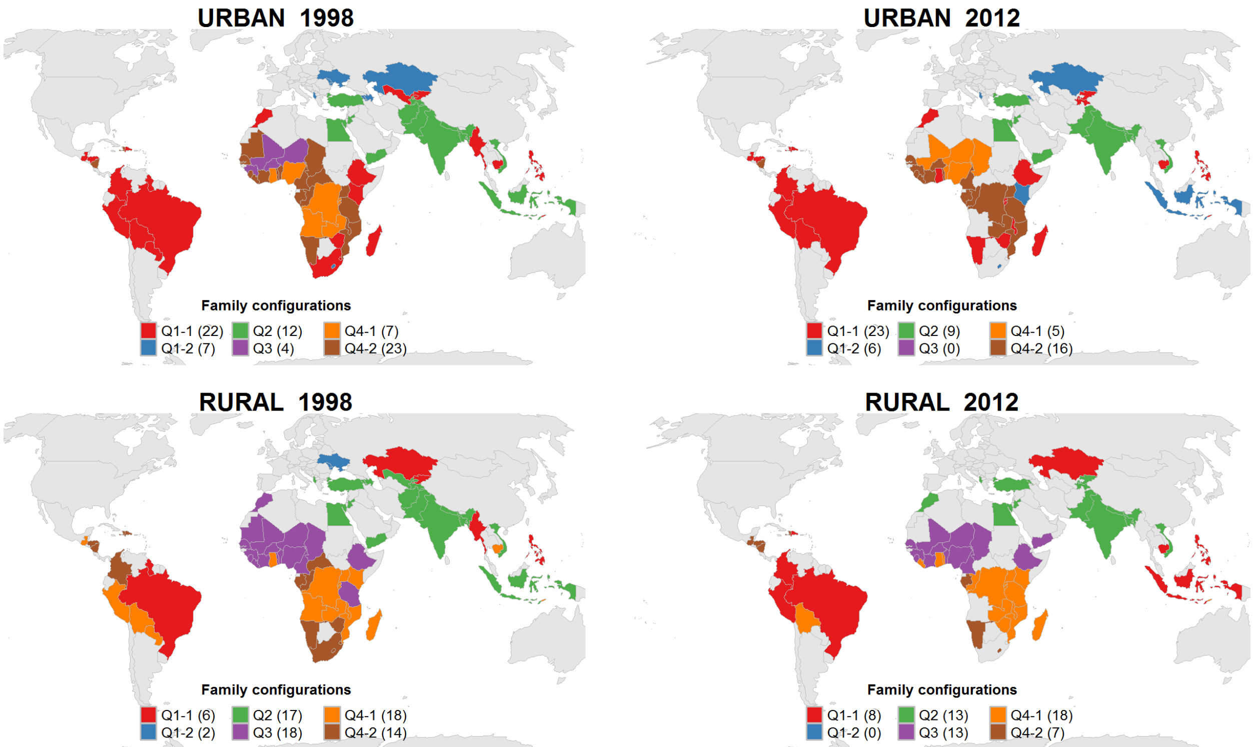
Also, these results underline that substantial differences in the pace and direction of change across *family configurations* characterize global family change. Some *family configurations* are rigid in all dimensions. Others only display a significant change in some of them, and some others are very fluid, meaning that they display a significant change in all three MCA-axes. The most rigid configuration is Q1-2, as none of the changes is significant, but these results should be taken with care given the small number of country-areas in this group.

Family configurations labeled as Q1-1, Q2, and Q4-2, display similar change patterns. These three *family configurations* are moving rapidly (around 0.5 standard deviations per decade) in the second dimension, while changes in the first are not statistically significant. The two predominantly rural configurations are the most fluid (Q3 and Q4-1). Notably, the angle of change for Q3 is the lowest (35.6 degrees) meaning that traditional family forms and gender norms are changing faster than reproduction-related variables among units in this *family configuration*. On the contrary, reproduction-related changes are much more significant among units in Q4-1 (angle = 63.1 degrees). Finally, the last configuration (Q1-2) is predominantly urban and rather static. Changes in all factorial axes are not significant. However, results should be taken with care due to the small number of units in this configuration.

Our final result is the geographical distribution of *family configurations*. Figure 5 displays this distribution for the two areas of residence around two different moments in time. The left panel uses the first survey for the 75 countries (mean survey year = 1998), and the right panel uses the most recent survey wave only for countries with at least two waves (mean survey year = 2012).

Overall, urban areas are becoming more diverse, especially in Africa whereby 2012, there are no urban areas in Q3. In contrast, the geographical clustering of *family configurations* in rural areas strengthened between the 1990s and the years after 2010. There are not rural areas in Q1-2 in the map for the most recent survey waves.

Figure 5 – Geographical distribution of *family configurations* by area (Urban vs. Rural) for the first (left panel) and last (right panel) DHS waves



Notes: the left panel display *family configurations* for all 75 countries using the first DHS waves (mean survey year = 1998). The right panel displays *family configurations* for the most recent survey across the 59 countries with at least two DHS (mean survey year = 2012).

The most striking pattern from Figure 5 is that in almost all countries, rural and urban areas pertain to different *family configurations*. The most notable exceptions are countries from South-Asia and the Middle-East. In most of these countries, rural and urban areas are grouped in Q2, the most distinct and somehow rigid *family configuration*. This cluster is remarkably consistent over time, with only rural-Yemen, the Philippines, and Indonesia dropping out of this category in the most recent wave. This switch in the *family configuration* is very unique and significant, given the strong distinctiveness of Q2.

For all other countries outside of Q2, variation and changes over time in *family configurations* are more visible in urban areas than rural. The geographical distribution of *family configurations* of rural areas does not change much over time. Notably, there is a clear-cut distinction among *family configurations* in the rural areas of West, Central, and South Africa, three geographical locations often grouped under the category Sub-Saharan Africa.

What is very distinct from urban *family configurations* is their geographical dispersion. The color patterning in urban areas is much more variegated than rural even though there are no urban areas in Q3 among the most recent DHS waves. The Q1-1 *family configuration* appears all over the globe in the two urban maps (1998 and 2012), from Nicaragua to the Philippines passing by Ghana, Kenya, Kyrgyzstan, and Cambodia. In addition, there is also a clear divide between west and east urban areas. There is no urban area to the west of Albania classified in Q1-2 or Q3; all urban areas of the west are Q1-1, Q4-1, or Q4-2.

A final caveat deserves attention; the consistency of the classification of Latin American and Caribbean areas overtime should be taken with care. Not all Latin American countries have DHS surveys after 2010 (e.g., Brazil, Bolivia Guyana, Nicaragua and Paraguay). Haiti is very small in area and it may not be identified (*family configuration* = Q4-2). Not to mention the notable absence of Mexico in the analysis.

Conclusions and discussion

We start with the hypothesis that family change across LMICs can be better understood from a systemic perspective, i.e., from a perspective that focuses on the correlations among family indicators and the *family configurations* ensuing from them. We note that previous research has not paid enough attention to this aspect; at the very least previous research has not attempted to measure *family configurations* directly.

Under this assumption, we expected that a small set of *family configurations*—specific combinations of family-related demographic features—across LMICs could be empirically identified using demographic information. We expected these *family configurations* to have similar patterns of change over time, and a significant level of geographical grouping according to the regions typically considered in demographic studies (Latin American and the Caribbean, Sub-Saharan Africa, East-Asia). We used external country-level data to validate *family configurations* (e.g., decision-making indicators, Human Development Index, Gender Development Index).

Using data from 75 LMICs over 27 years, we confirm our expectations and provide an in-depth description of six *family configurations*, their geographical distribution, and their dynamics of change between 1990 and 2017. This analysis uses the information of more than 4 million women interviewed by the DHS, and the 20 million people that lived with them at the moment of the survey. To do this, we follow four steps.

First, we identified five family dimensions typically studied by demographers and sociologists of the family and computed four standardized indicators per dimension (attributing equal *a priori* importance to each indicator). Second, we conducted an MCA on a country-area-year level dataset of 502 units (country-area-year combinations) and 20 indicators. This analysis allowed us to identify three factorial dimensions distinguishing families in our sample: the first three MCA-axes. In a third step, we used these dimensions to cluster units of analysis into six *family* *configurations*. Finally, leveraging information from 59 countries with multiple DHS waves, we explore changes over time in these *family configurations*.

We found family indicators to be strongly correlated, which underlines the importance of conceptualizing family demographics systemically. Three uncorrelated factorial axes summarize approximately 77% of the total variation across the 20 indicators. The first axis separates areas with opposing regimes in terms of how and when families are formed (early, universal, and stable, i.e., traditional vs. non-traditional ways) and in terms of gender roles (less favorable vs. more favorable for women). The association between family forms and gender relations is consistent with anthropological and historical accounts of the evolution of the family that have pointed to the role of the family in the development and reproduction of patriarchy (Coontz 2014; England and Budig 1998; Goldin and Katz 2002; Héritier 2002). The second dimension opposes country-areas in terms of their level of fertility, the propensity of progressing to third births, and middle ages of transition to family formation and childbearing. A third (more marginal) dimension comprises remaining differences across areas in the proportion of women living in complex vs. non-complex household contexts.

Along these three dimensions, we identified six *family configurations* with very distinct family regimes, geographical distributions, urban-rural compositions, and patterns of family change over time. *Family configurations* range from predominately urban, relatively stable, and geographically widespread configurations (e.g., Q1-1), to predominantly rural, rapidly changing, and geographically concentrated ones (e.g., Q3). In between these two extremes, there are *family configurations* of mixed composition of urban and rural areas. One of them is very rigid (Q2), and the other much more fluid (Q4-2). The aggregation of these dynamics produces a global context of diverse family change. This composite picture explains in part why convergence hypotheses are not fully confirmed in previous studies. While gaps in some aspects of the family are merging more rapidly (e.g., reproduction-related indicators), some others are changing at a slower pace (e.g., traditions and customs on when and how to form family units).

These results support the interpretation of recent family dynamics across LMICs in terms of changes within durable structures. This understanding highlights, on the one hand, structural conditions that limit the universe of possible family arrangements. On the other, it also shows how this universe of possibilities is changing. The relative stability of family dimensions and the sustained divergent positions of *family configurations* along them are the product of a long history of cultural development (Livi Bacci 1992). One can hardly expect this pattern of stability and macro-regional differences to vanish in the short- or mid-term.

Meanwhile, *family configurations* do change but in a more limited set of aspects and within the boundaries of the structural conditions, as a response to economic and demographic development (increasing HDI and higher life expectancy, for example). In short, a *family configurations* approach refines the interpretation of family change across LMICs in terms of "convergence towards diversity" to systemic family change within durable structures.

The geographical clustering of *family configurations* is weaker than we expected. We were especially surprised by the considerable variation in the geographical locations of Q1-1. Despite the apparent clustering of colors in Figure 5, sub-regional distinctions are also very apparent. In every continent and almost in every sub-region within continents, there is at least one country-area with a *family configuration* that differs from the most prevailing one; although results may be different if we include all countries of the world, it is possible to raise a warning against mere regional groupings for describing demographic patterns in the family.

These results could inform the design of future comparative studies of smaller scales (e.g., two to six countries). The clusters presented here as *family configurations* may help to create samples with strong external or internal validity. For example, this classification can help researchers to select countries from different *family configurations* and examine differences in population-level outcomes. These outcomes could include child health, maternal mortality, sex differences in children's nutritional status (to mention a few examples of information available in the DHS). This classification can also help to select units that pertain to the same *family configuration* (urban areas) across different continents to test the significance of *family configurations* for other demographic, social or economic outcomes.

References

Bianchi, Suzanne M. 2014. "A Demographic Perspective on Family Change." *Journal of Family Theory & Review* 6(1):35–44.

Blossfeld, Hans-Peter. 2009. "Educational Assortative Marriage in Comparative Perspective." *Annual Review of Sociology* 35(1):513–30.

Bongaarts, John. 2001. "Household Size and Composition in the Developing World in the 1990s." *Population Studies* 55(3):263–79.

Bongaarts, John. 2017. "Africa's Unique Fertility Transition." *Population and Development Review* 43:39–58.

Bongaarts, John and Judith Bruce. 1995. "The Causes of Unmet Need for Contraception and the Social Content of Services." *Studies in Family Planning* 26(2):57.

Bongaarts, John, Barbara S. Mensch, and Ann K. Blanc. 2017. "Trends in the Age at Reproductive Transitions in the Developing World: The Role of Education." *Population Studies* 71(2):139–54.

Bongaarts, John and Steven Sinding. 2011. "Population Policy in Transition in the Developing World." *Science* 333(6042):574–76.

Bongaarts, John and Steven W. Sinding. 2009. "A Response to Critics of Family Planning Programs." 39(1).

Bozon, Michel, Cecilia Gayet, and Jaime Barrientos. 2009. "A Life Course Approach to Patterns and Trends in Modern Latin American Sexual Behavior." *JAIDS Journal of Acquired Immune Deficiency Syndromes* 51:S4–12.

Caldwell, John C. 2004. "Demographic Theory: A Long View." *Population and Development Review* 30(2):297–316.

Caldwell, John C., I. O. Orubuloye, and Pat Caldwell. 1992. "Fertility Decline in Africa: A New Type of Transition?" *Population and Development Review* 18(2):211.

Casterline, John B. 2017. "Prospects for Fertility Decline in Africa." *Population and Development Review* 43:3–18.

Cherlin, Andrew J. 2012. "Goode's World Revolution and Family Patterns: A Reconsideration at Fifty Years." *Population and Development Review* 38(4):577–607.

Cherlin, Andrew J. 2016. "A Happy Ending to a Half-Century of Family Change ?" *Population and Development Review* 42(1):121–29.

Clark, Samuel J. 2015. "A Singular Value Decomposition-Based Factorization and Parsimonious Component Model of Demographic Quantities Correlated by Age: Predicting Complete Demographic Age Schedules with Few Parameters."

Clark, Shelley and Sarah Brauner-Otto. 2015. "Divorce in Sub-Saharan Africa: Are Unions

Becoming Less Stable?" *Population and Development Review* 41(4):583–605.

Coontz, Stephanie. 2014. *Marriage, a History : How Love Conquered Marriage*. 1st ed. New York: Penguin Books.

Dorius, Shawn F. 2008. "Global Demographic Convergence? A Reconsideration of Changing Intercountry Inequality in Fertility." *Population and Development Review* 34(3):519–37.

England, Paula. 2010. "The Gender Revolution: Uneven and Stalled." *Gender & Society* 24(2):149–66.

England, Paula and Michelle J. Budig. 1998. "Gary Becker on the Family: His Genius, Impact, and Blind Spots." Pp. 95–111 in *Required Reading: Sociology's Most Influential Books*, edited by D. Clawson. Amherst: University of Massachusetts Press.

Esteve, Albert and Elizabeth Florez-Paredes. 2018. "The Stability Paradox: Why Expansion of Women's Education Has Not Delayed Early Union Formation or Childbearing in Latin America." *Studies in Family Planning* 49(2):127–42.

Esteve, Albert and Ron J. Lesthaeghe. 2016. *Cohabitation and Marriage in the Americas: Geo-Historical Legacies and New Trends*. edited by A. Esteve and R. J. Lesthaeghe. Cham: Springer International Publishing.

Esteve, Albert and Chia Liu. 2017. "Family and Household Composition in Asia." Pp. 370–93 in *Routledge Handbook of Asian Demography*. New York : Routledge, 2018.: Routledge.

Esteve, Albert, Christine R. Schwartz, Jan van Bavel, Iñaki Permanyer, Martin Klesment, and Joan García-Román. 2016. "The End of Hypergamy: Global Trends and Implications." *Population and Development Review* 42(4):615–25.

Fussell, Elizabeth and Alberto Palloni. 2004. "Persistent Marriage Regimes in Changing Times." *Journal of Marriage and Family* 66(5):1201–13.

García, Brígida and Orlandina de Oliveira. 2011. "Family Changes and Public Policies in Latin America." *Annual Review of Sociology* 37(1):593–611.

Gaye, Amie, Jeni Klugman, Milorad Kovacevic, Sarah Twigg, and Eduardo Zambrano. 2010. "Measuring Key Disparities in Human Development: The Gender Inequality Index." *Human Development Research Paper*.

Goldin, Claudia and Lawrence F. Katz. 2002. "The Power of the Pill: Oral Contraceptives and Women's Career and Marriage Decisions." *Journal of Political Economy* 110(4):730–70.

Goode, W. J. 1963. *World Revolution and Family Patterns*. Free Press of Glencoe.

Grant, Monica J. and Frank F. Furstenberg. 2007. "Changes in the Transition to Adulthood in Less Developed Countries." *European Journal of Population* 23(3–4):415–28.

Greenacre, M. and J. Blasius. 2006. *Multiple Correspondence Analysis and Related Methods*. 1st ed. Chapman & Hall/CRC Press.

Guzmán, José, Jorge Rodríguez, Jorge Martínez, Juan Contreras, and Daniela González. 2006. "The Demography of Latin America and the Caribbean since 1950." *Population-E* 61(5–6):519–76.

Héritier, Francoise. 1996. *Masculin/Feminin I. La Pensée de La Différence*. Paris: Odile Jacob.

Héritier, Francoise. 2002. *Masculin/Feminin II. Dissoudre La Hiérarchie*. Paris: Odile Jacob.

Heuveline, Patrick. 2004. "Impact of the HIV Epidemic on Population and Household Structure: The Dynamics and Evidence to Date." *Aids* 18(Supplement 2):S45–53.

Jackson, Cecile. 2015. "Modernity and Matrifocality: The Feminization of Kinship?" *Development and Change* 46(1):1–24.

Jenks, George. 1967. "The Data Model Concept in Statistical Mapping." *International Yearbook of Cartography* 7.

Johnson-Hanks, Jennifer, Christine A. Bachrach, Philip Morgan, and Hans-Peter Kohler. 2011. *Understanding Family Change and Variation: Toward a Theory of Conjunctural Action*. 1st ed. New York: Springer.

Juarez, Fatima and Cecilia Gayet. 2014. "Transitions to Adulthood in Developing Countries." *Annual Review of Sociology* 40:521–38.

van de Kaa, D. J. 1996. "Anchored Narratives : The Story and Findings of Half a Century of Research into the Determinants of Fertility." *Population Studies* 50(3):389–432.

Kaufman, Leonard and Peter J. Rousseeuw. 1990. *Finding Groups in Data: An Introduction to Cluster Analysis*. New York: Wiley.

Koski, Alissa, Shelley Clark, and Arijit Nandi. 2017. "Has Child Marriage Declined in Sub-Saharan Africa? An Analysis of Trends in 31 Countries." *Population and Development Review*.

Landale, N. and R. Oropesa. 2007. "Hispanic Familie: Stability and Change." *Annual Review of Sociology* 33.

Laplante, Benoît, Teresa Castro-Martín, and Clara Cortina. 2018. "Change and Continuity in the Fertility of Unpartnered Women in Latin America, 1980–2010." *Demographic Research* 38(1):1577–1604.

Lebart, Ludovic, Alain Morineau, and Marie Piron. 1997. *Statistique Exploratoire Multidimensionnelle*. 2nd ed. Paris: Dunod.

Lee, Ronald. 2003. "The Demographic Transition: Three Centuries of Fundamental Change." *Journal of Economic Perspectives* 17(4):167–90.

Lerch, Mathias. 2017. "Urban and Rural Fertility Transitions in the Developing World: A Cohort Perspective."

Lerch, Mathias. 2019. "Regional Variations in the Rural-Urban Fertility Gradient in the Global

South” edited by B. Lanza Queiroz. *PLOS ONE* 14(7):e0219624.

Lima, Everton E. C., Krystof Zeman, Tomas Sobotka, Mathias Nathan, and Ruben Castro. 2018. “The Emergence of Bimodal Fertility Profiles in Latin America.” *Population and Development Review* 0(0):1–21.

Liu, Chia, Albert Esteve, and Rocío Treviño. 2017. “Female-Headed Households and Living Conditions in Latin America.” *World Development* 90(637768):311–28.

Livi Bacci, Massimo. 1992. *A Concise History of World Population*. 3rd ed. Malden, MA: Blackwell.

Lundh, Christer and Satomi Kurosu. 2014. *Similarity in Difference : Marriage in Europe and Asia, 1700-1900*. London: The MIT Press.

Mason, Karen. 2001. “Gender and Family Systems in the Fertility Transition.” *Population and Development Review* 27(Supplement):160–76.

McNicoll, Geoffrey. 1992. “Changing Fertility Patterns and Policies in the Third World.” *Annual Review of Sociology* 18:85–108.

Multiple Authors. 2018. *Routledge Handbook of Asian Demography*. 1st ed. edited by Z. Zhongwei and A. C. Hayes. New York: Routledge.

Murdock, George Peter. 1949. *Social Structure*. London: The Macmillan Company.

Myrskylä, Mikko, Hans-Peter Kohler, and Francesco C. Billari. 2009. “Advances in Development Reverse Fertility Declines.” *Nature* 460(7256):741–43.

Nathan, Mathias, Ignacio Pardo, and Wanda Cabella. 2016. “Diverging Patterns of Fertility Decline in Uruguay.” *Demographic Research* 34(1):563–86.

Pardo, Campo Elías and Pedro César Del Campo. 2007. “Combinación de Métodos Factoriales y de Análisis de Conglomerados En R: El Paquete FactoClass.” *Revista Colombiana de Estadistica* 30(2):231–45.

Pesando, Luca Maria and Alejandra Abufhele. 2019. “Household Determinants of Teen Marriage: Sister Effects Across Four Low- and Middle-Income Countries.” *Studies in Family Planning* 50(2):113–36.

Pesando, Luca Maria and GFC-team. 2019. “Global Family Change: Persistent Diversity with Development.” *Population and Development Review* 45(1):133–68.

Raymo, James M., Hyunjoon Park, Yu Xie, and Wei-jun Jean Yeung. 2015. “Marriage and Family in East Asia: Continuity and Change.” *Annual Review of Sociology* 41(1):471–92.

Le Roux, Brigitte and Henry Rouanet. 2004. *Geometric Data Analysis: From Correspondence Analysis to Structured Data Analysis*. Dordrecht.

Ruggles, Steven. 2012. “The Future of Historical Family Demography.” *Annual Review of Sociology* 38(1):423–41.

Rutstein, Shea Oscar and Guillermo Rojas. 2006. *Guide to DHS Statistics*. DHS Program - USAID.

Sánchez-Páez, David Antonio and José Antonio Ortega. 2018. "Adolescent Contraceptive Use and Its Effects on Fertility." *Demographic Research* 38(April):1359–88.

Sedgh, Gilda, Lori S. Ashford, and Rubina Hussain. 2016. "Unmet Need for Contraception in Developing Countries: Examining Women's Reasons for Not Using a Method." *Guttmacher Institute* (June):2–48.

Seltzer, Judith A. 2019. "Family Change and Changing Family Demography." *Demography* 56(2):405–26.

Seltzer, Judith, Christine Bachrach, Suzanne Bianchi, Caroline Bledsoe, Lynne Casper, Lindsay Chase-Lansdale, Thomas DiPierete, Joseph Hotz, Philip Morgan, Seth Sanders, and Duncan Thomas. 2005. "Explaining Family Change and Variation: Challenges for Family Demographers." *Journal of Marriage and Family* 67:908–25.

Sullivan, Oriel, Jonathan Gershuny, and John P. Robinson. 2018. "Stalled or Uneven Gender Revolution? A Long-Term Processual Framework for Understanding Why Change Is Slow." *Journal of Family Theory and Review* 10(1):263–79.

United Nations. 2015a. *World Fertility Patterns 2015*. New York.

United Nations. 2015b. *World Population Prospects: The 2015 Revision*. Vol. XXXIII.

United Nations. 2017. *From Commitment to Action : Policies to End Violence Against Women in Latin America and the Caribbean.* Panama: United Nations Development Programme.

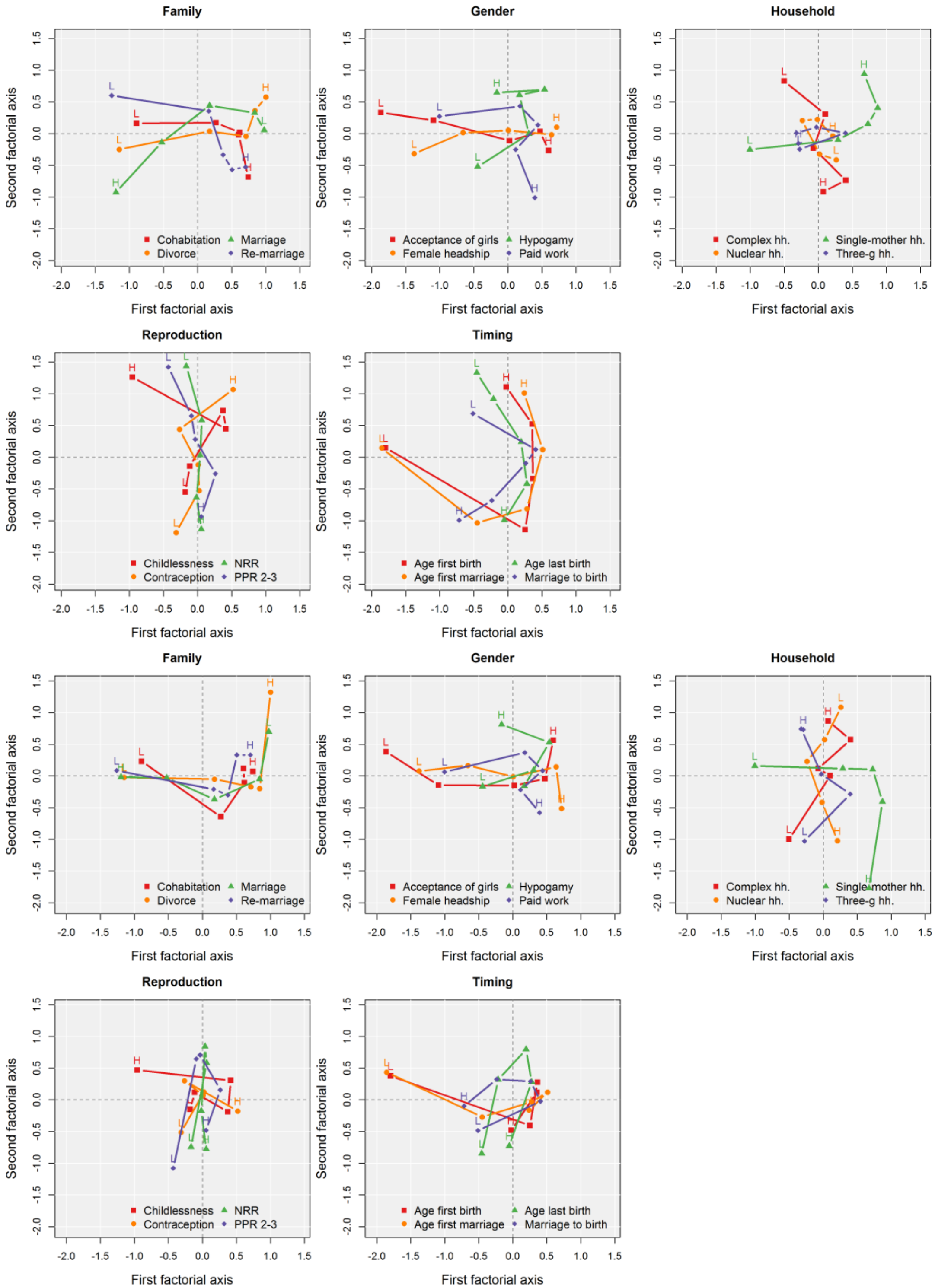
De Vos, Susan. 1995. *Household Composition in Latin America*. 1st ed. New York: Plenum Press.

Weitzman, A. 2014. "Women's and Men 's Relative Status and Intimate Partner Violence in India." *Population and Development Review* 40(1):55–75.

Whitehouse, Bruce. 2018. "The Exaggerated Demise of Polygyny: Transformations in Marriage and Gender Relations in West Africa." Pp. 299–313 in.

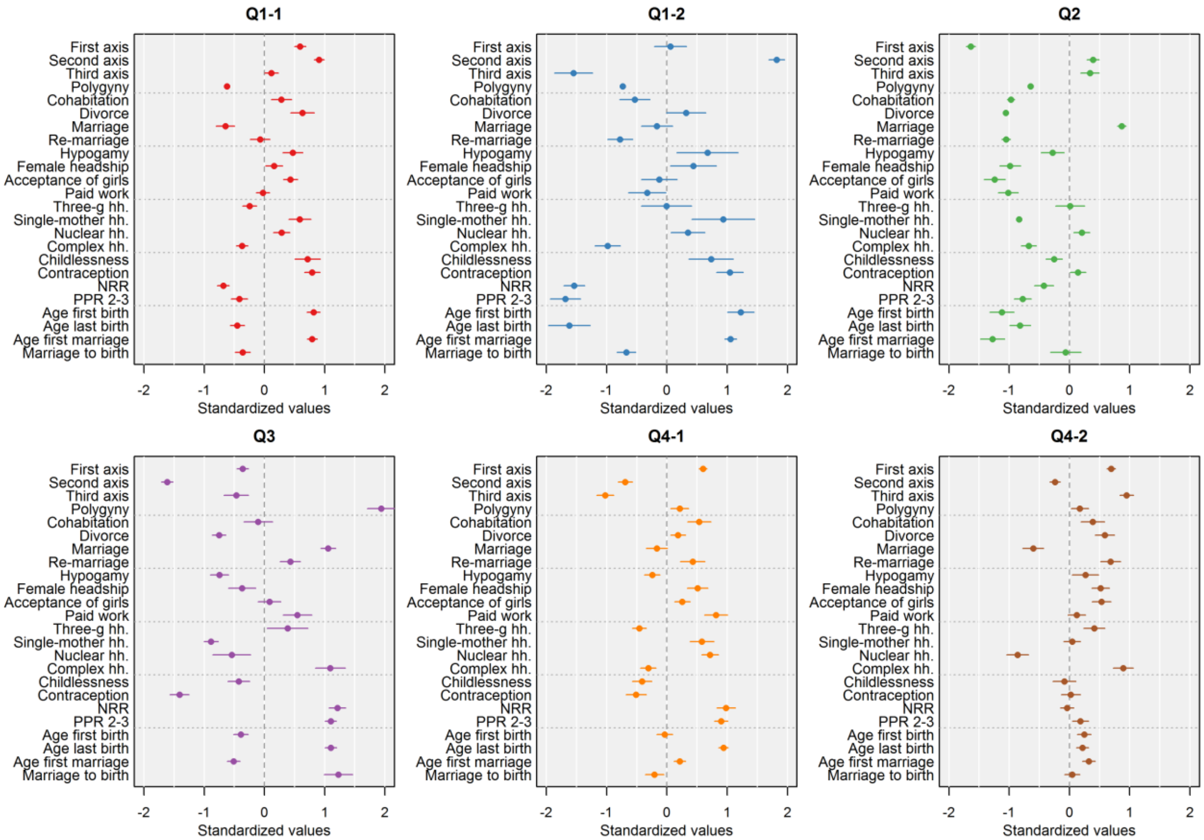
Appendix A – Results for of the Multiple Correspondence Analysis and Cluster Analysis

Figure A1 – Categories' distribution along the first three factorial axes



Notes: Only extreme categories are labeled (L: lowest, H: highest). All graphs within panels have the same scale and they can be interpreted jointly (superposed) with Figure 3.

Figure A2 – Standardized clusters' characteristics



Notes: All variables are standardized using the mean and standard deviation of the overall sample (502 country-year-area units). Points represent the cluster mean, and the mid-length of the bar is two times the Standard Error.

Table A1 – Standardized bivariate association between factorial axes and external indicators

Dependent variable	First axis		Second axis		Third axis	
	M1	**M2**	**M1**	**M2**	**M1**	**M2**
United Nations Indicators						
Human Development Index	-0.12 *	0.06	0.67 ***	0.56 ***	0.02	0.04
	(0.06)	(0.09)	(0.03)	(0.04)	(0.05)	(0.08)
Gender Development Index	0.36 ***	0.36 ***	0.50 ***	0.36 ***	-0.03	-0.06
	(0.10)	(0.11)	(0.12)	(0.09)	(0.08)	(0.09)
Life expectancy index	-0.29 ***	-0.26 **	0.58 ***	0.30 ***	0.10 +	0.15 +
	(0.05)	(0.08)	(0.04)	(0.07)	(0.05)	(0.08)
Income index	-0.15 **	-0.06	0.57 ***	0.34 ***	0.10 +	0.14 +
	(0.05)	(0.08)	(0.04)	(0.04)	(0.06)	(0.08)
Education index	0.04	0.26 ***	0.65 ***	0.53 ***	-0.09 +	-0.13 +
	(0.05)	(0.05)	(0.03)	(0.04)	(0.05)	(0.07)
Female labor force pption.	0.56 ***	0.43 ***	-0.13 ***	0.13 ***	-0.30 ***	-0.40 ***
	(0.07)	(0.08)	(0.04)	(0.06)	(0.05)	(0.07)
Decision making indicators						
Woman's health care	0.25 ***	0.40 ***	0.70 ***	0.55 ***	-0.08	-0.18 ***
	(0.05)	(0.04)	(0.03)	(0.04)	(0.05)	(0.05)
Large purchases	0.26 ***	0.41 ***	0.56 ***	0.45 ***	-0.08	-0.18 ***
	(0.05)	(0.04)	(0.05)	(0.05)	(0.05)	(0.05)
Small purchases	0.31 ***	0.36 ***	0.48 ***	0.42 ***	-0.02	-0.13 +
	(0.06)	(0.05)	(0.07)	(0.06)	(0.08)	(0.07)
Visits to family and friends	0.33 ***	0.42 ***	0.58 ***	0.42 ***	-0.14 *	-0.23 ***
	(0.05)	(0.04)	(0.04)	(0.04)	(0.06)	(0.05)
Food cooked at home	0.17 *	0.15 *	0.39 ***	0.26 **	-0.02	-0.12
	(0.08)	(0.07)	(0.08)	(0.08)	(0.07)	(0.07)
Use of money	0.19 ***	0.35 ***	0.67 ***	0.54 ***	-0.05 ***	-0.23 ***
	(0.05)	(0.05)	(0.04)	(0.05)	(0.07)	(0.06)
Year dummy vars.	No	Yes	No	Yes	No	Yes
Region dummy vars.	No	Yes	No	Yes	No	Yes

Notes: M1 is a bivariate model. M2 includes dummy variables for the survey year and geographical region. Significance levels are represented as: + 0.1, * 0.05, ** 0.01 and *** 0.001. Standard errors, in parenthesis, are clustered at the country-area-level.

Table A2 – Validation of clusters

	Family configurations						Overall	Units
	Q1-1	**Q1-2**	**Q2**	**Q3**	**Q4-1**	**Q4-2**	**mean**	**(n)**
Factorial coordinates								
First axis	0.245 ***	-0.060	-0.909 ***	-0.231 ***	0.343 ***	0.360 ***	0.000	502
Second axis	0.484 ***	0.938 ***	0.200 ***	-0.777 ***	-0.327 ***	-0.095 ***	0.000	502
Third axis	0.057 *	-0.572 ***	0.108 ***	-0.159 ***	-0.345 ***	0.376 ***	0.000	502
Decision making indicators (%)								
Woman's health care	82.4 ***	87.8 ***	57.4 **	33.7 ***	63.1	56.5 ***	64.1	318
Large purchases	73.1 ***	76.5 ***	47.8 ***	32.2 ***	55.5	54.2	57.7	320
Small purchases	77.1 ***	77.4 **	53.3 ***	48.3 ***	60.2 *	67.1	67.2	172
Visits to family and friends	84.1 ***	84.6 ***	57.6 ***	41.7 ***	68.5	62.3 **	67.9	318
Food cooked at home	74.5 *	83.2 **	69.9	60.9 *	70.6	68.0	68.2	104
Use of money	80.3 ***	77.8 ***	51.9 *	26.9 ***	57.2	51.2 *	57.4	224
United Nations Indicators								
Human Development index	0.59 ***	0.68 ***	0.60 ***	0.40 ***	0.46 ***	0.49 **	0.53	486
Gender Development Index	0.94 ***	0.98 ***	0.82 ***	0.78 ***	0.90	0.90	0.88	254
Life expectancy index	0.70 ***	0.74 ***	0.75 ***	0.54 ***	0.57 ***	0.59 ***	0.64	502
Income index	0.56 ***	0.64 ***	0.58 ***	0.42 ***	0.43 ***	0.50 +	0.51	502
Education index	0.52 ***	0.68 ***	0.50 ***	0.28 ***	0.41 ***	0.42 **	0.45	486
Female labor force participation	61.1 ***	53.7	34.7 ***	49.3	68.5 ***	55.1	52.6	306

Notes: Significance tests are run against the overall mean (μ), i.e., Ho: $\mu_i = \mu$, where *i* indexes *family configurations*. Significance levels are represented as: + 0.1, * 0.05, ** 0.01 and *** 0.001. Standard errors are clustered at the country-area-level

Appendix B - Identifying household structures of women in reproductive ages

The classification of women, according to the structure of the household they live involves four steps. The first step uses the information of women and classifies them into four categories (nuclear, couple, single mother, and single). The second step uses information from household members to create three types of households: pure nuclear, three-generation, and complex. The third step combines these two previous results at the household level. The fourth and final step brings these combined categories to the women's level. Theoretically and data-driven criteria inform each of these steps, as explained below.

First step: identifying living arrangements among women in reproductive ages

For each woman in reproductive age, we create two dummy variables indicating: (1) the presence of a husband or partner and (2) the presence of their own children in the household. The four possible combinations of these two dummies identify four types of family context from women's perspective.

- Nuclear: women with both partner and children (code '1-1')
- Couple: women with a partner but no children (code '1-0')
- Single mother: women with children but without a partner (code '0-1')
- Single: women with neither children nor partner (code '0-0')

Since two or more women can reside in the same household, two or more categories can apply to the same household, producing combinations such as "Nuclear + Couple," "Nuclear + Single mother." All combinations are coded at the household-level into five categories: Nuclear, Couple, Single mother, Single, and Complex, according to the following two rules:

1. When only one type appears in a household, the same category is kept.
2. When two or more living arrangements appear, they are coded as "Complex."

Second step: identification of household context using the information of household members

Household members were classified using their relationship with the household head based (variable H101) on two criteria. (1) The vertical generation where grandparents' generation is generation zero (G0), parents' generations is generation one (G1), children are generation two (G2), and grandchildren are generation four (G4). (2) Collateral kinship, i.e., when household members are siblings, nephews, nieces or other relatives of the household head.

We generate two dummy variables at the household level. One for the presence of G0, G1 and G4 members (three-generation households), and another for collateral members (complex households). We concatenate these two dummy variables to created four possible types as follow:

- 0-0: no three-generation members and no collateral members, i.e., non-complex family
- 1-0: the presence of a third-generation member (grandchild, grandfather, etc.), i.e., Three generations household
- 1-1: the presence of both, three generations and collateral, i.e., Three generation family
- 0-1: the presence of collateral members, i.e., complex (fragmented) family

Third step: the combination of women's and household members' perspective

We merge the household-level classifications produced in steps one and two. This merged dataset produces twenty family types: five family types from the women's perspective times four family contexts based on other members, as seen in Table B1.

Table B1 - Cross-tabulation of household classification according to women's and household members' perspectives.

Women's perspective	No other members	Other member			Total	%
		Collateral member	Three-g member	Both		
Nuclear	1,476,291	175,034	346,087	73,618	2,071,030	69%
	71%	8%	17%	4%	100%	
Couple	79,706	12,530	10,435	4,637	107,308	4%
	74%	12%	10%	4%	100%	
Single mother	117,906	27,025	66,351	18,923	230,205	8%
	51%	12%	29%	8%	100%	
Single	121,571	34,981	45,143	11,767	213,462	7%
	57%	16%	21%	6%	100%	
Complex	74,222	59,914	159,448	69,729	363,313	12%
	20%	16%	44%	19%	100%	
Total	1,869,699	309,484	627,465	178,674	2,985,322	100%
	63%	10%	21%	6%	100%	

Most of the households do not include collateral members and three-generation members (63%). Among the remaining 37% of the households, 10% includes only collateral members, 21% three-g members, and 6% both. We use these 20 combinations to create six dummy variables, as follow:

- Nuclear: 1 if the household is purely nuclear, i.e., if there are one a couple and their children, 0 otherwise.
- Couple: 1 if there is only one couple in the household, 0 otherwise.
- Single mother: 1 if there is at least one single-mother in the household.
- Single: 1 if at least one single woman is living in the household, 0 otherwise.
- Complex: 1 if there is at least one collateral member in the household, 0 otherwise.
- Three-generation: if there is at least one member of the generations zero, three, or four.

Note that only the first two dummies refer to pure configurations, i.e., the first two dummies are mutually exclusive. On the contrary, the other four dummies are not mutually exclusive. This exclusiveness is beneficial because it reduces mechanical correlation among country-level indicators of the prevalence of these household types.

Fourth step: merging back results with the woman-level file

We merge the file obtained in step three with the women's file. Table B2 presents women's distribution according to the household type they live in for 12 geographical regions. This table does not account for sample weights.

Table B2 - Women's distribution according to household type by geographical region

World region	Household context for women						Total
	Nuclear	Couple	Single m.	Single	Complex	Three-g	
Africa central	52,621	2,584	6,181	5,291	40,318	43,892	150,887
	35%	2%	4%	4%	27%	29%	100%
Africa east	247,422	10,347	34,966	31,785	112,584	127,928	565,032
	44%	2%	6%	6%	20%	23%	100%
Africa north	75,097	4,322	3,938	3,451	10,953	35,431	133,192
	56%	3%	3%	3%	8%	27%	100%
Africa south	16,004	948	4,550	4,560	16,710	26,446	69,218
	23%	1%	7%	7%	24%	38%	100%
Africa west	165,348	8,484	10,303	20,652	153,518	164,495	522,800
	32%	2%	2%	4%	29%	31%	100%
Americas central	101,028	3,892	13,484	15,231	36,744	75,267	245,646
	41%	2%	5%	6%	15%	31%	100%
Americas south	202,236	7,201	28,664	36,946	48,839	123,094	446,980
	45%	2%	6%	8%	11%	28%	100%
Asia central	18,120	651	1,767	2,430	3,566	18,882	45,416
	40%	1%	4%	5%	8%	42%	100%
Asia south	495,187	25,827	24,805	42,825	125,000	512,327	1,225,971
	40%	2%	2%	3%	10%	42%	100%
Asia southeast	227,398	9,519	11,358	27,385	53,467	124,304	453,431
	50%	2%	3%	6%	12%	27%	100%
Asia west	88,178	4,878	3,722	5,997	10,813	39,222	152,810
	58%	3%	2%	4%	7%	26%	100%
Eastern Europe	15,936	1,053	1,445	3,016	1,452	9,823	32,725
	49%	3%	4%	9%	4%	30%	100%
Total	1,704,580	79,706	145,183	199,570	613,966	1,301,114	4,044,119
	42%	2%	4%	5%	15%	32%	100%

Due to their relatively small size, the primary analysis did not include indicators on the proportion of women living in Couples and as Singles. The proportion of women living as Single mother was included because this indicator is considered high in some countries.