The Gender-Gap Reversal in Education and Its Effect on Union Formation: The End of Hypergamy?

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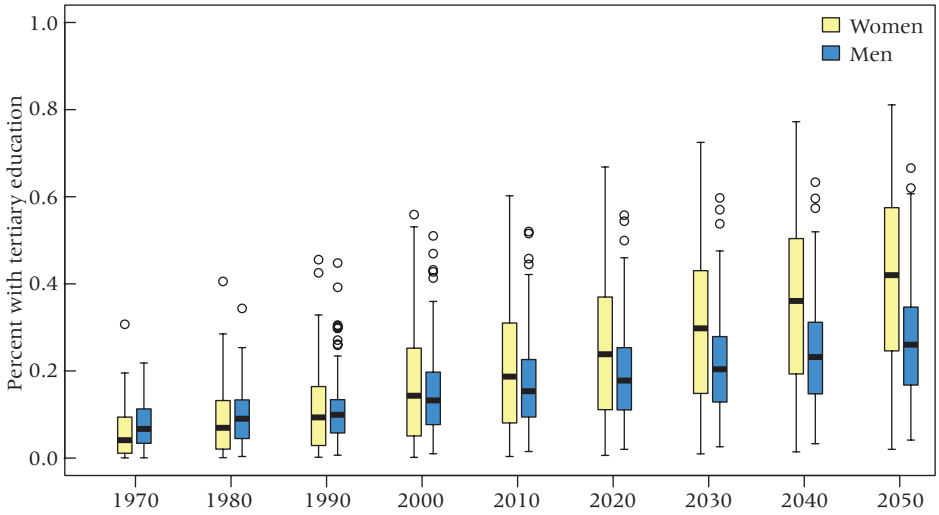
Union formation is in many ways a gender-asymmetrical process. This asymmetry has been a characteristic both of societies in which marriages are arranged and of those in which they are based on romantic love (Coontz 2005; Goody 1983). Although arranged marriages are often gender-symmetrical within such characteristics as ethnicity, race, caste, or religion, the conditions and implications of marriage for women and men are highly asymmetrical, as exemplified by the ancient custom of dowry. As societies underwent the transition from arranged to free-choice unions, individual characteristics gradually took precedence over ascribed ones in mate selection, and educational attainment became a major structuring dimension within marriage markets (Kalmijn 1998; Mare 1991; Smits, Ultee, and Lammers 1998; Blossfeld and Timm 2003; Schwartz and Mare 2005; Smits and Park 2009). While educational homogamy remains the rule, educational hypergamy has been pervasive within heterogamous unions. (Educational hypergamy refers to those unions in which the wife has a lower educational attainment than her husband, homogamy to unions between persons of similar education.) Several studies have documented the former ubiquity of hypergamy and its gradual disappearance over time in a limited number of countries (Schoen and Cheng 2006; Qian 1998; Esteve and Cortina 2006; Esteve and McCaa 2007). The extent to which this trend of decreasing hypergamy is connected to the worldwide rise in female educational attainment is the subject of this article.

The impressive expansion in educational opportunities and attainment that the world has witnessed in recent years has been accompanied by a

significant decrease in the gender gap in education (Hausmann, Tyson, and Zahidi 2009; UNESCO 2007; Grant and Behrman 2010; Dorius and Firebaugh 2010). In some high- and middle-income countries, younger women are attaining higher levels of education than men, and the same trend is likely to occur in other countries as well. Figure 1 illustrates these trends. The figure combines data on educational attainment for men and women aged 25–29 years in 120 countries for the period 1970–2000 (Lutz et al. 2007) and population projections by level of educational attainment in the same countries for 2010–2050 (KC et al. 2010). Proportions of men and women with some tertiary education have been increasing during recent decades in most of these countries and are projected to continue to increase during the next 40 years. Women's educational attainment is expected to rise faster than men's, and the number of countries in which women have more education than men is expected to rise as well.

Among the effects of this unprecedented phenomenon on the many dimensions of social life, the rise of women's educational attainment may have implications for assortative mating. Has the tendency for women to marry men who are more educated than they are been reversed in those countries where women are more educated than men? In this article, we explore the effect of the rise in women's levels of education on gender symmetry in union formation and, more specifically, on educational hypergamy.

FIGURE 1 Historical (1970–2000) and projected (2010–2050) levels of tertiary education among men and women aged 25–29 years, 120 countries



NOTES: Each box-and-whisker plot summarizes the distribution of the percentages of men and women aged 25–29 with tertiary education over time for 120 countries. The box gives the range of the middle 50 percent between the lower (Q_1) and upper quartiles (Q_3). The lower and upper whiskers show the lowest and highest values in the absence of outliers. An outlier, represented by a circle, is any observation below Q_1–1.58 (Q_3–Q_1) or above Q_3+1.58 (Q_3–Q_1).
SOURCE: Lutz et al. (2007) for the 1970–2000 data and KC et al. (2010) for the 2010–2050 data.

The article has two primary objectives. First, we document patterns of educational hypergamy across 56 countries from the 1970s to the 2000s. We examine whether educational hypergamy is prevalent in these countries, and we track its change over time. Second, we explore the association between women's educational attainment in a particular country and the prevalence of hypergamy. In other words, we examine the extent to which the tendency for women to marry men of higher educational status is related to the gender gap in education. To this end, we have developed an index of female educational advantage that measures gender differences in educational attainment.

Our analysis is based on newly harmonized census microdata samples from the Integrated Public Use Microdata Series (IPUMS) international database (Minnesota Population Center 2010). The dataset used here contains 138 samples (the basic units of our analysis) from 56 countries (some countries have several observations) from census rounds from the 1970s to the 2000s (see Appendix Table 1 for details on the countries included in the dataset). All possible IPUMS samples have been included in the dataset except for those cases in which information was not organized at the household level or for which information on educational attainment was not available.

Educational hypergamy: Concept, measurement, and trends

The concept of hypergamy

Couples can be homogamous or heterogamous depending on whether or not the spouses belong to the same group in a given dimension (e.g., age, status, religion, or ethnicity). For ordinal or continuous dimensions (e.g., age, education, and income), heterogamous (and heterosexual) unions can be further classified as *hypergamic* or *hypogamic*.[1] Popular expressions of these concepts are *marrying up* and *marrying down*. When a woman marries up, a hypergamic couple is formed.

In the study of assortative mating, hypergamy has attracted the interest of social scientists because of its ability to unravel gender differences in union formation. For example, age hypergamy mirrors gender inequalities in age at marriage, just as educational hypergamy reflects the tendency of women to marry men of higher socioeconomic status. In this article, we take the log-transformed ratio of hypergamic to hypogamic couples and refer to it as the prevalence of hypergamy.

Measuring the prevalence of hypergamy

Our dependent variable is the prevalence of educational hypergamy (hereafter simply hypergamy). As noted, a couple is hypergamic if a woman's educa-

tional attainment is lower than that of her spouse. The reverse arrangement is called hypogamy. Hence, hypergamy in education for a given sample is defined as $H = \ln(A/B)$, where A and B are the numbers of hypergamic and hypogamic couples, respectively, and the operator is the natural log. Thus, $H = 0$ when the number of hypergamic couples equals the number of hypogamic couples, $H<0$ when hypogamic couples outnumber hypergamic couples, and $H>0$ in the opposite case. Defining H as the log of A/B allows us to guarantee that our theoretical distribution is symmetrically distributed around 0.

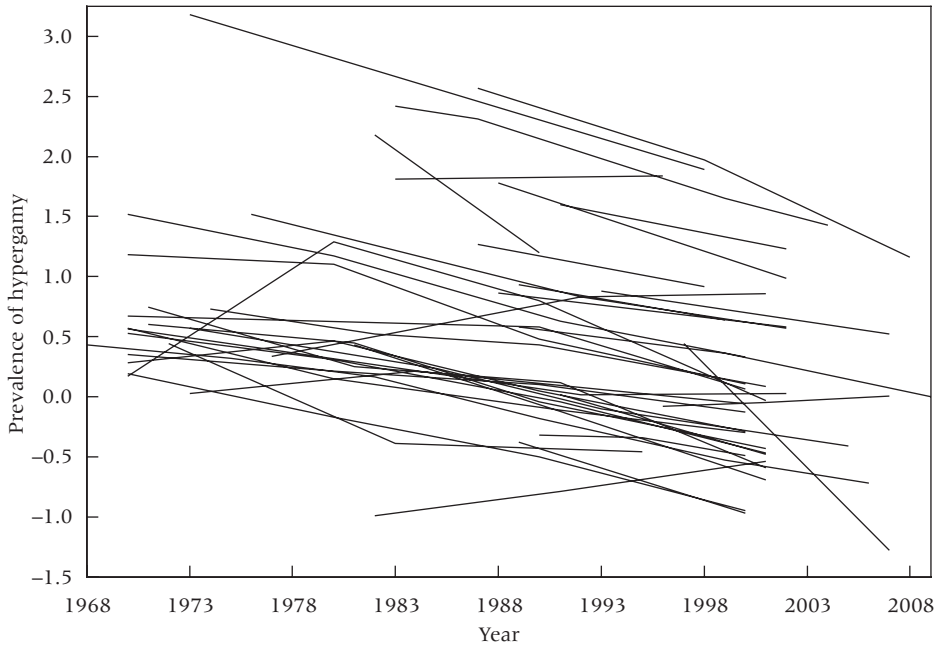
To construct this variable, we required the following basic variables: age, sex, educational attainment, marital status, and household relationship identifiers. IPUMS created and harmonized the educational attainment variable using the following four categories: "less than primary," "primary completed," "secondary completed," and "university level." Despite being somewhat crude, these divisions allow for fairly accurate comparability across countries with different educational systems (Esteve and Sobek 2003). Marital status simply identifies the marital status of the different household members. Household relationship identifiers specify the position occupied by the spouse or partner within the list of household members. This information was required to compare spouses' educational attainment.

Choosing the age range of spouses or partners to include in the dataset presents certain difficulties. If the range is too narrow, it might not include the entire set of relevant couples. If it is too wide, marital dissolution and mortality may unduly modify the set of couples that should be taken into account. The results in this article are based on the age range 25–34 years. This restricted range also avoids overlapping cohorts in countries with more than one observation. Virtually all individuals have reached their highest educational levels by or during this interval. To avoid specification problems, we performed sensitivity analyses using alternative age ranges (e.g., 25–40 years); the results we obtained are essentially the same, so they are not reported here (they are available on request).

Trends in educational hypergamy

Figure 2 shows trends in educational hypergamy for 56 countries from 1968 to 2009. Our variable of interest, the prevalence of hypergamy, takes both positive and negative values. With few exceptions, we observe a steadily decreasing level of hypergamy over time despite the significant differences in levels among countries. For instance, the prevalence of hypergamy in India decreased from 2.42 in 1981 to 1.43 in 2004, while in France the values fell from 0.43 in 1968 to –0.72 in 2006. Hypergamous couples also declined in Brazil (from 0.57 in 1970 to –0.3 in 2000), the United States (from 0.28 to –0.29 between 1970 and 2000), and Malawi (from 2.57 in 1987 to 1.16 in 2008). In the early 1970s, hypergamous couples outnumbered hypogamous

FIGURE 2 Prevalence of hypergamy for 138 census samples from 56 countries, 1968–2009



NOTE: The prevalence of hypergamy is defined as the logged ratio of hypergamous to hypogamous couples.
SOURCE: Authors' calculations based on IPUMS international census microdata.

ones in all 18 countries for which we have data between 1970 and 1975. In early 2000, 26 out of 51 countries showed negative values of hypergamy, indicating that more women were married to men with lower education than the opposite. Among these countries are societies as diverse as France, Jordan, Mongolia, Slovenia, and South Africa.

Gender gaps in educational attainment and the prevalence of hypergamy

We now examine the extent to which the prevalence of hypergamy is associated with the educational composition of the population and with the worldwide increase in female educational attainment. We hypothesize that educational hypergamy is influenced by the structural constraints of the marriage market, so that cross-national differences in hypergamy echo gender inequalities in educational enrollment and completion. Therefore, as countries progress toward more gender-balanced educational distributions, the prevalence of hypergamy will tend to diminish. Furthermore, the reversal of the gender gap in education should also lead to a reversal of trends in hyper-

gamy. Hence, we expect the prevalence of hypergamy to be lower in those countries where the female educational advantage is greater.

Measuring female educational advantage

To measure the extent to which the educational attainment of women is higher than that of men for the population at large, we introduce an index of female educational advantage, *F*. If we denote the proportions of men and women in educational category e by p_m^e and p_f^e, respectively, where $e = 1, \ldots 4$, then the index of female educational advantage is defined as follows:

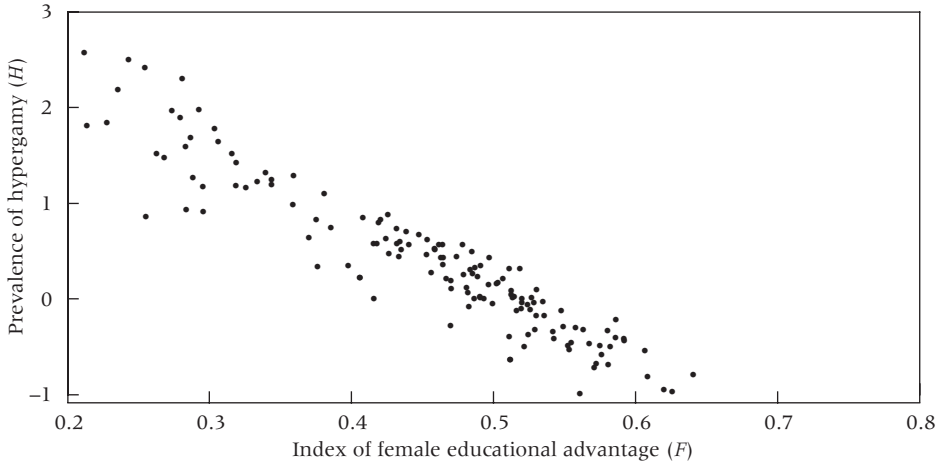
$$F = \frac{p_f^4(p_m^1 + p_m^2 + p_m^3) + p_f^3(p_m^1 + p_m^2) + p_f^2 p_m^1}{1 - (p_f^1 p_m^1 + p_f^2 p_m^2 + p_f^3 p_m^3 + p_f^4 p_m^4)} \quad (1)$$

The values of this indicator answer the following question: If a man and a woman are picked at random from the population and they have different educational attainments, what is the probability that the educational attainment of the woman is higher than that of the man?[2] *F* is calculated on the basis of all values in the education distribution, and its values range from 0 to 1. If $F = 0$, there is no woman whose educational attainment is higher than or equal to that of any man, and if $F = 1$, the reverse is true. When the educational distributions for women and men are identical, $F = 0.5$. Therefore, values of *F* above 0.5 indicate higher educational attainment for women than for men. Among several possible measurements of the extent to which women are more highly educated than men, *F* was chosen for simplicity: its definition and interpretation are obvious. Alternative definitions of female advantage yield similar results and convey essentially the same message. An additional merit of this measurement is that it takes into account all educational categories, not just one category (e.g., university level). Gender inequalities among university graduates may be more informative for high-income countries, while gender differences among adults who have less than a primary school education may be more informative for low-income countries.

Advances in female education reduce (and reverse) the prevalence of hypergamy

The horizontal axis in Figure 3 shows the values of the index of female educational advantage (a value of 0.5 denotes gender equality), and the vertical axis represents the levels of hypergamy (a value of 0 indicates that the number of hypergamous unions equals the number of hypogamous ones). The two variables are negatively related in a strongly linear fashion. The index of female educational advantage has the expected negative relationship with the prevalence of hypergamy; that is, in countries where women have higher levels

FIGURE 3 Relationship between the prevalence of hypergamy and index of female educational advantage for 138 census samples from 56 countries, 1968–2009

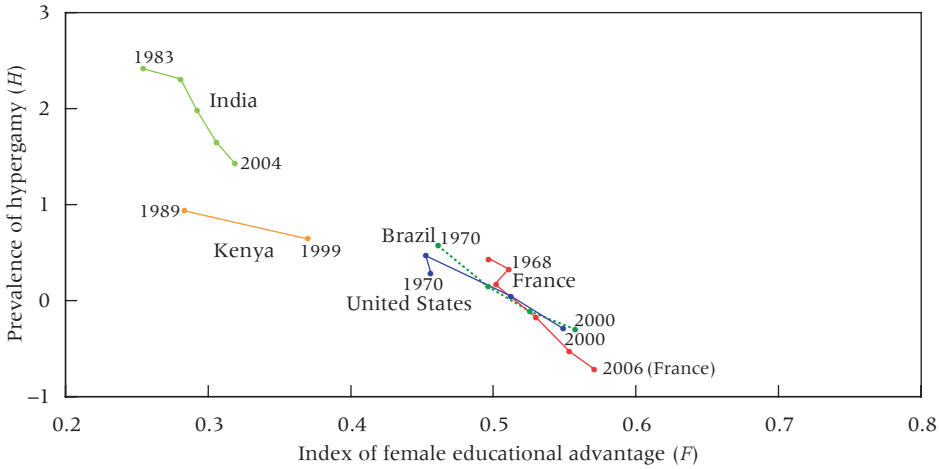


NOTE: See text for definitions of *H* and *F*.
SOURCE: Authors' calculations based on IPUMS international census microdata.

of educational attainment than men, the prevalence of hypergamy is lower. Comparing data from the same country over time, we can also state that gains in women's educational attainment relative to men's reduce levels of hypergamy. For illustrative purposes, Figure 4 compares the trajectories over time of highly populated countries on various continents. Brazil, France, India, Kenya, and the United States follow similar patterns: increases in women's education are closely followed by declining prevalence of hypergamy. Gains in female educational attainment in these countries, regardless of their initial levels, have increased the probability that women's educational attainment is higher than that of men's. Thus, women's educational attainment has had a demonstrable impact on the prevalence of hypergamy.

Using a multilevel regression model, we have determined that female educational advantage accounts for as much as 93 percent and 79 percent of the cross-country and cross-sample variances in observed hypergamy, respectively (results available on request).[3] It is informative to observe that although women's levels of education have already caught up with and exceeded men's, highly educated women have not been left behind in the marriage market as one might have expected had the social preference for hypergamy continued to prevail. This finding suggests that individual educational choices are generally well adapted to the constraints imposed by the current marriage market distribution, even though causality has not been directly tested. The extent to which people adapt to marriage market constraints or make educational decisions based on changing preferences for mates is a subject that should be addressed in future work.

FIGURE 4 Change over time in the relationship between the prevalence of hypergamy and the index of female educational advantage in census samples from five countries



NOTE: See text for definitions of *H* and *F*.
SOURCE: Authors' calculations based on IPUMS international census microdata.

Discussion

We examined the international prevalence of educational hypergamy and the extent to which it is associated with the degree of gender inequality in educational attainment. The IPUMS data show that educational hypergamy is an enduring form of gender inequality in union formation, although it has been decreasing over the last few decades and, in a growing number of countries, has even reversed in recent years. For example, in Brazil and the United States, hypogamous couples now outnumber hypergamous couples. While some studies have already documented this trend (Schoen and Cheng 2006; Qian 1998; Esteve and Cortina 2006; Esteve and McCaa 2007), we confirm the trend in a large number of countries, both developed and developing.

We also explored the relationship between hypergamy and the reversal in the gender gap in education measured in terms of female educational advantage. We showed that societies in which the female educational advantage is greater tend to have lower levels of educational hypergamy and that there is a tendency, observed in all our census countries over time, toward a simultaneous increase in women's educational levels and decrease in educational hypergamy. Moreover, the reversal of the gender gap in education is associated with a gender-reversal of the pattern of assortative mating. Almost 90 percent of the cross-country and cross-sample variance in educational hypergamy is accounted for by gender differences in educational attainment.

If current trends in education continue, the prevalence of hypergamy among heterogamous unions will continue to decline. This scenario suggests that women's increasing levels of education may have important implications for the erosion of traditional patterns in assortative mating and may represent a step toward achieving symmetry in union formation. From a broader perspective, the consequences of these changes for the distribution of gender roles within and outside marital unions need to be explored. Will these transformations lead to more egalitarian relationships? How will these changes affect the prospects and expectations of men and women with regard to marriage? Will gender asymmetry in assortative mating become apparent within other dimensions? Will education remain a stratifying dimension as societies continue to make higher education more widely available to all their members? What implications will these changes have for union formation? What will be the relative value of education as a determinant of partner choice in marriage markets? We believe these are among the substantive issues researchers will need to address in the future.

Notes

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1 This article does not differentiate between married and cohabiting couples. Our analyses are based on all identifiable (heterosexual) unions, regardless of their nature.

2 Formally speaking, *F* is a conditional probability. The denominator of *F* measures the probability that a randomly selected woman and a randomly selected man have different educational attainments. The numerator of *F* measures the probability that a randomly selected woman has a higher educational attainment than does a randomly selected man.

3 Alternative models using proxy variables to identify the educational gradient in union formation and marriage timing neither diminished the strength of the association between female educational advantage and the prevalence of hypergamy nor increased the cross-national variance explained by the first model (results available upon request).

APPENDIX TABLE 1 Prevalence of hypergamy and index of female educational advantage in 56 countries included in the analysis

Country and year	Prevalence of hypergamy	Index of female educational advantage
Armenia		
2001	–0.330	0.563
Belarus		
1999	–0.330	0.580
France		
1968	0.431	0.497
1975	0.320	0.511
1982	0.163	0.502
1990	–0.180	0.530
1999	–0.530	0.553
2006	–0.720	0.571
Germany		
1981	0.622	0.453
Greece		
1971	0.747	0.386
1981	0.250	0.479
1991	0.117	0.481
2001	–0.590	0.576
Hungary		
1970	0.172	0.503
1980	1.290	0.359
1990	0.798	0.419
2001	–0.030	0.535
Ireland		
1981	0.010	0.491
Italy		
2001	–0.670	0.572
Portugal		
1981	0.429	0.463
1991	–0.120	0.516
2001	–0.690	0.581
Romania		
1977	0.337	0.376
1992	0.832	0.421
2002	0.572	0.478
Slovenia		
2002	–0.810	0.609
Spain		
1991	0.017	0.513
2001	–0.480	0.575
Argentina		
1970	0.528	0.459
1980	0.311	0.484
1991	–0.040	0.520
2001	–0.470	0.567
Bolivia		
1976	1.520	0.316
1992	0.832	0.375
2001	0.856	0.408
Brazil		
1970	0.568	0.461
1980	0.149	0.496
1991	–0.110	0.526
2000	–0.300	0.558
Chile		
1970	0.564	0.464
1982	0.266	0.485
1992	0.017	0.527
2002	0.028	0.514
Colombia		
1973	0.572	0.440
1985	0.235	0.489
1993	–0.100	0.520
2005	–0.410	0.543
Costa Rica		
1973	0.028	0.490
1984	0.211	0.467
2000	–0.060	0.524
Cuba		
2002	–0.220	0.586
Ecuador		
1974	0.731	0.432
1982	0.520	0.435
1990	0.430	0.464
2001	0.083	0.512
Jamaica		
1982	–0.990	0.561
1991	–0.790	0.641
2001	–0.540	0.607
Mexico		
1970	0.671	0.447
1990	0.580	0.432
2000	0.065	0.482
Panama		
1970	0.351	0.491
1980	0.213	0.507
1990	0.102	0.530
2000	–0.130	0.548
Peru		
1993	0.881	0.426
2007	0.520	0.459
Puerto Rico		
1970	0.192	0.470
1980	–0.170	0.536
1990	–0.500	0.582
2000	–0.950	0.620
Saint Lucia		
1991	–0.410	0.592

APPENDIX TABLE 1 (continued)

Country and year	Prevalence of hypergamy	Index of female educational advantage
United States		
1970	0.280	0.456
1980	0.464	0.453
1990	0.047	0.512
2000	–0.290	0.549
Venezuela		
1971	0.604	0.434
1981	0.447	0.474
1990	–0.040	0.528
2001	–0.430	0.592
Ghana		
2000	1.250	0.344
Guinea		
1983	1.810	0.214
1996	1.840	0.228
Kenya		
1989	0.934	0.284
1999	0.640	0.370
Malawi		
1987	2.570	0.212
1998	1.970	0.274
2008	1.160	0.326
Mali		
1987	1.270	0.288
1998	0.918	0.295
Rwanda		
2002	0.007	0.416
Senegal		
1988	1.780	0.304
2002	0.986	0.359
Sierra Leone		
2004	1.690	0.287
South Africa		
1996	–0.080	0.483
2001	–0.050	0.499
2007	0.003	0.520
Sudan		
2008	0.347	0.398
Uganda		
1991	1.600	0.283
2002	1.230	0.334
Tanzania		
1988	0.865	0.255
2002	0.580	0.418
Cambodia		
1998	1.480	0.268
China		
1982	2.180	0.235
1990	1.200	0.344
India		
1983	2.420	0.255
1987	2.310	0.281
1993	1.980	0.292
1999	1.650	0.306
2004	1.430	0.319
Iran		
2006	–0.280	0.470
Iraq		
1997	1.320	0.340
Israel		
1972	0.442	0.433
1983	–0.390	0.511
1995	–0.460	0.555
Jordan		
2004	–0.500	0.522
Kyrgyzstan		
1999	–0.400	0.586
Malaysia		
1970	1.520	0.263
1980	1.170	0.295
1991	0.631	0.424
2000	0.331	0.487
Mongolia		
1989	–0.380	0.524
2000	–0.970	0.626
Nepal		
2001	2.500	0.243
Pakistan		
1973	3.180	0.164
1998	1.890	0.279
Palestine		
1997	0.442	0.812
2007	–1.280	1.024
Philippines		
1990	–0.320	0.529
1995	–0.340	0.542
2000	–0.490	0.552
Vietnam		
1989	0.581	0.415
1999	0.360	0.464
2009	0.001	0.486
Thailand		
1970	1.180	0.319
1980	1.100	0.381
1990	0.478	0.426
2000	0.108	0.470

NOTE: For derivation of prevalence of hypergamy and index of female educational advantage see discussion in text.
SOURCE: IPUMS international census microdata.

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