

EDUCATIONAL ASSORTATIVE MATING IN ARMENIA

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Abstract – The paper examines the pattern of educational assortative mating in Armenia. It uses data on married women born between 1921 and 1970 from the 2001 Armenian Population Census. About 60 percent of women marry men with similar educational attainment, and this pattern of assortative mating has remained relatively stable over the decades. Multivariate estimates show that female university graduates born in 1960s are more likely to marry down. The estimates also show that women are likely to marry down if they are older than their mates.

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1. INTRODUCTION

Who an individual marries and why are questions that have gained interest over the years since the earlier works of Becker (1974, 1981). Do individuals sort themselves according to income, educational attainment, and religion, among others? And if they do, what implications would this have? For instance, if individuals marry assortatively according to education, would this lead to greater inequality and less income mobility in a society?

Indeed, Fernández, Guner, and Knowles (2005) provide broad empirical support for a positive correlation between marital sorting and wage inequality using survey data for 34 countries. In addition, assortative mating may also play a role in the shaping of intergenerational economic mobility. Using German and British household surveys, Ermisch, Francesconi, and Siedler (2006) find that who a person marries may explain about 40-50% of the covariance between parents and own permanent family income.

Cognizant of its implications, the pattern of mating choices has been explored for a growing number of countries, both by examining prevailing marriages as well as new marriages using population census data and occasionally survey data. This analysis has

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not been extended to Armenia. Questions of interest include the extent of assortative mating and how it may have changed across cohorts.

Armenia, as with most of the former countries of the Soviet Union, experienced rapid industrialization and urbanization beginning in the 1920s. With this came rapid expansion in access to education and increases in educational attainment, leading to a great reduction in illiteracy. At the same time, the country experienced a number of shocks related to wars, natural disasters, and the break up of the Soviet Union that may have impacted access to quality education and the supply of educated men and women. An interesting question is how mating choices may have evolved in the presence of these shocks that the country has experienced.

This paper analyses trends in the educational assortative mating of Armenian women. Do the latter marry up, down, or men with the same educational attainment? Equally important, how have these choices changed across different age cohorts and how differences in age, among others, may have influenced the choices made? Using the 2001 Armenian Population Census, the paper provides evidence on the mating choices and its evolution for women born between 1921 and 1970.

The next section provides a brief review of the literature. Section 3 describes the data source and the various adjustments made. Section 4 provides evidence on the mating choices in prevailing marriages for women born in every decade spanning the period 1921-1970, and how these choices have changed across the various cohorts. First evidence is provided using cross tabulations of women's educational attainment by that of their mates. This is followed by multivariate estimates that control for age differences between husbands and wives and region. About 60 percent of women marry homogamously, a figure that remains relatively stable over time. There is evidence that women born in the 1960s with tertiary education are more likely to have married down than the older cohorts. Section 5 concludes.

2. REVIEW OF THE LITERATURE

In Becker (1991), husbands and wives engage in two types of activities – home and market – and that their time inputs are perfect substitutes in household production. The gains from marriage arise from the gender specialization in these two tasks. This specialization (and division of labor) implies that those with greater education (wages) will marry those with lesser education (wages); market equilibrium implies negative assortative mating.

In contrast to Becker, gains from marriage may come instead from the joint consumption of household public goods (Lam, 1988). Rather than specialization individuals may seek mates with similar attributes, and positive assortative mating is the equilibrium outcome of the marriage market equilibrium. High wage earners or the highly educated will marry each other.

Of course market equilibrium and the choices made are constrained by the supply of available mates. For instance, Becker and others have highlighted the importance of the sex ratio, i.e. the ratio of men to women. Empirical support is provided in Angrist (2002). Such ratio may not only determine who one chooses for a spouse, but may even contribute to shaping the fabric of a society with imbalances leading to divorces and remarriages if not polygamous marriages.

There is growing empirical support for positive rather than the negative sorting as implied by specialization. Evidence from new marriages in the US, over the period 1940 to 2003, shows that Americans with similar educational attainment are more likely to marry each other (Schwartz and Mare, 2005). Evidence from Central Europe (Czech Republic, Poland, and Slovakia) also suggests that 50 to 60 percent of new marriages in 1988 and 1991 are homogamous; an exception is Hungary with about 50 percent (Katrnak, Kreidl, and Fonadova, 2006).

Moving to studies of the pattern of assortative mating in prevailing marriages, Esteve and Cortina (2006) report homogamy in Spain declined from 78 percent in the case of women born in the 1920s down to 53 percent to those born in the 1960s. In Norway, some 70 percent of marriages for those born in the first decade of the twentieth century were

homogamous, compared to 40 percent for those born in the fifth decade (Birkelund and Heldal, 2003). Similar studies have been extended to a number of countries, but not yet to Armenia.

3. THE ARMENIAN CENSUS OF POPULATION

The newly released data from the 2001 Armenian Population Census provides an opportunity to gauge the extent of educational assortative mating in Armenia. The data consist of 81,929 households and 326,560 individuals, and represents a 10 percent sample of the population. A limited set of variables are publicly available and can be accessed from IPUMS-International.² The unit of observation in the data is the individual.

We link couples using the available serial number for each individual observation, but only for women born between 1921 and 1970. As such, the age of women in our sample is restricted to 31 through 80 years. For each mate we observe age, educational attainment, province or region of residence, among others. Some 52 observations were discarded where matched couples had the same gender. The resulting sample consists of 46,653 households that are representative of 466,530 couples nationwide.

Three measures or variants of educational attainment are available in the IPUMS census data: (1) International Detailed, (2) Armenian Detailed, and (3) International. The primary difference is aggregation at the very top, and the treatment of technical and professional education. We create 5 categories or levels of educational attainment that bridge the Armenian and international definitions. These are (1) up to 3 years of primary education, (2) lower secondary or 4-8 years, (3) higher secondary, (4) professional, and (5) university graduate. Category (3) includes technical secondary as well as those who never graduate from university. Category (4) reflects post secondary professional technical training. Category (5) includes graduate and post graduate training.

Educational attainment is observed at the time the census was conducted, and not at the time of marriage. While it is possible that some of the education was completed

²The Integrated Public Use Microdata Series International (IPUMS-International), hosted by the Minnesota Population Center of the University of Minnesota, provides free access to census microdata for 44 countries. For more information, see <https://international.ipums.org/international>.

after marriage, this may not be a serious data limitation as most university education is typically completed in the early 20s for women. But by excluding from the data those born in the 1980s this potential measurement error is minimized. Nevertheless, the lack of data makes it difficult to control for pre versus post marriage education. In addition, we do not observe family dissolutions, divorces and remarriages.

TABLE 1. Descriptive Statistics for Select Variables

Variable	Mean	Std. Dev.
Age, male	53.11	11.89
Age, female	49.33	11.76
Age difference, female	-3.78	3.96
Birth Cohorts, female		
1921-1930	0.0582	0.0011
1931-1940	0.1671	0.0017
1941-1950	0.1632	0.0017
1951-1960	0.3477	0.0022
1961-1970	0.2639	0.0020
Education, male		
Primary or Less (grade 3 or less)	0.1003	0.0014
Low secondary (grade 4 to 8)	0.1125	0.0015
High Secondary	0.3788	0.0022
Professional (technical)	0.1998	0.0019
University	0.2086	0.0019
Education, female		
Primary or Less (grade 3 or less)	0.0824	0.0013
Low secondary (grade 4 to 8)	0.0964	0.0014
High Secondary	0.4107	0.0023
Professional (technical)	0.2317	0.0020
University	0.1789	0.0018
Reside in Yerevan, the capital	0.3309	
Reside in Regions		
Aragatsotn	0.0435	0.0009
Ararat	0.0824	0.0013
Armavir	0.0833	0.0013
Gegharkunik	0.0718	0.0012
Lori	0.0969	0.0014
Kotayk	0.0901	0.0013
Shirak	0.0889	0.0013
Syunik	0.0498	0.0010
Vayots Dzor	0.0182	0.0006
Tavush	0.0442	0.0010
Observations (10% sample)	46,653 couples	

3.1. **Descriptive statistics.** Table 1 reports descriptive statistics for select variables in the sample. On average, women are 49 years old, with 53 years for men; the mean age difference between the genders is 3.8 years ($sd=4$). Six percent of the women were born in the 1920s, 16 percent in each of the 1930s and the 1940s, 35 percent in the 1950s, and 26 percent in the 1960s. About 18 percent of women are university graduates compared to 21 percent for men. On the other hand, 8 percent of women have not gone beyond the third grade compared to 10 percent of men. Similarly, about 41 percent of women completed secondary education compared to 38 percent for men.

Table 2 provides further detail on educational attainment. About one third of the individuals born in the 1920s had an education at the third grade level or below. This fraction declines to 25 percent for women and 29 percent for men born in the 1930s; 7 and 10 percent respectively in the 1940s; 2 and 3 percent in the 1950s; and close to one percent in the 1960s for both genders. This trend highlights the spectacular educational expansion from the formative years of Soviet Armenia. At the other end of the spectrum, about 10 percent of women born in the 1920s were university graduates (15 percent of men). This fraction became 11 percent (men 13 percent) in the 1930s, 23 percent (men 25 percent) in the 1940s, 20 percent (men 23 percent) in the 1950s, and about 18 percent (men 21 percent) in the 1960s.

One third of the couples in the sample live in Yerevan, the Capital, 9.7 percent in Lori, 9 percent in Kotayk, 8 percent in each of Ararat and Armavir, 7 percent in Gegharkunik, 5 percent in Syunik, 4 percent in Tavush, and 2 percent in Vayotz Dzor. The census data reveal considerable variation in the sex ratio among these regions. For example, the sex ratio is 0.88 percent for those age 21 and over in the entire country; there are 88 men for every one hundred women between the age of 21 and 80. In contrast it is only 0.81 in Yerevan.

TABLE 2. Educational Attainment of Partners (%) by Female Birth Cohorts

Men	Women					Total	N
	Primary or Less	Lower Secondary	Higher Secondary	Professional	University		
All							
Primary or Less	6.15	1.28	1.91	0.59	0.09	10.03	
Lower Secondary	0.79	5.14	3.76	1.32	0.24	11.25	
Higher Secondary	0.80	2.21	26.05	6.78	2.04	37.88	
Professional	0.38	0.77	6.27	9.99	2.56	19.98	
University	0.12	0.24	3.08	4.48	12.95	20.86	
Total	8.24	9.64	41.07	23.17	17.89	100.00	466,530
1921-1930							
Primary or Less	26.47	3.13	3.21	1.25	0.15	34.21	
Lower Secondary	3.17	9.62	2.36	0.81	0.33	16.29	
Higher Secondary	2.80	2.10	14.93	1.84	1.18	22.85	
Professional	1.73	1.18	3.35	4.20	0.85	11.32	
University	0.52	0.63	3.98	3.10	7.11	15.33	
Total	34.68	16.66	27.83	11.21	9.62	100.00	27,130
1931-1940							
Primary or Less	19.82	3.75	4.40	1.33	0.13	29.43	
Lower Secondary	2.34	9.61	3.17	1.41	0.27	16.79	
Higher Secondary	1.90	2.69	19.48	3.02	1.55	28.64	
Professional	0.86	0.94	3.80	4.98	1.28	11.86	
University	0.32	0.24	2.12	2.49	8.11	13.28	
Total	25.24	17.23	32.96	13.23	11.34	100.00	77,940
1941-1950							
Primary or Less	4.77	1.55	2.84	0.74	0.14	10.04	
Lower Secondary	0.77	6.69	3.70	1.39	0.26	12.82	
Higher Secondary	0.76	2.44	22.72	5.21	2.10	33.25	
Professional	0.37	0.97	5.48	8.77	3.14	18.73	
University	0.08	0.30	2.98	4.30	17.51	25.17	
Total	6.75	11.95	37.72	20.41	23.16	100.00	76,130
1951-1960							
Primary or Less	1.14	0.46	1.06	0.36	0.10	3.12	
Lower Secondary	0.16	3.53	4.20	1.49	0.22	9.60	
Higher Secondary	0.34	2.04	27.37	8.16	2.15	40.06	
Professional	0.10	0.68	7.24	12.70	3.11	23.83	
University	0.01	0.20	3.45	5.35	14.37	23.39	
Total	1.75	6.90	43.33	28.07	19.95	100.00	162,230
1961-1970							
Primary or Less	0.48	0.22	0.60	0.19	0.02	1.52	
Lower Secondary	0.11	2.50	3.90	1.11	0.20	7.83	
Higher Secondary	0.29	2.01	32.97	9.42	2.37	47.05	
Professional	0.15	0.58	7.70	11.62	2.65	22.71	
University	0.06	0.15	3.05	5.00	12.62	20.89	
Total	1.10	5.47	48.22	27.34	17.86	100.00	123,100

4. EMPIRICAL EVIDENCE ON SORTING PATTERNS

4.1. Basic Tabulations. The top pane of Table 2 summarizes the pattern of mating choices made by the population of women born between 1921 and 1970. University graduates make up 17.9 percent of all women but only 12.95 percent marry men who have attained similar education; the remaining five percent marry down. At the other end, eight percent of women have not completed education beyond the third grade with only six percent marrying men at their levels; the remaining two percent marry up.

Overall, and as shown in Table 3, about 60 percent of women (sum of main diagonal of Table 2) marry men with the same educational attainment. About 21 percent marry below their educational level (sum above main diagonal), while the remaining 19 percent marry up (sum below main diagonal).

Moving to those born in the 1920s, the pattern is markedly different from that of the general population. As summarized in Table 3, about 62 percent of women married men at their levels of education. However, 22.6 percent married up while 15 percent married down. Perhaps this is a reflection on the low educational attainment of this segment of the population captured in Table 2. Indeed, the gap between the fraction of women and men with university degrees is much wider; 9.6 versus 15.3 percent.

For those born in the 1930s, the pattern of assortative mating is relatively unchanged with 62 percent of women marrying men at their levels. However, there is a reversal in the fraction of women marrying up versus down. Now about 18 percent marry up and 20 percent marry down. The gap in tertiary education is now narrower; 11.3 versus 13.3 percent. In addition, there are fewer women with primary education or less; 25 versus 29 percent for men.

Those born in the 1940s experienced rapid transformation in educational attainment. Less than 7 percent of married women did not complete education beyond the primary level, compared to 25 percent and 35 percent for the 1930s and 1920s cohorts. Homogamy slightly declined for this group; 60 percent married at their levels compared to 62 percent for the older cohorts. The above pattern generally carries over to the 1950s and 1960s,

TABLE 3. Summary Mating Choices of Armenian Women

Birth Cohorts	Percent Marrying		
	Same	Up	Down
All	60.28	19.15	20.57
1921-1930	62.33	22.56	15.11
1931-1940	62.00	17.69	20.31
1941-1950	60.46	18.47	21.07
1951-1960	59.11	19.58	21.31
1961-1970	60.19	19.13	20.68

where 60 percent of the women marry homogamously; 21 percent marry up and 19 percent marry down.

4.2. Ordered Probit Estimates. While the figures in Tables 2 and 3 are quite informative in measuring the overall pattern and extent of assortative mating in Armenia, they do not control for differences in the age of mates, regional supply of men, nor for whether homogamy varies across all women born between 1921 and 1970.

Table 4 reports marginal effects from ordered probit estimates for the choices made by women born between 1921 and 1970. The regressors include wife-husband age differentials, birth cohorts, the educational attainment of women, an interaction term between educational attainment and birth cohorts, and regional dummies (Yerevan, the capital is the excluded region).

The probability of marrying down increases with the difference in age. The older a woman is than her mate, the more likely it is that she had married someone with less education than her. Holding other variables constant, the probability of a woman marrying down rises by 3.5 percent if she were 10 years older than her mate.

Some of the findings on educational attainment should not be surprising. University graduates cannot move up, and the least educated cannot move down. Overall, the probability of homogamous unions changes little over the cohorts; the probability for a woman marrying a man with similar educational attainment has not changed significantly, consistent with Table 3. An exception is the youngest cohort, those born in the 1960s, with completed secondary education and beyond.

TABLE 4. Ordered Probit Estimates of Choices: Marginal Effects

Variable	Marry Down		Marry Same		Marry Up	
	ME	z	ME	z	ME	Z
Age _f – Age _m	0.0035	9.4300	-0.0002	-4.5100	-0.0033	-9.4300
1930s	0.0185	1.4500	-0.0016	-1.0100	-0.0169	-1.5100
1940s	-0.0138	-0.8300	0.0002	0.9200	0.0135	0.8000
1950s	-0.0410	-2.0200	0.0003	0.3200	0.0407	1.9300
1960s	-0.1505	-6.8600	-0.0375	-2.7200	0.1881	5.2800
Lo Secondary	0.1205	5.4300	-0.0346	-3.3200	-0.0860	-7.2600
Hi Secondary	0.1107	6.9300	-0.0119	-4.3200	-0.0988	-7.3700
Professional	0.2031	7.9400	-0.0617	-4.9300	-0.1414	-10.7100
University	0.3624	12.1200	-0.1686	-8.1400	-0.1938	-20.6000
1930s*Lo Secondary	0.0078	0.3700	-0.0006	-0.2800	-0.0072	-0.3700
1930s*Hi Secondary	0.0479	2.4000	-0.0081	-1.4700	-0.0398	-2.7500
1930s*Professional	0.0903	3.1100	-0.0241	-1.8900	-0.0663	-4.0400
1930s*University	0.0034	0.1300	-0.0002	-0.1100	-0.0032	-0.1300
1940s*Lo Secondary	-0.0368	-1.7100	-0.0030	-0.6000	0.0398	1.5100
1940s*Hi Secondary	0.0366	1.5700	-0.0052	-0.9800	-0.0314	-1.7500
1940s*Professional	0.0740	2.4100	-0.0171	-1.4600	-0.0569	-2.9800
1940s*University	0.0189	0.6700	-0.0019	-0.4500	-0.0170	-0.7100
1950s*Lo Secondary	-0.0905	-5.0400	-0.0317	-1.8900	0.1222	3.5200
1950s*Hi Secondary	0.0155	0.6200	-0.0013	-0.4400	-0.0143	-0.6400
1950s*Professional	0.1077	3.1200	-0.0287	-1.9100	-0.0790	-4.0600
1950s*University	0.0609	1.8100	-0.0118	-1.1000	-0.0491	-2.1300
1960s*Lo Secondary	-0.0370	-1.2000	-0.0031	-0.4300	0.0401	1.0500
1960s*Hi Secondary	0.1642	3.9200	-0.0542	-2.4400	-0.1101	-5.5700
1960s*Professional	0.3202	6.3200	-0.1652	-4.2700	-0.1550	-12.8300
1960s*University	0.2452	4.7200	-0.1142	-3.1000	-0.1310	-8.6800

Notes: Estimates control for regional fixed effects.

University graduates born in the 1960s are less likely to marry men with similar educational attainment than older cohort. They are more likely to marry down than the 1950s cohort as well as all the older cohorts. More specifically, university graduates in the 1960s are 18 percent more likely to marry down than those born in the 1950s; they are six percent less likely to marry homogamously.³

5. CONCLUSION

This paper explored the extent of educational assortative mating in prevailing marriages in Armenia. It employed data from a 10 percent sample from the 2001 Armenian

³As a robustness test, 171 observations were dropped where age differences between matched couples was 20 years and over. This exclusion of 143 men and 28 women, with matched juniors for mates, does not change the qualitative results reported below. It is not clear whether these differences represent coding errors.

Population Census and examined how women born in the 1920s through the 1960s sorted themselves in the marriage market.

The findings are subject to a number of caveats. First, and in focusing on prevailing marriages, they do not control for divorces and remarriages, nor for the attributes of the first and second (or more) spouses. Second, they do not control for the choices made by widowed women, and the limited pool of available men. Tens of thousands died during the 1988 earthquake and the following war with its neighbor to the east few years later; many more during Stalin's purges and the Second World War. Third, hundred of thousands left the country in the early 1990s following the war and the blockade by Turkey. The impact of these events on the observed size of the population is quite noticeable in the figures reported in Table 2 (1940s and 1960s cohorts in particular). A priori, however, it is not clear how biased are the empirical findings in this paper given that these demographic changes are not controlled for.

The economic shocks that the country has witnessed over the past two decades have also altered occupational choices and the level of educational opportunities. Whereas before 1991 only 18 percent of the work force was engaged in agriculture, today that fraction has risen to 46 percent (Armenian Statistical Agency, 2008). Equally important is the noticeable increase in the ratio of female to male enrollments in tertiary education.⁴ These are likely to have altered the choices available for women in previous decades. It would be interesting to explore how the mating patterns have changed using the recently released 2011 Population Census.

⁴The ratio was 120 percent in 2007 (see World Bank).

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