

Can We Have it All?

The Impact of Marriage on the Returns to Education in Sweden

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Abstract

Higher levels of education are typically associated with higher incomes. But transfers within the family may also be an important source of income, especially for women who generally earn less than men in the labor market. This paper uses Swedish data to compute rates of returns to education that incorporate mechanisms operating through the marriage market, i.e., marriage behavior and assortative mating. Positive spousal transfers are most important for women with less than two years of college. For this group, over 80 percent of the overall income returns to higher education operates through the marriage market. Spousal transfers are negative for men, and particularly so for highly educated men.

Keywords: returns to education, assortative mating, marriage market, marriage income.

JEL-classification: I21, J12, J24.

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I. Introduction

As has been discussed in the vast literature on the returns to education, a higher level of education generally corresponds to a higher labor market income. Recently, the literature has been extended to a much broader context by showing how education leads to reduced mortality (Lleras-Muney 2002), increased baby birth weight (Moretti 2003) and lower incidence of criminal activity (Lochner and Moretti 2004). However, even in terms of the income one enjoys, merely looking at one's personal income provides an incomplete view. As the economics of family pioneered by Becker (1981) has indicated, one can think of a family as a resource-pooling unit where transfers within the family should also be seen as a source of income. To obtain the estimate of the "total" returns to education, it is arguably appropriate to incorporate the marriage market and the associated within-family transfers. This is the main purpose of this paper which examines the Swedish case and use data from 2002. Sweden is quite unique with its free of charge education, high female labor force participation rate, compressed wage distribution, and low marriage rates.

Goldin (1997) terms the part of one's resources obtained through spousal income as "indirect" return. Badgett and Folbre (2003) argue that "individuals make decisions based on their perception of payoffs in the marriage market, as well as the labor market." A recent study by Lefgren and McIntyre (2006) shows that roughly half of the correlation between women's education and consumption operates through the marriage market in the US, arguing that "the marriage market is one of the primary channels through which education is correlated to women's well-being". Similar to Lefgren and McIntyre (2006), my paper studies the association between education and marriage market outcomes. Highly educated women can have higher labor market incomes, but need not necessarily enjoy higher consumption if the within-family transfers operate to their disadvantage.

I present further decompositions to see how much of the association between women's education and their overall income that operates through the labor market and the marriage market. I find that marriage market can be very important for women. For women with less

than two years of university studies, transfers within the families can account for more than a quarter of their overall income increase associated with higher education. Women with graduate degrees are on average disadvantaged in the marriage market; on average they give higher transfers to their husbands than what less educated women do.

II. Education, Work Income and Marriage Income

A large literature on the returns to education has been dedicated to study how one's education level determines one's labor market income following the human capital framework of Mincer (1974). But the marriage market also matters for consumption opportunities. Badgett and Folbre (2003) argue that "women benefit greatly from the earnings of a spouse", and their research shows that women may choose "feminine" occupations even though they pay less because otherwise they may be penalized in the marriage market through lower probability of marriage and/or lower spousal income.

I use the overall income—the sum of work income and marriage income—as the outcome measure of one's investment into education. I define marriage income as the transfers one enjoys from the spouse. Let P be an indicator variable for marriage: $P = 1$ if a person is married and $P = 0$ if s/he is unmarried. Assume that the total family income is equally shared between the spouses. Marriage income (MI) is then defined as

$$MI = P \times \frac{Y^{spouse} - Y^{own}}{2}$$

and corresponds to the prospective income transfer within a family under equal sharing. If the person is married, $MI = (Y^{spouse} - Y^{own}) / 2$; if s/he is unmarried, $MI = 0$. Marriage income can clearly be positive as well as negative. The level of education affects marriage income through two channels, the first one being the marriage rate and the second through who one marries (assortative mating). Overall income (OI), assuming equal sharing, is given as

$(Y^{spouse} + Y^{own})/2$ if the person is married; if s/he is unmarried, $OI = Y^{own}$. We can express overall income as the sum of own income and marriage income, i.e.,

$$OI = Y^{own} + P \times \frac{Y^{spouse} - Y^{own}}{2}$$

Rose (2004) finds that the relationship between years of schooling and the likelihood of marriage takes the shape of an inverted-U for American women, and the marriage rate of those with more than 16 years of schooling (college degree) is lower than 12 years of schooling (high school degree). If the most highly educated women (usually) are disadvantaged in the marriage market, then the “total” return to education may conceivably be low or even negative. But Cherlin (1992) argues that it is not that women forego marriage at all, but rather that they postpone their marriages. Goldstein and Kenney (2001) study the cohorts born in the 1950s and the 1960s in the U.S. and suggest that women’s economic independence is becoming associated with higher rates of marriage. For Sweden, Bracher and Santow (1998) find a positive influence of economic self-sufficiency on cohabitation for women.

Concerning assortative mating, a higher level of education arguably provides people with more offers and choices of partners as Ge (2006) puts it, and “a relationship with a similarly qualified partner” as Blossfeld et al (2003) argue. Indeed, men can prefer a well educated wife who is smart and able to share intellectual life experiences. But on the other hand, men may also be intimidated by highly successful women, whose education and/or income is higher than their own.

The assortative mating pattern has been studied by many sociologists (e.g. Schwartz and Mare, 2005; Qian, 1998) and some economists (e.g. Pencavel, 1998; Choo and Siow, 2006). Becker (1985) argues that housework responsibilities discourage women’s investment in market human capital. Recent studies suggest positive assortative mating by education. For

instance, Pencavel (1998) studies the assortative mating on years of schooling in America in several years and find that young couples have become more similar in their schooling backgrounds ever since 1960. Henz and Jonsson (2003) use a hazard model to the Swedish dataset and conclude that Sweden is one of very few countries with no statistical significance for the correlation between duration in school and homogamous marriage rates. One of the interpretations Henz and Jonsson (2003) offer is “an underlying trend towards equalization in Swedish society”.

To conclude, one’s education level can influence one’s overall income in two different ways: a direct effect on personal work income, and an indirect effect on marriage income through the probability of getting married as well as the spouses’ incomes.

III. Summary Statistics

A. The LINDA Dataset

I use the Swedish dataset LINDA – short for Longitudinal INdividual Data – to link individuals and their spouses. LINDA contains a representative population sample of around 3.35 percent of the whole population, and an individual does not leave the sample unless s/he dies or emigrates outside Sweden. Family members stay in the sample as long as they stay in the family. For a detailed description of LINDA, see Edin and Fredriksson (2000).

I use LINDA register data for the year 2002 and drop observations with missing information on education. For each randomly chosen person (urvalsperson) and gender, I keep the individuals that are between and including ages 25 and 59 and born in Sweden. I put no restrictions on the spouses’ ethnicity and age. The reason for choosing those born in Sweden is to have a sample of people with reasonably homogeneous cultural background. By restricting the age group to between 25 and 59, I focus on the working age population.

The definition of marriage can be tricky in Sweden. The Swedish marriage rate is one of the lowest in the world since many Swedes choose to “sambo”, which literally means living together. In the 2002 LINDA, households are defined for tax purposes in the register, meaning that two adult individuals belong to the same family if they are married or if they are cohabiting and have children in common. Cohabiting individuals without common children are separate households for tax purposes, and thus regarded as singles in my paper.¹

I categorize education levels into six groups: 1 denotes those with less than nine years of compulsory schooling, 2 for nine years of schooling, 3 for high school education, 4 for less than two years of university, 5 for at least two years of university, 6 for graduate studies. For age groups, I have group 1 indicating ages between and including 25 and 29, group 2 for 30 to 34, group 3 for 35 to 39, group 4 for 40 to 44, group 5 for 45 to 49, group 6 for 50 to 54 and group 7 for 55 to 59.

B. Marriage Rates in Sweden

Due to the characteristics of the dataset, I use the stock measure of currently married individuals. I study the marriage rate for men and women with each combination of age group and education level. Figure 1 shows the marriage rate for women. Generally the older one is, the higher the marriage rate. In addition, the patterns of all age groups with different levels of education are almost the same except for relatively young women with education level 1. However, the sample is very small for this category; for instance, there are only five women between ages 35 and 39 with less than nine years of schooling in the sample².

Figure 2 shows the association between education level and the marriage rate, pooling all age

1 There can be times where more than one person of the opposite sex shares the same household number with one chosen person, the reason being that they can be the parents or children. I solve this by setting an age difference limit between the spouses. I exclude the “spouse” that is younger than 20 years old, and the “spouse” that has a positive/negative age difference more than 30 years for men sample, and 28 years for women sample.

2 I also run a probit model for one being married. The regression results have the same pattern as the summary statistics and the detailed tables are available upon request.

groups together. Different from the results in Rose (2004) for the U.S. where there is an inverted-U shape between women's education and the marriage rate, my results display a W-shape: women with high school diploma and graduate studies have high marriage rates, whereas women with less than two years of university have the lowest marriage rate. The marriage rate pattern for men is less erratic. The correlation between marriage rates and men's education level is positive, with graduate degrees having the highest marriage rate of 71.5% and nine years of schooling having the lowest of 56.0%.

C. Assortative Mating in Sweden

I study the assortative mating pattern by education level, age group, and earnings rank. The sample is based on the chosen and married women (urvalsperson) together with their husbands. In addition, these women are between and including ages 25 and 59, with all levels of education and including missing information ones.

Figure 3 displays the assortative mating pattern by education levels. The 45-degree line indicates homogamy, i.e. when women marry men that share the same education level. The total homogamy rate is 47.8%. Women with nine years of schooling marry mostly with men who have high school diplomas, and women with less than two years of university tend to marry down—the number of those who marry someone with a high school diploma almost triples the number of those who marry someone with some university studies.

Figure 4 shows the assortative mating pattern by age groups. Again, there is a very high homogamy rate, namely 47%. Women younger than 45 years old tend to be married with someone older, and those older than 45 years tend to be married with someone slightly younger or of the same age.

Table 1 displays the assortative mating pattern by earnings rank. Earnings here are personal annual work income (arbetsinkomst). I rank each gender's earnings, and include those who have zero earnings. There are five earnings rank categories: category 1 is for those who earn

up to 25% of the earnings rank; category 2 is for those whose earnings are between 25% and at most half way of the earnings rank; category 3 is for those whose earnings are between half and 75% earnings rank; category 4 is for those between 75% and 90% of the earnings rank; and category 5 is for those in the top 10% of the earnings rank. I divide the top 25% earnings ranking into two groups to see the assortative mating pattern of the wealthiest group. Overall, the homogamy rate is 30.6%. The top 10% earning women mostly marry the top 10% earnings men, while the between 75% and 90% earning women in majority marry down one category with men between 50% and 75% earnings rank. The 75% and 90% earnings rank men choose to marry down one category, women with earnings of 50% and 75% in the rank.

Summing up, it is clear that the assortative mating pattern in Sweden is positive: the homogamy rate is high in terms of education, age and earnings.

D. Summary Statistics

Table 2, table 3 and figure 5 display summary income statistics for women and men, married as well as married and singles pooled together. I show the mean personal annual work income, mean annual marriage income, the mean overall annual income, as well marriage income relative to work income and overall income.

For women, work income and overall income increase as the education level increases. The mean marriage income for all women displays an inverted U-shape in relation to the education level, with the highest marriage income for women who have less than two years of university education (35,000 SEK annually).³ The lowest marriage income goes to women who have graduate degrees (16,800 SEK).

Women with less than two years of university have on average the lowest marriage rate so their high marriage income must come from very high intra-household transfers. Indeed,

³ The exchange rate is around 7.0 SEK to 1 dollar in the year 2007.

married women with less than two years of university have on average marriage income as high as 63,500 SEK, almost three times as much as those with a graduate degree. For married women, marriage income corresponds to one third of work income for those with less than two years of university.

The corresponding patterns for men are quite different. Men usually earn more than women and once a couple gets married and shares their family income, it is usually the men that transfer resources to women. In general, therefore, marriage income is negative for men and positive for women. In my sample, 46% women are married and with positive marriage income compared to only 17.5% women with negative marriage income. Only 13% of the men have positive marriage income. The mean marriage incomes for men are all negative, and the resources they give transfer to their wives are monotonically increasing in relation to their own education levels. Men with graduate degrees on average give out 98,400 SEK annually, almost twice as much as men with less than two years of university. The marriage income they lose corresponds to one-fifth of their work income, as opposed to 15 percent for those having university degrees and 11 percent for those with high school diplomas.

IV. Econometric Model and Regression Results

I use a version of the standard Mincer's earnings equation:

$$WI = \alpha_1 + \beta_1 \times Edu + \gamma_1 \times X + \varepsilon_1 \quad (1)$$

$$MI = \alpha_2 + \beta_2 \times Edu + \gamma_2 \times X + \varepsilon_2 \quad (2)$$

$$OI = \alpha_3 + \beta_3 \times Edu + \gamma_3 \times X + \varepsilon_3 \quad (3)$$

where *WI* indicates personal annual work income, *MI* annual marriage income, and *OI* annual overall income. *Edu* is a series of dummy variables indicating education levels: less than nine years of compulsory schooling (reference group), nine years of compulsory

schooling, high school diploma, less than two years of university, at least two years of university, and graduate degree. X is a group of covariates including age, age squared, number of children in the household that are under the age of eighteen and dummy variables for spouses' countries of birth: born in Sweden (reference group), born in the Nordic countries, born in Europe or six other OECD countries⁴, and born elsewhere.

Sample selection can be potentially problematic, but fortunately the employment rate in Sweden is quite high compared to other countries, even for females. According to the Swedish labor force survey, the unemployment rate of women between ages 25 and 54 in Sweden was 3.0% in 2001. In my sample, the proportion of people with zero annual work income is 7.2% for women and 6.9% for men. I drop the observations where both members of the family have zero work incomes.

I show the regression results in table 4. The dependent variables are annual work income, annual marriage income, and annual overall income. For women, annual work income increases monotonically with education but marriage incomes displays an inverted-U shape against education. Women with less than two years of university benefit the most from marriage incomes and women with graduate degrees benefit the least. For instance, women with less than two years of university studies have nearly 20,000 SEK higher annual work incomes compared to women with only high school diplomas, and they gain an additional 9,700 SEK in annual marriage incomes, resulting in a 50% increase in their overall incomes. Their overall incomes increase monotonically with education levels.

The number of children under the age of eighteen is negatively associated with women's annual work income, as one can expect. On average, each additional non-adult kid is associated with almost 10,000 SEK annual work income decrease. But interestingly the coefficient becomes non-significant with dependent variable being annual overall income. This suggests that the overall income that women have access to, an indicator of individual

4 Including Great Britain and Northern Ireland, Australia, Belgium, France, Greece, Ireland, Italy, Japan, Canada, Luxemburg, the Netherlands, New Zealand, Portugal, Switzerland, Spain, Turkey, Germany, USA.

consumptions, is not affected by the number of children as common perceptions go; the intra-household compensations from the husbands will be sizable enough to offset women's loss from work incomes. The corresponding story goes alike for men—the coefficient is positive with dependent variable being work income and non-significant if overall income.

In addition, marrying a husband who was born outside Sweden is associated with a decrease in woman's overall income. Overall income is associated with an income decrease of 46,500 SEK for a woman who marries a man born outside Sweden, the Nordic countries or OECD countries. These results are mostly driven by lower marriage incomes.

I also run regressions using log incomes as dependent variables. The rates of return are displayed in Figure 6. The pattern for the returns to overall income is much flatter and less dramatic and somewhat linear compared to the return derived from work incomes only, and this can be attributed mainly to two sources: The first one is that the adjusted returns for women with relatively low educations, in particular those with less than two years of university studies, are much higher than the traditional returns derived from the traditional approaches. The second one is that the adjusted returns for women with graduate degrees are lower than otherwise.

One can interpret this less dramatic curve as a result of the marriage market. Here the marriage market works as a cushion to reduce the earnings differences among women with different education levels—low educated women can be partially compensated from their husbands' incomes, while highly educated women may be disadvantaged in the marriage market through the assortative mating. Alternatively, it could also be that some women may choose to give up further investment into education since they have already secured good access to marriage incomes, and they can have an earlier entry into the labor market, thus they can potentially enjoy higher overall incomes than otherwise⁵.

5 Ideally, to precisely calculate the sum/present value of overall incomes over one's entire life requires detailed information of each entry and exit of the labor market, as well as each entry and/or exit of the marriage market. Since I cannot track everyone throughout his/her lifetime from the dataset, I study only one cross-sectional time.

For men, the pattern is different. While their work incomes are positively correlated with education levels, their marriage incomes are negatively correlated. One can see from Table 4 that the higher education a man has, the more he gives out to his wife on average. For instance, men with at least two years of university have 38,300 SEK lower marriage incomes than men with less than nine years of compulsory schooling; the corresponding number is 72,300 SEK for men with graduate studies. The results from regressions using log incomes are displayed in Figure 6. The adjusted overall return curve for men is almost the same as the traditional curve.

I also use a continuous variable of years of schooling in the regressions instead of six education level categories. For those that have less than nine years of compulsory schooling, I set their schoolings as 4.5 years. High school diploma, less than two years of university, at least two years of university, graduate degrees are defined for 12, 14, 16, 20 years of schooling, respectively. The results for women and men are shown in table 5. For men, one extra year of schooling is associated with approximately 4.9% higher annual work income in the traditional approach. But if one takes marriage income into consideration, the result would instead be slightly lower, a 4.5% higher return in men's annual overall income. As the literature of returns to education generally agrees, the annual income return is higher for women—5.6% from one extra year of education investment.

The regressions above provide a picture of the association between education and outcomes in labor and marriage market, but a causal interpretation is problematic. The selection into marriage is endogenous and marriage and incomes may be jointly determined. Lefgren and McIntyre (2006) use one's quarter of birth as an instrumental variable for education, as Angrist and Kruger (1991); people born early in the year start school at an later age and can drop out of school earlier than people born later in the year. But there are potential problems, too. For instance, one has to make sure that quite a fraction of the sample does choose to drop out of school when they hit some certain age. In addition, Bound, Jaeger and Baker (1995) show that randomly generated instrumental variables can result in very similar results. Furthermore, this method works best when one wants to compare the two groups who

manage or not to remain in school when they are allowed to. And if one is interested to compare several different education level groups, this may not be the best solution.

V. Decomposition of Labor and Marriage Market Impacts

The previous section discussed the importance of the marriage market and calculated the returns to education with overall incomes as the outcome measure. This section studies how much of the association between women's education and overall incomes that operates through the marriage market and the labor market. Since marriage incomes matter more for women, this section focuses on women. I shall first present the results derived from the method used by Lefgren and McIntyre (2006) – henceforth denoted LM – and then present the results from my extended method with a further detailed decomposition.

The basic idea follows LM's calculation. The overall income (denoted as OI) is given by

$$OI = P \times \left(\frac{H}{2} + \frac{I_m}{2} \right) + (1 - P) \times I_s \quad (4)$$

where P is the probability of marriage, H is the husband's income, I_m is the woman's work income if married and I_s if single. The reason to distinguish I_m and I_s is because of the potential marriage premium; marriage per se may matter for earnings.

The marginal change in overall income is associated with higher education is given as

$$\frac{dOI}{dE} = \frac{dP}{dE} \left(\frac{H + I_m - 2I_s}{2} \right) + \frac{P}{2} \frac{dH}{dE} + \frac{P}{2} \frac{dI_m}{dE} + (1 - P) \frac{dI_s}{dE} \quad (5)$$

Assuming no economics of scale, no utility benefit from marriage and equal resource

allocations between two spouses (if married), LM's paper argues that the combination of the first and second terms is the marginal change in overall incomes operating through the marriage market. With the data available on the marriage rate, husband's incomes and personal incomes, I can compute all of the above variables and their changes associated with increases in education levels. The regressions include age squared. Table 6 shows the results. Column 10 is the fraction change through marriages and the other columns contain the calculations necessary to obtain the results in column 10. For women with less than two years of university studies, more than half of improvements in their overall incomes associated with higher education operate through the marriage market.

Arguably there is a slight problem with LM's decomposition. I_m appears in the third term in equation 5 and is considered as the effects from the labor market. It is true that I_m is one's work income and operates through the labor market, but one should recognize that I_m can be different from I_s , and that the difference is associated with the marriage market. Put in another way, I_m seems to be operating through the labor market but it is in fact caused by the marriage market. Therefore I present a further decomposition of the marriage market and the labor market.

The overall income is equal to the work income plus the marriage income:

$$OI = WI + MI \quad (6)$$

And the Work income, denoted as WI , is:

$$WI = I_s + P(I_m - I_s) \quad (7)$$

This means that if one is single, then $P = 0$ and $WI = I_s$. If one is married, then $P = 1$ and

her work income also includes the marriage premium $I_m - I_s$, which operates in the labor market since it is shown in a way of work income, but is in essence associated with/caused by the marriage market. And the marginal change in work income is

$$\frac{dWI}{dE} = \frac{dI_s}{dE} + \frac{dP}{dE}(I_m - I_s) + P\left(\frac{dI_m}{dE} - \frac{dI_s}{dE}\right) \quad (8)$$

The first term is the marginal change in work income while one is single, and I denote this as the effects from Single Work Income. The rest is the marginal change in one's work income after one is married, and I denote it as the effects from Marriage Premium Work Income, which as I discussed above works through the labor market but is caused by the marriage market.

The marriage income (denoted as MI) is the difference between the overall income (OI) and work income (WI), $MI = OI - WI$. It is also half of the two spouses' incomes difference, since the differences in incomes are equally shared between the two people,

thus $MI = \frac{H - I_m}{2}$. The marginal change in marriage income is then:

$$\frac{dMI}{dE} = \frac{dOI}{dE} - \frac{dWI}{dE} = \frac{dP}{dE} \frac{H - I_m}{2} + \frac{P}{2} \left(\frac{dH}{dE} - \frac{dI_m}{dE} \right) \quad (9)$$

The first term is due to the change in marriage rate, and the second term is due to the change in assortative mating pattern.

To sum up, the marginal change in overall income dOI / dE can be decomposed into three effects—single work income, marriage premium work income, and marriage income, and I show this in the following expression:

$$\frac{dOI}{dE} = \frac{dI_s}{dE} + \left[\frac{dP}{dE} (I_m - I_s) + P \left(\frac{dI_m}{dE} - \frac{dI_s}{dE} \right) \right] + \left[\frac{dP}{dE} \frac{H - I_m}{2} + \frac{P}{2} \left(\frac{dH}{dE} - \frac{dI_m}{dE} \right) \right] \quad (10)$$

Effects of: Single Work Income

↓

Caused by: Labor Market

↓

Works through: Labor Market

Marriage Premium Work Income

↓

Labor Market

Marriage Income

↓

Marriage Market

The first term is purely work income and comes from the labor market. The terms in the second bracket are also work income, but they are caused by the marriage market. The terms in the third bracket are purely marriage income and come from the marriage market. I shall refer to the third bracket as the marriage income, and refer to the marriage market impacts as the combination of the second and the third brackets. Obviously equation 5 according to LM's decomposition is equal to equation 10; what distinguishes the two is the mechanism operating through the labor market as well as marriage market as discussed earlier.

The results obtained from my extended decompositions are presented in table 7. The marginal changes in women's overall incomes dOI / dE vary significantly among different educational categories. A high school degree is associated with 34,100 SEK increase in annual overall income compared to those who only finish nine years of compulsory schooling, while obtaining a graduate degree is associated with an increase in annual overall income of 118,200 SEK. Changes from Single Work Income, Marriage Premium Work Income and Marriage Incomes are presented in columns 2, 3+4, 5+6, respectively. Table 7 calculates the detailed fraction change accordingly – fraction change due to single work income in column 7, fraction change due to marriage premium work income in column 10, and fraction change due to marriage income in column 13.

The most striking group is women with university attendance of less than two years. Compared to those who only finish high school educations, these women can enjoy an increase of 24,400 SEK in overall incomes. But only 13% of this increase is attributed to their single work income changes. Their marriage income changes account for 30.5% of the

overall changes, the highest among all education groups. This confirms that women with less than two years of university tend to marry someone fairly wealthy who makes generous positive transfers to them. Furthermore, the changes in their marriage premium work income accounts for 56.5% of the overall increase, also the highest among all groups. This indicates that they not only benefit directly from the intra-household transfers, but they also tend to be having better-paid jobs after their marriages. The total effect of the marriage market for them is $56.5\%+30.5\%=87\%$.

It is quite different for women with graduate studies for whom the marriage market contributes negatively to marginal overall income changes. Although their marginal overall income increase is as high as 118,226 SEK (16,889 USD), this comes almost purely from her own single work income, accounting for 107.2% of the overall changes, and her marriage income contributes a negative 14.9%. An even further decomposition within the marriage income in columns 11 and 12 shows that the negative transfer is because of the assortative mating rather than the marriage rate, meaning that women with graduate degrees are expected to give out more transfers to their husbands.

The results in table 7 using my method are quite different from the results in table 6 using LM's method, and this shows the importance of distinguishing the effects of single work income and marriage premium work income. For instance, according to LM's method, the fraction change through marriage is 20.7% for women who attend university for at least two years, and this means that marriage accounts for 20.7% among all the marginal changes in her annual overall income. In my method, the total fraction change due to marriage, including marriage premium work income change and marriage income change, is a negative 40.9%. Among the 40.9%, 31% comes from the marriage premium work income which could be for instance that these women choose to have a less-paid job after marriages for the division of labor within households. This means that compared to women who drop out of university, those who continue with university enjoy an increase of 39,895 SEK (5,699 USD) in their annual overall incomes, but it comes from higher productivities and higher work incomes, and their marriages in fact contribute negatively.

In this section I have decomposed the association between women's education and their overall incomes into three sources: single work income, marriage premium work income, and marriage income. Single work income is caused by the labor market and operates through the labor market; marriage premium work income is in essence influenced by the marriage market, although it operates in the labor market; marriage income is caused by the marriage market and operates through the marriage market. The decomposition results show that the marriage market can contribute negatively to one's overall income changes, and it can also account as much as almost 90% of one's overall income changes.

VI. Conclusions

A higher level of education typically corresponds to a higher labor market income. But individual consumption is also affected by outcomes in the marriage market and intra-family transfers. This paper examines the interplay between labor and marriage markets in shaping the returns to education in Sweden.

My paper shows that the marriage market can work as a cushion to reduce the earnings gap among different education categories. For instance, although women with graduate degrees earn on average more than twice in annual work income than women with less than two years of university, their marriage incomes are less than half of the latter group.

If the impact of the marriage market is negative and much enough, it is in theory possible for some people in particular highly educated women, to enjoy higher work income but lose out in overall incomes. In other words, it may be difficult for them to "have it all"—a good balance between career arena and family life. Pooling both work income and marriage income together, my paper finds an overall monotonic increase in the rate of return in education for both women and men, which means one could "have it all". On average, one extra year of schooling results in approximately 5.6% higher annual overall income for women, and around 4.5% for men.

Overall, the results of the paper suggest that the marriage market should be taken into consideration when it comes to estimations of the “full” return to education.

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Table 1. Assortative Mating by Earnings Rank in 2002

Earnings Rank Woman	Earnings Rank Man					
	0%-25%	25%-50%	50%-75%	75%-90%	90%-100%	Total
0%-25%	1.7	1.8	2.0	1.1	0.8	7.3
25%-50%	1.7	5.5	7.5	4.1	2.6	21.4
50%-75%	2.4	7.3	13.3	7.6	4.0	34.6
75%-90%	1.7	4.0	7.3	5.3	3.5	21.7
90%-100%	1.0	2.1	3.2	3.8	4.8	15.0
Total	8.5	20.7	33.2	21.9	15.6	100.0

Note: The sample is based on married chosen women together with their husbands. The women are between and including ages 25 and 59, with all levels of education and including missing information ones. The earnings are personal annual work income and the rankings are from each gender respectively.

Table 2. Summary Statistics for Mean Work Income, Mean Marriage Income and Mean Overall Income

Education Level	Women								Men							
	All Women (married + single)				Married Women				All Men (Married + single)				Married Men			
	# Obs	Work Income	Marriage Income	Overall Income	# Obs	Work Income	Marriage Income	Overall Income	# Obs	Work Income	Marriage Income	Overall Income	# Obs	Work Income	Marriage Income	Overall Income
<9 years	2,274	116,748	20,684	137,432	1,532	123,796	30,701	154,497	3,550	193,701	-18,638	175,064	2,230	213,963	-29,670	184,293
=9 years	5,569	142,985	24,513	167,499	3,468	152,184	39,364	191,548	7,778	206,559	-20,309	186,250	4,357	234,228	-36,255	197,973
High School	29,756	171,478	28,865	200,343	19,517	172,212	44,008	216,220	31,944	240,227	-26,414	213,813	18,466	262,822	-45,693	217,130
<2 Univ	2,856	182,487	35,189	217,676	1,582	194,081	63,528	257,608	5,022	314,500	-47,829	266,671	3,028	352,437	-79,325	273,111
>=2 Univ	18,753	234,012	32,341	266,353	11,876	238,428	51,068	289,496	13,192	352,519	-54,440	298,079	7,846	403,490	-91,534	311,956
Graduate	258	376,391	16,821	393,212	179	381,654	24,245	405,899	687	492,800	-98,359	394,441	491	533,421	-137,622	395,799

Table 3. Summary Statistics Married Income Relative to Work Income and Marriage Income Relative to Overall Income (%)

Education Level	Women				Men			
	All Women		Married Women		All Men		Married Men	
	marriage/work	marriage/overall	marriage/work	marriage/overall	marriage/work	marriage/overall	marriage/work	marriage/overall
<9 years	17.7	15.1	24.8	19.9	-9.6	-10.6	-13.9	-16.1
=9 years	17.1	14.6	25.9	20.6	-9.8	-10.9	-15.5	-18.3
High School	16.8	14.4	25.6	20.4	-11.0	-12.4	-17.4	-21.0
<2 University	19.3	16.2	32.7	24.7	-15.2	-17.9	-22.5	-29.0
>=2 University	13.8	12.1	21.4	17.6	-15.4	-18.3	-22.7	-29.3
Graduate	4.5	4.3	6.4	6.0	-20.0	-24.9	-25.8	-34.8

Table 4. Ordinary Least Squares Regression with Annual Work/Marriage/Overall Incomes as Dependent Variables

	Women			Men		
	Dependent Variables:			Dependent Variables:		
	Work Income	Marriage Income	Overall Income	Work Income	Marriage Income	Overall Income
Age	15,230	-1,019	14,211	18,598	-3,646	14,953
	(463)***	(350)***	(498)***	(771)***	(340)***	(582)***
Age Square	-16,598	926	-15,672	-19,680	3,730	-15,949
	(564)***	(429)**	(606)***	(940)***	(419)***	(704)***
No. Kids<18	-9,922	9,642	-280	5,124	-5,495	-372
	(531)***	(517)***	(634)	(1,010)***	(522)***	(660)
9 Yrs School	28,650	-2,967	25,682	17,791	-4,295	13,495
	(2,469)***	(1,765)*	(2,417)***	(2,822)***	(1,336)***	(2,275)***
High School	60,682	-2,103	58,578	56,690	-10,747	45,943
	(2,180)***	(1,686)	(2,204)***	(2,581)***	(1,236)***	(2,039)***
<2 yr College	78,273	7,622	85,895	126,774	-29,948	96,826
	(3,327)***	(2,511)***	(3,453)***	(3,796)***	(1,774)***	(2,914)***
>=2yr College	123,805	2,735	126,540	169,949	-38,317	131,632
	(2,296)***	(1,937)	(2,449)***	(3,631)***	(1,744)***	(2,590)***
Graduate	259,426	-14,999	244,426	291,230	-72,258	218,972
	(12,424)***	(7,337)**	(11,789)***	(12,901)***	(6,535)***	(8,258)***
No Spouse	-9,832	-41,508	-51,340	-59,867	48,146	-11,721
	(1,072)***	(755)***	(1,178)***	(1,812)***	(812)***	(1,408)***
Spouse Nordic	-10,539	-5,132	-15,671	-20,432	9,145	-11,287
	(3,492)***	(3,543)	(3,713)***	(5,181)***	(2,963)***	(3,432)***
Spouse Europe/OECD	-214,448	-16,933	-17,148	8,171	-14,951	-6,779
	(5,129)	(4,810)***	(5,403)***	(10,854)	(6,364)**	(6,983)
Spouse Elsewhere	-6,795	-39,705	-46,500	-29,951	-11,313	-41,264
	(3,980)*	(3,811)***	(4,219)***	(5,510)***	(3,240)***	(3,513)***
Constant	-206,251	63,012	-143,239	-205,820	51,150	-154,670
	(8,847)***	(6,627)***	(9,529)***	(14,390)***	(6,252)***	(11,054)***
Observations	59035	59035	59035	61775	61775	61775
R-squared	0.130	0.055	0.129	0.130	0.118	0.114

Note: The reference group is people with less than nine years of schooling and whose spouses are born in Sweden.

Observations where both family members have zero annual work incomes are excluded from the sample. Robust standard errors are in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 5. Ordinary Least Squares Regression Results with log Incomes as Dependent Variables

	Women		Men	
	Dependent Variables: Log of		Dependent Variables: Log of	
	Work Income	Overall Income	Work Income	Overall Income
Yrs of Schooling	0.056	0.056	0.049	0.045
	(0.001)***	(0.001)***	(0.002)***	(0.002)***
Observations	55211	56828	57902	58997
R-squared	0.06	0.08	0.07	0.06

Note: The reference group is people with less than nine years of schooling and whose spouses are born in Sweden. Observations where both family members have zero annual work incomes are excluded from the sample. The regressions also include variables of one's age, a quadratic form of age, as well as the spouses' countries of birth. Robust standard errors are in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 6. Decomposition of the Marginal Changes in Overall Incomes Using the Lefgren and McIntyre (2006) Method

	Married Women Income (SEK) I_m	Change Married Women Income (SEK) $\frac{dI_m}{dE}$	Single Women Income (SEK) I_s	Change Single Women Income (SEK) $\frac{dI_s}{dE}$	Husband's Income (SEK) H	Change Husband's Income (SEK) $\frac{dH}{dE}$	Probability Married P	Change Probability Married: $\frac{dP}{dE}$	Fraction Change in Overall Income through Husband *	Fraction Change in Overall Income through Marriages *
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<9 years	121,912		94,782		215,768		0.623			
=9 years	151,192	29,279	123,186	28,404	236,758	20,990	0.612	-0.011	0.418	0.220
High School	174,912	23,721	169,435	46,249	262,514	25,757	0.648	0.036	0.521	0.297
<2 College	202,697	27,785	172,612	3,177	322,633	60,118	0.608	-0.040	0.684	0.602
>=2 College	239,429	36,732	228,819	56,207	340,347	17,714	0.649	0.041	0.325	0.207
Graduate	379,376	139,947	355,610	126,791	426,062	85,716	0.664	0.015	0.380	0.247

Note: This table shows the fraction of the correlation between women's education and family or overall income that operates through the marriage market. The incomes reported are the predicted incomes for women of the given education category with covariates set to the sample average. The changes in incomes are the marginal increase in income associated with one higher educational category.

Column 9 is $\frac{dH / dE}{dH / dE + dI_m / dE}$

Column 10 is $\frac{\frac{dP}{dE} [\frac{H}{2} + \frac{I_m}{2} - I_s] + \frac{P}{2} \frac{dH}{dE}}{\frac{dP}{dE} [\frac{H}{2} + \frac{I_m}{2} - I_s] + \frac{P}{2} \frac{dH}{dE} + \frac{P}{2} \frac{dI_m}{dE} + (1 - P) \frac{dI_s}{dE}}$

Table 7. Decomposition of the Marginal Changes in Overall Incomes due to the Increase in Education

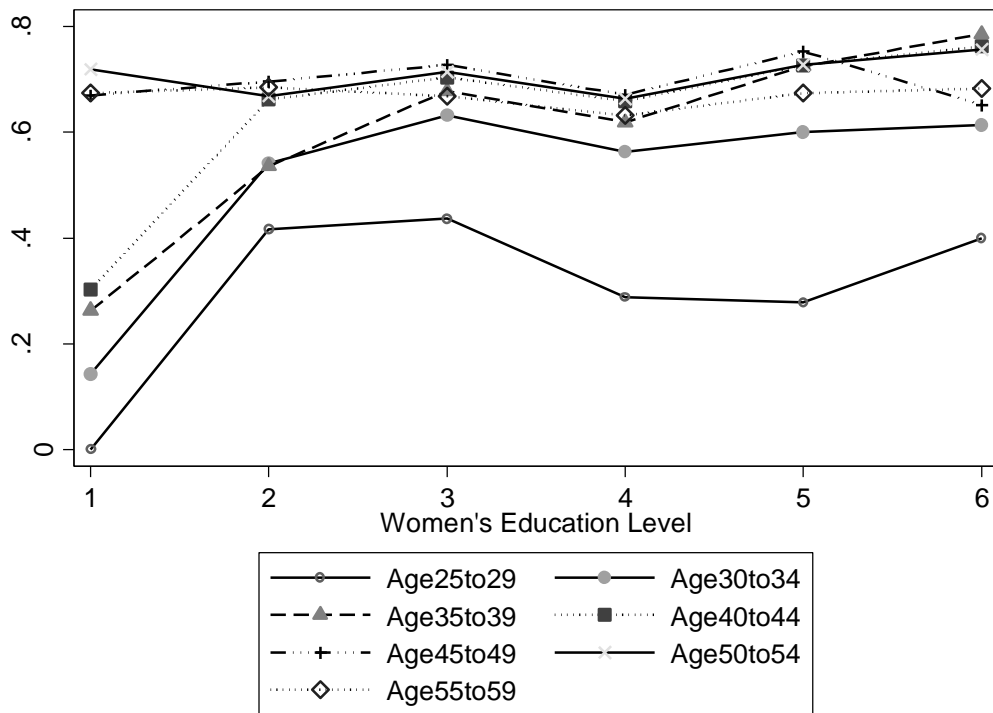
	Total Change $\frac{dOI}{dE}$	Change Single Women Income (SEK) $\frac{dI_s}{dE}$	Change in Own Income		Change in Marriage Income	
			Due to Marriage Rate $\frac{dP}{dE}(I_m - I_s)$	Due to Marriage Premium $P(\frac{dI_m}{dE} - \frac{dI_s}{dE})$	Due to Marriage Rate $\frac{dP}{dE} \frac{H - I_m}{2}$	Due to Assortative Mating $\frac{P}{2}(\frac{dH}{dE} - \frac{dI_m}{dE})$
	(1)	(2)	(3)	(4)	(5)	(6)
=9 yr	25,624	28,404	-308	536	-471	-2,537
High School	34,080	46,249	197	-14,603	1,577	660
<2 Univ	24,373	3,177	-1,203	14,967	-2,399	9,832
>=2 Univ	39,895	56,207	435	-12,643	2,069	-6,173
Graduate	118,226	126,791	356	8,738	350	-18,010

Table 7-cont'd Decomposition of the Fraction Change in Overall Incomes due to the Increase in Education

	Fraction Change due to Own Income while single $\frac{dI_s/dE}{dOI/dE}$	Fraction Change due to Own Income after Married			Fraction Change due to Marriage Income		
		Due to Marriage Rate $\frac{(I_m - I_s) \times dP/dE}{dOI/dE}$	Due to Marriage Premium $\frac{P(dI_m/dE - dI_s/dE)}{dOI/dE}$	(8)+(9)	Due to Marriage Rate $\frac{(H/2 - I_m/2)dP/dE}{dOI/dE}$	Due to Assortative Mating $\frac{(dH/dE - dI_m/dE)P/2}{dOI/dE}$	(11)+(12)
	(7)	(8)	(9)	(10)	(11)	(12)	(13)
=9 yr	1.108	-0.012	0.021	0.009	-0.018	-0.099	-0.117
HighSchool	1.357	0.006	-0.428	-0.423	0.046	0.019	0.066
<2 Univ	0.130	-0.049	0.614	0.565	-0.098	0.403	0.305
>=2 Univ	1.409	0.011	-0.317	-0.306	0.052	-0.155	-0.103
Graduate	1.072	0.003	0.074	0.077	0.003	-0.152	-0.149

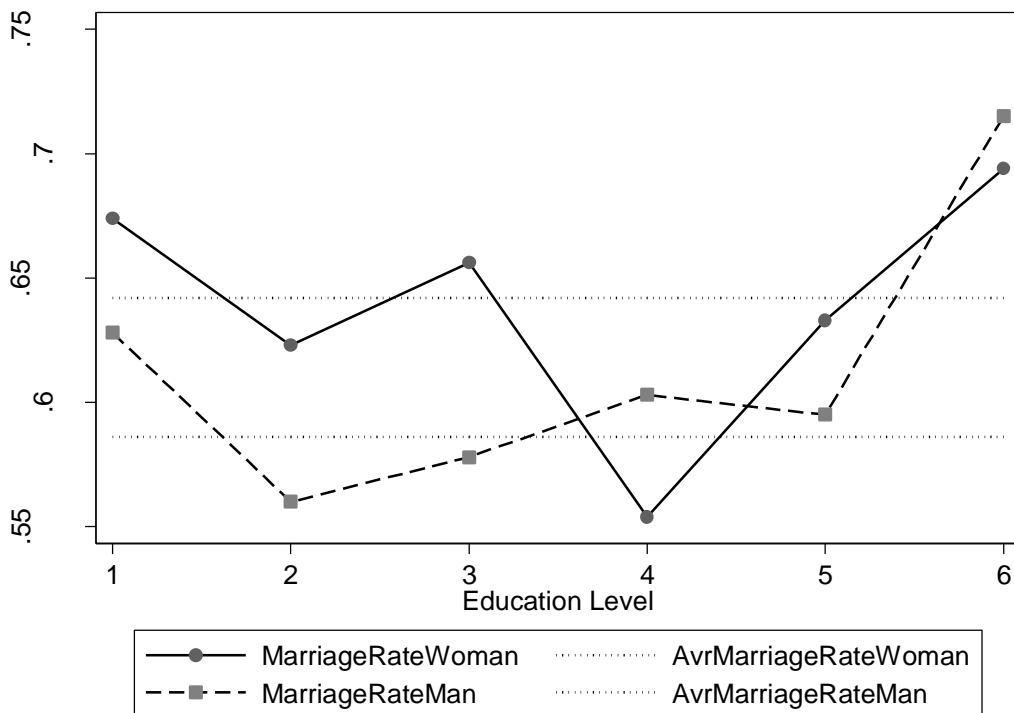
Note: The marginal change in OI from higher education in col. (1) can be decomposed into: her own single work income change (2), her marriage premium work income change (3 and 4), and her marriage income change (5 from marriage rate, and 6 from assortative mating); (7) is the fraction change through her single work income; (10) is the fraction change through her marriage premium work income (combination of 8 and 9); (13) is the fraction change through marriage income (combination of 11 and 12).

Figure 1. Marriage Rates for Women in Different Age Groups



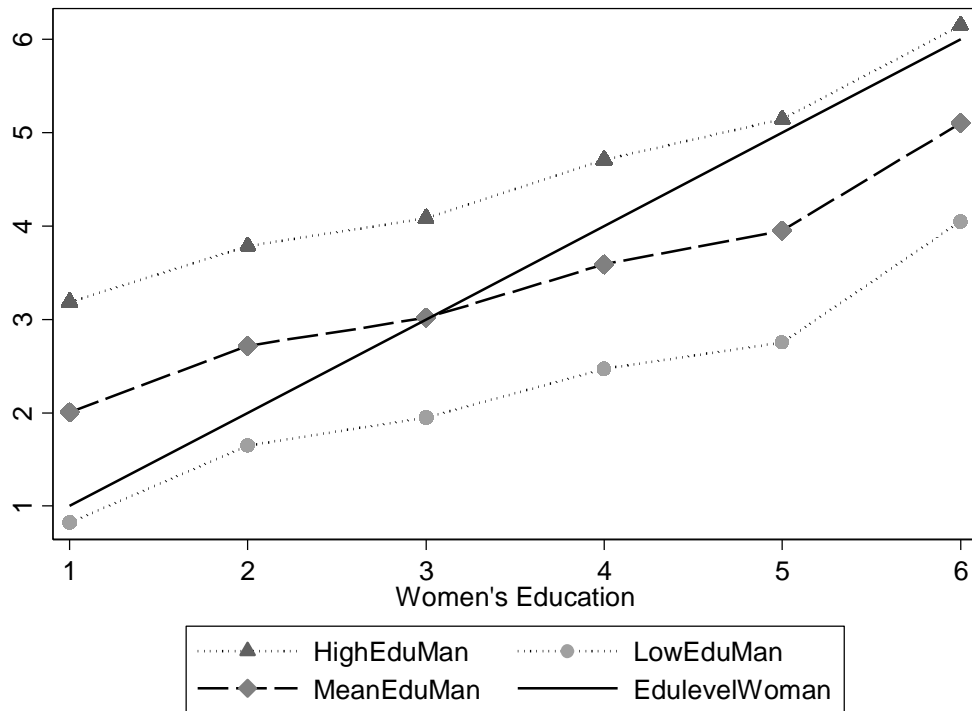
Note: Education level 1 is for less than 9 years of schooling; level 2 for 9 years of compulsory schooling; level 3 for high school diploma; level 4 for less than 2 years of college; level 5 for at least 2 years of college and level 6 for graduate studies.

Figure 2. Mean Marriage Rates for All Men and Women



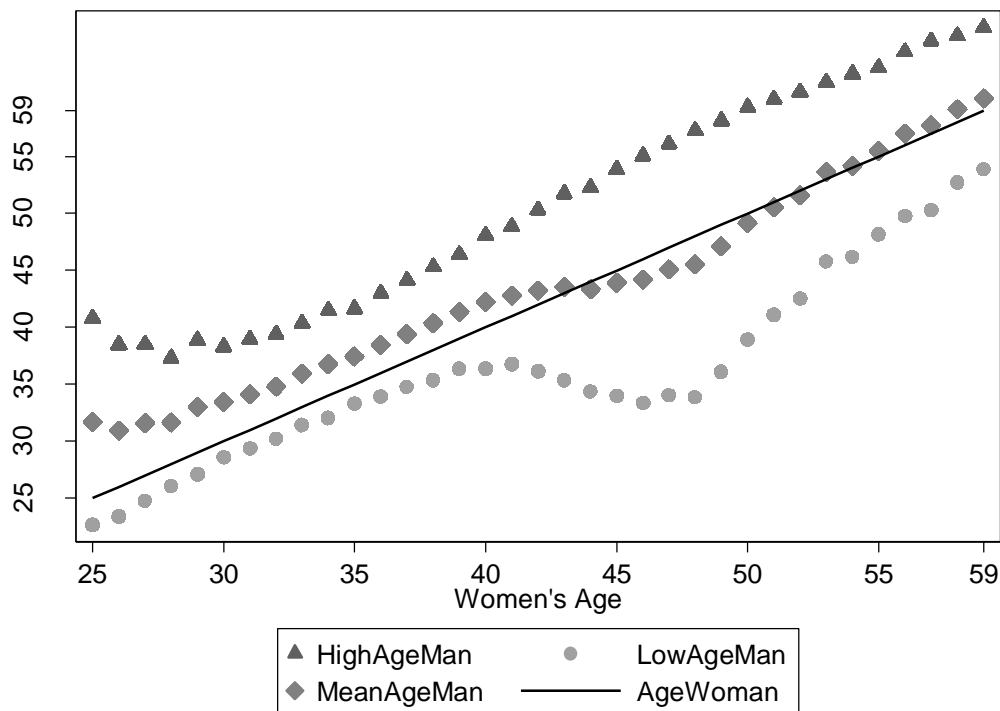
Note: Education level 1 is for less than 9 years of schooling; level 2 for 9 years of compulsory schooling; level 3 for high school diploma; level 4 for less than 2 years of college; level 5 for at least 2 years of college and level 6 for graduate studies.

Figure 3. Assortative Mating Pattern by Education Levels



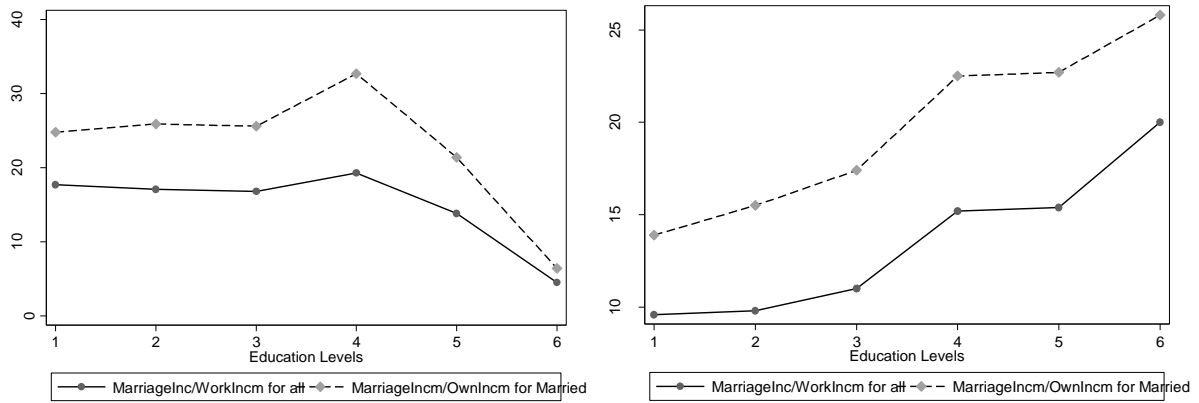
Note: The sample is based on the chosen and married women together with their husbands. These women are between and including ages 25 and 59. The 45 degree line is the perfect homogamy where both spouses share the same level of education. The circle-marked solid line denotes the mean level of education husbands have for each level of women's education. The two dotted lines are the mean education levels plus/minus the standard deviation.

Figure 4. Assortative Mating Pattern by Age Groups



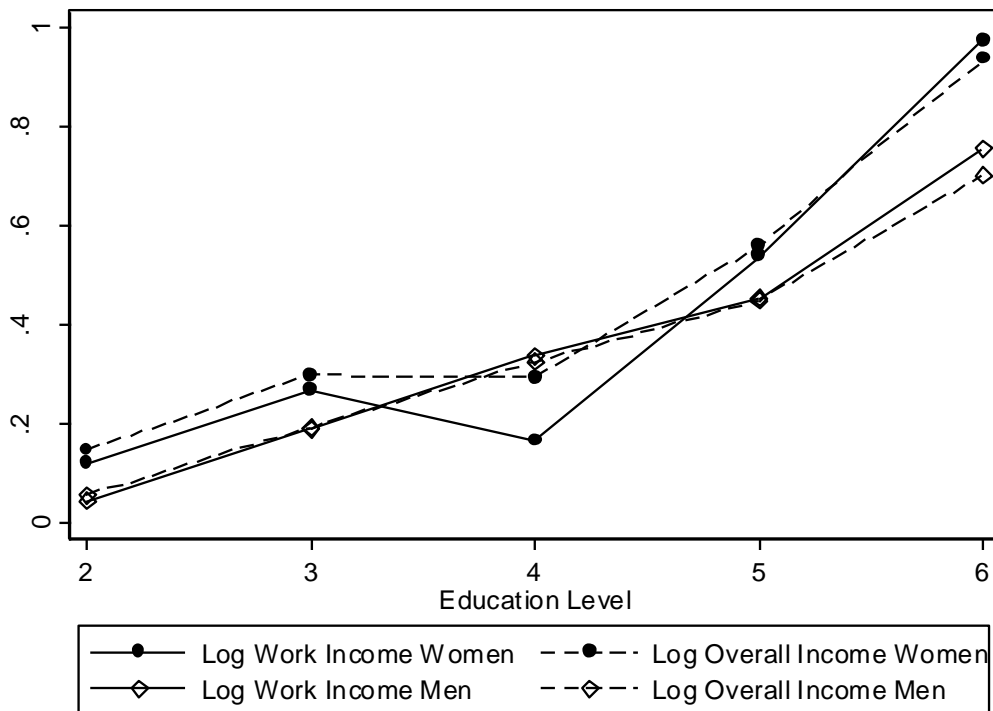
Note: The sample is based on the chosen and married women together with their husbands. These women are between and including ages 25 and 59. The 45 degree line is the perfect homogamy where both spouses have the same age. The circle-marked solid line denotes the mean age husbands have for each age of women. The two dotted lines are the mean age plus/minus the standard deviation.

Figure 5. Proportion of Marriage Income to Work Income for Men (absolute value) and Women



Note: The six education levels are: 1(the reference group) for less than nine years of compulsory schooling; 2 for nine years of compulsory schooling; 3 for high school diploma; 4 for less than two years of university; 5 for at least two years of university and 6 for graduate studies. The marriage income for men is on average negative; but the marriage income/work income in this figure takes on the absolute value.

Figure 6. Rate of Return to Education for Men and Women, with log Incomes as Dependent Variables



Note: The regressions also include variables of one's age, a quadratic form of age, as well as the spouses' countries of birth. The six education levels are: 1(the reference group) for less than nine years of compulsory schooling; 2 for nine years of compulsory schooling; 3 for high school diploma; 4 for less than two years of university; 5 for at least two years of university and 6 for graduate studies.