Appendix A

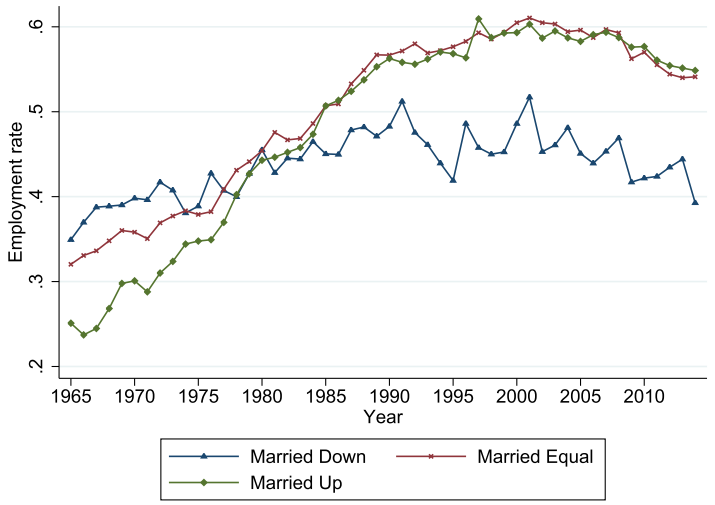

Fig. A.1. Married HS Graduate Female's Employment Rate by Match. *Source* - March CPS 1965 - 2011. *Notes* - White females, ages 25 - 55. Proportion working at least 20 weekly hours.

Appendix B

Table B.1
Men's Employment by Women and Men Education Group.

	Men Education Group			
Women Education Group	HSG	SC	CG	PC
High School Dropout (HSD)	**84.63**	**84.12**	**87.52**	**87.34**
High School Graduate (HS)	87.8	**88.93**	**92.51**	**92.97**
Some College (SC)	87.29	89.06	**92.78**	**93.34**
College Graduate (CG)	88.48	88.54	92.28	**93.2**
Post College Degree (PC)	85.8	85.88	89.54	92.02

Notes - * - small sample size. Proportion working at least 20 weekly hours. In bold: men marrying down.

Table B.2
Women Employment Rate by Women and Men Education Group.

(1)
Husband at the top 10% of income distribution

	Women Education Group			
Men Education Group	HSG	SC	CG	PC
High School Dropout (HSD)	**34.99**	**40.64**	**63.19**	**60**
High School Graduate (HS)	37.11	**46.05**	**52.43**	**70.24**
Some College (SC)	36.55	44.88	**53.24**	**65.35**
College Graduate (CG)	32.81	35.86	42.68	**59.44**
Post College Degree (PC)	33.2	36.02	39.18	58.33

(2)
Husband at median income (45-55% of income distribution)

	Women Education Group			
Men Education Group	HSG	SC	CG	PC
HSD	**54.28**	**63.64**	**68.85**	**75.38**
HSG	59.86	**68.66**	**78.25**	**83.61**
SC	59.95	68.43	**75.26**	**83.36**
CG	60.17	62.06	71.1	**80.32**
PC	48.33	54.22	56.86	73.52

Source - March CPS 1965 - 2011. *Notes* - Married white women, ages 25 - 55. Proportion working at least 20 weekly hours. In bold: women marrying down.

Appendix C

C.1. CPS data

Data were taken from the Annual Demographic Survey (March CPS supplement) conducted by the Bureau of Labor Statistics and the Bureau of the Census. A detailed description of the survey can be found at http://www.bls.census.gov/cps/ads/adsmain.htm. The data was extracted using the Unicon CPS utilities.

Table B.3
Women's Employment Rate by Women and Men Education Group.

(1)
Husband between the 80-90% of income distribution

	Women Education Group			
Men Education Group	HSG	SC	CG	PC
High School Dropout (HSD)	**38.53**	**52.33**	**66.83**	**65.52**
High School Graduate (HS)	43.88	**54.32**	**65.97**	**79.09**
Some College (SC)	46.14	55.44	**63.16**	**78.8**
College Graduate (CG)	41.64	49.61	57.3	**70.79**
Post College Degree (PC)	44.86	49.7	52.77	70.4

(2)
Husband between the 70-80% of income distribution

	Women Education Group			
Men Education Group	HSG	SC	CG	PC
High School Dropout (HSD)	**44.69**	**58.33**	**66.39**	**84.78**
High School Graduate (HS)	50.73	**61.32**	**72.02**	**80.59**
Some College (SC)	51.46	61.49	**68.26**	**80.74**
College Graduate (CG)	49.54	56.56	64.06	**75.83**
Post College Degree (PC)	52	54.11	58.99	72.86

(3)
Husband between the 60-70% of income distribution

	Women Education Group			
Men Education Group	HSG	SC	CG	PC
High School Dropout (HSD)	**48.87**	**57.01**	**68.42**	**66.67**
High School Graduate (HS)	54.82	**65.86**	**74.38**	**83.39**
Some College (SC)	55.89	64.76	**73.14**	**82.72**
College Graduate (CG)	52.36	58.43	68.14	**80.01**
Post College Degree (PC)	50.07	56.64	60.39	74.55

(4)
Husband between the 50-60% of income distribution

	Women Education Group			
Men Education Group	HSG	SC	CG	PC
High School Dropout (HSD)	**52.74**	**61.89**	**66.77**	**72.06**
High School Graduate (HS)	58.66	**68.56**	**77.42**	**86.06**
Some College (SC)	59.69	67.09	**75.07**	**84.94**
College Graduate (CG)	58.65	61.6	71.25	**80.63**
Post College Degree (PC)	53.61	54.92	57.83	74.64

(5)
Husband between the 40-50% of income distribution

	Women Education Group			
Men Education Group	HSG	SC	CG	PC
HSD	**55.83**	**62.62**	**71.25**	**75.71**
HSG	59.52	**67.67**	**77.81**	**84.65**
SC	59.84	68.43	**76.04**	**83.39**
CG	58.36	62.94	70.25	**81.18**
PC	51.94	51.85	56.51	72.49

(6)
Husband between the 30-40% of income distribution

	Women Education Group			
Men Education Group	HSG	SC	CG	PC
HSD	**53.85**	**58.59**	**71.47**	**72.46**
HSG	57.26	**65.65**	**75.84**	**81**
SC	58.49	64.63	**75.39**	**83.04**
CG	56.72	58.8	66.78	**80.5**
PC	54.3	53.86	57.38	72.94

(7)
Husband between the 20-30% of income distribution

	Women Education Group			
Men Education Group	HSG	SC	CG	PC
HSD	**48.48**	**53.5**	**73.33**	**90.48**
HSG	51.61	**63.44**	**74.86**	**87.34**
SC	55.98	60.27	**73.14**	**80.45**
CG	57.31	58.2	63.41	**81.86**
PC	46.46	48.08	53.69	70.24

Notes - Married white women, ages 25 - 55. Proportion working at least 20 weekly hours. In bold: women marrying down.

The sample is restricted to civilian adults, thus excluding the armed forces and children. We divided the sample into five education groups: high school dropouts (HSD), high school graduates (HSG), individuals with some college education (SC), college graduates (CG), and post-college degree holders (PC). In order to construct the education variable, until 1991 we used the years of schooling completed and added 0.5 years if the individual did not complete the highest grade attended; from 1992 onward we simply used years of schooling completed.

Weekly wages were constructed by taking the previous year's wage and salary income and dividing it by the number of weeks worked in the previous year. Hourly wages are defined as the weekly wage divided by the number of hours worked in the previous week in all jobs, while annual (annualized) wages are defined as the weekly wage multiplied by 52. Wages are multiplied by 1.75 for top-coded observations until 1995. Nominal wages are deflated using the Personal Consumption Expenditure (PCE) index from the National Income and Product Account (NIPA). Since wages refer to the previous year, we use the PCE for year $X-1$ for observations in year X and therefore all wages are expressed in constant 2010 dollars.

Information on number of children under six for the period 1968-1975, which is missing from the survey data, was imputed where possible using the distributions of this variable in 1967 and 1976 for each gender, marital status, and cohort separately. The imputed information can be used to construct an aggregate trend, though not to identify the number of children for a specific individual.

In order to construct a couple, we kept only heads of households and spouses (i.e., households with two families were dropped) and dropped households with more than one male or more than one female. We then merged women and men based on year and household identification, and dropped problematic couples such as those with two heads or two spouses, more than one family, and inconsistent marital status or number of children. To create the sample, we drew from the data all married white females aged 25-55. Individuals are considered employed if they reported working at least 20 hours weekly (Eckstein and Lifshitz, 2011).

C.2. NLSY data

Data was taken from the National Longitudinal Survey of Youth 1979 (NLSY79), a nationally representative sample of 12,686 men and women who were 14-22 years old at the time of the initial 1979 survey. We focused on the white female members of this sample, a group of 2,477 young women who are meant to be representative of the non-institutionalized civilian segment of the United States population in that age group. Members of this sample were re-interviewed annually from 1979-1994 and bi-annually since then, with the most recent interview being done in 2008 when members of the

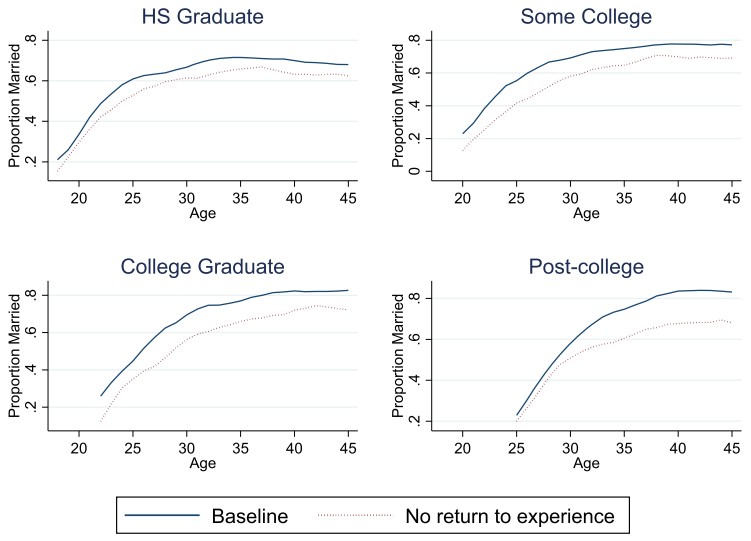

Fig. C.1. Women Marriage Rate - Baseline and No Returns to Experience.

sample were aged 43-52. The NLSY contains information on marital status, schooling, labor force status (in the past calendar year), income (in the past calendar year) and other socioeconomic indicators, as well as the age, sex, education, labor force status, and income of each co-resident family member, including the spouse.

In the sample, 2,230 (90%) respondents were or had been married while 247 had never been married. For the purpose of the analysis, the data set was transformed into a panel with multiple observations for each individual. A respondent was considered employed if she reported working at least 25 weeks and 20 hours per week in the past calendar year (Eckstein and Lifshitz, 2011).

We only included couples who had married during the sample period excluding those married previously, so that we are able to follow a couple from the beginning of the marriage onwards until they get divorced or until observations are right-censored. Of the 2,230 married women, 2,142 got married for the first time during the sample period. Of these, 864 got divorced during the sample period. The duration of marriage ranges from 0 to 29 years.

At the time of the woman's first marriage, we calculated the information on variables that remained fixed as long as the respondent remains in the marriage (e.g., age and education of the woman and her husband at the time of marriage). Respondents for whom age and/or education information was missing at the time of marriage for them or their spouse were dropped (29 respondents). We then created a series of observations, one for each completed interview, beginning with the first year of marriage. This series of observations ends either in the year of divorce or in 2008 for women who remained married until then. In addition to the fixed variables, each observation includes employment status and income for both spouses. The final sample of 2,142 women contains a total of 23,622 observations in the panel. Divorce occurrence is captured by a dummy variable that takes the value of one if the respondent divorced during the subsequent interview year.

C.3. Taxes

Given the gross income associated with any particular wage offer and labor supply choice, we calculate the household's tax liability based on the federal tax rules in effect in the relevant year. This depends on whether it a single household (subject to the individual tax schedule) or a married couple (subject to the joint tax schedule), as well as the number of dependents. We also account for the earned income tax credit (EITC). To calculate the tax liability of a given household or individual in any particular year, data was collected for the period 1980-2008 from the following sources:

- Federal income tax rate history (https://taxfoundation.org/federal-tax/individual-income-payroll-taxes)
- Standard deduction history (http://www.taxpolicycenter.org/statistics/standard-deduction)
- Personal and dependents exemption (https://www.irs.gov/publications/p17/ch03.html)
- Earned income tax credit parameters (http://www.taxpolicycenter.org/statistics/eitc-parameters)

Using these parameters, a "tax calculator" was programmed, were the inputs are gross income, marital status, number of children and the year, while the output is net income. The program uses the actual tax brackets and marginal tax rate, the full structure of the EITC and the number of deductions and exemptions (that varies by the marital status and the number of children). We used the code from Eckstein et al. (2019). The tax brackets and marginal rate that were used in

Table C.1
Parameter Estimates.

Utility Function		
Utility from children - single female α^0_{1W}	8.645	(0.171)
Utility from children - married female α^1_{1W}	9.769	(0.293)
Utility from children - married male α^1_{1H}	5.945	(0.414)
Utility from leisure - female α_{2W}	297.762	(54.105)
Utility from leisure interacted with # of children - female α_{3W}	31.864	(0.852)
Intertemporal elasticity of substitution χ	0.600	(0.018)
Fertility Process		
Being married λ_2	0.404	(0.008)
Age interacted with HSG attainment λ_3^{HSG}	-0.075	(0.003)
Age interacted with SC attainment λ_3^{SC}	-0.069	(0.007)
Age interacted with CG attainment λ_3^{CG}	-0.060	(0.026)
Age interacted with PC attainment λ_3^{PC}	-0.063	(0.014)
Age squared interacted with HSG attainment λ_4^{HSG}	0.000	(0.000)
Age squared interacted with SC attainment λ_4^{SC}	0.000	(0.000)
Age squared interacted with CG attainment λ_4^{CG}	0.000	(0.000)
Age squared interacted with PC attainment λ_4^{PC}	0.000	(0.000)
Husband's education λ_5	0.011	(0.000)
Number of children in the household λ_6	-0.040	(0.001)
Economies of Scale in Marriage		
ς	1.228	(0.024)
Wage Process, Female		
HSG returns φ^{HSG}_{2W}	9.711	(0.742)
SC returns φ^{SC}_{2W}	9.896	(0.434)
CG returns φ^{CG}_{2W}	10.167	(0.492)
PC returns φ^{PC}_{2W}	10.598	(0.373)
HSG returns to experience φ^{HSG}_{3W}	0.050	(0.006)
SC returns to experience φ^{SC}_{3W}	0.056	(0.002)
CG returns to experience φ^{CG}_{3W}	0.063	(0.002)
PC returns to experience φ^{PC}_{3W}	0.069	(0.004)
HSG returns to experience φ^{HSG}_{4W}	-0.001	(0.000)
SC returns to experience φ^{SC}_{4W}	-0.001	(0.000)
CG returns to experience φ^{CG}_{4W}	-0.001	(0.000)
PC returns to experience φ^{PC}_{4W}	-0.001	(0.000)
Variance of wage shock $\sigma^2_{\epsilon_W}$	0.327	(0.023)
Variance of ability $\sigma^2_{\varphi_{1W}}$	0.338	(0.092)
Wage Process, Male		
HSD returns φ^{HSD}_{2H}	9.916	(3.693)
HSG returns φ^{HSG}_{2H}	9.913	(0.289)
SC returns φ^{SC}_{2H}	9.988	(2.655)
CG returns φ^{CG}_{2H}	10.190	(1.210)
PC returns φ^{PC}_{2H}	10.416	(0.516)
HSD returns to experience φ^{HSD}_{3H}	0.049	(0.003)
HSG returns to experience φ^{HSG}_{3H}	0.067	(0.001)
SC returns to experience φ^{SC}_{3H}	0.079	(0.010)
CG returns to experience φ^{CG}_{3H}	0.087	(0.003)
PC returns to experience φ^{PC}_{3H}	0.098	(0.002)
HSD returns to experience φ^{HSD}_{4H}	-0.001	(0.000)
HSG returns to experience φ^{HSG}_{4H}	-0.001	(0.000)
SC returns to experience φ^{SC}_{4H}	-0.002	(0.000)
CG returns to experience φ^{CG}_{4H}	-0.002	(0.000)
PC returns to experience φ^{PC}_{4H}	-0.002	(0.000)
Variance of wage shock $\sigma^2_{\epsilon_H}$	0.378	(0.012)
Variance of ability $\sigma^2_{\varphi_{1H}}$	0.387	(0.008)
Job Offer, Female		
Working previous period ρ_{1W}	2.697	(0.804)
HSG ρ^{HSG}_{2W}	0.337	(0.045)
SC ρ^{SC}_{2W}	0.366	(0.008)
CG ρ^{CG}_{2W}	0.477	(0.014)
PC ρ^{PC}_{2W}	0.593	(0.019)
Accumulated experience ρ_{3W}	0.015	(0.001)
Match Quality		
Probability of meeting a partner p^W	-0.995	(0.064)
Probability of meeting a partner p^W_{age}	0.085	(0.003)
Probability of meeting a partner $p^W_{age^2}$	-0.003	(0.000)

Table C.1 (*continued*)

Probability of meeting a partner p^H	-0.838	(0.055)
Probability of meeting a partner p^H_{age}	0.094	(0.009)
Probability of meeting a partner $p^H_{age^2}$	-0.002	(0.000)
Variance of starting bliss shock σ^2_Q	0.311	(0.013)
Compatibility benefit - HSG θ^{HSG}	11.479	(0.465)
Compatibility benefit - SC θ^{SC}	12.335	(0.580)
Compatibility benefit - CG θ^{CG}	14.881	(6.245)
Compatibility benefit - PC θ^{PC}	14.549	(0.377)
Probability of a positive bliss shock P^-_Q	0.158	(0.018)
Probability of a negative bliss shock P^+_Q	0.198	(0.007)

Note - Standard errors in parentheses. Men always work so some male parameters are not estimated.

Table C.2
Married Women's Employment by Relative Position in Education - Random Matching and No Return to Experience.

Woman's Education	**Random Matching Model**	**Random Matching No Return to Experience**
HS Graduate		
Up	0.589	0.329
Equal	0.644	0.408
Down	0.664	0.419
Some College		
Up	0.596	0.412
Equal	0.654	0.439
Down	0.741	0.478
College Graduate		
Up	0.576	0.538
Equal	0.739	0.604
Down	0.792	0.639
Post-college		
Up	-	-
Equal	0.669	0.662
Down	0.821	0.706

the model, together with the full historical data on EITC, deductions and exemptions can be found on the website http://www1.idc.ac.il/Faculty/Eckstein/EKL.html.

C.4. Estimation details

The model is estimated using the Simulated Method of Moments (SMM). The objective of the estimation is to find the parameter vector $\hat{\vartheta}$ that minimizes the quadratic distance between a set of empirical moments (Ψ_D) and a set of simulated moments ($\Psi(\hat{\vartheta})$). Formally, the SMM estimator $\hat{\vartheta}$ solves:

$$\hat{\vartheta} = \arg\min_{\vartheta} \left[\Psi_D - \Psi(\hat{\vartheta})\right]' W \left[\Psi_D - \Psi(\hat{\vartheta})\right]$$

where ϑ is the vector of parameters of interest, W is the weighting matrix. Following Eisenhauer et al. (2015) we used a diagonal weighting matrix with the variances of the moments on the diagonal.

Given an individual's education and age, a potential spouse is drawn from a conditional distribution according to the actual distribution of the NLSY79 cohort (born during the period 1960–65). In particular, we use CPS data to generate the actual distribution of spouses' level of education and potential experience.[1] Each individual can draw a potential spouse with an educational level no more than two levels above or below his or hers. This restriction is not essential but is based on the consideration of geographic proximity and that individuals search/meet potential spouses in similar social circles.

The model is estimated using the 1979–2008 waves of the NLSY79. In solving the dynamic programming problem, we focus on women with at least a high school degree. The details of the data construction are described in Appendix C.2. We solve the model for each agent in each period. In order to allow agents to follow a rich set of paths, we simulate 5000 agents[2] for each level of schooling from the year schooling starting from the year they completed their education until they reach 45 years of age.

[1] We define years of potential experience as the difference between age and years of schooling.
[2] The number of replications was set to 30.

The following lists the set of empirical moments (Ψ_D) that we seek to reproduce: average employment rates for women by age, education, marital status, and number of children; employment transition rates by age, marital status, and number of kids; wages by gender, education, and experience; wage variances by gender; the average probability of giving birth by age and education; the average number of children at the age of 40 by education; the percentage of married females by age and education; the distribution of marital matches by education; and transition rates between marital states by age and education. The number of targeted moments in the estimation is therefore 871.

Following are the parameters (ϑ) to be estimated: the six parameters in the utility function (χ, α^m_{1j}, α_{2W}, α_{3W}); the eleven parameters that determine the probability of having a child ($\lambda_1, \ldots, \lambda_6$); the thirteen parameters governing the marriage market and match quality (p^j, p^j_{age}, $p^j_{age^2}$, θ^S, σ^2_Q, P^+_Q, P^-_Q); economies of scale parameter (ς); the thirty one parameters that determine the wage process for women and men (φ^S_{2j}, φ^S_{3j}, φ^S_{4j}, $\sigma^2_{\epsilon_j}$, $\sigma^2_{\varphi_{1j}}$); the six parameters of the probability of receiving a job offer for women (ρ_{1W}, ρ^S_{2j}, ρ^S_{3W}); and the parameters in the terminal utility function ($\tau_{1j}, \ldots, \tau_{9j}$). In light of the simplifying assumptions made, some of these parameters will be normalized to zero rather than estimated. The discount factor β is fixed at 0.97. There are a total of 101 parameters to estimate.

Appendix D. Alternative explanations

D.1. Schooling and non-market productivity

Pencavel (1998) suggests that in more educated couples, the woman tends to work less in order to stay at home with the children. He argues that schooling yields nonmarket as well as market benefits, or more specifically, more schooling indicates higher nonmarket productivity, which is suggested by the advantages conferred on the children of better-educated parents. He estimates a model in which the dependent variable is work hours rather than employment, and includes only the spouse's education rather than the wife's education relative to the husband. The result suggest that in a more educated couple, the husband will work more while the wife will work less, investing more of her leisure time in the couple's (young) children. He also notes that the effect of the spouse's schooling on the individual's labor supply is stronger for couples with young children. This suggests that one should consider interactive effects between the wife's relative level of education and the presence of young children, in addition to the effects already controlled (see Table 3). If a wife's relative level of education is associated with her non-market productivity in the early childrearing years, interaction effects should explain the observed correlation between a wife's relative level of education and her labor supply behavior.

We therefore re-estimated the basic model of female employment, adding an interaction term between the two indicator dummies for the relative education position and the presence of young child children.[3] Comparing column (1) with column (2) in Table D.1, we see that the effect of marrying down or up was slightly reduced but remained sizeable (marginal effect 3.2 and 1.5 percentage points, respectively). The effects are more pronounced for those with young children, particularly in the case of women who married up. The estimates of the interaction terms indicate that a married-up woman might choose to work less in order to invest more time in her children (marginal effect of 3 percentage points). In contrast, the effect of young children is not substantial married-down women (marginal effect of 1 percentage point). In conclusion, although children (particularly young ones) play a role in the employment decision of married-up relative to married-down women, the non-market productivity hypothesis is unable to explain the differences in employment rates, suggesting there is room for other explanations.[4]

D.2. The unemployment risk hypothesis

Another possible explanation derives from the correlation between the husband's unemployment risk and his education level. We already know that women married to a less-educated man will choose to work more regardless of his income. However, it may be the case that the woman makes her employment based on the long-term income of the husband rather than his income in the previous period. In this case, if less education is associated with higher employment instability, a woman married to a less-educated man might choose to work more as insurance against the possibility her husband being laid off which is known in the literature as the Added Worker Effect (AWE). In order to test this hypothesis, we created five unemployment indexes to capture the probability of a specific individual being unemployed in a specific year according to the individual's characteristics (occupation, education, age, and industry).[5] The estimated marginal effects of our two main variables of interest when including each of these indexes separately (Table D.2, columns (2) through (6)) do not differ significantly from the base model results (column (1)) and the marginal effects of the unemployment indexes are

[3] We also estimated the basic model separately for couples with and without children aged 0-6 and obtained similar results.

[4] Beck and González-Sancho (2009) find a positive impact for marital homogamy on child outcomes. Enhanced levels of parental agreement about the organization of family life and symmetry in the allocation of time to child care emerge as the intervening mechanisms behind this association. In our model, the asymmetry between the behavior of married-up and married-down women is particularly strong and the comparison between homogamous and heterogamous couples is unable to provide an explanation for the phenomenon.

[5] The unemployment index is defined as the proportion of unemployed individuals in a specific group, e.g., the percentage of unemployed individuals in occupation x in year y will be the probability of becoming unemployed for an individual in occupation x in year y.

Table D.1
Estimated Effects Including Interactions.

VARIABLES	(1)	(2)
Female married down (d)	**0.037*** **	**0.032*** **
	(0.003)	**(0.003)**
Female married up (d)	**-0.023*** **	**-0.015*** **
	(0.003)	**(0.003)**
F married down X presence of child 0-6		**0.012*** **
		(0.004)
F marriedup X presence of child 0-6		**-0.032*** **
		(0.004)
Female post graduate (d)	0.293***	0.297***
	(0.006)	(0.006)
Female college graduate (d)	0.204***	0.209***
	(0.006)	(0.006)
Female some college (d)	0.162***	0.167***
	(0.005)	(0.005)
Female high school graduate (d)	0.111***	0.114***
	(0.004)	(0.004)
Age	-0.003*	-0.003*
	(0.002)	(0.002)
Age gap	-0.001	-0.001*
	(0.000)	(0.000)
Number of children in the HH	-0.043*	-0.043*
	(0.025)	(0.025)
Presence of a child 0-6	-0.233***	-0.228***
	(0.002)	(0.002)
Male post graduate (d)	0.029***	0.023***
	(0.008)	(0.008)
Male college graduate (d)	0.059***	0.053***
	(0.006)	(0.007)
Male some college (d)	0.096***	0.090***
	(0.005)	(0.005)
Male high school graduate (d)	0.059***	0.055***
	(0.004)	(0.004)
Dummies for the deciles of Husband's annual income	YES	YES
Time dummies	YES	YES
MSA fixed effects	YES	YES
Observations	681,503	681,503

Notes - Married white women, ages 25 - 55. Employment indicator is one when working at least 20 weekly hours. Marginal effects (instead of logit coefficients) are reported. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. (d) for dummy variable. Reference education group: HSD. Column (1) is identical to column (6) in Table 3 (the preferred specification) and is reproduced here to facilitate comparison.

trivial and insignificant. We can conclude that the unemployment risk effect has no marked impact in the static framework, which is in line with results in the AWE literature. Empirical studies have generally been unable to uncover a significant magnitude for the AWE (Heckman and MaCurdy, 1980; Lundberg, 1985; Cullen and Gruber, 2000). Heckman and MaCurdy (1980) showed that in a life-cycle context the AWE should be relatively small since the wives of husbands facing greater risk of unemployment will generally work more hours, not necessarily only when their husbands are unemployed. This holds as long as the income loss from a short spell of unemployment is small relative to the husband's lifetime earnings.

D.3. The divorce risk hypothesis

Previous research has shown that couples are more likely to divorce when they do not share the same educational background, particularly when it is the wife who has more education. These negative effects appear to have remained unchanged over time and, by some estimates, may have even increased (Heaton, 2002; Teachman, 2002). Given the steady rise in the number of marriages in which wives have more education than their husbands (see Fig. 3), one would expect divorce rates to have increased as a result. However, divorce rates have gradually declined after increasing in the late 1970s (Stevenson and Wolfers, 2007). Nevertheless, we decided to test whether the negative coefficient of the education gap perhaps captures a higher probability of divorce. In other words, we wish to test a "precautionary working" hypothesis,

Table D.2
Estimated Effects Including Unemployment Indexes.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Female married down (d)	**0.037*** **	**0.040*** **	**0.040*** **	**0.041*** **	**0.040*** **	**0.040*** **
	(0.003)	**(0.003)**	**(0.003)**	**(0.003)**	**(0.003)**	**(0.003)**
Female married up (d)	**-0.023*** **	**-0.025*** **	**-0.024*** **	**-0.024*** **	**-0.024*** **	**-0.024*** **
	(0.003)	**(0.003)**	**(0.003)**	**(0.003)**	**(0.003)**	**(0.003)**
Occupation unempl index		-0.003				
		(0.002)				
Industry-Occupation unempl index			-0.001			
			(0.000)			
Industry unempl index				-0.003		
				(0.002)		
Occupation-Age-Education unempl index					-0.000	
					(0.000)	
Age-Education unempl index						-0.001
						(0.001)
Dummies for the deciles of Husband's annual income	YES	YES	YES	YES	YES	YES
Time dummies	YES	YES	YES	YES	YES	YES
MSA fixed effects	YES	YES	YES	YES	YES	YES
Observations	681,503	681,503	681,503	681,503	681,503	681,503

Notes - Married white women, ages 25 - 55. Employment indicator is one when working at least 20 weekly hours. Marginal effects (instead of logit coefficients) are reported. All models include indicators for own and spouse education, own age, age gap, number of children in the HH and an indicator for the presence of a child 0-6. *** p<0.01, ** p<0.05, * p<0.1. (d) for dummy variable. Reference education group: HSD. Column (1) is identical to column (6) in Table 3 (the preferred specification) and is reproduced here to facilitate comparison.

according to which married-down women work more in order to increase their experience and therefore their potential earnings in the case of marriage dissolution (Becker et al., 1977).[6]

D.3.1. Data[7]

We were unable to use the CPS to test this hypothesis, since it does not provide the ex-spouse's education once the individual is divorced. In order to capture the pre-divorce characteristics of the couple, we created a panel from the National Longitudinal Survey of Youth 1979 (NLSY79), a nationally representative sample of 12,686 men and women who were 14-22 years old at the time of the initial 1979 survey. We focus on white female members of the cross-sectional sample which constitute a group of 2,477 young women who are meant to be representative of the non-institutionalized civilian segment of the United States population in that age group. Members of this sample were re-interviewed annually from 1979 to 1994 and bi-annually after that, with the most recent available interview conducted in 2008, when members of the sample were aged 43-52. For each interview, the NLSY contains information on marital status, schooling, labor force status (during the past calendar year), income (during the past calendar year) and other socioeconomic variables, as well as the age, sex, education, labor force status, and income of each co-resident family member, including the spouse. A respondent is considered employed if she reported working at least 25 weeks and 20 hours per week in the past calendar year (Eckstein and Lifshitz, 2011). Of the 2,230 married women in the sample, 864 (39%) became divorced during 1979-2008. The duration of marriage in the sample ranges from 0 to 29 years.

D.3.2. Educational matching

Table D.4 illustrates the frequencies and percentages of the marriage matching distribution by educational attainment categories at the time of marriage. It can be seen that educational homogamy is most common (49% - sum of the diagonal). In about 25% of the couples, the wife is better educated. Extreme differences in education are uncommon: only 9 couples consist of a wife who is three education categories above her husband's (CG wife/ HSD husband and PC wife/ HSD or HSG husband); and 13 couples consist of a husband who is three education categories above his wife's (CG husband/ HSD wife and PC husband/ HSG wife).

D.3.3. Wife's employment and educational disparity between the spouses

We now wish to determine whether the employment phenomenon observed in the CPS are also found in the NLSY. As in the case of the CPS, we consider white married[8] women aged 25-55. By age 25, 90% of them are no longer enrolled in

[6] Fernandez and Wong (2011) argue that the increase in the probability of divorce can explain a large proportion of the observed differences in female LFP between the 1935 and 1955 cohorts.

[7] For further details about the data and variable coding, see Appendix C.2.

[8] We exclude 11 couples that married before the first interview so that the education gap will be at the time of marriage for all couples.

Table D.3
NLSY - Logit Regression on Employment for Married Age 25-55.

VARIABLES	(1) Married Females
Female married down (d)	**0.357****
	(0.180)
Female married up (d)	**-0.081**
	(0.175)
Female post graduate (d)	1.010*
	(0.528)
Female college graduate (d)	1.084***
	(0.382)
Female some college (d)	0.860***
	(0.298)
Female high school graduate (d)	0.707***
	(0.192)
Age	-0.011
	(0.018)
Age gap	-0.006
	(0.010)
Number of children in the HH	-0.400***
	(0.035)
Presence of a child 0-6	-0.874***
	(0.062)
Male post graduate (d)	0.043
	(0.499)
Male college graduate (d)	0.079
	(0.391)
Male some college (d)	-0.004
	(0.304)
Male high school graduate (d)	0.004
	(0.194)
Dummies for the deciles of spouse's annual income	YES
Time dummies	YES
Observations	18,460

Notes - Standard errors are corrected for clustering within individual - 1,823. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. (d) for dummy variable. Reference groups: High school dropouts; Females married homogamously.

Table D.4
NLSY - Distribution of Marital Matching by Education.

Wife's Education	Husband's Education HSD	HSG	SC	CG	PC	Total
High School Dropout (HSD)	130	131	20	4	0	285
	6.07	6.12	0.93	0.19	0.00	13.31
High School Graduate (HS)	150	571	160	53	9	943
	7.00	26.66	7.47	2.47	0.42	44.02
Some College (SC)	25	173	135	97	24	454
	1.17	8.08	6.30	4.53	1.12	21.20
College Graduate (CG)	4	63	72	178	62	379
	0.19	2.94	3.36	8.31	2.89	17.69
Post College Degree (PC)	1	5	15	27	33	81
	0.05	0.23	0.70	1.26	1.54	3.78
Total	310	943	402	359	128	2142
	14.47	44.02	18.77	16.76	5.98	100.00

Notes - First row reports the number of observations. Second row shows the cell percentage.

any college/university. We estimate the preferred model specification in Table 3 using the NLSY sample by regressing the wife's employment status on the two dummy variables for whether the female married down or married up and on a set of control variables (standard errors are clustered at the individual level). The results are shown in column (1) of Table D.3, and confirm our earlier results. Women that marry down have a higher probability of being employed, even after controlling

Table D.5
NLSY - Proportion of Marriages that Dissolve by Educational Matching.

Wife's Education	Husband's Education HSD	HSG	SC	CG	PC	Total
High School Dropout (HSD)	**0.68**	0.54	0.65	0.75	.	0.61
	130	131	20	4	0	285
High School Graduate (HS)	0.57	**0.44**	0.43	0.30	0.22	0.45
	150	571	160	53	9	943
Some College (SC)	0.40	0.38	**0.43**	0.30	0.17	0.37
	25	173	135	97	24	454
College Graduate (CG)	0.25	0.25	0.22	**0.22**	0.16	0.22
	4	63	72	178	62	379
College Graduate (CG)	1.00	0.00	0.40	0.15	**0.09**	0.17
	1	5	15	27	33	81
Total	0.60	0.43	0.40	0.26	0.15	0.40
	310	943	402	359	128	2142

Notes - In each cell, first row shows the probability of marriage termination for first marriages. Second row reports the number of observations.

for husband's income, and the results are highly significant. The estimated logit coefficients indicate that marrying down vs marrying up has an average marginal effect of 6 percentage points,[9] which implies an increase of about 10 percent in wives' employment rate.[10] The estimated coefficients of the other independent variables are properly signed and significant: The probability of being employed increases with education and age; the likelihood of employment declines with the husband's annual earnings, the presence of young children, and number of children.

D.3.4. Wife's relative educational position and divorce risk

Table D.5 shows the rate at which first marriages dissolve during the sample period for each educational match. The figures indicate that respondents with higher educational attainment tend to have more stable marriages. This is true for both husbands and wives and is strongest for couples in which both members are highly educated (note the pattern along the diagonal). However, the influence of educational disparity is small if it exists at all. The divorce rate for couples in which the wife is more educated than the husband is 38%, compared to 39% for couples in which the husband is more educated than the wife and 42% for homogamous couples.

We estimated the probability of divorce in period t given the explanatory variables in $t-1$ using a complementary log-log (cloglog) regression model.[11] We assumed a non-parametric baseline and created duration-specific dummy variables, one for each spell year at risk. The analysis focuses on the effects of the wife's relative educational position on the risk of divorce. We defined, as above, two dummy variables for whether the husband is more educated than the wife or vice versa (couples with same level of education are the control group). We further included a set of variables to control for various other factors that may influence the risk of divorce: Indicators for the wife's and the husband's education; wife's age; both spouses' income deciles; age gap at marriage (husband's - wife's); the number of children; and the presence of young children.

Table D.6 presents the results. The standard errors reported in the table allow for arbitrary correlation between the disturbance terms within a couple (cluster). The impact of educational disparities between the spouses on the risk of divorce has a negligible and insignificant effect. The effects of the other control variables are consistent with the literature that discusses the possible causes for marital instability (Becker et al., 1977). Getting married later (for the first time) is stability-enhancing (Rotz, 2011), since women who get married later tend to have spent more time searching for the best matches and/or have gathered more information about their future spouses. This group of women should experience less post-marriage shocks and therefore have lower chance of getting divorced. The age gap between the spouses has a positive but insignificant effect. The presence of children reduces the probability of divorce since it implies the accumulation of marriage-specific capital, which would be worth less in any other marriage or when divorced. As expected, own and spouse's education level have a negative effect on divorce risk. A higher level of education is a predictor of a partner's high levels of market and non-market skills. Thus, higher-educated couples gain more from marriage relatively to the less-educated couples and their risk of divorce is therefore lower.

The results using the NLSY indicate that the wife's relative education level does not affect the risk of divorce, and therefore, the divorce risk hypothesis is not confirmed.

[9] Applying the same sample restrictions, the logit model for married females' employment yielded a remarkably similar marginal effect for married down vs married up of roughly 7 percentage points for the CPS 1960-1965 birth cohorts data (the NLSY79 birth cohorts).

[10] A similarly specified regression for male respondents in the panel produces small and statistically insignificant results for the effect of educational disparities between the spouses on the husband's employment status.

[11] Results do not differ qualitatively for a logit model.

Table D.6
NLSY - Cloglog Estimates on Probability of Divorce, First Marriages Only.

VARIABLES	(1)	(2)	(3)
Female married down (d)	**0.183***	**-0.056**	
	(0.093)	**(0.179)**	
Female married up (d)	**-0.158***	**0.004**	
	(0.091)	**(0.180)**	
Female post graduate (d)	-0.937***	-0.321	-0.408
	(0.309)	(0.589)	(0.325)
Female college graduate (d)	-1.086***	-0.637	-0.702***
	(0.160)	(0.411)	(0.168)
Female some college (d)	-0.598***	-0.269	-0.321**
	(0.134)	(0.303)	(0.133)
Female high school graduate (d)	-0.368***	-0.160	-0.184*
	(0.104)	(0.180)	(0.103)
Age at marriage	-0.037***	-0.040***	-0.040***
	(0.011)	(0.011)	(0.011)
Age gap	0.010	0.009	0.009
	(0.008)	(0.008)	(0.008)
Number of children in the HH	-0.153***	-0.133***	-0.133***
	(0.049)	(0.049)	(0.049)
Presence of a child 0-6	-0.063	-0.009	-0.010
	(0.093)	(0.093)	(0.093)
Male PC (d)		-0.840	-0.759***
	(0.544)	(0.271)	
Male CG (d)		-0.510	-0.443***
	(0.406)	(0.157)	
Male SC (d)		-0.190	-0.142
	(0.299)	(0.124)	
Male HSG (d)		-0.326*	-0.296***
	(0.176)	(0.098)	
Dummies for the deciles of spouse's annual income	NO	YES	YES
Dummies for the deciles of wife's annual income	NO	YES	YES
Marriage duration dummies	YES	YES	YES
Observations	23,622	23,622	23,622
Clusters	2,142	2,142	2,142

Notes - Standard errors are corrected for clustering within couples; *** $p<0.01$, ** $p<0.05$, * $p<0.1$. (d) for dummy variable. Reference groups: High school dropouts; Females married homogamously.

D.4. Selection

We now attempt to determine whether a couple's pre-marriage characteristics (ability, expectations or attitudes) can explain observed behavior patterns. In this section, we will try to address the question of whether there is selection into marriage: assume two types of women: women who derive utility from consumption only and women who derive utility from consumption and work both.[12] The latter type of women may choose to marry a less-educated husband in order to be the main breadwinner in the household. On the other hand, we can also assume two types of men in the population: One preferring to more-educated women and the other preferring less-educated women. It is impossible, of course, to test those assumptions directly since the type of the individual is unobserved. Therefore, we will use observed pre-marriage characteristics of the couple that might be correlated with the unobserved type of the individual. Comparing the characteristics of the married-up women with those of the married-down women will help us decide whether selection into marriage exists. In this exercise, we will use both the CPS and NLSY data used in the previous chapters (which are described in detail in Appendix C).

D.4.1. Pre-marriage characteristics of the women

In order to test female selection into marriage, we examined pre-marriage variables that may be correlated with the unobserved work preferences of the women. We start with the age of marriage, assuming that a woman who married later might have more experience and therefore higher earning power and a higher probability of being employed. Overall,

[12] The difference between the two types can be in preferences toward work, children, leisure and so on.

Table D.7
NLSY - Mean Age at Marriage.

Wife's Education	Relative Position in Education Married down	Married equal	Married up	Total
HS dropout	NA	19.13	20.18	19.70
HS graduate	22.19	22.41	23.80	22.70
Some college	24.20	23.87	26.07	24.60
College graduate	26.76	26.10	28.23	26.69
Post-graduate	31.04	31.85	NA	31.37
Total	24.92	23.12	23.78	23.74

Table D.8
NLSY - Mean Wives' AFQT Score.

Wife's Education	Relative Position in Education Married down	Married equal	Married up	Total
HS dropout	NA	28,487	30,396	29,517
HS graduate	40,505	46,850	49,642	46,514
Some college	61,935	64,233	67,135	63,986
College graduate	76,438	78,569	82,348	78,408
Post-graduate	82,022	82,863	NA	82,369

Table D.9
NLSY - Mean Expected Number of Children.

Wife's Education	Relative Position in Education Married down	Married equal	Married up	Total
HS dropout	NA	1.20	1.27	1.24
HS graduate	1.95	2.02	2.11	2.03
Some college	2.04	2.27	2.49	2.23
College graduate	2.34	2.65	2.50	2.51
Post-graduate	2.27	2.24	NA	2.26
Total	2.12	2.07	2.00	2.06

Table D.10
NLSY - Mean Actual Number of Children.

Wife's Education	Relative Position in Education Married down	Married equal	Married up	Total
HS dropout	NA	1.04	1.20	1.14
HS graduate	1.47	1.65	1.86	1.68
Some college	1.74	2.00	1.92	1.86
College graduate	1.94	2.13	2.05	2.05
Post-graduate	1.33	1.61	NA	1.45
Total	1.71	1.79	1.76	1.76

Notes - In 2004, when the youngest women in the sample completed their 40th birthday, most women were with completed fertility. The oldest female in that survey year was 47 years of age.

the data show that although higher-educated women married later, there was no significant difference in age between married-up and married-down women at marriage (see Table D.7). The average age of marriage for HS dropouts was below 20 as compared to an average of above 31 for post-graduates, however, at each education level, married-down women got married a year earlier than married-up women. In addition, we observe that women marrying down married younger husbands (a year and a half younger relative to the married-up group).

We then wish to determine whether the reason married-down women work more is because of their higher unobserved ability. We used the average score on the AFQT, as a measure of underlying ability. As shown in Table D.8, it turns out that married-down women have lower average scores married-up women. In each education group, the women with higher scores married more educated husbands relative to women with lower scores, which is not a surprising. Nevertheless, it fails to explain why women with lower scores will have higher employment rates.

We next determine whether there is a difference in the preference for children between the two "types" of women, namely, whether a woman who plans a big family might choose a more educated husband, thus enabling her to work less.

Table D.11
NLSY - Gender Role Attitudes Mean Score at Age 21.

Wife's Education	Relative Position in Education Married down	Married equal	Married up	Total
HS dropout	NA	1.86	1.85	1.85
HS graduate	1.84	1.79	1.66	1.77
Some college	1.59	1.77	1.53	1.62
College graduate	1.45	1.46	1.44	1.45
Post-graduate	1.29	1.28	NA	1.29

Table D.12
Probit Estimates by Education Group (Dependent Variable: Marrying Down).

VARIABLES	(1) High School Graduate	(2) Some College	(3) College Graduate	(4) Post-Graduate
AFQT (in thousands)	-0.006**	-0.006**	-0.007*	0.005
	(0.002)	(0.003)	(0.004)	(0.010)
Gender role Attitudes	0.094	-0.109	-0.007	0.175
	(0.070)	(0.086)	(0.117)	(0.314)
Children expectations	-0.012	-0.099**	-0.078	0.004
	(0.042)	(0.049)	(0.051)	(0.117)
Underweight	-0.028	-0.187	-0.498*	0.438
	(0.180)	(0.197)	(0.276)	(0.452)
Overweight	0.197	0.416**	0.725**	
	(0.151)	(0.204)	(0.290)	
Obese	0.364	0.507	1.021**	
	(0.230)	(0.495)	(0.511)	
Observations	873	423	354	72

Notes - Married white women, first marriages. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

The NLSY79 survey contained a direct fertility expectation question in several interviews.[13] Respondents were asked how many children they actually expected to have, which is considered a good predictor of future fertility outcomes. As shown in Table D.9, conditional on the female's education category, there are no significant differences in mean expected number of children across the three match types (married up, equal, and down). These data are drawn for the survey year closest to the year in which the respondent was 21.[14] We then looked at differences in actual number of children at age of 40 (Table D.10) by which time most women had finished childbearing. No significant variation was found in the average number of children in the household. We also carried out this analysis using the CPS sample and reached the same conclusion.

A concern arises that this is a classic case of selection on women's attitudes towards their role in the household. The NLSY survey elicits the individual's opinion towards a woman's role in homemaking and in the labor market. In the 1979, 1982, 1987 and 2004 interviews, respondents are asked whether they strongly disagree (1), disagree (2), agree (3) or strongly agree (4) with various statements on this subject. Among them, the most straightforward statement was the following: "A woman's place is in the home, not in the office or shop". Table D.11 displays the mean response according to the woman's relative educational position and her education level based on the survey closest to the year in which the respondent was 21 (as above). The table reveals no substantial variation in opinion across the categories of married-up, equal or down, given their respective education level. The responses also indicate that a lower education level is associated with "more traditional" views, i.e., women should specialise in home production and men in market production.[15]

Finally, a probit model (Table D.12) for each female education group was estimated for an indicator of being married-down in order to test the relevance of various attributes. In addition to AFQT, number of expected children and attitude towards a woman's role, we added a measure of physical attractiveness (proxied by BMI[16]). The results are consistent with previous results: AFQT is negatively and significantly correlated with marrying down while attitudes and expected number of children are not relevant. There is some evidence among women with some college education and women who are

[13] The survey question read: "Altogether, how many (more) children do you expect to have?" For those women who already had children, the (total) expected number of children is given by expected number of children plus the number of children already born.

[14] The respondent may be as young as 19 or as old as 23.

[15] Responses to other similar statements revealed similar patterns.

[16] Height and weight measures were used to calculate body mass index (BMI), which was then categorized as underweight (< 18.5), normal weight ($>= 18.5$ and < 25), overweight ($>= 25$ and < 30), and obese ($>= 30$). The data used were drawn from the survey year closest to the year in which the respondent was 21.

Table D.13
NLSY - Mean Husbands' AFQT Score.

Husband's Education	Relative Position in Education Married down	Married equal	Married up	Total
HS dropout	NA	17,988	23,782	21,286
HS graduate	40,184	43,915	49,500	44,740
Some college	60,114	63,532	66,001	62,552
College graduate	74,462	79,375	85,830	77,874
Post-graduate	82,604	92,123	NA	85,079

Notes - Married respondents men in the sample. Men who marry down (up) are men that marry women of lower (higher) education level than themselves. A male marrying down means that the female marry up, and vice versa.

Table D.14
CPS - Log Hourly Wage for Married Men.

VARIABLES	(1)
Male married up (d)	**0.047*** **
	(0.002)
Male married down (d)	**-0.057*** **
	(0.002)
Male post graduate (d)	0.896***
	(0.005)
Male college graduate (d)	0.772***
	(0.004)
Male some college (d)	0.509***
	(0.004)
Male high school graduate (d)	0.303***
	(0.004)
Time dummies	YES
MSA fixed effects	YES
Observations	551,505

Notes - *** p<0.01, ** p<0.05, * p<0.1. (d) for dummy variable. Sample consists of husbands married to white females aged 25-55. Reference groups: High school dropouts; Males married homogamously. Model includes: education category indicators, full time full year indicator, and potential experience (age-education-6) quartic. The presence of children is controlled with two dummy variables: a child younger than 6 in the family and the number of children in the family.

college graduates that married-down women are more likely to be overweight or obese. However, BMI had no significant effect in the employment equation.

D.4.2. Pre-marriage characteristics of men

We wish to determine whether more educated husbands have different characteristics, which lead to their wives working less. We are interested in whether the male marriage premium differs for men that marry up compared to those that marry equally or down. Although we have already ruled out the husband's income as playing a large role, if any, in the wife's employment decision, we nonetheless estimate a log wage regression for the husband while controlling for the type of woman he married. Virtually all studies find that married men tend to earn significantly more than single men, with estimates of the marriage premium usually exceeding 10 percent, depending on the time period, sample, and model specification (Goldin, 1990; Gray, 1997). Using the CPS data for only married men we estimated the coefficient of a dummy variable indicating for "married-up" in a log wage regression. Marriage is coded into three separate categories (married up, down and equal) and the comparison is made between those who married equal and those who married down.[17] As shown in Table D.14, the results indicate that husbands married to a more educated wife earn 5% more per hour, with homogamous marriages as the reference group. This is consistent with the mean AFQT scores (Table D.13) for male respondents in the NLSY sample. Notice the higher mean score among men marrying up (females marrying down) conditional on educational attainment, while the average score increases monotonically with education level. This suggests that the male marriage premium mirrors the marriage selection pattern. Thus, an educated woman might choose to marry a less-educated man if his level of ability is higher than other man in the same education group. While this finding can help us to rationalize

[17] Control variables include education, a full-time full-year indicator, and potential experience (age-education-6) quartic. The presence of children is controlled for by including two dummy variables: a child younger than 6 in the family and the total number of children in the family. Other controls include dummy variables for the survey year and MSA fixed effects.

the match, it can't explain why those women are working more. Put together, Tables D.8 and D.13 indicate the positive assortative mating on AFQT since those with the relative lower (higher) ability within an education group are matching with their "equals", i.e., those from a lower (higher) education group yet with the higher (lower) relative ability within their group.

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