Economics 250a
Lecture 14
Gender Disparities in the Labor Market

Reading List

As with the topic of racial disparities, there is a huge literature on gender-related differences in the labor market. Here are some (relatively) recent papers that strike me as useful.

A. Useful overviews:

1) Joseph Altonji and Rebecca Blank. "Race and Gender in the Labor Market." In O. Ashenfelter and D. Card, Handbook of Labor Economics volume 3. Elsevier, 1999.

2) Marianne Bertrand. "New Perspectives on Gender." In Orley Ashenfelter and David Card (editors) *Handbook of Labor Economics*, Vol. 4b. Amsterdam: Elsevier. 2011. pp. 1543-1590.

3) O'Neill, June, and Dave O'Neill. 2006 "What Do Wage Differentials Tell Us about Labor Market Discrimination?" *Research in Labor Economics* 24: 293-357. This is an example of "old school Chicago" style analysis, pushed to the limit (and beyond).

4) Fancine Blau and Lawrence Kahn. 2016. "The Gender Wage Gap: Extent, Trends, and Explanations."NBER Working Paper No. 21913.

B. Human capital

Joseph G. Altonji, Erica Blom and Costas Meghir. 2012. "Heterogeneity in Human Capital Investments: High School Curriculum, College Major, and Careers" *Annual Review of Economics*, 4(1): 185-223. Get the NBER Version (WP #17985) for the extra tables and materials.

Casey B. Mulligan and Yona Rubinstein. 2008. "Selection, Investment, and Women's Relative Wages over Time" *Quarterly Journal of Economics*, 123 (3): 1061-1110. This is an extended analysis of the potential effect of "selection bias" induced by the lower participation rate of women than men.

Manning, Alan, and Joanna Swaffield. 2008. "The gender gap in early-career wage growth." *Economic Journal* 118: 983-1024. This is a nice, careful analysis of the causes of the widening wage gap with experience.

C. Employer Discrimination

One interesting thing you will notice right away is that very few recent papers try to measure "discrimination" or model/discuss the ways that discrimination works, or could work. Economists appear to have either "moved on" or "given up" on discrimination.

Peter Kuhn. 1987. "Sex Discrimination in Labor Markets: The Role of Statistical Evidence." *American Economic Review*, 77(4): 567-583. This paper uses survey information that asked women whether they felt that they were discriminated against, and compares responses to this question to estimates of the wage gap for the same person.

Michael Ransom and Ronald G. Oaxaca. 2005. "Intrafirm mobility and sex differences in pay." *Industrial & Labor Relations Review.* 2005. This is one one

of the few papers to carefully document how an employer set up "occupations" to enforce gender segregation and facilitate lower pay for women.

Goldin, Claudia and Cecilia Rouse. 2000. "Orchestrating Impartiality: The Impact Of 'Blind' Auditions On Female Musicians," *American Economic Review,* 90(4): 715-741.

David Neumark, Roy Bank and Kyle Van Nort. 1996 "Sex Discrimination in Restaurant Hiring: An Audit Study" *Quarterly Journal of Economic*s 111 (3): 915-941. This is an older audit study. By today's standards it has a number of weaknesses, but there are relatively few recent studies focused on gender.

D. Bargaining

Babcock, Linda, and Sara Laschever. *Women don't ask: Negotiation and the gender divide.* Princeton University Press, 2009.

Jenny Säve-Söderbergh. "Are Women Asking for Low Wages? Gender Differences in Wage Bargaining Strategies and Ensuing Bargaining Success. Unpublished Paper, Stockholm University, Swedish Inst. for Social Research.

David Card, Ana Rute Cardoso, and Patrick Kline. 2016. "Bargaining, Sorting, and the Gender Wage Gap: Quantifying the Impact of Firms on the Relative Pay of Women." *Quarterly Journal of Economics*, 131(2): 633-686.

E. Supply-Based Models

Bowlus, Audra J., 1997. A search interpretation of male–female wage differentials. Journal of Labor Economics 15, 625–657.

Barth, Erling, and Harald Dale-Olsen, "Monopsonistic Discrimination, Worker Turnover, and the Gender Wage Gap," IZA Discussion Paper No. 3930, 2009.

David Card, Ana Rute Cardoso, Joerg Heining and Patrick Kline. "Firms and Labor Market Inequality: Evidence and Some Theory". NBER Working Paper 22850, November 2016.

F. Compensating Differences (Broadly construed)

a. hours-based stories

Bertrand, Marianne, Claudia Goldin, and Lawrence F. Katz. 2010. "Dynamics of the Gender Gap for Young Professionals in the Financial and Corporate Sectors." American Economic Journal: Applied Economics, 2(3): 228-55.

Goldin, Claudia. 2014. "A Grand Gender Convergence: Its Last Chapter." *American Economic Review* 104(4): 1091-1119.

b. avoiding competition

Muriel Niederle and Lise Vesterlund. 2007. "Do Women Shy Away from Competition? Do Men Compete Too Much?" *Quarterly Journal of Economics* 122(3): 1067-1101.

Jeffrey A. Flory, Andreas Leibbrandt, and John A. List. 2015 "Do Competitive Workplaces Deter Female Workers? A Large-Scale Natural Field Experiment on Job Entry Decisions." *Review of Economic Studies* 82 (1): 122-155

G. Other Pyschological Stories

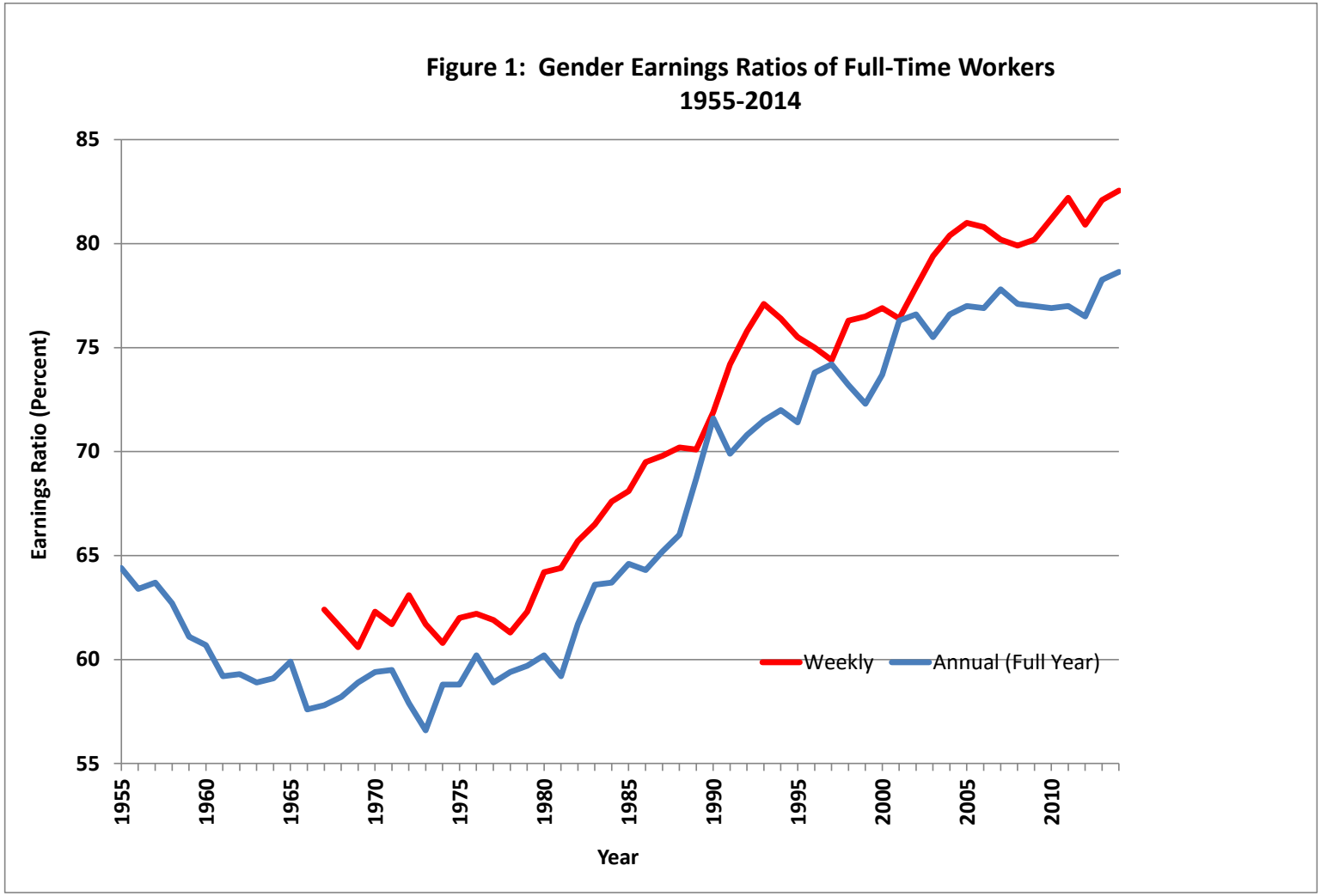
a. Fear of Earning More than One's Spouse

Marianne Bertrand, Emir Kamenica, and Jessica Pan. 2015 "Gender Identity and Relative Income within Households" *Quarterly Journal of Economics* (2015)

130 (2): 571-614. In this paper, it is argued that married women have a strong aversion to earning more than their spouse. They argue that this exerts a negative effect on women's earnings!

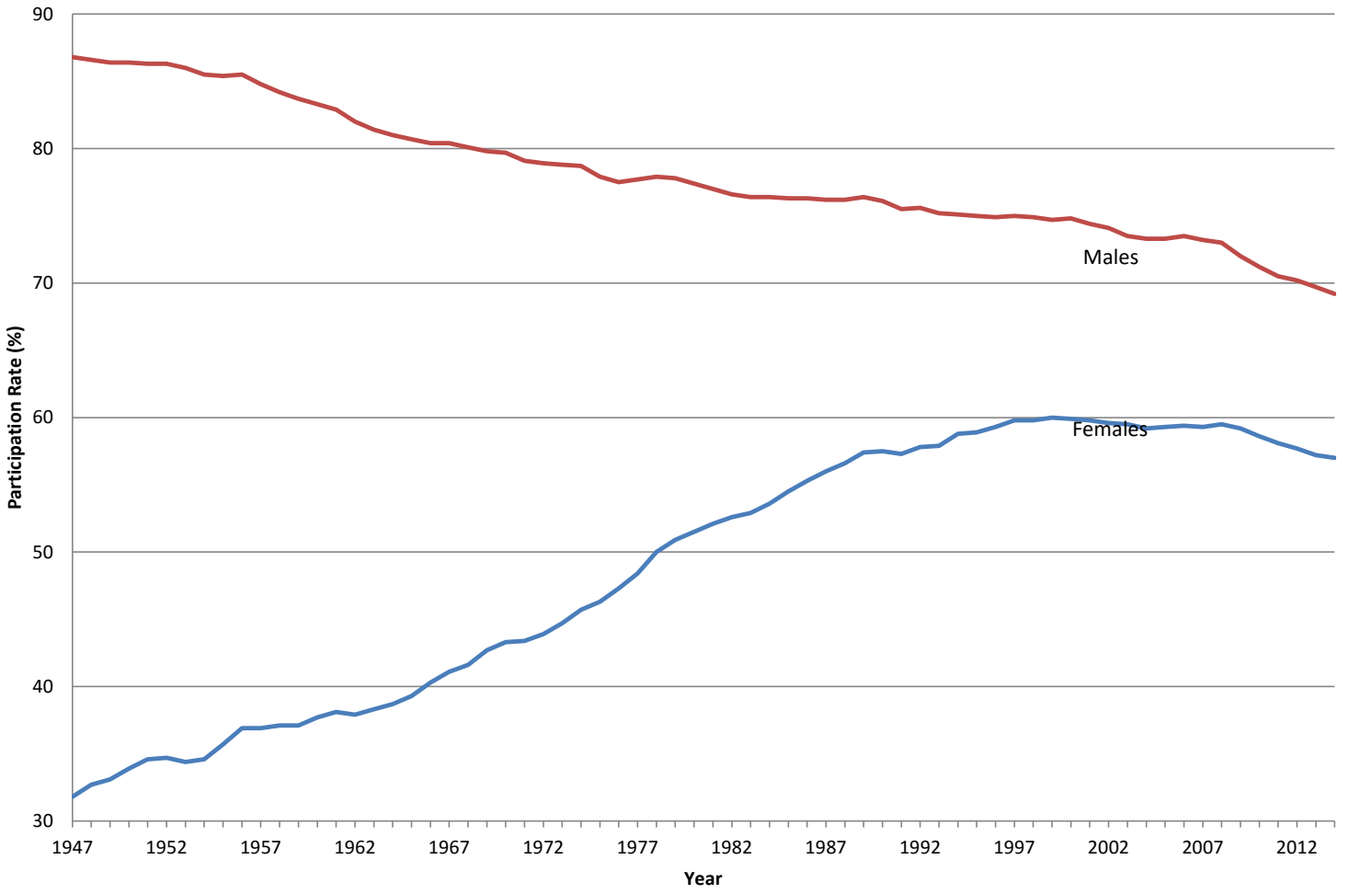
b. Gender Indentity

Nicole M. Fortin. 2008. "The Gender Wage Gap among Young Adults in the United States The Importance of Money versus People." Journal of Human Resources 43(4): 884-918



Notes: Updated version of Figure 7-2 from Blau, Ferber, and Winkler (2014); for additional information on references, see p. 148. Workers aged 16 and over from 1979 onward, and 14 and over prior to 1979.

Figure 3: Trends in Female and Male Labor Force Participation Rates, 1947-2014 (age 16 and over)



Notes: Updated version of Figure from Blau, Ferber and Winkler (2014) based on data from the Current Population Survey available at www.bls.gov and Employment & Earnings, various issues.

Table 1: Unadjusted Female/Male Log Hourly Wage Ratios, Full Time Workers

	Sample Size					
Year	Men	Women	Mean	10th Percentile	50th Percentile	90th Percentile
			Panel Study of Income Dynamic (PSID)			
1980	2282	1491	62.1%	64.8%	60.1%	62.4%
1989	2617	2068	74.0%	76.3%	72.4%	74.6%
1998	2391	2146	77.2%	80.3%	79.8%	73.8%
2010	2368	2456	79.3%	81.5%	82.4%	73.9%
			March Current Populations Survey (CPS)			
1980	21428	13484	63.5%	68.7%	61.9%	64.3%
1989	21343	16487	72.4%	78.1%	72.2%	71.4%
1998	17520	14231	77.1%	81.3%	76.2%	76.1%
2010	24229	20718	82.3%	87.6%	82.2%	76.6%

Notes: Sample includes nonfarm wage and salary workers age 25-64 with at least 26 weeks of employment. Entries are exp(D), where D is the female mean log wage, 10th, 50th or 90th percentile log wage minus the corresponding male log wage.

Table 2: Schooling and Actual Full Time Work Experience by Gender, PSID

Year	Men	Women	Men-Women
Years of Schooling			
1981	13.3	13.2	0.2
1990	13.8	13.7	0.0
1999	14.2	14.3	-0.1
2011	14.3	14.5	-0.2
Bachelor's Degree Only			
1981	18.1%	15.3%	2.7%
1990	20.0%	17.6%	2.3%
1999	23.4%	22.2%	1.2%
2011	26.2%	24.7%	1.5%
Advanced Degree			
1981	10.0%	7.4%	2.5%
1990	10.3%	8.7%	1.6%
1999	11.7%	10.8%	0.9%
2011	12.9%	15.7%	-2.8%
Years of Full Time Experience			
1981	20.3	13.5	6.8
1990	19.2	14.7	4.5
1999	19.8	15.9	3.8
2011	17.8	16.4	1.4

Notes: Sample includes full time nonfarm wage and salary workers age 25-64 with at least 26 weeks of employment.

Table 3: Incidence of Managerial or Professional Jobs and Collective Bargaining Coverage by Gender, PSID

Year	Men	Women	Men-Women
Managerial Jobs			
1981	21.5%	9.2%	12.3%
1990	21.1%	10.9%	10.2%
1999	21.8%	15.3%	6.5%
2011	18.3%	16.2%	2.2%
Professional Jobs			
1981	17.0%	21.8%	-4.8%
1990	19.4%	26.1%	-6.6%
1999	20.4%	26.9%	-6.4%
2011	21.7%	31.1%	-9.4%
"Male" Professional Jobs			
1981	14.6%	10.1%	4.5%
1990	17.3%	14.1%	3.2%
1999	17.6%	13.2%	4.4%
2011	18.6%	17.8%	0.8%
Collective Bargaining Coverage			
1981	34.5%	21.1%	13.3%
1990	25.4%	19.4%	6.1%
1999	21.5%	18.2%	3.3%
2011	17.4%	18.9%	-1.5%

Notes: Sample includes full time nonfarm wage and salary workers age 25-64 with at least 26 weeks of employment. "Male" Professional jobs are professional jobs excluding nurses and K-12 and other non-college teachers.

Table 4: Decomposition of Gender Wage Gap, 1980 and 2010 (PSID)

	1980		2010	
	Effect of Gender Gap in Explanatory Variables		Effect of Gender Gap in Explanatory Variables	
Variables	Log Points	Percent of Gender Gap Explained	Log Points	Percent of Gender Gap Explained
A. Human Capital Specification				
Education Variables	0.0129	2.7%	-0.0185	-7.9%
Experience Variables	0.1141	23.9%	0.0370	15.9%
Region Variables	0.0019	0.4%	0.0003	0.1%
Race Variables	0.0076	1.6%	0.0153	6.6%
Total Explained	0.1365	28.6%	0.0342	14.8%
Total Unexplained Gap	0.3405	71.4%	0.1972	85.2%
Total Pay Gap	0.4770	100.0%	0.2314	100.0%
B. Full Specification				
Education Variables	0.0123	2.6%	-0.0137	-5.9%
Experience Variables	0.1005	21.1%	0.0325	14.1%
Region Variables	0.0001	0.0%	0.0008	0.3%
Race Variables	0.0067	1.4%	0.0099	4.3%
Unionization	0.0298	6.2%	-0.0030	-1.3%
Industry Variables	0.0457	9.6%	0.0407	17.6%
Occupation Variables	0.0509	10.7%	0.0762	32.9%
Total Explained	0.2459	51.5%	0.1434	62.0%
Total Unexplained Gap	0.2312	48.5%	0.0880	38.0%
Total Pay Gap	0.4770	100.0%	0.2314	100.0%

Notes: Sample includes full time nonfarm wage and salary workers age 25-64 with at least 26 weeks of employment. Entries are the male-female differential in the indicated variables multiplied by the current year male log wage coefficients for the corresponding variables. The total unexplained gap is the mean female residual from the male log wage equation.

Table 5: Effect of Changes in Explanatory Variables and Male Wage Coefficients on the Change in the Gender Wage Gap, 1980-2010

	Base: 1980 Male Wage Equation; 2010 Male-Female Gap in Explanatory Variables		Base: 2010 Male Wage Equation; 1980 Male-Female Gap in Explanatory Variables	
Variables	**Human Capital Specification**	**Full Specification**	**Human Capital Specification**	**Full Specification**
Effect of Changing Means				
Education Variables	-0.0219	-0.0219	-0.0461	-0.0343
Experience Variables	-0.0767	-0.0674	-0.0460	-0.0433
Region Variables	-0.0058	-0.0030	-0.0004	0.0002
Race Variables	-0.0018	-0.0017	0.0006	0.0003
Unionization	--	-0.0331	--	-0.0303
Industry Variables	--	-0.0080	--	0.0032
Occupation Variables	--	-0.0253	--	-0.0369
All X's	-0.1062	-0.1603	-0.0920	-0.1411
Effect of Changing Coefficients				
Education Variables	-0.0095	-0.0041	0.0148	0.0083
Experience Variables	-0.0004	-0.0006	-0.0310	-0.0246
Region Variables	0.0042	0.0037	-0.0011	0.0005
Race Variables	0.0096	0.0049	0.0071	0.0030
Unionization	--	0.0003	--	-0.0025
Industry Variables	--	0.0031	--	-0.0082
Occupation Variables	--	0.0506	--	0.0622
All B's	0.0039	0.0579	-0.0103	0.0386
Effect of Changing Unexplained Gaps	-0.1433	-0.1432	-0.1433	-0.1432
Change in the Total Wage Gap	-0.2456	-0.2456	-0.2456	-0.2456

Notes: Effect of Changing Means is the change over the 1980-2010 period in the male-female difference in the indicated variables multiplied by the indicated male log wage coefficients for the corresponding variables. Effect of Changing Coefficients is the the change over the 1980-2010 period in the male wage coefficients for the indicated variables, multiplied by the corresponding male-female difference in the means of the indicated variables.

Table 9

Gender Wage Gap Among the NLSY Cohort, Ages 35-43 in 2000, Controlling for Different Sets of Explanatory Variables: Results for All Men and Women and Specified Sub-groups

		All	By Schooling Level		*Never had a child and never married*
			HS Grad or less	*COL Grad or more*	
Unadjusted log hourly wage gap		**-0.235**	**-0.229**	**-0.287**	**0.076** ns
Log wage differential controlling for:					
1).	**Age, SMSA, region and race, schooling, AFQT**	**-0.231**	**-0.230**	**-0.244**	**-0.019** ns
2).	**Variables in 1) plus life time work experience**	**-0.121**	**-0.074**	**-0.182**	**-0.065** ns
3).	**Variables in 2) plus L.F. withdrawal due to family responsibilities**	**-0.102**	**-0.058**	**-0.155**	**-0.054** ns
4).	**Variables in 3) plus class of worker**	**-0.095**	**-0.060**	**-0.120**	**-0.042** ns
5).	**Variables in 4) plus occupational characteristics**	**-0.084**	**-0.073**	**-0.078**	**-0.013** ns
6).	**Variables in 5) plus percent female in occupation**	**-0.079**	**-0.054**	**-0.078**	**-0.027** ns

* All female coefficients are significant at the 10% level or lower unless indicated with "ns".

Note: The log wage differentials are partial regression coefficients of a dummy (0,1) variable for "female" from a series of OLS log wage regressions containing the explanatory variables noted. Separate regressions were conducted for each population group shown. For further information on the individual variables included see the text and Table 10.

Source: National Longitudinal Survey of Youth (NLSY79) merged with measures of occupational characteristics (3-digit level) from the September 2001 CPS, the CPS March, and the Dictionary of Occupational Titles (1991).

Table 10

Means and Partial Regression Coefficients of Explanatory Variables[1)] from Separate NLSY Log Wage Regressions for Men and Women Ages 35-43 in 2000

	Means		Female				Male			
			M2		M4		M2		M4	
	Female	Male	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
Race										
Hispanic (0,1)	0.182	0.193	0.063	2.57	0.060	2.61	-0.025	-1.02	-0.018	-0.75
Black (0,1)	0.316	0.282	0.053	2.42	0.066	3.14	-0.022	-0.92	0.005	0.20
Education and skill level										
<10 yrs.	0.031	0.052	-0.089	-1.76	-0.078	-1.64	-0.028	-0.65	-0.025	-0.60
10-12 yrs (no diploma or GED) *	0.103	0.124	---	---	---	---	---	---	---	---
HS grad (diploma)	0.300	0.326	-0.003	-0.10	-0.008	-0.27	-0.018	-0.65	-0.013	-0.50
HS grad (GED)	0.045	0.056	-0.015	-0.34	-0.046	-1.12	0.027	0.63	0.015	0.38
Some college	0.308	0.232	0.090	2.99	0.060	2.09	0.166	5.31	0.123	4.08
BA or equiv. degree	0.153	0.155	0.276	7.61	0.216	6.19	0.373	10.23	0.260	7.08
MA or equiv. degree	0.053	0.041	0.391	8.49	0.348	7.76	0.562	10.84	0.446	8.62
Ph.D or prof. Degree	0.007	0.015	0.758	7.47	0.654	6.71	0.806	10.60	0.639	8.53
AFQT percentile score (x.10)	3.981	4.238	0.042	9.92	0.032	7.84	0.042	9.92	0.029	7.04
L.F. withdrawal due to family responsibilities (0,1)	0.549	0.130	-0.081	-4.16	-0.082	-4.46	-0.080	-3.14	-0.066	-2.74
Lifetime Work Experience										
Weeks worked in civilian job since age 18 ÷ 52	15.565	17.169	0.030	13.85	0.023	11.13	0.038	12.54	0.034	11.39
Weeks worked in military since 1978 ÷ 52	0.062	0.573	0.046	3.53	0.040	3.22	0.025	5.15	0.020	4.46
Weeks PT ÷ total weeks workd since age 22	0.137	0.050	-0.203	-4.24	-0.084	-1.81	-0.779	-7.90	-0.540	-5.70
Employment type										
Gov't employer (0,1)	0.215	0.144			-0.030	-1.50			-0.027	-1.13
Non-profit employer (0,1)	0.100	0.049			-0.056	-2.13			-0.121	-3.20
OCC. Characteristics of Person's 3-digit OCC.										
SVP required in occup. (months) *(DOT)*	26.961	28.773			0.001	2.44			0.003	5.43
Hazards (0,1) *(DOT)*	0.013	0.084			0.327	4.66			0.131	3.97
Fumes (0,1) *(DOT)*	0.004	0.043			-0.293	-2.27			-0.075	-1.72
Noise (0,1) *(DOT)*	0.080	0.307			0.005	0.18			0.019	0.83
Strength (0,1) *(DOT)*	0.092	0.215			0.011	0.37			-0.049	-1.99
Weather extreme (0,1) *(DOT)*	0.033	0.188			0.120	2.56			0.000	-0.01
Prop. using computers *(CPS)*	0.557	0.415			0.157	2.19			0.045	0.49
Prop. using computer for analysis *(CPS)*	0.143	0.139			0.497	4.62			0.258	2.22
Prop. using computer for word proc. *(CPS)*	0.345	0.236			-0.255	-3.19			-0.007	-0.06
Relative rate of transition to unemployment	0.772	1.092			-0.022	-1.11			-0.023	-1.91
Relative rate of transition to OLF	1.046	0.789			-0.144	-7.30			-0.073	-3.57
% female in OCC. X 0.1. (CPS ORG)	6.348	2.695			0.005	1.08			-0.019	-3.55
Adj. R-Square			**0.392**		**0.464**		**0.403**		**0.467**	
Dependent mean *(Log Hourly Wage)*			**2.529**				**2.764**			
Sample size			**2704**				**2694**			

[1)] Model also controls for age, central city, MSA, region, and occupation missing.

* Reference group.

Source: National Longitudinal Survey of Youth (NLSY79) merged with measures of occupational characteristics (3-digit level) from the September 2001 CPS, the March CPS, the CPS ORG, and the Dictionary of Occupational Titles (1991).

Table 11

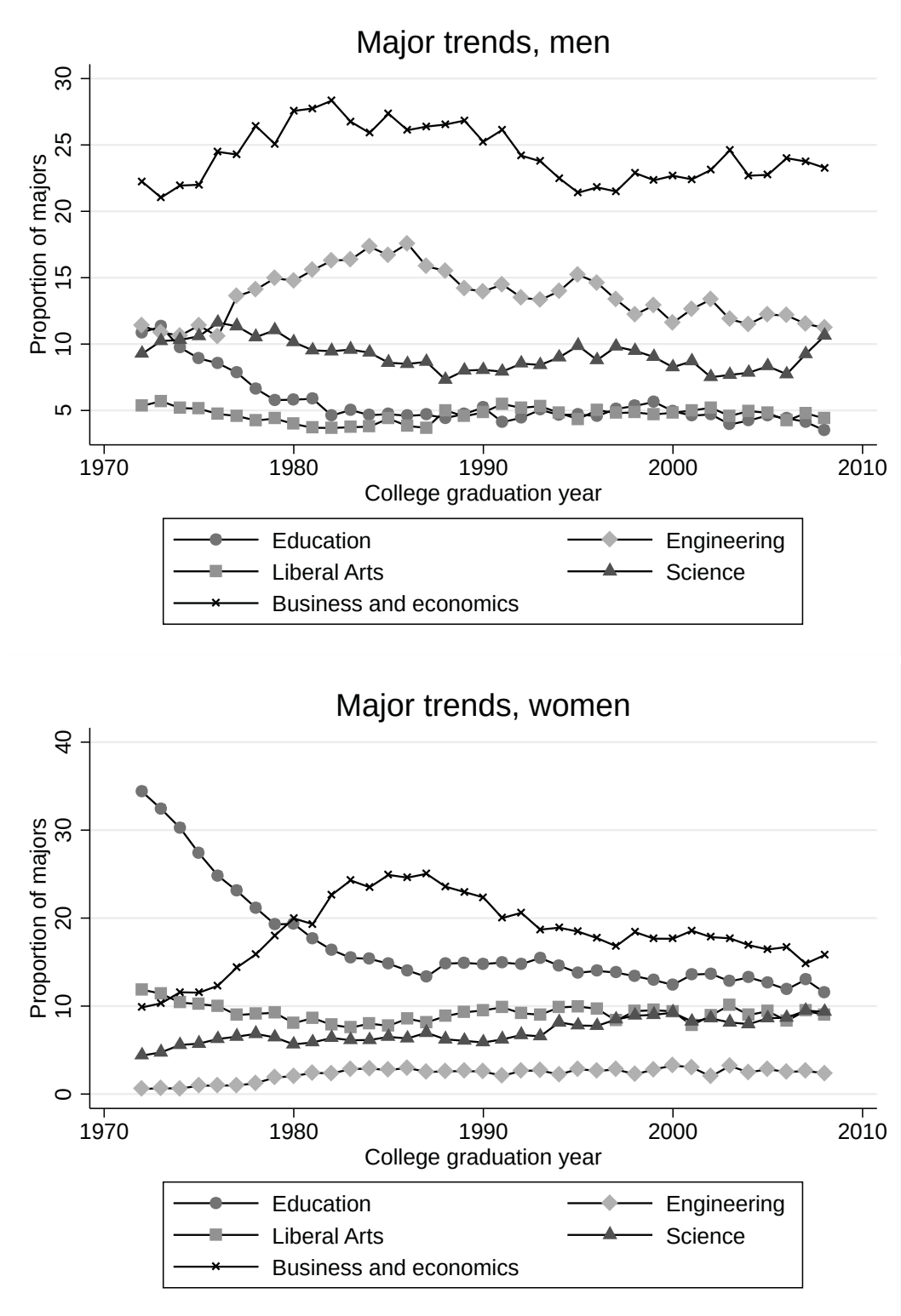
Gender Wage Gap: Decomposition Results (NLSY, 2000)

	Using male coefficients				Using female coefficients			
	M1	***M2***	***M3***	***M4***	***M1***	***M2***	***M3***	***M4***
Log Wage Gap (Male-Female) Attributable to:								
Age, race, region, central city, MSA	0.0044	0.0112	0.0089	0.0089	0.0040	0.0089	0.0064	0.0064
AFQT	0.0132	0.0107	0.0073	0.0074	0.0143	0.0107	0.0081	0.0081
Education level	-0.0138	-0.0128	-0.0094	-0.0096	-0.0147	-0.0068	-0.0054	-0.0052
L.F. withdrawal due to family responsibilities		0.0335	0.0272	0.0277		0.0340	0.0344	0.0343
Lifetime work experience		0.1425	0.1135	0.1116		0.0901	0.0649	0.0655
Nonprofit, government			0.0088	0.0081			0.0048	0.0050
Occupational characteristics:								
Investment related								
SVP (Specific Vocational Preparation)			0.0062	0.0053			0.0020	0.0021
Computer usage			0.0122	-0.0040			-0.0054	-0.0024
Compensating differences								
Disamenities (physical)			0.0167	0.0040			0.0252	0.0267
Unemployment risk; labor force turnover			0.0116	0.0028			0.0226	0.0259
TYP: % female in occupation				0.0721				-0.0137
Unadjusted log wage gap	0.2351	0.2351	0.2351	0.2351	0.2351	0.2351	0.2351	0.2351
Total explained by model	0.0037	0.1851	0.2030	0.2342	0.0036	0.1370	0.1578	0.1526
Unexplained log wage gap	0.2314	0.0500	0.0321	0.0009	0.2315	0.0981	0.0773	0.0825
Unadjusted hourly wage ratio (Female/Male) :	79.0	79.0	79.0	79.0	79.0	79.0	79.0	79.0
Adjusted hourly wage ratio (Female/Male) :	79.3	95.1	96.8	99.9	79.3	90.7	92.6	92.1

Note: Decomposition results shown are derived from results of separate regressions for men and women. See Table 10 for variable means and coefficients using Model 2 and 4. Wage ratios are based on the exponentiated log hourly wage.

Source: National Longitudinal Survey of Youth (NLSY79) merged with measures of occupational characteristics (3-digit level) from the September 2001 CPS, the March CPS, the CPS ORG, and the Dictionary of Occupational Titles (1991).

Supplementary Figure 1



Selected majors only. Data from ACS.

Table 3: Effects of college major on log wages by gender, with and without occupation controls

Major	Major dummies only		With occupation controls	
	Female	Male	Female	Male
Communications	0.202***	0.207***	0.063***	0.058**
Computer Science	0.441***	0.531***	0.161***	0.242***
Elementary Education	-0.024*	-0.009	-0.015	0.009
Electrical Engineering	0.556***	0.561***	0.258***	0.293***
Mechanical Engineering	0.554***	0.524***	0.265***	0.264***
English Language And Literature	0.107***	0.152***	0.026*	0.063***
Liberal Arts	0.073***	0.154***	0.021	0.055*
Biology	0.196***	0.302***	0.068***	0.114***
Mathematics	0.288***	0.426***	0.143***	0.224***
Chemistry	0.250***	0.366***	0.101***	0.193***
Criminal Justice And Fire Protection	0.076***	0.226***	-0.013	0.076***
Economics	0.400***	0.517***	0.224***	0.275***
Anthropology And Archeology	0.069**	0.135***	-0.001	0.053
Political Science And Government	0.246***	0.327***	0.112***	0.158***
Sociology	0.077***	0.165***	0.012	0.075***
Fine Arts	-0.021	0.017	-0.067**	-0.035
Nursing	0.391***	0.408***	0.172***	0.243***
General Business	0.218***	0.339***	0.077***	0.142***
Accounting	0.310***	0.431***	0.143***	0.199***
Business Management And Administration	0.199***	0.292***	0.054***	0.104***
Marketing And Marketing Research	0.256***	0.356***	0.089***	0.150***
Finance	0.342***	0.518***	0.151***	0.243***
History	0.105***	0.167***	0.033*	0.064***
R^2	0.200	0.217	0.330	0.337
SD of major coefficients	0.146	0.177	0.074	0.098
N	125794	140706	124858	139493

Notes: *** p<0.01, ** p<0.05, * p<0.10

All specifications include dummy variables for highest level of education attained, a cubic in potential experience, and race dummies. Bachelor's degrees are 4-digit; only a selected sample of the 171 are shown. Wages are top- and bottom-coded at 5 and 400 USD per hour, respectively. General Education is the excluded category. Occupation controls are 5-digit. SD is calculated over all majors using ACS weights.

Sample selection: Observations are included if the individual has at least a bachelor's degree, is working >34 hours per week and >40 weeks per year, and is 23-59 years old.

Figure 2: Average of major coefficients by age

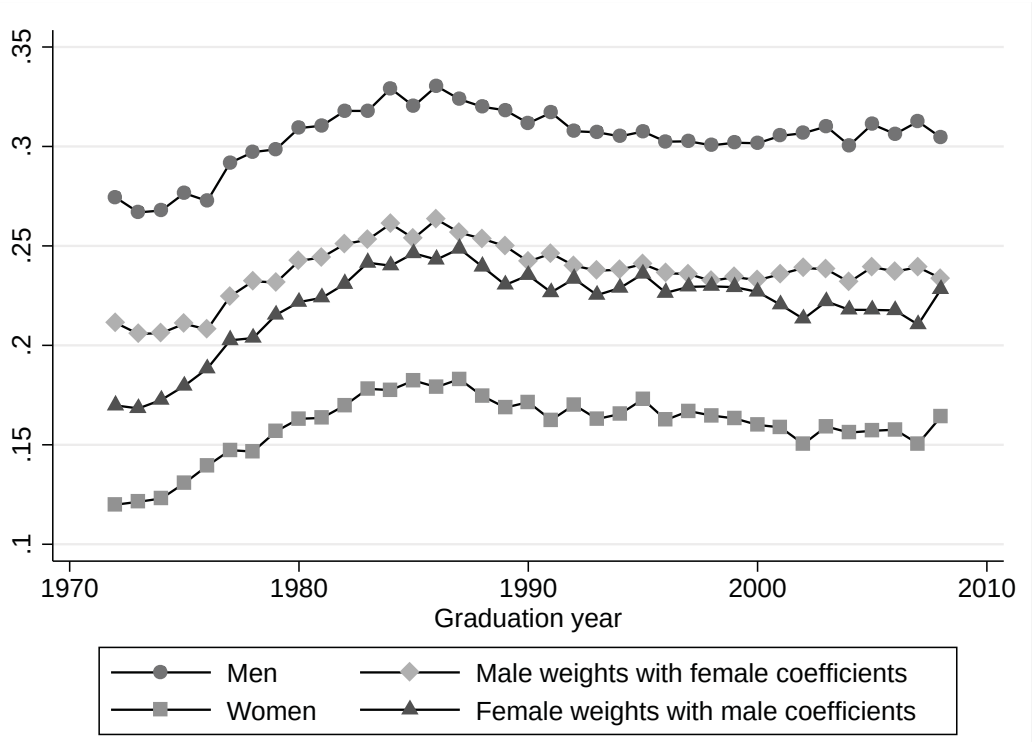


TABLE I
CORRECTING THE GENDER WAGE GAP USING THE HECKMAN TWO-STEP ESTIMATOR

Period	Method		Bias
	OLS	Two-Step	
	Panel A: Variable Weights		
1975–1979	−0.414	−0.337	−0.077
	(0.003)	(0.014)	(0.015)
1995–1999	−0.254	−0.339	0.085
	(0.003)	(0.014)	(0.015)
Change	0.160	−0.002	0.162
	(0.005)	(0.020)	(0.021)
	Panel B: Fixed Weights		
1975–1979	−0.404	−0.330	−0.075
	(0.003)	(0.014)	(0.014)
1995–1999	−0.264	−0.353	0.089
	(0.004)	(0.015)	(0.016)
Change	0.140	−0.024	0.164
	(0.005)	(0.021)	(0.021)

Notes. Each table entry summarizes regression results (reported in full in Appendix II). The entries are female minus male log wages, which differ from each other in terms of (a) rows, i.e., time period used for estimation (1975–1979 vs. 1995–1999); (b) columns, i.e., whether the regression includes the inverse Mills ratio (OLS does not include it, two-step does); and (c) panels, i.e., the weighting used to average the regression results across demographic groups (variable vs. fixed weights). The "Bias" column is the difference between the OLS and two-step columns. The "change" row is the difference between the 1995–1999 and 1975–1979 rows. Weights are factions of working women in each demographic group and are time-specific (variable) or pool both time periods (fixed).

The regressions control for demographics interacted with gender and use our CPS wage sample of white persons aged 25–54, trimming outliers and adjusting topcodes as described in Appendix I.

Bootstrap standard errors are in parentheses.

estimator), separately for every cross section. First, we estimate $P_t(\mathbf{Z})$ as the fitted values from the probit equation above, estimated on a CPS sample of all prime-age white women. The dependent variable for the probit is working FTFY. $P_t(\mathbf{Z})$ is set to 1 for men. Second, for a sample of persons employed FTFY, the log wage equation (14) is estimated using least squares, with a value for the inverse Mill's ratio assigned to each person according to estimates from the probit equation.[13] Tables I and II display the results from the CPS data (information about data processing and the samples used in the CPS regressions is provided in Appendix I). The tables are based on four wage regressions, which differ according to the years sampled (1975–1979 vs. 1995–1999) and whether the inverse Mills ratio is included as a regressor.

13. Standard errors are calculated with the nonparametric pairwise bootstrap method (1,000 replications), and thereby account for the facts that estimation occurs in two stages and that the regression equation error terms are heteroscedastic.

Table 2

'*Reduced Form*' *Estimates of Wage Growth Equation*

	1	2	3	4	5	6
	Men	Women	Men	Women	Men	Women
0 yrs of experience	0.145	0.120	0.161	0.131	0.160	0.160
	(0.013)	(0.012)	(0.013)	(0.011)	(0.019)	(0.016)
5 yrs of experience	0.068	0.040	0.070	0.046	0.074	0.041
	(0.005)	(0.004)	(0.004)	(0.004)	(0.008)	(0.006)
10 yrs of experience	0.013	0.009	0.030	0.035	0.018	0.020
	(0.010)	(0.006)	(0.007)	(0.007)	(0.015)	(0.011)
No. of obs	5,015	5,535	4,833	5,208	5,015	5,535
R^2	0.076	0.051	0.077	0.058	0.020	0.015
Fixed Effects	No	No	No	No	Yes	Yes
					P = 1.00	P = 1.00
Sample	All	All	Gap = 1	Gap = 1	All	All
Implied Gender Gap at 5 yrs	0.144		0.149		0.096	
	(0.044)		(0.041)		(0.062)	
Implied Gender Gap at 10 yrs	0.248		0.222		0.216	
	(0.054)		(0.044)		(0.066)	

Notes. These estimates are derived from the estimation of (4) where experience is modelled as a quadratic. Standard errors in parentheses. These are robust standard errors with clustering on the individual.

the right-hand side of which is simply two one-period sets of wage growth. One can readily extend this formula to any value of g in which case it will be given by:

$$\mathrm{E}(\Delta w_{it}) = \sum_{j=0}^{g-1} \phi(e_{it} + j). \tag{3}$$

Using the specific functional form in (1), this can be written as:

$$\mathrm{E}(\Delta w_{it}) = \beta_0 g + \beta_1 \sum_{j=0}^{g-1} (e_{it} + j) + \beta_2 \sum_{j=0}^{g-1} (e_{it} + j)^2. \tag{4}$$

Thus one can readily estimate wage growth on a consistent basis for individuals with different gaps by computing the 'adjusted' levels of experience in (4) and using these as regressors in a wage growth equation. Note that there is no constant in this regression – the constant in (1) gets multiplied by g. If wage growth does not vary with experience this approach is equivalent to the simple-minded approach of just dividing wage growth by the interval between wage observations as the gap would be the only remaining regressor and the coefficient on it can be interpreted as annual wage growth.

Table 2 reports estimates of the reduced-form wage growth equations. The first two columns of Table 2 report estimates of (4) for men and women separately. We report the estimates of earnings growth at 0, 5 and 10 years of experience together with their standard errors. Taking the coefficients for men, the estimates suggest that a man can expect 14.5% annual wage growth on entry into the labour market, falling to 6.8% after 5 years and 1.3% after 10 years. For women (the second column) earnings growth on entry is lower than for men (at 12.0% per annum) and still lower after 10 years though the gap in wage growth narrows.[9] These estimates are consistent with the finding that

[9] One might wonder whether these gender differences are significantly different from each other. At each individual level of experience the answer is often 'no' but one can easily reject the joint hypothesis that the returns to experience for men and women are equal in the first 10 years.

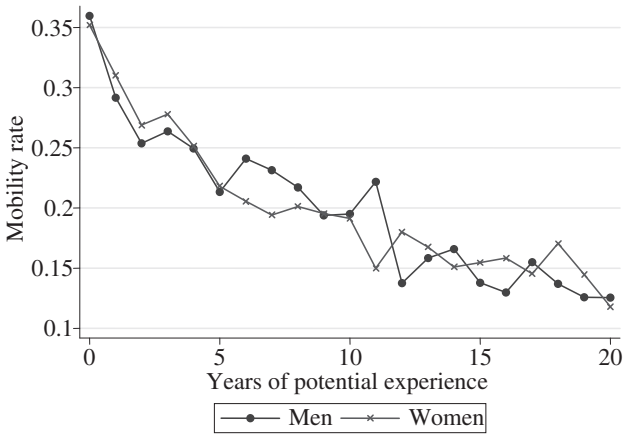


Fig. 8. *Job Mobility Rates: for Better Job*
Notes. As for Figure 7 but with mobility defined as being for a better job.

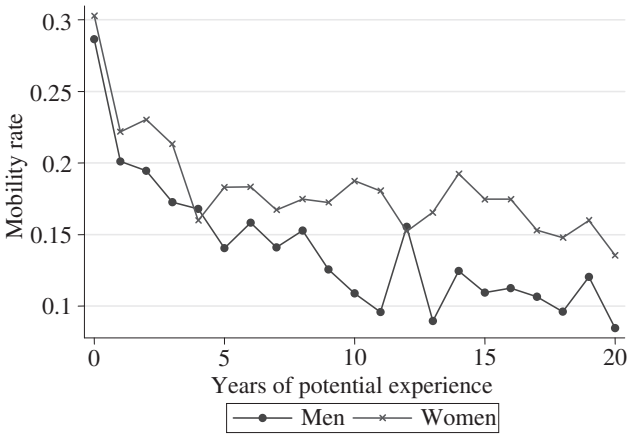


Fig. 9. *Job Mobility Rates: not for Better Job*
Notes. As for Figure 7 but with mobility not being defined as being for a better job.

Now let us consider the extent to which wage changes are related to different sorts of mobility. There is an existing literature on the impact of different sorts of moves on wage changes that starts with a series of papers in the early 1980s (Bartel, 1980, 1982; Borjas, 1981; Bartel and Borjas, 1981). More recent papers are Topel and Ward (1992) and, with a specific focus on gender differences, Loprest (1992), Crossley *et al.* (1994), Keith and McWilliams (1997, 1999) and Cobb-Clark (2001).

We examine the impact of job mobility by simply including dummy variables for different sorts of move.[20] There are a large number of reasons for moves given in

[20] There are reasons to doubt whether this specification is adequate. For example, theory predicts some variation in the returns to job mobility both in observables (like experience, job tenure and the current level of wages) and unobservables (because individuals are less likely to leave jobs with high wage growth). However, experimentation with the specification did not lead to any substantive change in the results and we only report the simplest specification here.

Table 7

The Gender Gap at Age 30 (BCS wage data at age 30)

			Wage Gap evaluated at 10 yrs of actual exp with:		Sample size
	Raw Log Wage gap	Wage Gap with controls	Female chars	Male chars	Women (Men)
1. Basic equation without	0.181	0.163	0.163	0.163	3,281
fertility or experience controls	(0.016)	(0.015)	(0.015)	(0.015)	(3,681)
2. Row 1 plus expected fertility controls	0.181	0.163	0.163	0.163	3,281
	(0.016)	(0.015)	(0.015)	(0.015)	(3,681)
3. Row 2 plus actual experience	0.181	0.159	0.169	0.152	3,281
	(0.016)	(0.015)	(0.002)	(0.002)	(3,681)
4. Row 2 plus actual full-time	0.181	0.119	0.127	0.115	3,281
and part-time experience	(0.016)	(0.016)	(0.002)	(0.003)	(3,681)
5. Row 4 plus 1-digit occupation	0.181	0.125	0.121	0.142	3,281
	(0.016)	(0.017)	(0.002)	(0.002)	(3,681)
6. Basic equation with sample restricted	0.081	0.110	0.121	0.115	1,310
to 'always in FT employment' with 'no kids'	(0.025)	(0.023)	(0.004)	(0.004)	(1,589)
7. Row 5 plus 1-digit occupation	0.081	0.095	0.086	0.107	1,310
	(0.025)	(0.025)	(0.005)	(0.005)	(1,589)

Notes: The basic equation for each row includes controls for whether there are any children in the household, quadratic in actual full-time and part-time labour market experience, age left full-time education, quadratic for current tenure, qualifications, marital status, ethnic, establishment size, whether a supervisor and future plans for (further) children.
Average wage gaps are evaluated at the means of the full-time only workers.

and women are estimated and the gender pay gap evaluated for a full-time worker with 10 years of actual experience whose other characteristics match those of the average woman (man).[24]

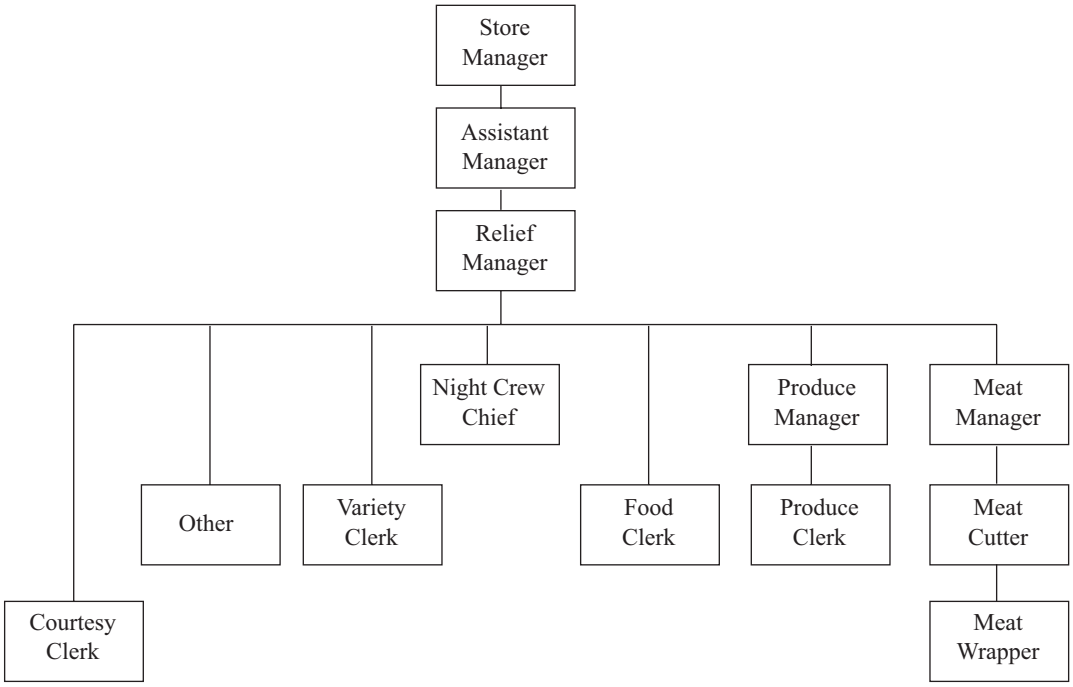
The raw gender pay gap is approximately 18 log points for the wage levels as shown in the second column of the first row, somewhat lower than estimates from the BHPS.[25] When controls for whether there are children in the household, marital status, race, tenure and qualifications are introduced (but not fertility intentions or actual labour market experience) the estimated gender wage gap falls to approximately 16 log points (row 1, column 3). The second row adds in the expected future fertility controls – a dummy for whether the individual is planning (further) children in the future but the impact of this control is negligible.

In the third row a quadratic for total labour market experience is included. This has a relatively small impact on the wage gap estimates, reducing slightly the wage gap with controls and the wage gap evaluated with male characteristics. By comparison, the inclusion of full-time and part-time actual labour market experience in the row below (row 4) has a much greater impact on the wage gap estimates. The estimated gender

[24] Our reason for showing this particular gender gap is that this is closest to the cumulated gap that has been the focus of attention in the BHPS data.

[25] It is worth noting that throughout this Section we use wage levels rather than wage growth because they are the only data available to us. But, as the gender gap is approximately zero on labour market entry this should not make a huge difference.

Figure 1. Store-Level Organization.



The most significant role of seniority appeared to be in the setting of work schedules. Part-time employees could claim the schedule of a less-senior part-time employee who was assigned to work more hours in a given week, provided that both employees worked in the same department. However, the contract made clear that the company could decide who was to fill any full-time position, although it required that the most senior part-time employee be considered.

There was some significance attached to working full-time, but this did not have a large impact on fringe benefits. Employees working at least 80 hours per month received the full employer contribution to the union's health and dental plan. Vacation and sick leave accrued roughly in proportion to the number of actual hours worked. (Thus, someone working 20 hours per week accrued vacation days at about half the rate of someone working 40 hours per week.) Courtesy Clerks did not qualify for benefits, regardless of number of hours worked.

There were basically four "departments" in each store: meat, produce, grocery, and variety (non-foods). The produce and meat departments each had a manager. These managers were part of the collective bargaining unit, and they received a higher wage than other employees. The night crew chief supervised stocking of the store during the night, and also received a wage premium. The variety department did not have a manager. A few stores had specialized departments, such as a bakery; for our analysis, these employees are lumped together in the "other" category. Courtesy clerks bagged and carried groceries for customers.

Table 2 provides summary statistics for the job categories shown in Figure 1. The average wage (or salary), as of December

Table 3. Distribution of Men and Women across Jobs in 1982.

Job	*Women Holding Title*	*Fraction of All Women*	*Men Holding Title*	*Fraction of All Men*
Store Manager	0	0.000	58	0.038
Assistant Manager	3	0.003	55	0.036
Relief Manager	3	0.003	55	0.036
Food Clerk	599	0.623	507	0.334
Night Crew Chief	3	0.003	53	0.035
Courtesy Clerk	170	0.177	403	0.265
Produce Manager	0	0.000	58	0.038
Produce Clerk	13	0.014	96	0.063
Meat Manager	0	0.000	57	0.038
Meat Cutter	1	0.001	167	0.110
Meat Wrapper	86	0.089	3	0.002
Variety Clerk	74	0.077	4	0.003
Other	10	0.010	3	0.002
Total	962	1.000	1,518	1.000

wage scale as food clerks, but the variety clerks' scale was much lower. The average wage of variety clerks was $1.75 per hour less than that of produce clerks and food clerks. Courtesy clerks worked for near the minimum wage. There was heavy turnover among courtesy clerks, with average seniority of only about one year. Courtesy clerks were about 10 years younger, on average, than food clerks and produce clerks.

Segregation and Wage Differentials

The distribution of men and women across job titles is reported in Table 3. Job titles within this company were highly segregated. For example, the store-level management and department management positions were occupied almost completely by male employees. (No woman had ever been a store manager for the firm as of December 31, 1982.) While 39% of the work force was composed of women, 95% of variety clerks and meat wrappers were women, compared to only 12% of produce clerks and less than 1% of meat cutters. Courtesy clerk jobs were disproportionately filled by men.

A convenient way to summarize the level of segregation is to use the dissimilarity index, *D*. This index is widely attributed to Duncan and Duncan (1955), who described some of its properties. The Duncan index is defined as

$$D = \tfrac{1}{2} \sum_{i=1}^{K} | p^m_i - p^f_i |,$$

where p^f_i is the proportion of all women in job i and p^m_i is the proportion of all men in job i. The dissimilarity index is bounded between 0 and 1. Proportional representation of men and women in all job categories would yield a value of 0; completely segregated categories would yield a value of 1. D has a convenient interpretation—it is equal to the fraction of women (or men) who would have to change jobs in order for the proportions of men and women in each job to be equal. In this case, about 46% of women would have to change jobs to achieve proportional representation in all jobs. For other applications of the dissimilarity index to labor market segregation, see Albelda (1986) or Ransom (1990). Because the number and types of job titles can be quite different across studies, it is not really possible to compare our estimated measure of occupational segregation with those from other studies. Nevertheless, as we discussed

in the introduction, occupational segregation is a well-documented feature of the contemporary work force.

Table 4 reports the average characteristics of men and women in the various hourly paid jobs. In most jobs, the average woman was paid more than the average man, reflecting the typically higher seniority and age of female employees. This is also demonstrated in Table 5.

Table 5 presents results of regression analysis of the natural logarithm of the hourly wage for employees present at the end of 1982. (Salaried employees are excluded.) The first column shows that women's wages were about 8.5% higher than men's, on average. However, this difference was due to the higher seniority and age of women. Column II shows that after we allow for these differences, women's wages were actually about 8.3% *less* than the wages of similarly qualified men.[2]

The third column of Table 5 includes indicators for the job title of the employee. Once these are included, the estimated male/female wage difference falls to only about 1.5%. Thus, virtually all sex differences in pay can be associated with the job assignment of the employee. In fact, column IV would suggest that job title variables explain about 95% of all of the variation in wages. However, the endogeneity between job title and wage rate is strongly manifest in these data. Of course, this result cannot be a surprise, since job titles were associated contractually with wage levels. But this makes the male/female wage difference that we observe all the more startling: among these workers, although wages were set by a collective bargaining agreement that was, ostensibly, gender-neutral, a large wage differential arose because women were placed in jobs different from those assigned to similar men. (It is also worth noting that most of the management positions, which had the highest pay, are excluded from this analysis since they were salaried. Those positions were exclusively male in 1982.)

Table 4. Average Characteristics of Employees in Hourly Paid Jobs, by Sex. (December 31, 1982)

Job Title	*Variable*	*Average Male*	*Average Female*
Food Clerk	Wage	9.03	9.09
	Seniority	5.84	6.88
	Age	27.9	37.99
Night Crew Chief	Wage	9.66	9.58
	Seniority	6.10	10.35
	Age	29.03	41.17
Courtesy Clerk	Wage	3.17	3.23
	Seniority	0.90	0.99
	Age	18.95	19.41
Produce Manager	Wage	9.85	—
	Seniority	14.64	—
	Age	36.29	—
Produce Clerk	Wage	9.02	8.48
	Seniority	7.10	2.95
	Age	30.56	27.65
Meat Manager	Wage	11.64	—
	Seniority	11.43	—
	Age	40.65	—
Meat Cutter	Wage	11.28	11.33
	Seniority	7.22	1.47
	Age	41.44	28.7
Meat Wrapper	Wage	9.76	10.3
	Seniority	2.15	8.55
	Age	21.25	42.63
Variety Clerk	Wage	5.71	7.35
	Seniority	2.15	8.55
	Age	18.31	33.47
Other	Wage	5.81	6.77
	Seniority	2.43	6.88
	Age	29.33	38.37

Intrafirm Mobility

The relatively disadvantageous job assignments for women could have arisen from two sources: (1) initial assignment at time of hire, and (2) promotions or other job changes during the employee's tenure

[2]Separate log hourly wage regressions were run for men and women that controlled only for age, age squared, seniority, and seniority squared. When evaluated at the combined sample mean, the cross-section rates of return to age and seniority were higher for men. This is consistent with the lower promotion rates and less desirable job assignments for the firm's female employees.

Table 5. Regression Results, Hourly Workers, 1982.
(Dependent Variable Is Logarithm of Hourly Wage; Standard Errors in Parentheses)

Variable	*I*	*II*	*III*	*IV*
Intercept	1.927 (0.013)	–0.292 (0.048)	0.856 (0.019)	1.152 (0.005)
Female	0.085 (0.021)	–0.083 (0.012)	–0.015 (0.005)	0.011 (0.005)
Seniority	—	0.063 (0.003)	0.019 (0.001)	—
(Seniority)^2	—	–2.19e–03 (1.25e–04)	–6.22e–04 (4.60e–05)	—
Age	—	0.116 (0.003)	0.020 (0.001)	—
(Age)^2	—	–1.35e–03 (4.02e–05)	–2.31e–04 (1.67e–05)	—
Food Clerk	—	—	0.900 (0.007)	1.038 (0.006)
Night Crew Chief	—	—	0.963 (0.015)	1.114 (0.015)
Produce Manager	—	—	0.942 (0.015)	1.135 (0.015)
Produce Clerk	—	—	0.900 (0.011)	1.029 (0.011)
Meat Manager	—	—	1.095 (0.016)	1.302 (0.015)
Meat Cutter	—	—	1.091 (0.011)	1.270 (0.010)
Meat Wrapper	—	—	1.012 (0.013)	1.167 (0.013)
Variety Clerk	—	—	0.687 (0.013)	0.811 (0.014)
Other	—	—	0.594 (0.027)	0.710 (0.031)
Courtesy Clerk	—	—	—	—
R^2	0.008	0.680	0.961	0.949

at the firm. We will examine both of these issues.

A Markov Model of Mobility

One way to capture intrafirm job movements is with a simple Markov model. Assume that there are K job categories. At any time t, the proportion of employees in each category can be represented by a $1 \times K$ vector, P_t, where the i^{th} element is P_{it}. We are interested in examining the relationship between P_t and P_{t-1}, as well as the long-run value of P_t as t becomes very large.

Central to this model is a matrix of transition probabilities. We define a $K \times K$ matrix, A, whose ij^{th} element a_{ij} represents the probability of moving from category i in period t–1 to category j in period t. The i^{th} row contains the probabilities of moving from category i in t–1 to each of the K categories in period t. Thus, the elements of each row sum to 1. If the job mobility process is stationary, then the following relationship must hold:

Conclusions

In our analysis of the employment records of a single firm, we have found a high level of segregation of jobs along gender lines. This segregation arose because some entry-level jobs were assigned almost exclusively to women (and others to men), and because movements between jobs were much less likely to occur for women than for men. In particular, women were almost totally excluded from department-level and store-level management positions during the early years of our study. These rates were more favorable for women in the later years of our data, perhaps due to the "shock effect" of a class-action lawsuit.

Our findings regarding turnover/quit rate behavior among food clerks are consistent with the findings in Blau and Kahn (1981), Viscusi (1980), and Weiss (1984) that women innately are no more likely and may even be less likely than men to quit. This is clearly relevant to the question of promotion to managerial positions within the firm. With regard to promotion rates and the existence of a glass ceiling, our results accord with those of Cannings and Montmarquette (1991), who found lower promotion rates among women and the presence of an invisible ceiling beyond which women cannot advance.

This segregation resulted in lower pay for women. Our analysis of hourly workers finds that in 1982, women's wage rates were about 8% lower than men's, after controlling for age and seniority and despite the fact that the hourly wage workers were unionized.[6] This difference can be associated almost completely with the different job assignments for men and women. Furthermore, the analysis understates the pay gap due to segregation, since the predominantly male, high-paying, store management positions were salaried, and thus were not included in our analysis.

An obvious question one might raise is why the firm's female employees did not seek alternative employment. The tautological answer is that this employment was their best alternative. There is no reason to believe that job prospects elsewhere in the local labor market were any different. This is consistent with the occupational crowding hypothesis, though we lack the data on the rest of the market that would enable us to test this hypothesis. Such data would have also permitted us to determine the impact of the class-action suit on other local employers similarly situated. We do

Table 9. Probit Regression Results—Food Clerks: Promotions to Store Level Management Positions, 1978–82. (Standard Errors in Parentheses)

Variable	*I*	*II*	*III*
Intercept	–1.363	–0.952	–1.299
	(0.084)	(1.063)	(1.185)
Female	–0.999	–0.755	–0.791
	(0.185)	(0.217)	(0.225)
Age	—	–0.018	–0.007
		(0.072)	(0.075)
Age^2	—	–0.0001	–0.0002
		(0.0011)	(0.001)
Seniority	—	0.096	0.110
		(0.092)	(0.093)
Seniority^2	—	–0.013	–0.013
		(0.011)	(0.0107)
Part-Time			0.156
			(0.222)
Φ_f	0.009	0.006	0.006
Φ_m	0.086	0.038	0.044
$\Phi_f - \Phi_m$	–0.077	–0.032	–0.038
Sample Size	1,001	1,001	1,001
Log Likelihood	–161.21	–155.46	–155.21

Note: Φ_f and Φ_m are the estimated promotion probabilities for women and men, respectively. The estimated probabilities in column II are calculated using the overall sample mean age and seniority as of December 31, 1978.

[6]Oaxaca and Ransom (1994) reported wage decompositions based on a 1986 sample from the same firm. Separate (log) earnings equations were estimated for men and women. Depending on the type of decomposition used, the unexplained earnings gap ranged from 28.8% to 33.1% in favor of men after accounting for age and seniority. Some of the unexplained gap may have resulted from different labor supply choices, but much had to do with job assignment.

TABLE 2—PROBIT ESTIMATES OF EFFECTS OF MEASURED DISCRIMINATION ON REPORTED DISCRIMINATION

	Canada			United States		
	Means	Coefficients		Means	Coefficients	
Intercept		−.977	−.994		−.965	−.677
		(.079)	(.133)		(.113)	(.219)
$\hat{D}_i^1$	.207	−.226		.396	−.428	
		(.182)			(.228)	
$\hat{D}_i^2$	.207		−.122	.396		−1.1628
			(.542)			(.544)
RD_i (dependent variable	.154			.131		
Number of observations	448	448	448	373	373	373
Log likelihood		−191.72	−192.44		−143.30	−142.75

nitude of the union status coefficients, which are considerably higher in the United States.

A convenient way to summarize the cross-sectional relationship between reported and measured discrimination in the two samples is to estimate a probit equation of the form:

$$(6)\quad \text{Prob}\left(RD_i = 1 | \hat{D}_i\right) = \text{Prob}\left(\epsilon_i \leq m + n\hat{D}_i\right),$$

where $\epsilon_i \sim N(0,1)$ is an individual-specific random variable assumed to be independent of $\hat{D}_i$, and m and n are unknown parameters. The extent to which the slope parameter n exceeds (is less than) zero then indicates the extent to which women with higher measured discrimination are more (less) likely to report being discriminated against.

Table 2 reports the results of the probit analyses in (6), when performed on measures of discrimination calculated from the regressions in Table 1. The most striking feature of the table is its very clear rejection of the notion that traditional "calculated" measures of discrimination are positively related to reported discrimination—in fact, all estimates of the relationship are negative, although only one of them has a t-ratio greater than two in absolute value. Since the standard errors in Table 2 underestimate the true standard errors (see Adrian Pagan, 1985), it is likely that none of these coefficients differs significantly from zero.

To judge the magnitude of the estimated effects in Table 2, consider the largest in absolute value, −1.1628. For a women experiencing the average level of $\hat{D}_i^2$ in the United States (.396), this implies that the marginal effect of $\hat{D}_i^2$ on the probability of reporting is −2.422. In other words, a 10 percent decrease in the wage this woman receives, holding her qualifications (i.e., her wage "as a man") fixed, is estimated to lower her probability of reporting by 2.4 percentage points, from 12.7 to 10.3 percent. Thus none of the effects in Table 2 seem particularly large in magnitude.

II. Alternative Measures of Discrimination

Two possible objections to the technique of the previous section are as follows: 1) The statistical measures of discrimination used above are biased and inconsistent because the earnings functions on which they are based, especially for women, could be subject to selectivity bias; 2) The statistical measures of discrimination are biased and inconsistent because the earnings functions control for the wrong set of characteristics, some of which may be viewed as endogenous outcomes of discrimination.[13] This section

[13]A third possible source of bias not analyzed here is classical measurement error in the X's. While some analysts have proposed reverse regression techniques to supply an upper bound to the bias on overall discrimination (see, for example, R. A. Kamalich and

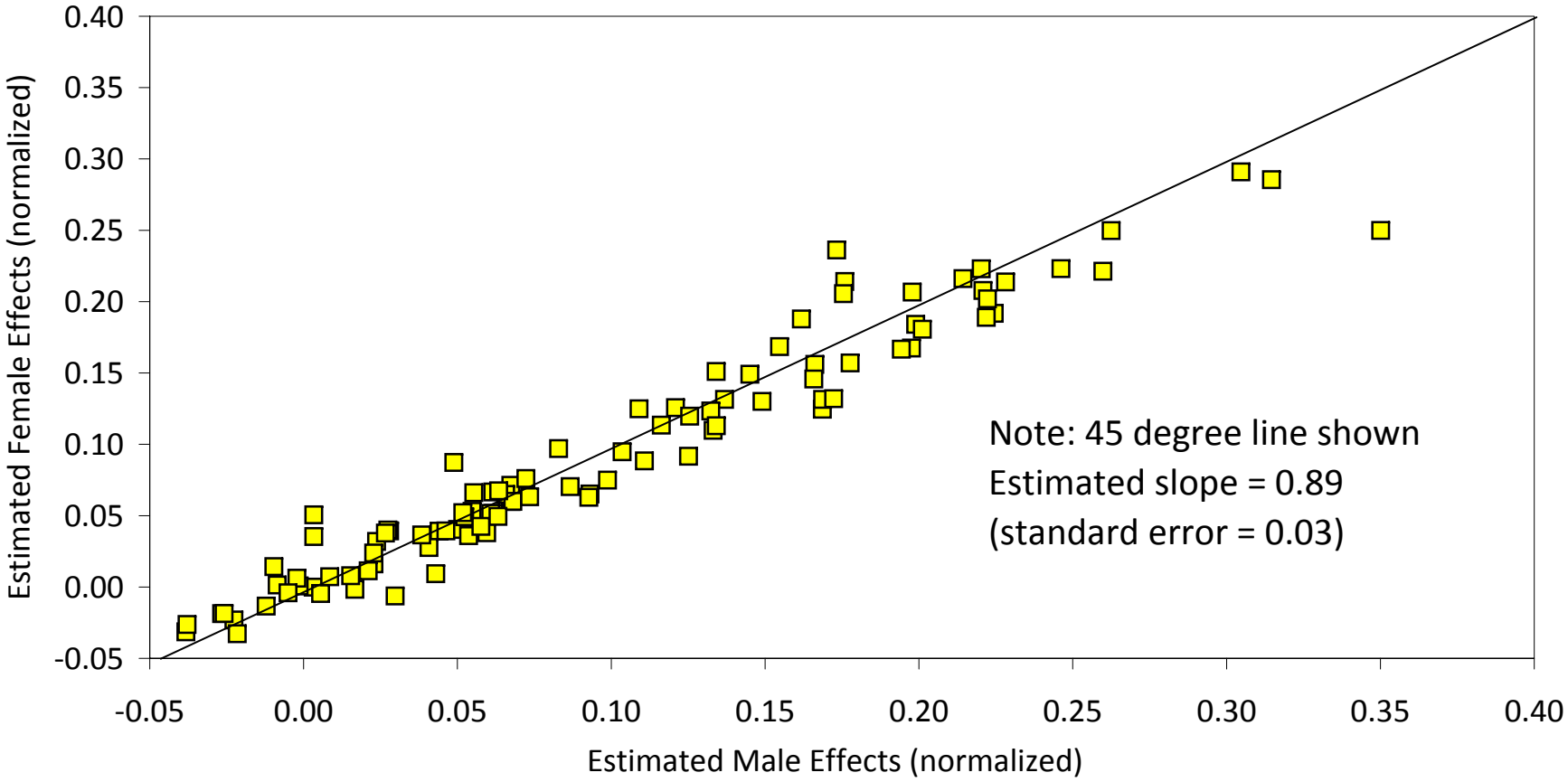
Tables

TABLE 1 SUMMARY STATISTICS ON WAGE BIDS AND WAGE OFFERS

	BMALE‡	BFEM‡	Raw-Wage gap	PWMALE‡	PWFEM‡	Raw-Wage gap
WAGE BID (SEK)	19 312***	18 196	0.942			
	(3 288.5)	(2 663.9)				
ln. WAGE BID	9.85***	9.80				
WAGE OFFER (SEK)	18 628***[a]	17 517 [a]	0.938	16 925***	16 047	0.948
	(3 311.1)	(2560.2)		(2 964.1)	(2 337.6)	
ln. WAGE OFFER	9.82***	9.76		9.72***	9.67	
No of Obs	901	1222		812	1030	

Note: Numbers in parentheses are standard deviations. ‡ "B" refers to those choosing a job involving individual wage bargaining and "PW" refers to those choosing a job with a posted wage. ***/**/* denote statistical gender differences at the 1/5/10 percent levels respectively in a t-test of equal variance. a/b/c denote statistical difference between bargainers and non-bargainers at the 1/5/10 percent levels respectively.

Figure V: Estimated Firm Effects for Female and Male Workers:
Firm Groups Based on Mean Log Value Added per Worker



Note: figure shows bin scatter plot of estimated firm-specific wage premiums for female workers against estimated firm-specific wage premiums for male workers. Firm-level data is grouped into 100 percentile bins based on mean log value added per worker at the firm. Estimated slope is estimated across percentile bins by OLS.

Table III: Contribution of Firm-Specific Pay Premiums to the Gender Wage Gap at Dual Connected Firms

		Means of Firm Premiums:		Total Contribution of Firm Components	Decompositions of Contribution of Firm Component			
					Sorting		Bargaining	
	Gender Wage Gap	Male Prem. Among Men	Female Prem. Among Women		Using M Effects	Using F Effects	Using M Distribution	Using F Distribution
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
All	0.234	0.148	0.099	0.049	0.035	0.047	0.003	0.015
				(21.2)	(14.9)	(19.9)	(1.2)	(6.3)
By Age Group:								
Up to age 30	0.099	0.114	0.087	0.028	0.019	0.029	-0.001	0.009
				(28.2)	(18.9)	(29.3)	1.2	(9.3)
Ages 31-40	0.228	0.156	0.111	0.045	0.029	0.040	0.004	0.016
				(19.7)	(12.6)	(17.8)	(1.9)	(7.0)
Over Age 40	0.336	0.169	0.099	0.069	0.050	0.064	0.005	0.019
				(20.6)	(15.0)	(19.1)	(1.5)	(5.6)
By Education Group:								
< High School	0.286	0.115	0.055	0.059	0.045	0.061	-0.002	0.015
				(20.8)	(15.6)	(21.4)	(0.6)	(5.2)
High School	0.262	0.198	0.137	0.061	0.051	0.051	0.010	0.010
				(23.3)	(19.6)	(19.5)	(3.8)	(3.7)
University	0.291	0.259	0.213	0.047	0.025	0.029	0.018	0.022
				(16.1)	(8.7)	(9.9)	(6.2)	(7.4)

Notes: Sample includes male and female workers in "dual connected" set (Table I, columns 5-6). Entry in column 1 is the difference in mean log wages of males and females, estimated over all workers in the subset of the dual connected set indicated by the row heading. Estimated firm effects are from models described in columns 1 and 2 of Table II. Entry in column 4 is the total contribution of firm-specific wage premiums to the gender wage gap reported in column 1. Entries in columns 5-8 are the contributions of sorting effect and bargaining effect to gender wage gap. Entries in parentheses represent the percent of the overall male female wage gap (in column 1) that is explained by the source described in column heading.

Table V: Estimated Relationship Between Gender-specific Firm Effects and Measures of Surplus per Worker

	Number Firms (1)	Regressions of Firm Effects on Measure of Surplus		Ratio : Col (3) / Col (2) (4)
		Males (2)	Females (3)	
Surplus Measure:				
1. Excess Mean Log Value Added per Worker	47,477	0.156 (0.006)	0.137 (0.006)	0.879 (0.031)
2. Mean Log Sales per Worker	75,163	0.072 (0.005)	0.064 (0.004)	0.897 (0.036)
3. Excess Mean Log Sales per Worker	75,163	0.092 (0.006)	0.081 (0.006)	0.883 (0.038)

Notes: Columns 2-3 report coefficients of surplus measure indicated in row heading in regression models in which the dependent variables are the estimated firm effects for males or females. All specifications include a constant, and are estimated at the firm level, weighting by the total number of male and female workers at the firm. Ratios in column 4 are estimated by instrumental variables, treating average change in female wages as dependent variable, average change in male wages as endogenous explanatory variable, and change in surplus measure as the instrument. Robust standard errors in parentheses.

Table 1—Labor Supply by Gender and Number of Years since MBA Graduation: Descriptive Statistics

	Number of years since MBA graduation					
	0	1	3	6	9	≥ 10
Share not working at all in current year						
Female	0.054	0.012	0.027	0.067	0.129	0.166
Male	0.028	0.005	0.003	0.008	0.011	0.010
Share working full time/full-year (52 weeks and $>$ 30 to 40 hours per week)						
Female	NA	0.89	0.84	0.78	0.69	0.62
Male	NA	0.93	0.94	0.93	0.93	0.92
Cumulative share with any no work spell (until given year)						
Female	0.064	0.088	0.143	0.229	0.319	0.405
Male	0.032	0.040	0.064	0.081	0.095	0.101
Cumulative years not working						
Female	0	0.050	0.118	0.282	0.569	1.052
Male	0	0.026	0.045	0.069	0.098	0.120
Mean weekly hours worked for the employed						
Female	59.1	58.8	56.2	54.7	51.5	49.3
Male	60.9	60.7	59.5	57.9	57.5	56.7
Share working part time ($\leq$ 30 to 40 hours per week)						
Female	0.04	0.05	0.07	0.09	0.15	0.22
Male	0.02	0.02	0.02	0.03	0.03	0.04
Share working fewer than 52 weeks						
Female	NA	0.07	0.07	0.09	0.06	0.06
Male	NA	0.05	0.04	0.03	0.03	0.03

Note: Individuals who do not work at all in a given year are excluded from those "working part time" and "working fewer than 52 weeks" and are included as zeros in the definition of "working full time/full year."

Gender differences in labor force participation translate into differences in actual post-MBA labor-market experience. The fraction of men who had at least one career interruption (a period of six months or more without working) is 4 percent a year after graduation, and 10 percent by 10 years out. In contrast, the fraction of women with at least one post-MBA career interruption is 9 percent a year after graduation, 32 percent by year 9, and 41 percent 10 to 16 years after graduation. Among all women in the sample, just 4 percent had children upon receiving their MBA, but more than one-half (56 percent) did nine years out.

Non-work spells are generally brief for both men and women, as indicated by the tabulations of cumulative years not working by years since graduation in Table 1. The average woman spends 0.28 years out of work by year six, and 0.57 years out of work by year nine; for men, the equivalent figures are 0.07 at year six and 0.10 at year nine. Ten years or more post-MBA, mean cumulative years not working are 1.05 for women and just 0.12 for men.

Weekly work hours are high for all MBAs, and highest among the newly minted. Men in their first year out average 61 hours per week; women average 59 hours, despite being less likely to start in investment banking where hours are especially long.[19] Hours of work decline for male and female MBAs in the years following graduation, but far more so for women. Three years after receiving their MBA,

[19] See Renée M. Landers, James B. Rebitzer, and Taylor (1996) on the role of similarly long hours for law associates at large US law firms in the career dynamics of young lawyers.

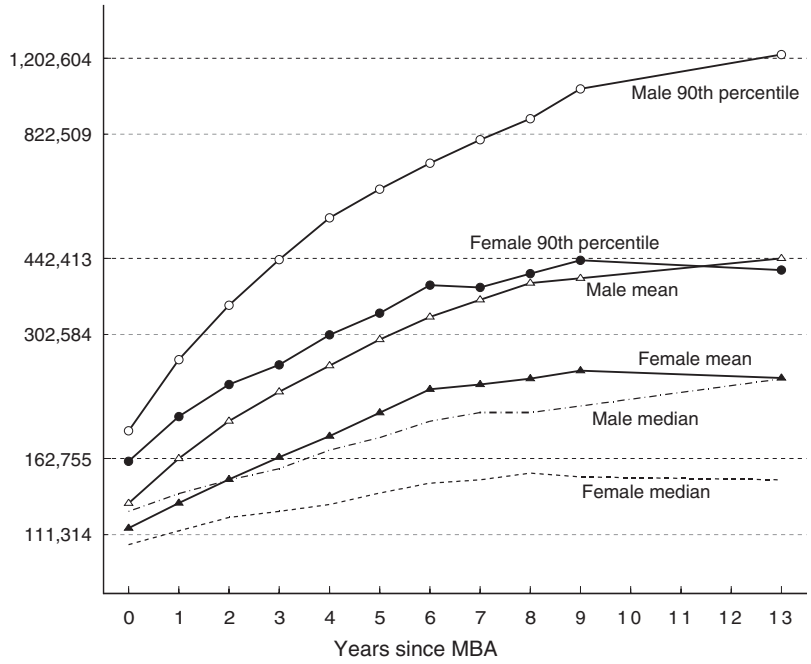


FIGURE 1. MALE AND FEMALE MEAN, MEDIAN, AND NINETIETH PERCENTILE ANNUAL SALARIES (2006 DOLLARS) BY YEARS SINCE MBA

Notes: Web Appendix Table A5 contains the data points for a selected group of years since MBA. Nominal earnings in each year are converted into real earnings in 2006 dollars using the Consumer Price Index for All Urban Consumers (CPI-U). The vertical axis uses a natural logarithm (ln) scale.

Mean differences in earnings between men and women (conditional on only cohort × year dummies) are given in Table 2, arrayed by years since receipt of the MBA. The 11 log point gender earnings gap at graduation jumps to 31 log points at five years out, 40 log points at nine years out and nearly 60 log points at 10 or more years out (column 2). The time profile of the earnings gap is roughly similar for the subset that starts a new job in that year (column 3).

III. Explaining the Gender Gap in Earnings

To understand why female MBAs have lower incomes than male MBAs, we estimate (log) annual earnings equations that pool all individual-year observations; the observations include *all* job stages previously held by the individual. The impact of the various factors discussed, including pre-MBA characteristics, MBA courses, post-MBA job experience, and non-working spells, on the gender gap in earnings, is explored. The estimation in Table 3 is done with and without controlling for weekly hours worked.

The raw gap in mean log earnings between men and women in the pooled sample is about 31 log points. The gender earnings gap shrinks slightly to 29 log points conditioning only on (cohort × year) dummies (column 1). The inclusion of pre-MBA characteristics, MBA GPA, and fraction of finance classes reduces the gender

TABLE 3—WAGE REGRESSIONS FOR POOLED SAMPLE

	Dependent variable: Log (annual earnings)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Female	−0.287	−0.190	−0.146	−0.173	−0.094	−0.064	−0.054	−0.038
	[0.035]***	[0.033]***	[0.032]***	[0.030]***	[0.029]***	[0.029]**	[0.028]	[0.025]
MBA GPA		0.429	0.406		0.369	0.351	0.367	0.347
		[0.054]***	[0.053]***		[0.051]***	[0.051]***	[0.049]***	[0.043]***
Fraction finance classes		1.833	1.807		1.758	1.737	1.65	0.430
		[0.211]***	[0.206]***		[0.199]***	[0.194]***	[0.193]***	[0.180]**
Actual post-MBA exp			0.046			0.085	0.056	0.029
			[0.075]			[0.071]	[0.068]	[0.064]
Actual post-MBA exp^2			0.010			0.005	0.008	0.007
			[0.004]***			[0.004]	[0.003]**	[0.003]**
Any no work spell			−0.290			−0.228	−0.218	−0.173
			[0.067]***			[0.062]***	[0.061]***	[0.054]***
Dummy variables:								
Weekly hours worked	No	No	No	Yes	Yes	Yes	Yes	Yes
Pre-MBA characteristics	No	Yes	Yes	No	Yes	Yes	Yes	Yes
Reason for choosing job	No	No	No	No	No	No	Yes	Yes
Job function	No	No	No	No	No	No	No	Yes
Employer type	No	No	No	No	No	No	No	Yes
Cohort × year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	12.156	9.493	8.809	10.385	8.08	7.525	8.229	8.324
	[0.018]***	[0.585]***	[0.667]***	[0.151]***	[0.603]***	[0.694]***	[0.733]***	[0.547]***
Observations	18,272	18,272	18,272	18,272	18,272	18,272	18,272	18,272
R^2	0.15	0.31	0.34	0.26	0.40	0.41	0.43	0.54

Notes: The unit of observation is a survey respondent in a given post-MBA year. Pre-MBA characteristics include: a dummy for US citizen, a "white" dummy, an Asian dummy, a dummy for "top 10" undergraduate institution and a dummy for a "top 10–20" undergraduate institution (from the *US News and World Report* rankings), undergraduate GPA, a dummy for missing undergraduate GPA, a quadratic in age, verbal GMAT score, quantitative GMAT score, a dummy for pre-MBA industry and a dummy for pre-MBA job function. "Any no work spell" is a dummy variable that equals 1 for a given individual in a given year if the individual experiences a period of at least six months without work between MBA graduation and that year. "Weekly hours worked" dummies include: $<$ 20 hours, 20–29, 30–39, 40–49, 50–59, 60–69, 70–79, 80–89, 90–99, and $\geq$ 100 hours. "Reason for choosing job" dummies include: Compensation and other benefits; Career advancement or broadening; Prestige; Culture/people/environment; Flexible hours; Reasonable total hours per week; Limited travel schedule; Opportunity to work remotely; Location; Other. "Employer type" dummies include: Public for-profit, $<$ 100 employees; Public for-profit, 100–1,000 employees; Public for-profit, 1,000–15,000 employees; Public for-profit, $>$ 15,000 employees; Private for-profit, $<$ 100 employees; Private for-profit, 101–1,000 employees; Private for-profit, 1,000–15,000 employees; Private for-profit, $>$ 15,000 employees; Not-for-profit; and Other. Standard errors (in brackets) are clustered at the individual level.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

one's current job, job function, and employer type further reduces the coefficient on the female dummy to a (statistically insignificant) –3.8 log points (column 8).[27]

The estimates from our preferred specification in column 6 of Table 3 can be used to obtain the earnings penalty from taking time out. The loss is 23 log points from

[27] The basic findings are almost identical for log hourly wage regressions as for log annual earnings regressions that include controls for weekly hours worked. See Web Appendix Table A6 for log hourly wage regressions, comparable to the specifications in Table 3, for the full pooled sample.

TABLE 5—DETERMINANTS OF THE GENDER GAP IN LABOR SUPPLY: THE ROLE OF CHILDREN

	Not working		Actual post-MBA experience		Log (weekly hours worked)	
Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)
Female	0.084		−0.286		−0.089	
	[0.009]***		[0.039]***		[0.013]***	
Female with child		0.200		−0.660		−0.238
		[0.024]***		[0.094]***		[0.031]***
Female without child		0.034		−0.126		−0.033
		[0.007]***		[0.031]***		[0.012]***
Pre-MBA characteristics	Yes	Yes	Yes	Yes	Yes	Yes
MBA performance	Yes	Yes	Yes	Yes	Yes	Yes
Cohort × year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Constant	−0.175	−0.111	5.929	5.757	3.951	3.914
	[0.145]	[0.126]	[0.618]***	[0.550]***	[0.462]***	[0.426]***
Observations	19,366	19,286	19,366	19,286	18,611	18,535
R^2	0.07	0.11	0.98	0.98	0.14	0.16

Notes: The unit of observation is a survey respondent in a given post-MBA year. "Female with child" ("Female without child") is a dummy variable that equals 1 if the respondent is a female and has at least one child (no child) in that year. Pre-MBA characteristics include: a dummy for US citizen, a white dummy, an Asian dummy, a dummy for "top 10" undergraduate institution, a dummy for "top 10–20" undergraduate institution, undergraduate GPA, a dummy for missing undergraduate GPA, a quadratic in age, verbal GMAT score, quantitative GMAT score, a dummy for pre-MBA industry and a dummy for pre-MBA job function. MBA performance includes overall MBA GPA and fraction of finance classes. Standard errors (in brackets) are clustered at the individual level.

***Significant at the 1 percent level.

(column 4). Although there is a 9 log point mean difference in weekly hours worked between employed men and women, it is 24 log points for women with kids and only 3 log points for women without kids (column 6). And the "impact" of children on female labor supply differs substantially by spousal earnings (Table 6).

Because our survey asked for spousal earnings only in the current year, we use spousal earnings as of the survey date as a proxy for spousal earnings in any prior year. We then separate women into those with "lower" earnings (less than $100K per year) spouses, "medium" earnings (between $100K and $200K per year) spouses, and "high" earnings (more than $200K per year) spouses. These spousal earnings categories are then interacted with an indicator variable for whether or not a woman has at least one child in a given year, thereby comparing the average man to six different groups of women.[36]

The effect of motherhood on the likelihood that a woman is not working is more than twice as large if the woman has a high-earnings spouse rather than a lower-earnings spouse: these mothers are 30 percentage points less likely to work than the average man (Table 6, column 1; 0.119 + 0.185). Mothers with a medium-earnings spouse also work less than those with a lower-earnings spouse, but the difference is smaller and not statistically significant. Similarly, mothers with high-earnings spouses accumulate more than six months more in nonemployment spells following

[36] The Table 6 specifications include only women who were "married" at the survey date.

TABLE 8—IMPACT OF FIRST BIRTH ON EMPLOYMENT STATUS, SALARY, AND WORKING HOURS

	Not working		Log (annual earnings)		Annual earnings (0 if not working)		Log (weekly hours worked)	
	Male (1)	Female (2)	Male (3)	Female (4)	Male (5)	Female (6)	Male (7)	Female (8)
Year of birth of first child	−0.001	0.096	0.008	−0.096	−2,315	−45,666	−0.006	−0.126
	[0.007]	[0.032]***	[0.036]	[0.054]	[20,942]	[20,936]**	[0.010]	[0.029]***
Years after birth of first child:								
1 or 2	−0.009	0.131	0.040	−0.164	5,117	−64,586	−0.013	−0.168
	[0.007]	[0.036]***	[0.040]	[0.066]**	[24,118]	[26,335]**	[0.011]	[0.036]***
3 or 4	−0.007	0.178	0.065	−0.292	9,721	−99,397	−0.011	−0.238
	[0.008]	[0.045]***	[0.049]	[0.092]***	[29,915]	[34,839]***	[0.013]	[0.049]***
5 or more	0.000	0.190	0.162	−0.301	62,581	−101,719	0.000	−0.233
	[0.0012]	[0.054]***	[0.060]**	[0.119]**	[37,872]	[44,384]**	[0.017]	[0.071]***
Years before birth of first child:								
1 or 2	−0.006	−0.015	−0.008	−0.051	−7,830	−19,137	−0.005	−0.043
	[0.005]	[0.021]	[0.030]	[0.041]	[16,303]	[15,226]	[0.009]	[0.023]
Observations	14,490	5,070	13,969	4,545	14,523	5,070	14,193	4,560
R^2	0.29	0.46	0.77	0.73	0.66	0.68	0.72	0.68

Notes: The unit of observation is a survey respondent in a given post-MBA year. Individuals who had children prior to completing their MBA are not included in the regressions. Each column corresponds to a different regression. All regressions include (cohort × year) dummies, person fixed effects, and a quadratic in age. Each row reports the coefficient on a dummy variable indicating the year of first birth or the number of years after or before the birth of the first child. Standard errors (in brackets) are clustered at the individual level.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

variables summarize the dynamics of labor supply and earnings responses to a first birth relative to the base period of three or more years prior to the first birth.[41]

MBA women reduce their labor supply on both the extensive and intensive margins after a birth. There is a large decline in labor force participation in the year of the first birth, and a further reduction over the next four years. A woman's likelihood of not working in a year is about 13 percentage points higher in the two years immediately following her first birth than in the base period, increasing to 18 to 19 percentage points higher at three years following the birth and beyond (Table 8, column 2). Similarly, weekly hours worked for the employed (column 8) decrease sharply in the year of a first birth and continue to decline over the next four years, reaching a 24 log-point deficit relative to the pre-birth base period. The reduction in weekly hours is associated with a large shift into part-time work and self-employment in the four years following a first birth.[42] In contrast, there is no decline in labor force participation, and only a modest (4 log points) decline in weekly hours worked in the one or two years before the first birth. MBA moms are,

[41] The regression samples exclude individuals who had children prior to completing their MBA.

[42] The share of MBA women working part time increases from 5 percent 2 years before a first birth to 34 percent 4 years after a first birth with about one-half of this increase accounted for by women shifting into self-employment. Jane L. Herr and Catherine Wolfram (2009) emphasize that corporate work environments contribute to MBA mothers' decisions to exit the labor force at motherhood. We find, in addition, that MBA mothers shift into self-employment, and also that self-employment enables part-time work.

TABLE I
PERFORMANCE CHARACTERISTICS BY CHOICE OF COMPENSATION SCHEME (TASK 3)

		Average performance		
	Compensation scheme	Piece rate	Tournament	Tournament–piece rate
Women	Piece rate	10.35	11.77	1.42
		(0.61)	(0.67)	(0.47)
	Tournament	9.79	11.93	2.14
		(0.58)	(0.63)	(0.54)
Men	Piece rate	9.91	11.09	1.18
		(0.84)	(0.85)	(0.60)
	Tournament	10.97	12.52	1.55
		(0.69)	(0.48)	(0.49)

Averages with standard errors in parentheses. Sample is forty women and forty men.

mance between those who do and do not enter the tournament ($p \geq .35$ for each of the three performance measures). For men, only the tournament performance is marginally higher for those who enter the tournament ($p = .14$ for the Task-2 tournament). Conditional on the choice of compensation scheme, there is, however, no gender difference in Task-1 and Task-2 performance or in the increase between the two ($p \geq .28$ for each of the six tests).

A probit regression reveals that while the participant's performance under the two compensation schemes does not significantly affect the decision to enter the tournament, the participant's gender does. The reported marginal gender effect of $-.380$ in Table II shows that a man with a performance of thirteen in

TABLE II
PROBIT OF TOURNAMENT CHOICE IN TASK 3

	Coefficient	p-value
Female	$-.380$	.00
Tournament	.015	.41
Tournament–piece rate	.015	.50

Dependent variable: Task-3 choice of compensation scheme (1-tournament and 0-piece rate). Tournament refers to Task-2 performance, tournament–piece rate to the change in performance between Task 2 and Task 1. The table presents marginal effects of the coefficient evaluated at a man with thirteen correct answers in the tournament and twelve in the piece rate. Sample is forty women and forty men.