Work Environment and "Opt-Out" Rates at Motherhood Across High-Education Career Paths*

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Abstract

Using a sample of Harvard alumnae observed in their late 30s, we study the relationship between workplace flexibility and the labor force participation of mothers. We first document a large variation in labor force participation rates across high-education fields. Mindful of the possibility of systematic patterns in the types of women who complete different graduate degrees, we use the rich information available for our sample, supplemented by the longitudinal nature of a subset of these data, to assess the extent to which these labor supply patterns may reflect variation in the difficulty of combining work with family. While it is difficult to rule out systematic sorting entirely, our evidence suggests that inflexible work environments "push" women out of the labor force at motherhood.

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One of the most profound social changes of the 20th century has been the dramatic increase in the percentage of women in the labor force. Recent statistics, however, suggest that the increase in female labor force participation began to level off in the late 1990s (Mosisa and Hippie 2006). This has led to speculation about whether the "natural" rate of female labor force participation has been achieved (Goldin 2006), whether this is instead a temporary slow-down driven by economic conditions (Boushey 2005), or whether there are remaining policy, cultural, or social changes that would accommodate more women in the workforce (Drago and Hyatt 2003).

One response to this stagnation in the work rates of women, a majority of whom have children, has been to focus on the "family friendliness" of jobs, that is, the relative utility they provide to women who must balance work and family commitments. One aspect of "family friendliness," the variation across jobs in the long-run consequences of post-birth labor force gaps, has been well studied in the economic literature, starting with Mincer and Polachek's (1974) model of human capital depreciation. A second aspect – the influence of hours flexibility on mothers' labor force participation – has generated much less consideration. To our knowledge, this study is the first to directly consider the influence of workplace flexibility on the labor supply of mothers.

Using a sample of Harvard alumnae observed in their late 30s, we find that labor force participation rates of mothers vary markedly across professions: 94 percent of MDs work, compared to 79 percent of JDs and only 72 percent of MBAs. If variation in flexibility helps explain these large differences, this may suggest that there are elements of the work environment that drive mothers out of the labor force. We therefore evaluate the extent to which this pattern is explained by systematic differences in the characteristics of women who pursue these degrees. We then directly consider the role of work environment in female labor force participation.

One benefit of considering the influence of workplace flexibility among highly educated women is that graduate degree is observable, and provides a clear delineation across which

we expect systematic variation in work environment. Furthermore, highly educated women may be more responsive to a given level of flexibility. Although work environment may affect all women's utility, because these women are more likely to be married to high-earning men, they may have a greater capacity to respond by exiting the labor force.[1] By using this set of women, we are therefore focusing on the "canaries in the coal mine," and can thus detect the effect of flexibility when using a relatively blunt measure such as labor force participation.

At the same time, we might expect educated women to work in positions with greater benefits and professional standing, suggesting that they should have a greater capacity to adjust their work schedule in response to motherhood. If we then find evidence that workplace flexibility is correlated with labor force participation among these women, this may reflect an underestimate of the effect felt by women in lower ranks of the professional hierarchy.

Lastly, a strength of our analysis is the richness of the data available for our sample, which includes detailed information on family, education, and current work setting. We also observe information about these women at college graduation, and can tie this to their subsequent work and family choices. One key consideration in our analysis is the elements of taste that influence not only a woman's labor supply decision at motherhood, but also the initial decision across graduate degrees and the jobs they can lead to. Furthermore, for a subset of our sample, we can observe women both before and after motherhood, to consider how pre-birth work environment affects post-birth labor supply. Our aim is to assess whether flexibility influences women's labor supply decision after motherhood, while mindful of the inherent differences in the set of women who pursue a given career path.

1 Framework for Assessing Women's Career and Work Choices

In this section we lay out a framework for assessing the influence of workplace flexibility on the labor force participation decision of mothers. Given that we focus on variation in work levels across women with different graduate degrees, we face the complication created by

[1] Conversely, because these women are more likely to be the primary earner in their household, they may have greater parity with their spouse in home production, and may therefore be less likely to quit.

two selection processes: the initial sorting of women across "fields" (as defined by graduate degree), and the subsequent sorting across job types (*e.g.*, for JDs, working for a large law firm versus the government, or for MBAs, working at a Fortune 500 company versus a small firm).[2] This section describes how women make these decisions based on the relative "family friendliness" of a given field or specific job, as well as on individual taste.

Consider the labor supply decision at time t of a given mother i. The first dimension of this decision is the comparison of the relative value of her marginal hour at work (w_{it}) versus at home (w^*_{it}), when the value of the latter has risen with the time demands of children (Heckman 1974).[3] In this standard married woman's labor supply model, a woman will work, $h_{it} > 0$, if the hourly wage is greater than her reservation wage assessed at $h = 0$. Such a woman will then choose her optimal labor supply, h^*_{it}, where the two are equal.

This formulation assumes, however, that women have perfect control over their work hours. Suppose, instead, that there exist minimum hours requirements, and that these constraints vary across jobs j.[4] A job with a high minimum will thus offer women fairly little flexibility in adjusting their work hours after motherhood.

Under this assumption, as shown in Figure 1, the budget constraint of the married woman's labor supply model now has a second corner solution at $h = h^{min}$.[5] For all mothers

[2]There is a third potential complication if work environment influences the initial decision to have children. If some women working in inflexible jobs respond by foregoing motherhood, the average taste for children among those who choose to have kids will be higher among mothers from an inflexible environment. If this taste is positively correlated with taste for time at home with one's children, labor force participation rates among these women will be accordingly lower. As we show in Section B of the appendix, we find no evidence of variation in the propensity to have children among women from different work environments, so, for the sake of simplicity, we ignore this issue here. (We also find little overall evidence of selection into parenthood on ability, although among mothers, for MBAs we find evidence of positive selection into "late" motherhood, defined as a first birth more than 10 years after college graduation.)

[3]Note that although the offered wage in her current job may have reflected her best alternative before motherhood, a richer specification would consider that she is now choosing between her post-motherhood reservation wage and the offered wage and corresponding job characteristics of each of the jobs that she is qualified for, with the caveat that the choice to shift across jobs can in some instances be one-way.

[4]There is a well-established literature on the inflexibility of work hours (see, for instance, Altonji and Paxson 1986). Cogan (1981) first considered the question of minimum hours constraints; in his case, individuals have a "reservation" hours level created by the fixed cost of entry into the labor force.

[5]In Figure 1, total hours worked is measured on the x-axis from right to left, ranging from 0 to the maximum T. On the y-axis, Y reflects husband's earnings, and w the wife's hourly wage. The indifference curves reflect a given woman's relative taste for time at home versus her taste for consumption. As drawn,

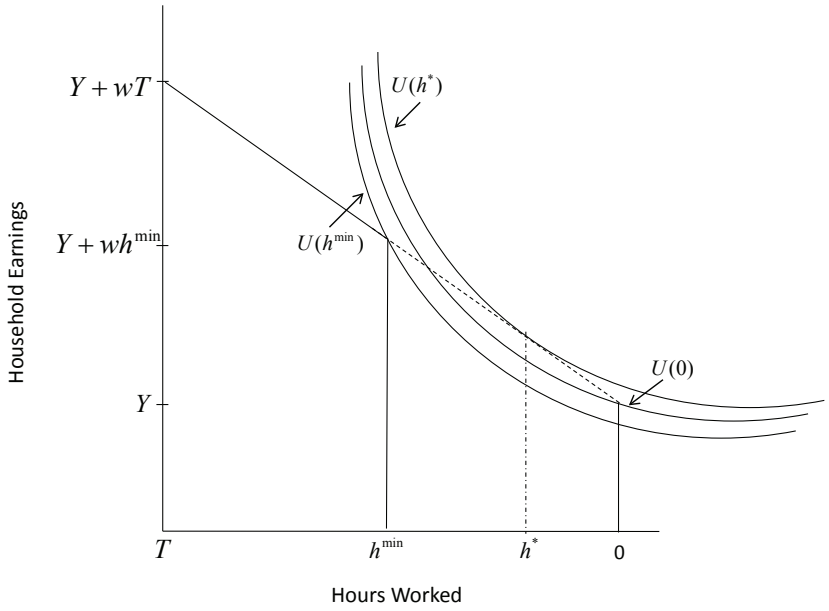

Figure 1: Married Woman's Labor Supply Model with Minimum Hours Requirement

for whom h^* falls below the minimum hours requirement in their job j, the first consideration in the decision of whether to remain working is the comparison of the utility, at time t, of working $h_t = h_j^{min}$ versus $h_t = 0$. For those women for whom $U_t(h_t = 0) > U_t(h_t = h_j^{min})$ – as drawn in the example in Figure 1 – a second consideration is the long-run career implications of a labor force gap, which again will vary across jobs.

There are two distinct mechanisms by which a labor force gap may affect a woman's wage path upon her return to work. The first is the rate at which job-specific human capital depreciates during this time off (Mincer and Polachek 1974), and how quickly it rebounds thereafter (Mincer and Ofek 1982). Given the short labor force gaps observed among current cohorts of highly educated women (Goldin and Katz 2008), the second, potentially more important factor, is a permanent penalty for time off (Albrecht *et al.* 1999) – such as being irreversibly relegated to a lower-wage "mommy track."

the given woman's optimal labor supply (h^*) falls below the minimum hours requirement in her job, and working 0 hours provides higher utility than working h_j^{min}.

Among women in the high-education fields considered here, Goldin and Katz (2011) find that the earnings penalty for an 18-month career interruption, measured 15 years after college graduation, is 16 percent for MDs, 29 percent for both JDs and PhDs, and 41 percent for MBAs. They also find that, whereas the earnings loss for MDs is roughly linear in time off, the loss for MBAs is persistent and unrelated to the length of the labor force gap. Bertrand, Goldin, and Katz (2010) find a similarly large 37 log-point wage penalty for time off among MBAs, measured on average 6 years after graduate school, with two-thirds of this cost reflecting a discrete penalty for any time out of the labor force. In combination, these results suggest, that in terms of this dimension of "family friendliness," MBAs work in especially unfriendly environments.

Now consider the comparison of two fields whose jobs have similar average penalties for time off, for instance JDs and PhDs. Since we see that PhDs are more likely to remain working after motherhood, this could suggest that the average h^{min} among JD-type jobs is higher – that PhDs generally work in more flexible environments.

Yet this conclusion ignores that other factors will also vary systematically across fields. For instance, average wages will vary, shifting the slope of the budget constraint, and since many women meet their spouse in graduate school, we would also expect systematic variation in their husbands' salary, Y. Furthermore, the tastes of women working in each field may vary, which will influence the shape of the indifference curves in Figure 1.

Specifically, women may initially sort across fields and subsequent jobs based on elements of taste that will likewise influence the labor supply decision at time t (Polachek 1977). For instance, one factor that will influence a mother's labor supply decision will be the relative importance of her sense of professional identity that she derives from working in her field, ψ. Furthermore, we would expect this sense of identity to vary across fields – a given woman may feel a very strong professional identity associated with being a doctor, but no such affinity to being a lawyer.

For fields with high initial investment costs, this element of taste may help explain the high work rates observed among mothers. For instance, one would anticipate that the average value of ψ would be especially high among women who choose medicine; those who would derive less satisfaction from the work would be daunted by the length of training required. This, in turn, would mean that the average MD derives more satisfaction from her work, and thus would be more likely to remain in her job after motherhood.

A second key element of taste is a woman's preference for time at home with her children, ζ.[6] If there is no variation in the cost for time off, all else equal, we should expect women with high ζ to choose jobs with low hours requirements, thus offering themselves greater flexibility in adjusting their work hours once they have children.[7]

Given this direction of sorting, because the mean value of ζ will be higher among mothers who chose flexible jobs, their optimal labor supply (h^*) will be lower than the level among mothers who instead chose inflexible jobs. Thus for a *given* value of h^{min}, all else equal, women who chose flexible jobs should be *more* likely to quit after motherhood. If we cannot fully absorb variation in ζ, our measure of the influence of workplace flexibility on mothers' labor supply will therefore understate the true causal effect.

Now consider sorting on ζ in terms of the long-run cost for time off.[8] There will be some women with especially high values of ζ who intend to leave the labor force after motherhood, regardless of the level of h^{min} in their job. Among these women, for those who anticipate a return to work, their initial choice across jobs will be driven primarily by variation in the penalty for time off. If in most instances jobs with low penalties likewise have low minimum

[6]This factor is distinct from the taste for leisure, and thus only directly influences a woman's labor supply after motherhood.

[7]An intriguing possibility is that high-ζ women may use graduate school as a marriage market for high-earning spouses. Considering the three high-salary professions – doctors, lawyers, and businessmen – the least costly choice would be to enroll in business school. Using our Harvard data, comparing the labor force participation rates of women who are paired before graduate school versus those who marry a classmate, a comparison across degrees finds no evidence suggesting this phenomenon.

[8]We should also expect systematic differences in ψ by the cost for time off. On average, only women with a strong affinity for the work will select jobs with high penalties, decreasing the probability that they will subsequently want to leave the labor force.

hours requirements, this will lead to the same direction of sorting as discussed above. But if there are some jobs with high minimum hours requirements but low penalties for time off, such as being a school teacher (Flyer and Rosen 1997), these jobs may attract women with high ζ despite the high h^{min}.[9]

Throughout this section, however, we are likely overstating the level of bias created by variation in taste by assuming complete information. In truth, women make choices under great uncertainty. It is difficult to gauge either dimension of the family friendliness of a given job before the fact. And at the point of choosing a graduate program, it is even harder to determine the distribution of family friendliness across the set of jobs that the degree can lead to, especially since it will change over time, and at potentially varying rates.[10]

Furthermore, women may not be fully cognizant of their value of ζ before they have their first child, which for most occurs after they have started their first post-graduate job. In our Harvard sample, the average age at first birth is 32, on average 7 to 9 years after applying to graduate school. Thus at each stage, the effects of selection are likely to be dampened by a lack of complete information.

2 Data and Descriptive Statistics

In this section we begin by discussing the Harvard data, and then introduce our measure of workplace flexibility.

2.1 Harvard Graduate Data

We collect data from the 10th and 15th anniversary reports for the Harvard graduating classes of 1988 through 1991, focusing on women observed 15 years after earning their BA (in 2003 to 2006), when they are approximately 37.[11] Among these classes, 55 percent of

[9] See Table 3 and footnote 24 for evidence of the long hours requirements for school teachers. Furthermore, women with high ζ may also select teaching based on the nature of the job – working with children.

[10] When choosing across graduate programs women will also have, at best, a rough estimate of their (potential) spouse's future earnings.

[11] See the appendix for greater detail, including Section A for a discussion of the survey response patterns. Given the age of the children of these Harvard graduates (on average, the oldest child is 5), we do not address

women responded to the 15th-year survey.

The anniversary reports provide rich professional and demographic information. The former includes detailed information on post-graduate education (including the program attended, institution, and year of graduation), and current occupation and firm. The latter includes spouse's detailed education and occupation, and children's years of birth.

We supplement the anniversary reports with data collected from the yearbook, including college activities (major and varsity sports participation), family background (region of origin, private school attendance, and race/ethnicity), and dormitory. Students chose dorms at the end of their first year, and many were known to have a certain identity (*e.g.*, "artsy", "jocks", "legacy", or "pre-med"). As discussed below, we find that this information predicts much about these women's subsequent career decisions.

In the anniversary reports many graduates also write a narrative describing their life and achievements over the previous five years. Among those respondents moving into parenthood, this often focuses on a description of life after children, including a discussion of their work choices. From these comments, as well as those reporting their occupation as "mom" or its equivalent, we can measure the current employment status of Harvard mothers.[12]

One limitation of the Harvard data is that we lack information on earnings. We therefore hired a career consultant to impute salaries for both the graduates and their spouses. We provided him our rich information on an individual's education, location, occupation, and firm. Because he did not observe gender or parental status, these estimates reflect gender-neutral salary levels associated with a given career. We estimate "gendered" wages

"opt-in" patterns, or re-entry into the labor force. Although some women may have already moved out and back into the labor force by their 15th year, too few have their first child by their 10th year to let us consider what proportion of those mothers out of the labor force at the 10th have returned by the 15th, and the data are structured such that we cannot reliably establish who both left and returned in the five years in between. Our analysis relies on a different data source than the "Harvard and Beyond" survey (Goldin and Katz 2008, 2011), although our sample overlaps with its 1990 cohort.

[12]Using data from married Harvard couples, we test for two potential sources of bias: that stay-at-home mothers under-respond to the survey or fail to report their at-home status, or that at-home mothers are over-represented. We find weak evidence that at-home mothers may be slightly over-represented.

from these salary values using detailed sector/industry/occupation average hours and gender wage gaps, as described in detail in the appendix.[13]

Table 1: **Family Formation and Employment Rates of Harvard Graduates**

	All	**MD**	**PhD**	**JD**	**MBA**	**MA**	**None**
	Family Formation Patterns						
Married at 15th (%):							
Women	77.1	81.2	73.5	76.5	77.6	75.8	78.1
	[1,522]	[223]	[219]	[311]	[210]	[285]	[274]
Men	79.8	82.9	80.4	80.4	82.2	75.3	77.2
	[1,934]	[286]	[230]	[429]	[343]	[215]	[431]
If Married at 15th, Children (%):							
Women	79.6	85.1	72.7	82.4	84.7	76.9	76.2
	[1,173]	[181]	[161]	[238]	[163]	[216]	[214]
Men	76.2	78.5	70.3	78.6	80.9	72.8	73.0
	[1,544]	[237]	[185]	[345]	[282]	[162]	[333]
	Employment Rates						
Parents at 15th (%):							
Women	78.8	94.3	85.7	79.2	72.3	73.7	69.6
	[961]	[157]	[119]	[202]	[141]	[171]	[171]
Men	99.5	98.9	100.0	100.0	100.0	99.1	98.8
	[1,195]	[190]	[132]	[274]	[231]	[119]	[249]
Childless at 10th (%):							
Women	97.5	99.4	99.1	98.0	95.3	96.1	97.7
	[1,091]	[159]	[113]	[252]	[148]	[206]	[213]
Men	97.5	100.0	99.3	97.8	95.5	97.3	97.0
	[1,366]	[163]	[136]	[315]	[243]	[146]	[363]

NOTES:
This table reports mean values, with sample sizes in brackets. The majority of these statistics reflect information for 15 years after graduation, among all Harvard graduates who responded to their 15th-year reunion survey. The 10th-year data reflect information for those observed in the 10th-year reunion survey.

The top panel of Table 1 reports the family formation patterns, by graduate degree and gender, for Harvard alumni observed 15 years after graduation.[14] We see that females are less likely to be married, but among those married, more likely to have children. We also see that the pattern varies across degrees, especially among women. For instance, among married women, MDs, MBAs, and JDs are appreciably more likely to have children than

[13]Appendix Section D discusses whether our initial salary estimates are systematically understated. We conclude that spouse's, but not own, earnings may be too low. Because this pattern may vary systematically by spouse's graduate degree, we include his degree directly in our analysis.

[14]We do not distinguish between types of MAs (other than MBAs), primarily because a large proportion of graduates provide no detail on the type received.

PhDs, MAs, or women with no graduate degree.[15] Furthermore, comparing these rates to those observed among women from the 2003 National Survey of College Graduates (NSCG), we find that these patterns are surprisingly similar, both overall, and by degree.[16]

The second panel of Table 1 compares employment rates, by gender, degree, and parental status. (Because a relatively small proportion of graduates remain childless by their 15th year, we report employment patterns for childless alumni 10 years after graduation, when 73 percent have no children.) From these data we see that employment rates are very high for both men and childless women, and vary by fairly little across graduate degrees.[17]

Among mothers, however, the proportion working varies strongly by degree. For instance, 94 percent of MDs work, compared to 72 to 73 percent of MBAs and MAs, and 69 percent of women with no graduate degree. Furthermore, these employment rates are again strikingly similar to those observed for women from the NSCG, where 93 percent of MDs work, compared to 73 percent of MBAs and MAs.[18]

Our final sample is limited to the 934 married Harvard mothers observed 15 years after graduation. Table 2 reports summary statistics for this sample (additional variables can be

[15]For MDs and MBAs, each of these differences is significant at the 10-percent level or higher, and JDs are significantly more likely to have children than PhDs at the 5-percent level.

[16]In the NSCG we observe highest degree attained, grouped by PhD, MA, or a professional degree. We distinguish MBAs from MAs based on graduate field of study (business); among those with professional degrees, we distinguish JDs, MDs, and those with specialized MAs, based on field of study and occupation. Using respondents who are between the ages of 35 and 40 (and for the sake of homogeneity, those who completed their BA in the US by the year they turned 25, and never attended community college), among women, 77 percent are married, and of those married, 81 percent have children. We also find that among married women, by graduate degree, 81, 75, 81, 82, 79, and 83 percent have children (listed in the order observed in Table 1).

[17]Although employment rates are above 95 percent in all graduate degree groups, among both childless women and men, MBAs are the least likely to work. (In both genders, these differences relative to MDs and PhDs are statistically significant at at least the 10-percent level.)

[18]Starting from the sample described in footnote 16, we limit the sample to women with children under age 6 to better reflect the demographics of the Harvard sample. Within this population, 87 percent of PhDs are employed, as are 80 percent of JDs and 65 percent of women with only a BA. Likewise, among their sample of Harvard business, law, and medical school alumnae who graduated 15 to 25 years before our sample, Swiss and Walker (1993) find similar results: by their 30s and 40s, only 75 percent of MBA mothers are working, compared to 89 percent of JDs and 96 percent of MDs. Note that across the board, however, these rates are high compared to those for the average population of college graduates, calling into question the media focus on the "excessive" opt-out rates among highly educated mothers (*e.g.*, Belkin 2003, Wallis 2004).

Table 2: **Summary Statistics**

Graduate Degree:	**All**	**MD**	**PhD**	**JD**	**MBA**	**MA**	**None**
Working at 15th (%)	78.1	94.2	85.5	77.6	71.7	72.9	68.7
Hourly wage (estimated)	43.41	58.21	28.92	48.18	49.92	30.88	35.08
(2000$)	(24.63)	(20.97)	(9.97)	(21.13)	(37.29)	(16.25)	(19.99)
Schooling Information: (%)							
Undergraduate Major:							
Sciences	15.0	43.5	31.6	3.4	3.9	6.8	6.6
Psychology	10.4	10.2	10.5	8.0	10.2	13.6	10.3
Econ. & social studies	13.3	2.7	5.3	13.6	35.2	8.2	14.7
Political science	6.9	2.0	2.1	17.0	8.6	3.4	4.4
Other social sciences	8.9	12.9	4.2	3.4	4.7	17.7	9.6
English	21.0	12.2	22.1	26.7	14.1	23.1	26.5
History	10.9	10.9	8.4	14.2	10.9	6.8	12.5
Played sports in college	31.2	29.9	17.9	26.7	39.1	38.1	33.1
Top-10 graduate program	47.5	34.4	53.0	44.4	70.3	40.4	-
Family Variables:							
Age at first birth	32.0	32.0	32.4	32.1	32.3	32.2	31.1
	(2.8)	(2.8)	(2.9)	(2.7)	(2.6)	(2.9)	(3.1)
Total children at 15th	1.88	1.84	1.74	1.94	1.88	1.86	1.97
	(0.79)	(0.67)	(0.78)	(0.74)	(0.85)	(0.88)	(0.79)
Changed name at marr (%)	57.1	50.6	39.3	56.6	73.9	52.4	66.9
Spouse's salary (estimated)	119.3	141.8	93.8	129.4	133.6	107.7	101.0
('000, 2000$)	(77.4)	(83.0)	(58.9)	(87.6)	(76.7)	(75.1)	(58.4)
Spouse holds same graduate degree	42.4	43.5	41.0	49.0	46.4	21.1	52.8
Sample Size:	**934**	**154**	**117**	**196**	**138**	**166**	**163**
(% of total):		(16.5)	(12.5)	(21.0)	(14.8)	(17.8)	(17.5)

This table reports variable means, and for continuous variables, lists standard deviations in parentheses.

found in Table A-1).[19] We see that by our estimates, MDs earn the highest hourly wages, followed by JDs and MBAs, while PhDs earn the least. The same pattern holds by degree for spouse's earnings, chiefly because of the large proportion of women who are married to men holding the same degree. We also see a striking lack of variation in the timing of first birth; almost all groups have their first child on average at age 32.[20]

[19]Also see Appendix Section C for a detailed listing of the types of jobs held by women within each graduate degree group.

[20]We also find little variation in the career timing of first birth (defined in terms of the year in which a woman completed her graduate degree), either across degrees, or, within degrees, across job types. For instance, among JDs in the longitudinal sample, the average career timing is 6.8 years after graduate school among women working for large, inflexible law firms before motherhood, and 7.0 and 7.1 years among those working for the government or for non-profits. Thus we find no evidence suggesting that women adjust their timing in response to job-specific incentives, such as the incentive to delay motherhood until making partner.

We also separately focus on the subset of these Harvard mothers who we observe both before and after first birth, the "longitudinal" sample. This sample includes 286 women observed both 10 and 15 years after graduation, who had their first child within this period, who provide sufficient work information at both points, and who do not hold either an MD or PhD.[21] We exclude these two degree groups from the longitudinal sample because too many remain in training ten years after graduation.[22]

2.2 Identifying Flexible Fields

The flexibility of a given job is a function of several factors, including the availability of "work-family" policies, and the culture of the workplace. Elements of the former will include the generosity of available maternity leave, formal part- or flex-time policies, or telecommuting options. The latter will include *de facto* norms on the implications of using such policies, as well as the importance of factors such as "face time."[23]

Because we cannot directly observe the broader set of elements that go into the flexibility of a given job, our measure of flexibility is primarily built on the simplest dimension – the capacity to cut one's hours. For our first step in defining flexibility, we use the distribution of hours worked among childless women in the NSCG. The NSCG provides detailed data on hours worked, employer sector (*e.g.*, for-profit, non-profit, government), employer size, and occupation. We use these data – by graduate degree – to distinguish types of work environments, for instance large versus small firms, or in education, working as a teacher versus in another capacity. Since we only use this measure in the analysis of the longitudinal sample, we do not consider MDs and PhDs.

[21] Women in the Harvard longitudinal sample have higher labor force participation rates 15 years after graduation: 84 percent for the JDs, 74 percent for the MBAs, and 81 percent for both the MAs and those with no additional degree.

[22] We lack sufficient information on these women's pre-birth/post-training work environment to assess its influence on their subsequent labor supply. For instance, 43 percent of women who hold a PhD by 15 years after graduation are still in graduate school or are completing post-doctoral fellowships 5 years earlier, and 58 percent of MDs are completing their residency or fellowships, or are still in medical school.

[23] One might also consider the production function of a job as a central factor of its family friendliness, such as the flexibility of where and when the work itself is done or in who completes it, although the production function need not be a fixed characteristic.

Grouping childless women by degree and job type, we define as inflexible those settings in which fewer than roughly 5 percent work part-time. We use data on the proportion working part-time because we think it will reflect the existence of a minimum hours requirement. As the top panel of Table 3 shows, this criterion captures almost exactly the same job types across all degrees: big firms, the government, teaching, and for JDs and MBAs, small firms.[24]

Table 3: **Labor Supply Patterns of Childless Women and Men**

	Big Firm	**Small Firm**	**Non-profit**	**School Teacher**	**Education**	**Government**	**Self-Employed**
				Childless Women:			
Proportion Working Part-Time (< 35 hrs/wk):							
BA	**4.6**	12.9	12.4	**5.5**	18.8	**4.1**	16.0
	[1,078]	[319]	[217]	**[237]**	[266]	**[244]**	[325]
MA	**4.7**	18.8	10.1	**1.8**	30.0	**3.6**	15.5
	[296]	[96]	[159]	**[228]**	[400]	**[165]**	[103]
MBA	**0.5**	**3.4**	9.0	-	-	**0.0**	13.5
	[212]	**[29]**	[89]	-	-	**[39]**	[37]
JD	**1.4**	**0.0**	12.1	-	-	**4.1**	14.3
	[72]	**[24]**	[33]	-	-	**[74]**	[56]
				Men:			
Proportion Working Part-Time (< 35 hrs/wk):							
BA	**1.7**	3.7	6.2	**5.9**	14.3	**1.9**	7.0
	[3,054]	[854]	[227]	**[255]**	[301]	**[519]**	[855]
MA	**1.4**	4.6	3.9	**2.4**	29.9	**2.5**	5.7
	[865]	[218]	[103]	**[168]**	[368]	**[162]**	[212]
MBA	**0.7**	**2.1**	8.0	-	-	**0.7**	9.9
	[1,094]	**[189]**	[112]	-	-	**[148]**	[202]
JD	**0.8**	**3.6**	2.1	-	-	**0.0**	5.0
	[125]	**[110]**	[48]	-	-	**[114]**	[201]

NOTES:

Each cell reports the proportion working part-time (less than 35 hours per week), and the cell size (in brackets). Environments defined as inflexible are distinguished in bold. Relative to JDs and MBAs, a much higher proportion of MAs and BAs work in education, so we distinguish education from other non-profits, and within education, distinguish primary- and secondary-school teachers from those working in other capacities. For both genders, our sample captures all NSCG respondents with positive work hours, who are between the ages of 25 and 35 for BAs and MAs, and between the ages of 25 and 48 for JDs and MBAs (to offer larger cell sizes). These definitions are not sensitive to the age ranges used.

[24]Some may find this result for teaching surprising; these data clearly suggest that it is relatively difficult to work part-time as a primary- or secondary-school teacher. (Among NSCG mothers of small children, only 12 percent of teachers work part-time, compared to 40 percent or more of those who work in the environments categorized as "flexible.") As we note in Section 1, however, teaching has a low penalty for time off (and allows women to work closely with children), thus we distinguish teachers from those in other inflexible environments in our specifications reported in Table 7.

Lastly, because we observe firm names in our Harvard data, we can capture additional information on flexibility by using firm-specific "family friendliness" rankings. In particular, we reclassify as "flexible" those large firms that are included in the list of "Top Ten Family-Friendly Firms" as compiled by the Yale Law Women, or the list of "Best Places" for working mothers by *Working Mother* magazine.[25] Both rankings specifically reflect information on both the availability and uptake of "work-family" policies, thus for large for-profit firms, our measure captures the richer dimensions of workplace flexibility. Using this information, 20 percent of the Harvard women in large firms are re-categorized as working in a flexible environment, including 25 percent of MBAs and JDs.

One concern with this definition is that our initial measure of flexibility is endogenous to sorting across work environments. As discussed in Section 1, among women who anticipate having children, those with high taste for time at home with their kids (ζ) may select more flexible jobs. Although ζ should not yet directly influence the labor supply choices of these *childless* women, among those who have chosen jobs with low h^{min}, women who likewise have high taste for leisure will have a greater capacity to work part time, even before motherhood.

An alternative approach would be to rely on the labor supply patterns of men to gauge access to part-time schedules. Looking at the bottom panel of Table 3, we see that men are generally less likely to work part-time. Yet the pattern across job types is surprisingly similar. The only clear difference is in small firms, where fewer than 5 percent of men with an MA or BA work part-time. In this instance, we rely on the data for women because occupational sex segregation suggests that mothers are more likely to work in jobs similar to those held by childless women than by men. Overall, however, we find reassuring the general similarity of the labor supply patterns across these two populations.

Using this definition, Table 4 shows the proportion of the Harvard longitudinal sample working in inflexible jobs before and after motherhood, overall and by graduate degree. Before children, we see that roughly three-quarters of JDs and MBAs work in inflexible jobs,

[25]See Table A-4 for a list of the firms included in each of these sources.

Table 4: **Distribution of Flexible Work Environments**

	All	JD	MBA	MA	None
Before Children:					
Inflexible (%)	59.8	75.0	71.2	36.0	52.8
Big inflexible firm	**35.0**	**32.6**	**51.5**	**16.0**	**45.3**
Government	**9.4**	**18.5**	**1.5**	**9.3**	**3.8**
School teacher	**3.5**	-	-	**10.7**	**3.8**
Small firm	18.9	**23.9**	**18.2**	20.0	9.4
Big flexible firm	9.1	10.9	18.2	0.0	7.5
Non-profit	12.9	10.9	4.5	25.3	9.4
Other education	4.9	-	-	14.7	5.7
Self-employed	6.3	3.3	6.1	4.0	15.1
After Children:					
Inflexible, if working (%)	47.1	55.3	61.7	30.0	40.5
Big inflexible firm	**23.1**	**25.3**	**28.1**	**13.5**	**26.9**
Government	**5.7**	**11.0**	**1.6**	**5.4**	**1.9**
School teacher	**2.1**	-	-	**5.4**	**3.8**
Small firm	10.0	**9.9**	**15.6**	5.4	9.6
Big flexible firm	5.0	6.6	7.8	1.4	3.8
Non-profit	17.4	22.0	10.9	20.3	13.5
Other education	4.6	-	-	13.5	5.8
Self-employed	12.1	8.8	9.4	16.2	15.4
Out of labor force	19.9	16.5	26.6	18.9	19.2
Sample Size:	**286**	**92**	**66**	**75**	**53**

NOTES:

This table reports the distribution of work environments observed among women in the Harvard longitudinal sample 10 and 15 years after college graduation. In both the top and bottom panels, the first line reflects the percentage working in inflexible settings, calculated only among those currently employed. The remaining lines report the percentage of each degree group working in each type of work setting, including, at the 15th, those out of the labor force.

compared to only half of women with no graduate degree, and a third of MAs.[26] Yet the types of jobs held by MBAs and JDs are quite different, with many fewer JDs in large inflexible firms. By comparison, the types of jobs held by MBAs and women with no graduate degree

[26]Based on insight from other sources on the constraints in law, if we were to designate only litigation-heavy government positions as inflexible (Swiss and Walker 1993), and distinguish jobs as legal counsels for big firms as flexible (Mason and Eckman 2007), a much lower 60 percent of the JDs would be categorized as working in an "inflexible" environment before having children. (In the longitudinal sample, among JDs working for the government before children, 35 percent work in litigation-heavy positions, *e.g.*, assistant U.S. attorney; among JDs working for large inflexible firms, 10 percent work as corporate counsels.) We do not incorporate this information into our primary measure of flexibility because we have no similar means to refine our definition for women with other degrees, who tend to work in much less homogenous settings.

are much more similar.

After children, we see that the proportion of women working in inflexible jobs has dropped by 20 percentage points among JDs, but by only 10 points among MBAs and women with no graduate degree. For the latter we see a larger proportion of women leaving big inflexible firms, whereas for JDs we instead see women leaving the government and small firms. Overall, we see a clear increase in the proportion working for non-profits and in self employment.[27]

3 Empirical Strategy

The following section outlines how we will attempt to identify the treatment effect of workplace flexibility, given the sources of potential bias discussed in Section 1.

3.1 Controlling for Differences in Characteristics

Exploiting the richness of our data, we begin with the simple approach of assessing whether the observed labor supply differences across women with different graduate degrees can be explained by their characteristics. In particular, using the full Harvard sample, we use a probit specification to estimate the following equation,

$$p(h_i > 0) = F\bigg(\alpha + \sum_j \beta_j S_{ij} + \gamma_1 X_i + \gamma_2 \theta_i\bigg), \tag{1}$$

where S_j reflects the type of graduate degree, X are factors that influence the wage and reservation wage, and $\theta = (\zeta, \psi)$ are unobserved taste. We first run this specification with no controls, then add elements of X standard to the married woman's labor supply model, followed by proxies for θ. Our focus is on the degree coefficients, β_j, which reflect the level difference in labor supply between each degree j and MBAs, the excluded category.

Our variables X include a woman's potential wage, number of children, and our es-

[27] This shift towards self-employment supports past research suggesting that women enter self-employment as a means to balance household responsibilities with a maintained labor force presence (Connelly 1992; Hundley 2000; Lombard 2001).

timate of her spouse's earnings.[28] We also include proxies for family assets (whether she attended a private high school, and whether her husband attended a private university), and controls to capture variation in childcare costs (census region, and whether she lives in the same region in which she was raised, suggesting proximity to family). As with many of the variables that we classify as "X," current region may also capture an element of taste, if there exists geographic variation in the social norms on the acceptability of being a working mother (Fogli and Veldkamp 2011).

As noted above, because we do not directly observe spouse's earnings, we rely on estimates based on his education, occupation, location, and in some instances, firm. We also supplement this with detailed information on his education type and quality, including his graduate degree.[29] Along with its influence on his earnings, the latter may also speak to different time constraints that translate into variation in the value of a woman's time at home. For instance, husbands who are MDs may be on call many nights, and husbands who are MBAs may travel frequently, making each less available for household responsibilities.

We next include controls that may speak more directly to underlying elements of taste, θ. For instance, we expect undergraduate major to reflect much about taste, especially ψ. We can also control for whether a woman had her first child before she started graduate school; choosing a career path after motherhood may signal a strong value associated with the identity of working in that field.

Our detailed information on marriage and spouses also provides an especially rich set of potential proxies for ζ. This includes whether a woman changed her name at marriage, and her age difference with her spouse.[30] Both may speak to differences in the strength of

[28] See Appendix Section D for greater detail on how we build potential wages. Following Blau and Kahn (2007) and Juhn and Murphy (1997), we instrument for wages using predicted wage distribution dummies to address measurement error. Because we rely on salary estimates as our building block, to absorb any residual effect that may not be captured in our career consultant's estimates, we also control for whether each woman attended a top-10 graduate program and whether she holds more than one graduate degree. We also include year-of-graduation (from graduate school) fixed effects, to allow for long-term effects of the economic environment at the time of graduation (Oyer 2008).

[29] Quality is reflected by whether he attended a top-20 undergraduate, or top-10 graduate, program.

[30] Goldin and Shim (2004) use the Harvard anniversary reports to assess women's surname choices at

gender norms within the household. We also include a rich set of controls that are likely to pick up both elements of taste. These include family background, such as race/ethnicity, and place of origin. We can also control for the dorm in which each woman lived during college, and whether she played sports.

Given our focus on β_j, our assumption is that these elements of X and proxies for θ absorb much of the variation in taste that leads to sorting across graduate degrees. As a check, we can test this directly for the subset of controls observed by the time of college graduation, C_i (see Table A-5). Not only do we find that undergraduate major is strongly related to a woman's subsequent graduate degree, but other factors are likewise important, such as a woman's race, where she grew up, and whether she played sports.

3.2 Controlling for Pre-Birth Work Environment

After controlling for X and θ in Equation (1), if there remain large differences in labor force participation across fields – β_j remain significantly different from zero – one might interpret this as evidence of systematic variation in other factors, such as work environment. For the longitudinal sample, we can test for this directly by assessing whether working in a flexible environment before having children, F_{i10}, predicts subsequent labor supply:

$$p(h_i > 0) = F\left(\alpha + \sum_j \beta_j S_{ij} + \delta F_{i10} + \gamma_1 X_i + \gamma_2 \theta_i\right). \tag{2}$$

As discussed in Section 1, however, because women can sort across jobs, in the probit estimation of Equation (2), we cannot necessarily interpret our estimate of the coefficient δ as a measure of the causal effect of work environment. If women sort across jobs such that those observed in flexible environments before children have systematically higher ζ (and thus lower h^*), and if we cannot fully control for taste, the coefficient estimate of δ will be attenuated towards zero.[31] (Any measurement error in F_{i10} will likewise cause attenuation.)

marriage.

[31] Given the types of jobs classified as flexible, sorting across jobs may also vary systematically with ψ. For instance, non-profit jobs – which may attract high-ψ women – are classified as flexible. Yet teaching and government, which are classified as inflexible, may attract women with similar taste.

To address the bias introduced by this possible sorting, we adopt a control-function strategy (Garen 1984). Using the rich data from when our longitudinal sample were college-age, C_i, we begin by predicting via OLS a woman's choice of pre-birth (post-graduate school) work environment: $\hat{F}_{i10} = P(F_{i10} = 1|C_i, S_{ij})$. We then calculate the residual element of workplace flexibility, $\tilde{F}_{i10} = F_{i10} - \hat{F}_{i10}$. To the extent that C_i absorb the factors that drive selection across jobs, we can interpret $\tilde{F}_{i10}$ as the random element of a woman's pre-birth work environment.

We find that the factors observable at college graduation are clearly related to the types of jobs women hold 10 years later (see Table A-6). For instance, undergraduate major has a strong relationship with whether a woman subsequently works in a flexible job, and place of origin, sports participation, and undergraduate dorm are also related to subsequent job choices.

One might worry, however, that these college-level variables are more likely to pick up variation in ψ than in ζ. Do 19- or 22-year old women really know if they will want to take time off when they have children? Our results suggest that they do. If we regress the residual element of workplace flexibility, $\tilde{F}_{i10}$, on factors that are likely correlated with ζ that occur after graduation but before the 10th-year job, these controls provide little additional explanatory power, even though many are strongly related to subsequent labor supply after motherhood (as we show in Table 6).[32]

Furthermore, we find that C can predict who will take her husband's name at marriage, which we consider a proxy for ζ. In particular, it is the information on undergraduate dorm that provides this power, suggesting that the element of taste that drives a woman's choice of dorm at the age of 19 is strongly correlated with ζ.[33]

[32]When we regress $\tilde{F}_{i10}$ on whether a woman changed her name at marriage (if married by then), the age difference with her spouse, the type and quality of her husband's education, her age at marriage, and whether she attended a top-10 graduate program, these variables are completely unrelated. (The regression has an R^2 of 0.08, an adjusted R^2 of -0.01, and the joint significance of these regressors is 0.5.)

[33]A regression of whether a woman changed her name at marriage on C has an R^2 of 0.24 and an adjusted R^2 of 0.10. In particular, the dummies for undergraduate dorm are jointly significant with a p-value of 0.01, and dummies for region of origin are jointly significant with a p-value of 0.10, whereas the remainder of the

Given this decomposition of observed pre-birth work environment, we then rerun Equation (2), replacing F_{i10} with the predicted value and the residual, $\hat{F}_{i10}$ and $\tilde{F}_{i10}$. In this control-function regression, to the extent that the college-level factors C_i absorb selection across jobs, the coefficient on $\tilde{F}_{i10}$ should give us the causal effect of workplace flexibility, and the difference between the coefficient on $\tilde{F}_{i10}$ and $\hat{F}_{i10}$ will give us insight into the direction of the bias created by selection. Furthermore, any attenuation in the graduate degree coefficients after controlling for work environment will suggest that variation in flexibility across fields helps drive the overall variation in labor supply.

4 Results

Table 5 reports the marginal effects associated with the degree coefficients, β_j, when we run Equation (1) on the full Harvard sample. Line (1) reports the results before including controls, Line (2) the results after including only X, and Line (3) the fully-controlled specification. The columns between the marginals report whether the differences between adjacent graduate programs are statistically significant. Table 6 reports the marginal effects for a subset of the controls X and θ.

In Line (1), we see that before controlling for individual characteristics, MDs work appreciably more than PhDs, and both MDs and PhDs work more than MBAs, the excluded category. But we cannot reject that MBAs are as likely to work as JDs, MAs, or those with no graduate degree.

As the results in Line (2) and Table 6 demonstrate, the elements of X are highly correlated with labor supply in the predicted ways. For instance, women with higher potential wages are more likely to work, and those with higher-earning spouses and more children are less likely. Yet including these controls does little to narrow the difference in labor supply across graduate degrees. The coefficient on JDs in fact rises, in part because they have more children than MBAs, augmenting the difference between these two fields.

variables are insignificant at standard testing thresholds.

Table 5: **Differences in Probability Working by Graduate Degree**

		MD		PhD		JD	MA	None	R^2
(1)	Uncontrolled	0.205***	**	0.114***	*	0.049	0.011	-0.025	0.05
		(0.027)		(0.036)		(0.039)	(0.043)	(0.045)	
(2)	+ Xs	0.172***	*	0.090**		0.069*	0.044	0.007	0.21
		(0.026)		(0.042)		(0.038)	(0.047)	(0.073)	
(3)	+ Proxies for θ	0.158***	**	0.066		0.046	0.015	-0.029	0.28
		(0.025)		(0.045)		(0.040)	(0.052)	(0.081)	

NOTES:

Each line reflects the results from a different probit regression of labor force participation after motherhood, including an increasing number of controls, with the excluded category MBAs. The values listed are the marginal effects associated with the given degree coefficient, β_j, from Equation (1), with its standard error in parentheses. The first line reports results when we control only for graduate degree. The second and third lines reflect the results when we control for the observable elements of the wage equation (X) and proxies for the unobservable elements (θ). (Lines (2) and (3) are estimated via instrumental variables; see footnote 28 for more detail.) See the notes to Table 6 for a full listing of the controls included in the regressions reported in Lines (2) and (3), as well as the marginal coefficients for a subset of these controls. The columns between the coefficients in this table report whether the differences between adjacent graduate programs are statistically significant. The last column reports the pseudo-R^2 when we run the probit without instrumenting for own wage. Significance levels marked as * (significant at 10%), ** (at 5%), and *** (at 1%).

When we include the proxies for taste, we likewise find that many are strongly related to labor force participation. For instance, women who begin graduate school after having a child – a proxy for ψ – are 10 percentage points more likely to remain working. We also see that those who change their last name at marriage are instead 11 percentage points more likely to quit. Because MBAs are by far the most likely to do so, this in part helps explain their lower participation.

Despite the power of these controls in predicting work patterns, and the resulting attenuation of most of the degree coefficients towards zero, the overall changes are fairly small. Comparing Lines (1) and (3) in Table 5 shows that persistent differences in labor supply remain, even after controlling for this rich set of individual-specific factors.

Table 6: **Marginal Effects for Controls X and θ**

	+ Xs		+ θs	
	marginal	(s.e.)	marginal	(s.e.)
Conventional Elements of the Labor Supply Decision, X:				
Log potential wage	0.149*	(0.078)	0.125*	(0.076)
Extra degree (non-MA)	0.114**	(0.051)	0.097**	(0.047)
Top-10 graduate school	0.033	(0.030)	0.027	(0.029)
Private high school	-0.062**	(0.030)	-0.057*	(0.030)
Live in same region as grew up	0.036	(0.027)	0.029	(0.027)
Family Size: (excluded = 1 child)				
2nd child	-0.115**	(0.026)	-0.088**	(0.026)
3rd child	-0.133**	(0.045)	-0.134**	(0.046)
Spouse Information:				
Log earnings	-0.059**	(0.028)	-0.056**	(0.026)
Top-10 graduate school	-0.061*	(0.036)	-0.052	(0.034)
Graduate degree: (excluded = None)				
MD	-0.117*	(0.070)	-0.172**	(0.079)
PhD	0.035	(0.047)	0.014	(0.049)
JD	-0.074	(0.051)	-0.077	(0.052)
MBA	-0.078	(0.054)	-0.072	(0.054)
MA	0.020	(0.046)	-0.003	(0.048)
Taste-Based Elements of the Labor Supply Decision, $\theta = (\zeta, \psi)$:				
Changed last name at marriage			-0.105***	(0.026)
Age gap with spouse:				
Older			-0.132*	(0.072)
Yrs (if not older)			-0.039***	(0.012)
Yrs (if not older), sq ($x10^{-1}$)			0.024**	(0.011)
First child before graduate school			0.097***	(0.036)
Played college sports			-0.052	(0.032)
Minority			0.048	(0.033)

NOTES:

The first two columns report the marginal effect and standard error for the controls X, corresponding to the results reported on Line (2) of Table 5; the second set reports the results when we also include proxies for unobserved taste (θ), corresponding to Line (3). Other elements of X include: year of graduation from graduate school, whether the individual has an additional MA or a 4th or more children, whether her husband attended a top-20 undergraduate institution, and current region of residence. Other elements of θ include: year of college graduation, region in high school and whether a woman grew up in a big city and/or in a low-density state, undergraduate major and whether it was a small major, and undergraduate dorm. Significance levels marked as * (significant at 10%), ** (at 5%), and *** (at 1%).

Table 7 reports the results of estimating Equation (2), where we rerun the fully-controlled specification on the longitudinal sample, now controlling directly for pre-birth work environment. Column (1) lists the degree-specific coefficients, β_j, for this subset of women before controlling for workplace flexibility, Column (2) reports the results when we control for the observed value, F_{i10}, and Column (3) reports the control-function results.

Table 7: **Effect of Pre-Birth Work Environment**

	(1)	(2)	(3)
Graduate Degree Controls: (Excluded = MBA)			
JD	0.042	0.034*	0.036*
	(0.030)	(0.024)	(0.025)
MA	-0.022	-0.014	-0.017
	(0.065)	(0.045)	(0.046)
None	0.043	0.025	0.023
	(0.037)	(0.024)	(0.024)
Pre-Birth Work Environment:			
Flexible job (F_{i10})		0.061***	
		(0.030)	
Residual flexibility ($\tilde{F}_{i10}$)			0.052**
			(0.030)
Predicted flexibility ($\hat{F}_{i10}$)			0.086**
			(0.052)
School teacher		0.002	-0.001
		(0.033)	(0.039)
Pseudo R^2	**0.45**	**0.49**	**0.49**

NOTES:
Each column reflects a different specification predicting labor force participation after children (15 years after college graduation) among the longitudinal sample, reporting results before and after controlling for pre-birth workplace flexibility. (All of the previously discussed controls, listed in Table 6, remain in each of these specifications.) Reported values reflect the marginal effect calculated from a probit regression; we do not use the IV specification described in the notes to Table 5 because doing so has no effect on the results. See footnote 24 for why we separately distinguish teachers from those in other inflexible environments. Because wages may be systematically lower in flexible jobs, we also run regressions which control for wages in a more flexible way; this has no effect on the results reported here. Standard errors reported in parentheses; significance levels marked as * significant at 10%; ** at 5%; *** at 1%.

As Columns (2) and (3) show, working in a flexible job before having children is significantly associated with a woman's labor supply five years later. The insignificant difference between the coefficients on $\hat{F}_{i10}$ and $\tilde{F}_{i10}$ in Column (3), combined with the evidence in Section 3 that $\tilde{F}_{i10}$ is largely orthogonal to taste, suggest that sorting across work environments

creates little bias in the estimated effect of workplace flexibility.[34] The coefficients on F_{i10} in Column (2) and on $\tilde{F}_{i10}$ in Column (3) are accordingly very similar: women who work in a flexible environment are 5 to 6 percentage points less likely to leave the labor force after motherhood.[35]

5 Revisiting Variation in Labor Supply by Graduate Degree

Although the results in Table 7 make clear that workplace flexibility influences mothers' labor supply, it is less clear that it can explain the work patterns that we observe across women by graduate degree. As discussed in Section 3, if variation in flexibility is a driving factor, controlling for it directly should attenuate the degree coefficients in Equation (2). Although we do find that two of the three degree coefficients in Table 7 are attenuated slightly towards zero, the results are too imprecise to conclude that variation in labor supply across graduate degrees is driven by variation in flexibility, at least as evident using our admittedly blunt measure.

Furthermore, at the graduate degree level, flexibility and subsequent labor supply do not appear to line up: by our measure, JDs are most likely to work in inflexible jobs before motherhood (followed closely by MBAs), yet they are the least likely to quit.[36] Does this

[34]Note that the larger (although statistically equivalent) coefficient on $\hat{F}_{i10}$ suggests that, if anything, the *type* of women who choose flexible jobs are the type who are systematically *more* likely to remain working, the opposite direction of the sorting predicted in Section 1. (This same pattern holds if we rerun the specifications excluding the MBAs from the sample.)

[35]One might ask whether this result reflects variation in the production functions of jobs across industries. Are the jobs in certain industries easier to pair with motherhood than the jobs in other industries, simply by the nature of the work? We do not include industry fixed effects for two reasons: (1) controlling for industry may also capture systematic variation in work norms and mores (*e.g.*, variation in the strength of the "old boys" network), which may influence workplace flexibility, and (2) we do not believe that production functions are a fixed characteristic. (Consider the shift in the structure of many medical specialties over the last 30 years, and its influence on the capacity for MDs to work part-time.) If, however, one splits the sample of women who worked in large for-profit firms into seven broad industry groups, within each, the proportion who remain working is higher among those who worked for flexible firms. For instance, in banking, 88 percent of those who worked in such firms remain working after motherhood, compared to only 67 percent of those who previously worked for inflexible firms.

[36]See footnote 21 for the labor force participation levels by graduate degree in the longitudinal sample. Considering the proportion of JDs in inflexible jobs, as noted in footnote 26, our measure may overstate this proportion, although the proportion for other fields will likewise be measured with error. If we use the alternate classification, the JD coefficient in Equation (2) is attenuated by slightly more; the estimates of the effect of workplace flexibility are completely unchanged.

suggest that their inflexible jobs are *less* inflexible than those held by MBAs? Or is it instead that their shorter-hour job alternatives are more appealing than the alternatives for women working in MBA-type jobs?

For the longitudinal sample, Table 8 reports the distribution of 15th-year job setting, grouping women by whether they worked in an inflexible or flexible job before motherhood. In the top panel we see, for instance, that among those women working in inflexible jobs beforehand, JDs, MBAs, and women with no graduate degree are roughly equally likely to remain in such an environment.[37] Notice that the 15th-year distribution for MBAs and women with no graduate degree are very similar, echoing our finding in Table 4 that these two groups work in similar types of jobs.

Table 8: **Switching Patterns Across Work Environments**

	All	**JD**	**MBA**	**MA**	**None**
Working in an inflexible job at 10th:					
% Inflexible (at 15th)	51.8	57.4	53.3	33.3	53.6
% Flexible	23.2	23.5	15.6	40.7	17.9
% At home	25.0	19.1	31.1	25.9	28.6
Working in a flexible job at 10th:					
% Inflexible (at 15th)	16.8	13.0	26.3	19.1	8.3
% Flexible	70.8	78.3	57.9	66.0	83.3
% At home	12.4	8.7	15.8	14.9	8.3

NOTES: Data for the Harvard longitudinal sample.

Focusing on the top panel of Table 8, we see no evidence to suggest that the inflexible jobs held by JDs are relatively less inflexible: JDs are no more likely to remain in an inflexible environment after motherhood than either MBAs or women with no graduate degree. (With our data, we cannot distinguish whether a woman has gone part-time.) Yet among those who leave, JDs are more likely to switch to a flexible job, whereas MBAs and women with no graduate degree are more likely to quit.[38]

[37] Within each graduate degree group, the proportion who stay, switch, or quit are very similar across the job types categorized as inflexible. For instance, among JDs, 60 percent of those who worked in large inflexible firms before motherhood remain in an inflexible environment, as do 65 percent of those who worked for the government.

[38] Among those who leave an inflexible environment, this difference in the propensity to quit (comparing JDs to MBAs or women with no degree) is significant at the 15-percent level. The same holds if we limit the comparison to women working in large inflexible firms before motherhood.

These results may suggest that the career consequences of choosing a shorter-hour alternative – either taking advantage of work-family policies to go part-time, or switching to a more flexible job – may be especially high for women working in MBA-type jobs. For instance, suppose that in certain jobs, one can be irreversibly relegated to the "mommy track" simply by temporarily working part-time. In jobs where productivity is especially hard to measure, long hours can become its signal (Landers, Rebitzer, and Taylor 1996), and the use of part-time schedules may therefore be especially harmful to career advancement.

Existing research supports this possibility (Hewlett *et al.* 2005; Eaton 2003). For instance, Hewlett *et al.* find that women working in business perceive greater barriers to using work-family policies than women in law, medicine, or academia, and take-up rates are accordingly lower. Furthermore, among women in business, they find that 32 percent report an "unspoken rule" that those who use such policies will not be promoted, compared to only 24 percent of women in law.[39]

If, as these results suggest, MBAs are more likely to work in jobs with a permanent penalty for part-time work, the relative loss in lifetime earnings of going part-time may be only slightly smaller than the loss associated with a labor force gap. This may help explain the greater tendency of MBAs to quit after motherhood, rather than to shift to a shorter-hour alternative.[40]

For a woman working in an inflexible job before motherhood, this discussion highlights the fact that the characteristics of the more flexible job alternatives that she faces – beyond their shorter hours – will also influence her labor supply decision. This will include both the earnings and promotion potential associated with the given job, but also whether the

[39]A higher 41 percent of women in finance and banking report such an unspoken rule (the authors do not indicate whether these differences are statistically significant). These results are especially telling for Harvard women, since 26 percent of the MBAs in the longitudinal sample worked in finance or banking before they had children.

[40]Note, however, that given that MBAs face especially high penalties for labor force gaps, if the penalties are similar for part-time work, the puzzle remains why MBA women consider *either* alternative. Furthermore, if women are aware of these large penalties when they select graduate fields, the women who choose an MBA should have lower average values of ζ and thus relatively high h^*. In combination, this evidence suggests that h^{min} in MBA-type jobs must be *especially* high to be forcing these women off the "fast track."

work is as interesting or dynamic as her previous job. Thus, although our results in Table 7 clearly show that jobs with high hours requirements push mothers out of the labor force, this evidence suggests that a number of factors may explain the differences in mothers' labor supply across graduate degrees, including both the characteristics of the jobs women worked in before children, and the characteristics of the jobs available for them to switch to.

6 Conclusion

Our results provide new insight on the influence of workplace flexibility on the labor supply decision of mothers. Using data for Harvard graduates, we focus on the labor supply of highly educated women, many of whom delayed fertility as they completed additional schooling and established their careers. Yet despite the large opportunity cost of doing so, we see that a substantial proportion leave the labor force, at least temporarily, at the transition into motherhood.

More strikingly, we find that this propensity varies dramatically across career paths, suggesting that certain fields may be systematically more flexible, or "family friendly," than others. We see, for instance, that this difference remains, even when we take into consideration variation in a very rich set of observable characteristics, many of which we expect to be correlated with unobservable elements of taste important in both the labor supply decision and selection across careers. Furthermore, we find that women who worked in flexible jobs before they had children are 5 to 6 percentage points more likely to remain working after motherhood.

Although it is extremely difficult to rule out explanations based on selection, we find these results suggestive that the inflexibility of a woman's work environment plays a causal role in "pushing" her out of the labor force at motherhood. Our results therefore suggest that with improved work-family policies or changes to social norms, a smaller proportion of women might exit, or "opt out" of, the labor force at motherhood.

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Data Appendix

The Harvard college graduating classes of 1988 through 1991 included 6,764 students, of which 41 percent were female. This sample reflects those individuals listed in either their 10th or 15th anniversary reports, which includes anyone for whom the alumni association had a current or previous address, including parent's address. (For those who do not respond to the survey, the report lists only the name and address.) We focus on the 3,456 who responded to the 15th-year survey (51 percent of the sample overall, with a larger 55 percent of women).[41] Appendix Section A discusses the representativeness of the population who respond to the survey. Of these 3,456 graduates, 1,522 (44 percent) are women.

Our main sample is the 934 women who are married and have had their first child at the time of the 15th anniversary survey; Table A-1 reports additional summary statistics for this sample.[42] For 743 of these women (80 percent), we can supplement these data with additional information from their 10th anniversary survey. From these, we separately focus on the 286 women that we observe both 10 and 15 years after college, who had their first child between these two points, who provide labor force and occupation data at each, and who do not hold a PhD or MD.

Table A-1: **Additional Summary Statistics**

Graduate Degree:	**All**	**MD**	**PhD**	**JD**	**MBA**	**MA**	**None**
Minority (%)	16.6	24.5	11.6	17.0	21.1	11.6	12.5
Private high school (%)	35.7	32.7	32.6	35.8	40.6	36.7	35.3
Additional graduate degree (%):							
MA	14.0	20.1	22.2	13.8	8.7	7.2	-
non-MA	2.2	3.9	0.9	2.6	2.2	1.2	-
Child before graduate school (%)	3.4	0.6	0.9	5.1	2.9	6.0	-
Age gap with spouse:							
Older (%)	8.0	9.7	6.0	7.1	5.8	7.2	8.0
Years, if not older	1.4	0.9	1.2	1.5	1.6	1.8	1.2
	(2.7)	(2.2)	(2.4)	(3.5)	(2.9)	(2.8)	(2.5)
Spouse attended top-10 graduate institution (%)	48.3	36.2	48.5	45.1	64.2	43.0	56.0

NOTES: Reported mean (and for continuous variables, standard deviations).

For the purpose of our analysis, we define a woman's labor supply based on her self-reported current occupation, supplemented by information provided in her narrative.[43] For a

[41] This number includes 84 individuals captured because their spouse – a Harvard graduate in one of the four years covered – provided information for both. (We also use spouse data to supplement details missing from the self-reported information.) For those married to members of a different class, this means that the information reflects a period shortly before or after the 15th year.

[42] This excludes 27 mothers who are unmarried at the time of the 15th.

[43] Because we define 'at home' status based on current employment, women who report that they recently

small number of women, we infer that they are at home if they provide detailed information for their spouses' occupation, but none for their own. Or, if they listed two occupations, such as "Attorney, Mom", we assumed the second reflected her current situation and the first her occupation before leaving the labor force.

A Sample Selection into the 15th-Year Anniversary Report

We next consider the representativeness, among female Harvard graduates, of the population who respond to the 15th-year anniversary survey.[44] Table A-2 reports mean background characteristics available from the graduation yearbooks, comparing those women who are and are not observed in the 15th-year survey. Looking at the first set of columns, there is clear evidence that the women observed at the 15th year are a non-random sample of all Harvard graduates. In particular, if we use these background characteristics to predict who will respond to the survey, a χ^2 test of their predictive power is highly statistically significant. Comparing across background characteristics, the most striking difference is by race: whites are more likely to respond.

Because our analysis focuses on the comparison of women who choose different graduate programs, an important question is whether selection into the sample varies systematically among women of different education types. Unfortunately a direct comparison is infeasible because we cannot observe the graduate education of those women who do not respond. However as an indirect test, we can compare the response rates among Harvard graduates in the undergraduate majors that are the primary feeders for three of the graduate degrees considered: biology (MDs), political science (JDs), and economics (MBAs).[45] Because masters and doctoral degrees are granted across all fields, we have no similar means to compare reporting propensities for MAs and PhDs, or for those who get no additional schooling.

went back to work or that they anticipate leaving soon, are defined as 'at work'. Maternity leaves are coded as 'at work', but women who report that they are 'on leave' from their past position are coded as 'at home'.

[44] There is evidence that graduates who are married and/or have children are generally more likely to respond. For instance, taking the sample who report the year of their first birth in their 15th-year response, we can compare the 10th-year response rates of those who had their first birth in the 2 years prior to the 10th-year reunion, to those who have their first birth afterwards. In both genders we find higher response rates among the already-parents, although the difference is only statistically significant among men. Likewise, we see that among women (but not men), those who married recently before the 10th-year reunion are significantly more likely to respond, and among men (but not women), those who recently finished their primary degree are more likely to respond.

[45] Among all respondents to the 15th year survey who have an MD, 38 percent hold a BA in biology. Similarly, among observed biology majors, 66 percent go on to get an MD. Among observed MBAs, 23 percent studied economics, and 44 percent of observed economics majors get an MBA; among JDs, 15 percent studied political science, and 44 percent of political science majors complete a JD. (Among all observed JDs, a larger 23 percent studied English. Among observed English majors, however, although 24 percent complete a JD, this is followed closely by 23 percent who get an MA, and 23 percent who complete no graduate degree. For that reason we do not treat an English undergraduate degree as a feeder for a law degree.)

Table A-2: **Characteristics of Responders vs. Non-Responders to 15th-Year Survey**

	All Women			**Biology Majors (potential MDs)**			**Economics Majors (potential MBAs)**			**Political Science Majors (potential JDs)**		
Characteristic:	Respond		Do Not	Respond		Do Not	Respond		Do Not	Respond		Do Not
Race: (%)												
White	0.80	**	0.69	0.66	*	0.52	0.76	+	0.62	0.86	**	0.58
Asian	0.12	**	0.17	0.23	+	0.35	0.15		0.22	0.06	+	0.14
Other	0.08	**	0.14	0.10		0.13	0.08		0.16	0.07	**	0.26
Region in High School: (%)												
New England	0.24		0.25	0.20		0.22	0.33		0.25	0.31	*	0.17
Middle Atlantic	0.27		0.25	0.26		0.25	0.26		0.20	0.22		0.27
DC Region	0.06		0.06	0.06		0.03	0.04		0.02	0.04		0.06
South	0.10		0.09	0.09		0.11	0.08		0.07	0.10		0.08
Midwest	0.13		0.12	0.14		0.11	0.14		0.22	0.14		0.09
West (excluding CA)	0.04		0.04	0.08		0.07	0.04		0.00	0.06		0.05
California	0.12		0.12	0.13		0.15	0.09		0.04	0.11		0.17
Outside of US	0.04	**	0.07	0.05		0.05	0.03	**	0.20	0.02	*	0.10
Private High School (%)	0.33	+	0.37	0.23		0.32	0.28		0.27	0.27		0.31
Undergraduate Major: (%)												
Arts	0.04	+	0.06	-		-	-		-	-		-
English	0.22		0.20	-		-	-		-	-		-
Cultural Studies	0.09	*	0.12	-		-	-		-	-		-
Anthropology	0.07	**	0.04	-		-	-		-	-		-
History	0.11		0.10	-		-	-		-	-		-
Political Science	0.07		0.08	-		-	-		-	-		-
Social Studies	0.07		0.07	-		-	-		-	-		-
Economics	0.08	*	0.06	-		-	-		-	-		-
Psychology	0.09		0.09	-		-	-		-	-		-
Biology	0.10		0.10	-		-	-		-	-		-
Sample size:	1,337		932	128		95	109		55	94		77
Proportion observed:	0.59			0.57			0.66			0.55		
χ^2 **test of joint sig:**	0.00**			0.32			0.05+			0.03*		

NOTES:

These data exclude the 18 percent of women who we can not match between the anniversary surveys and yearbooks. Although not listed, we also include graduation class in the χ^2 calculations, but their inclusion has relatively little effect on the results. MBA response rates are significantly higher than all other majors combined (at the 5%level), and than either potential MDs or JDs (at the 10% and 5% levels, respectively). Significance levels are distinguished by + (significant at 10%), * (at 5%), and ** (at 1%).

The foot of Table A-2 compares the 15th-year response rates for all female graduates to the response rates for women in these three majors. As we see, potential MBAs are the most likely to respond. Their response rate is significantly higher than all other majors combined, and than either potential MDs or JDs. (This might reflect the nature of the business world relative to other career paths, if MBAs are more likely to view the anniversary surveys as a networking mechanism.) This higher response rate, however, does not translate into a more representative sample. We instead find that as with potential JDs, among potential MBAs, background characteristics can predict who will respond (significant at the 5 percent level), whereas among potential MDs the response rate appears more random.

In combination, these results show two things. First it is clear that our responding sample is not randomly drawn from the full pool of Harvard graduates. In particular, in direct contrast to the NSCG sample, our Harvard sample under-represents minorities. Furthermore, because our results suggest that minority women tend to work at higher rates, all else equal, our sample may therefore include a higher proportion of at-home mothers than among the full population of female Harvard graduates. (This may be tempered somewhat by the lower response rates among those who attended a private school, a characteristic that is instead associated with lower labor force participation among the observed sample.)

Our second result is that the level of selection likely varies across women who choose different career paths. For instance, based on the three degrees that we can match to specific undergraduate majors, we see that the observed sample of potential MDs is less strongly selected than the sample of either potential MBAs or potential JDs. Beyond the difference in reporting rates by race that is evident across all women, it is not obvious how these selection patterns will affect our overall results.

As a check, we therefore build a predicted probability of being included in our final sample – those women who respond to the 15th year anniversary survey and are married and have had a child by that point – based on characteristics observable at the time of graduation from college. We find that women included in our sample have a mean predicted probability of 0.40 of meeting these criteria, which is completely invariable across degrees (from 0.39 to 0.40). Furthermore, if we include this predicted probability as a control in the labor supply probits in Table 5, it has no effect on the variation across degrees, and is itself completely uncorrelated with labor force status.

B Selecting Parenthood

One worry in considering the effect of work environment on mothers' labor force participation is that work environment may influence the initial decision to have children. If some women in inflexible jobs respond by foregoing children, the average taste for kids among those who

become mothers will be higher among mothers from an inflexible environment. If this is then positively correlated with taste for time at home, mean labor force participation rates among those women will be driven downwards because of this stronger taste for time at home.

A first, indirect, test of whether work environment influences the decision to have children, is to compare across graduate degrees the proportion of women who are mothers. If, for instance, MDs are more likely to work in a flexible environment, this may translate into a larger proportion having children.

Using the full Harvard sample, we test whether the proportion of mothers varies by graduate degree. We find that MDs are most likely to have children, followed closely by MBAs (both rates significantly higher than the average overall), and PhDs are significantly less likely to be mothers. Since we see the highest rates of motherhood among MDs and MBAs - the former the group *most* likely to work, and the latter almost the *least* likely, if this difference in labor supply reflects systematic variation in flexibility, then by this admittedly weak test, there is no evidence suggesting that work environment influences the decision to have children.

For the Harvard longitudinal sample we can test this more directly. Expanding this sample to include women with no children (but who otherwise fit the criteria discussed in Section 2.1), we find that women who were in inflexible environments 10 years after graduation are equally likely to have children as those who were in flexible jobs. The proportion is likewise almost exactly equal just among the women with MBAs. Thus we again find no evidence that work environment influences the propensity to have children.

A second consideration is whether there is evidence of selection into parenthood on ability. If mothers are systematically positively selected, this will increase their marginal benefit of working and thus raise their labor force participation. If the level of selection varies across graduate degrees, this may drive some of the observed variation in work rates.

To test for such possible selection in the Harvard sample, for those women with a graduate degree we compare the proportion who attended a top-10 graduate program. By this admittedly noisy measure, in this sample we find no evidence of selection into parenthood on ability. The mean proportion who attended a top-10 graduate program is almost exactly equal among mothers and non-mothers, both for the sample as a whole and within each graduate degree.

Because the Harvard longitudinal sample focuses on mothers who have their first birth more than 10 years after graduation, we also consider whether there is evidence of selection

on ability into 'late' motherhood. For MBAs (and to a lesser extent MAs), we do find some evidence of positive selection. Whereas among 'early' MBA mothers only 56 percent attended a top-10 program, a significantly higher 79 percent of late mothers did so.

Comparing these late mothers to non-mothers, we generally find no difference in the proportion who attended a top-10 program by the flexibility of their 10th-year work environment. The one exception is again among MBAs. Among those who worked in an inflexible environment, 89 percent of the women who ultimately had children attended a top-10 program, compared to 71 percent of non-mothers (significantly different at the 10 percent level). There is no such difference among the MBAs who worked in a flexible environment.

In combination, these two findings suggest that within the longitudinal sample of Harvard mothers, the MBAs are an especially high-ability group. This selection may therefore bias downwards the level difference in labor force participation between these MBAs and the mothers with other graduate degrees.

C Distribution of Jobs by Degree 15 Years after Graduation

The following provides more detail on the types of jobs held by our Harvard sample, among those working 15 years after graduation:

- **MDs:** The majority of MDs work in specialties centered on women, children, and family: 31 percent in pediatrics, 13 percent in obstetrics/gynecology, and 8 percent in family medicine. The next largest specialties are psychiatry (6 percent), emergency medicine (5 percent), and surgery (5 percent). Among these women, all are working in jobs clearly related to their degree, as either practicing physicians or scientific researchers.[46]

- **PhDs:** Among the PhDs, 47 percent are tenure-track professors. The next largest groups are scientists working in industry (10 percent) and non-industry research settings (11 percent). An additional 11 percent are psychologists, 6 percent work in non-science industry jobs, 6 percent are writers, and 3 percent are in non-tenure track academic positions. Of all, roughly 20 percent work in jobs that may not necessarily require a PhD, for instance as school teachers, writers, or in certain industry jobs.

- **JDs:** The majority of JDs work in law firms (43 percent, of which 55 percent work at one of the 250 largest law firms in the country) or as corporate counsels (14 percent). The remainder work primarily in nonprofit or public-sector environments: 15 percent

[46] Among MDs we can only observe the specialty for 70 percent, whereas for the other degrees we can use occupation or firm to distinguish the field for over 90 percent of those working.

within government, 9 percent in academia, and 11 percent for other nonprofit institutions.[47] Of all, only 8 percent work in positions that might not require a JD, primarily in business or certain public policy positions.

- **MBAs:** Among MBAs, the two most common occupations are in the financial sector (27 percent) and consulting (17 percent). An additional 31 percent work in industry: 13 percent in technology, 10 percent in biotechnology/pharmaceuticals, and 8 percent in other industries. Thus 75 percent of MBAs work in finance, consulting or industry. Only 20 percent work for nonprofits, including 7 percent in education (as teachers or otherwise associated with educational institutions).[48]

- **MAs:** By comparison, more than half of MAs work in nonprofit environments or the public sector: 24 percent in education (of which only one-third are teachers), 9 percent in healthcare, 15 percent in other nonprofit institutions, and 5 percent in other government positions.[49] Only 7 percent work in consulting, 4 percent in finance, and 6 percent in industry. An additional 6 percent work in news, 5 percent in architecture, 5 percent in publishing, and 10 percent as artists or writers.

- **No Degree:** The occupation and sector mix of women with no graduate degree reflects a mix of those observed among MBAs and other MAs. For instance, like MBAs, the largest proportion work in the financial sector (16 percent), and an additional 5 percent work in consulting and 20 percent in industry. Like MAs, however, many (24 percent) work in nonprofit environments or the public sector, including 10 percent in education and 11 percent in other nonprofits. An additional 6 percent work in publishing, 6 percent in news, and 5 percent in advertising, plus 16 percent as artists or writers.[50]

D Estimating Wages and Spouse's Salary

Despite this rich professional data, we lack information on salaries and wages. We therefore had a career consultant build imputed salaries, for both mothers and their spouses, based on self-reported education, location, occupation, and firm. He used sources such as the Bureau of Labor Statistics' Occupational Employment Statistics, information from the Chronicle of Higher Education, and online sources such as CareerJournal.com, PayScale.com, Vault.com, and Indeed.com. For example, to determine the salary of an assistant US attorney, he

[47] Among women observed 10 years after graduation who have not yet had children, a higher fraction (55 percent) worked at a law firm (57 percent of these in large firms) and 8 percent as corporate counsels, compared to 22 percent in government, 7 percent in nonprofits, and 5 percent in academia.

[48] At the 10th, 92 percent of not-yet-mothers work in finance, consulting or industry – 26 percent in finance and 28 percent in consulting – and only 5 percent work for education or other nonprofit institutions.

[49] Among non-parents observed at the 10th, a similar half work in the public or nonprofit sectors.

[50] Among non-parents observed at the 10th, 37 percent work in finance, consulting or industry, and only 19 percent are in nonprofit or public sector jobs.

used salaries reported on a Justice Department website for attorneys with similar years of experience. All salaries are updated to year 2000 dollars using the Consumer Price Index for all urban consumers (US city averages for all items).

Because these salary estimates are based on occupation-specific averages, one worry is that they will systematically understate the salaries received by this population of Harvard graduates. As a rough comparison, we can compare our values to those reported for women in the Harvard & Beyond sample (Goldin and Katz 2008). They report a mean 2005 full-time/full-year salary of $99,500 (in year 2000 dollars), although because this reflects a combined value for cohorts graduating in approximately 1970, 1980, and 1990, it may be a poor estimate of the salaries received by the youngest cohort.[51] By comparison, doing a back-of-the-envelope calculation, we estimate average annual salaries of $106,000.[52] Thus from this (admittedly poor) comparison we see no evidence that our starting salaries are systematically too low for the female Harvard graduates.

Likewise, if we compare our wage estimates for the working population of Harvard mothers to the wages of working mothers in the NSCG (with Harvard wages calculated via the method described below), the Harvard wages are systematically higher.[53] Thus although the building blocks for our salary estimates are based on occupation-specific averages, Harvard women are clearly distributed across a different, higher-paid, set of jobs.

Even if our initial salary estimates are too low for this population of women, this is only problematic if the relative understatement varies across graduate degrees. Unfortunately Goldin and Katz (2008) does not provide average salaries by degree. The only data available for a relevant comparison group (in terms of age, cohort, and education quality), that provides information by specific degree, are data for a recent cohort of graduates from the Booth School of Business at the University of Chicago (Bertrand *et al.* 2010).

Bertrand *et al.* report significantly higher earnings for MBA mothers than our estimates for these Harvard graduates. Measured 8 years post-MBA (approximately 15 years after

[51] It is unclear whether this suggests that this number over- or under-states the earnings received by the 1990 cohort. If there is a strong earnings gradient in experience, mean 1990 cohort salaries may be lower; but if recent cohorts have greater representation among high-paying positions, 1990 salaries may be higher.

[52] As discussed below, our initial salary estimates reflect "gender-neutral" values. This average uses a back-of-the-envelope calculation of "gendered" salaries by applying our motherhood wage gap values to our initial gender-neutral salaries (thus ignoring the differences in labor supply by parental status). See below for greater detail on how we calculate these wage gap ratios.

[53] For instance, using the sample described in footnote 16, MDs earn on average $52 per hour (in year 2000 dollars), JDs and MBAs earn $41 to $42 per hour, and MAs and women with no graduate degree earn $26. (These calculations use 2002 earnings and 2003 average weekly hours, assuming 50 weeks worked per year, and excludes values for women working fewer than 10 hours per week, and wages of less than $6 per hour or greater than $300.)

college, given their average age at entry), they find mean and median annual salaries of $192,000 and $138,000, respectively (in year 2000 dollars). Given reported labor supply levels, these translate roughly into mean and median hourly wages of $79 and $61, both of which are higher than our estimated hourly wage of $50. Yet if our wage values for these MBA women are especially understated compared to our estimated wages for the other degree groups, this will only dampen our result that MBA women are less likely to work.

This potential understatement of earnings may be more problematic in terms of spouse's salaries. Goldin and Katz (2008) report average annual salaries of $165,300 for men in the Harvard & Beyond sample. (Again, because this value reflects information for all three cohorts, in this case this likely overstates the earnings of the youngest generation.) By comparison, looking only at the Harvard women who are married to Harvard men, our mean estimated spouses' salaries are much lower at $123,900.

Furthermore, given the high rate of intermarriage by graduate degree, this may be especially important if we are systematically understating the earnings of MBA men. Goldin and Katz find especially high salaries for the MBA men[54], and likewise, Bertrand *et al.* (2010) find mean and median earnings of $337,000 and $177,000, respectively. By comparison, we estimate average salaries of $120,800 for Harvard-graduate spouses holding MBAs.

Thus, potential underestimation of earnings for husbands holding MBAs may help explain the especially low labor force participation rates observed among our sample of Harvard MBA women. Yet given the size of the level differences, and the fact that they remain after controlling for spouse's graduate degree, it seems highly unlikely that it would explain the full effect. Furthermore, in a sensitivity analysis in which we instrument for spouse's salary using distribution dummies, and force into the top 5 percent those spouse's with job titles suggesting especially high earnings, the degree coefficients are unchanged.[55]

Taking these salary estimates as our starting point, note that since we did not provide gender or parental status to our career consultant, our values reflect "gender neutral" salaries. (We did not want him to incorporate his own statistical discrimination into these numbers.) To translate these salaries into "gendered" wages for our population of Harvard women, we use the following approach. (Because most of the Harvard spouses work in generally male fields, we do not adjust their salaries.)

- To provide a population at roughly the same stage of their careers as our Harvard sample, we use an NSCG sample of men and women ages 30 to 45 (and otherwise

[54]Personal communication with Lawrence Katz, December, 2008.

[55]Before this adjustment, more than half of the men in this group are MDs (with mean estimated earnings of over $300,000); in this adjustment we re-categorize 21 men, of which 19 hold MBAs.

selected as described in footnote 16). We then create detailed graduate degree and occupation groupings to capture the types of jobs observed among our Harvard women.

- We calculate average weekly hours using the full sample of men and women in a given degree/occupation group. Assuming 50 weeks worked per year, we apply these numbers to our gender-neutral Harvard salaries to create "gender-neutral" wages.

- Because much of the gender wage gap arises only after children (Bertrand *et al.* 2010), within each degree/occupation group we calculate separate measures of the gender wage gap for women with and without children. In particular, we use the NSCG data to calculate two ratios: the average experience-adjusted wages of women with children compared to the average wage overall, and likewise the average experience-adjusted wages of women without children compared to all. We apply these ratios to our "gender neutral" values to calculate "gendered" wages.

- For doctors, because the NSCG lacks area of specialty (*e.g.*, pediatrics), to calculate "gender-neutral" hourly wages we rely on average weekly hours data per specialty as reported in the American Medical Association's *Physician Socioeconomic Statistics, 2000-2002*. Because this source does not provide salary data by gender and parental status, we must rely on the NSCG data to transform these into "gendered" wages. There exist large differences in gender distribution across medical specialties, however, and likewise large differences in salary by specialty.[56] We therefore build the wage ratio for mothers by comparing their average wages to average wages for all *female* doctors. This effectively assumes that the distribution across specialties is the same for female doctors, regardless of parental status, and that the scaling ratio is 1.0 for non-moms.

- For MBAs, the NSCG captures too few women who work in high-level management positions to distinguish across sectors (we group finance and consulting, high tech and other science-related industries, and all other fields). Because high-level MBAs work longer hours, we use average hours for this combined set to calculate gender-neutral wages. To scale these into "gendered" wages, we then use wage ratios calculated separately for the three sectors, after combining the high- and non-high level MBAs.[57]

The first lines of Table A-3 lists our initial gender-neutral salary estimates for the working Harvard women, and our subsequent "gendered" wage values. These represent year 2000

[56]For instance, among our Harvard sample, 27 percent are pediatricians (with an average gender-neutral estimated salary of $136,000) and 5 percent are surgeons (estimated salary of $219,000). By comparison, among the full population of doctors reported in the *Physician Socioeconomic Statistics, 2000-2002*, 11 percent are pediatricians and 19 percent are surgeons.

[57]This provides scaling ratios of 87 to 91 percent. These line up well with an estimated scaling ratio of 88 percent calculated using median hours and salary data for the MBA graduates of Chicago's Booth School of Business (Bertrand *et al.* 2010).

dollars, calculated using the Consumer Price Index for all urban consumers (US city averages for all items).

To estimate wages for the non-working women and those with missing values, we use the following approach.[58] We begin by estimating a woman's predicted probability of working, $\hat{p}$, built from a specification that excludes wages. To allow for selection out of the labor force, we split the sample by the degree-specific medians of $\hat{p}$, and estimate wages separately within each half of the distribution.[59] The controls in the wage equation include graduate degree, years experience since completing that degree, 10th-year wage interacted by degree, and region. Table A-3 reports mean predicted log hourly wages, both for the sample as a whole, and separately for those women working and those at home.

Table A-3: **Harvard Sample Earnings and Wage Estimates**

	All	**MD**	**PhD**	**JD**	**MBA**	**MA**	**None**
Salary and Wage Estimates at 15th (2000$):							
If working:							
Gender-neutral	115.2	166.5	70.0	136.1	138.6	66.1	80.7
salary ('000s)	(74.9)	(59.5)	(27.5)	(69.5)	(107.4)	(39.8)	(51.8)
'Gendered' hourly	43.32	58.11	29.24	48.10	49.63	30.91	34.95
wage	(24.57)	(20.92)	(10.83)	(21.15)	(37.18)	(16.32)	(19.91)
Predicted log wage:	3.61	4.00	3.33	3.77	3.76	3.29	3.44
	(0.32)	(0.16)	(0.16)	(0.21)	(0.27)	(0.19)	(0.12)
If working	3.63	4.00	3.33	3.78	3.78	3.30	3.45
	(0.33)	(0.17)	(0.16)	(0.22)	(0.29)	(0.19)	(0.12)
If at home	3.53	4.03	3.36	3.74	3.71	3.25	3.41
	(0.28)	(0.11)	(0.18)	(0.17)	(0.21)	(0.18)	(0.13)

NOTES:

Reported mean (and standard deviations) of a subset of the controls included in the specifications in Table 5. (See the notes to Table 6 for the full set of controls.)

E Other Variable Definitions

Lastly, for other variable definitions:

- For women with more than one graduate degree, we categorize the professional degrees (JD, MBA, or MD) as the primary degree, or define the primary degree based on its alignment with their occupation. For instance, women with an MD/PhD who are practicing doctors are

[58] For 10 percent of those working, we lack 15th-year salaries because we lacked sufficient occupation data.

[59] This amounts to assuming selection on observables, and is in the spirit of Blau and Kahn (2007), who use only women who work fewer than 20 hours per week to predict wages for women who are out of the labor force. As an alternative approach we estimate wages including the whole sample, thus assuming no selection. The results are qualitatively similar throughout the analysis.

categorized as an MD. We define an LLM, masters of law, as a JD for those practicing law with no additional law degree. When controlling for extra degrees, we exclude those MAs that appear to be an intermediate step towards a completed PhD.

- We define gender, as well as race and ethnicity, as best estimated from yearbook photos and graduates' names.

- For MDs, JDs, and MBAs, we define top-10 graduate programs using the *U.S. News and World Report* professional school rankings for 2001. Because we often lack specific field for many PhDs and MAs, we define top-10 status based on the *U.S. News and World Report* 2001 rankings for top research universities. Likewise, for the spouses, we define the top 20 undergraduate programs using the 2001 rankings of the top 15 research universities and the top 5 liberal arts schools (excluding all-women's colleges).

- We define an undergraduate major as small if fewer than 50 individuals graduated in that major, using the full sample of graduates from the classes of 1988 through 1991 that we can observe in the graduation yearbooks.

- We define own and spouse's age based on year of graduation from college, assuming all were 22 at the time. We define spouses to be of the same age if, by this measure, they are the same age, or $+/-1$ year.

- We use Peterson's *Private Secondary Schools* and the yearbook information on the high school attended to distinguish which graduates attended a private school.

- We classify the top 25 cities, using 1990 population, as our measure of 'big' cities.

- We define a person as having grown up in a 'low-density' state if their state of residence in high school had a year 2000 density of fewer than 100 people per square mile.

- To estimate whether the first child is born before graduate school, we estimate average schooling lengths as follows: for PhDs we assume 8 years for the humanities, 7 years for the sciences, 10 years for education, and 6 years for economics (Russo 2004; Berger 2007). We assign a length of 8 years for those with an unknown field, but, as with all degrees, we bound the length to have begun at the year of college graduation. For professional non-business masters we assume 2 years, except for architecture degrees (3 years) and British degrees (1 year). For those with an MA or MS in an undefined field, where some of these degrees will reflect 2-year programs and others longer, unfinished PhDs, we assume an average length of 2.5 years. Most of the women estimated to have had their first child before entering graduate school attended programs with concrete lengths (JDs and specific MA programs).

F Other Tables

Table A-4 lists the firms included in *Working Mother* Magazine's 2001 list of "Best Places" to work, and the Yale Law Women's 2004 list of "Top-10 Family Friendly Firms". This section then reports the results of predicting graduate degree type (Table A-5) and, given graduate degree, 10th-year work environment (Table A-6), based on characteristics observable at graduation from college (C_i).

Each column of Table A-5 reflects the coefficients from a different probit regression in which the dependent variable is whether a given woman i has a specific graduate degree, *e.g.*, a JD. As expected, we see that biology majors are especially likely to get an MD, economics majors are especially likely to get an MBA, and political science majors are especially likely to get a JD. We also find, however, that other factors are correlated with this choice, such as region of residence and race. Notice, for instance, that graduates who grew up in DC are much more likely to get a JD.

Table A-6 reports the coefficients on C in an OLS prediction of 10th-year work environment, F_{i10}, using our longitudinal sample. We include as necessary interactions between individual elements of C and graduate degree S_j.[60] The first column reports the marginal effect for factors that are not interacted by degree; the following four columns report the coefficient on the interaction term between the given control and each graduate degree.

Table A-6 shows that the factors observable at college graduation are clearly related to the types of jobs women hold 10 years later. For instance, undergraduate major has a strong relationship with whether a woman subsequently works in a flexible job, although the direction of sorting varies across degrees. For instance, we see that JDs who study the social sciences (*e.g.*, political science, economics, and psychology) are more likely to choose flexible jobs compared to those who studied English or history (the other majors common among JDs). By comparison, among MAs, whereas those who studied other social sciences (*e.g.*, anthropology) are more likely to choose flexible jobs, those who studied economics are not. Place of origin and sports participation are also related to subsequent job choices, again at times with varying effects across graduate degree groups.

[60] We include interactions only in those instances in which at least one interaction term is individually significant, and significantly different from another interaction term. We also only consider interactions for those elements of C which have a sufficient distribution across degrees (at least 5 women in each C x degree cell).

Table A-4: **Family-Friendly Firms**

Abbott Laboratories	First Tennessee Bank	Patagonia
ABN AMRO North America	Fleet Boston Financial	Paul Hastings*
AFLAC	Ford Motor	Pearson Education
Allstate Insurance	Genentech	Pfizer
American Airlines	General Mills	Phoenix Companies
American Express	General Motors	The PNC Financial Srvs Grp
American Home Products	Gibson, Dunn & Crutcher*	PricewaterhouseCoopers
Arnold & Porter**	GlaxoSmithKline	Principal Financial Group
Arthur Andersen	Goldman Sachs	Procter & Gamble
Bank of America	Hewlett-Packard	Prudential Financial
Bank One	Hoffman-La Roche	Republic Bancorp
Baptist Health South Florida	Household International	Ropes & Gray*
Bausch & Lomb	IBM	SAS Institute
Bon Secours Richmond Health	Inova Health System	S.C. Johnson & Son
Booz Allen Hamilton	Johnson & Johnson	Schering-Plough
BP America Upstream	JPMorgan Chase	Sears, Roebuck and Co.
Bristol-Myers Squibb	KPMG	Security Benefit Group
BryanLGH Medical Center	Kraft Foods	Simpson Thacher*
Carlson Companies	Lincoln Financial Group	The St. Paul Companies
Cigna	Liz Claiborne	State Street Corporation
Cinergy	Lucent Technologies	Sun Microsystems
Cisco	Marriott International	Synovus Financial
Citigroup	MBNA America Bank	Target
Cleary Gottlieb*	McDonalds Corporation	Texas Instruments
Computer Associates	Merck & Co.	TIAA-CREF
Corning	Merrill Lynch	Toms of Maine
Covington & Burling*	MetLife	TRW
Cravath, Swaine & Moore*	Morgan Stanley	Union Pacific Railroad
DaimlerChrysler	Morrison & Foerster	United Airlines
Debevoise & Plimpton*	Mutual of Omaha	USAA Life Insurance Co.
Deloitte & Touche	New York Life Insurance	The Vanguard Group
Discovery Communications	The New York Times	Verizon/Verizon Wireless
Eastman Kodak	Northern Trust	Vivendi Universal
Edward Jones	Northwestern Memorial	Wachovia
Eli Lilly	HealthCare	West Group
Ernst & Young	Novant Health	Wilmer Hale*
Fannie Mae	Novartis Pharmaceuticals	Zurich North America

NOTES:

Law firms marked with * reflect those included on the 2004 list of 'Top 10 Family-Friendly Firm', as designated by the Yale Law Women. The remaining firms are those included on the 2001 *Working Mother* Magazine's list of 'top 100' places to work. Firms listed with ** appear on both lists. *Working Mother* ranks corporations both by the number and types of work-family benefits offered, and by the proportion of employees who use them. We use the October 2001 rankings as roughly representative of the period 10 to 15 years after graduation for our cohorts. The Yale Law Women's listing can be found at http://media.gibsondunn.com/fstore/pubs/YaleTop10.pdf, and is based on a 2004 student-run survey.

Table A-5: **Predicting Graduate Degree**

	MD	**PhD**	**JD**	**MBA**	**MA**	**None**
Undergraduate Major: (excluded = English)						
Biology	0.613***	0.032	-0.203***	-0.061	-0.131***	-0.143***
	(0.066)	(0.041)	(0.019)	(0.037)	(0.025)	(0.022)
Other sciences &	0.047	0.310***	-0.146***	-0.088**	-0.051	-0.038
engineering	(0.075)	(0.095)	(0.028)	(0.038)	(0.050)	(0.053)
Psychology	0.087	-0.006	-0.094***	0.046	0.032	-0.030
	(0.060)	(0.032)	(0.035)	(0.052)	(0.049)	(0.041)
Economics	-0.069*	-0.057**	-0.100***	0.371***	-0.104***	0.003
	(0.041)	(0.023)	(0.035)	(0.077)	(0.030)	(0.048)
Political science	-0.064	-0.055**	0.241***	0.080	-0.105***	-0.088**
	(0.047)	(0.024)	(0.078)	(0.065)	(0.031)	(0.035)
Anthropology	0.218***	-0.042	-0.158***	-0.086**	0.192**	-0.041
	(0.080)	(0.026)	(0.025)	(0.034)	(0.075)	(0.044)
Other social studies	-0.094**	-0.036	-0.002	0.188**	-0.029	-0.021
	(0.038)	(0.031)	(0.057)	(0.080)	(0.048)	(0.051)
History	0.091	-0.019	0.029	0.041	-0.085***	-0.022
	(0.060)	(0.030)	(0.050)	(0.050)	(0.032)	(0.041)
Played sports	-0.002	-0.047**	-0.041	0.036	0.064**	-0.014
in college	(0.030)	(0.020)	(0.031)	(0.028)	(0.032)	(0.028)
Minority	0.077*	-0.068***	0.035	0.051	-0.020	-0.045
	(0.044)	(0.017)	(0.042)	(0.038)	(0.036)	(0.033)
Region in High School: (excluded = California)						
District of Columbia	-0.076*	0.014	0.203**	0.016	0.021	-0.119***
	(0.042)	(0.049)	(0.096)	(0.065)	(0.063)	(0.028)
South	-0.055	0.021	0.202**	0.080	-0.115***	-0.077*
	(0.045)	(0.049)	(0.092)	(0.072)	(0.032)	(0.040)
Midwest	-0.023	0.003	0.125	0.049	-0.090**	-0.048
	(0.049)	(0.041)	(0.080)	(0.062)	(0.038)	(0.044)
Pseudo R^2	0.24	0.17	0.14	0.15	0.12	0.07

NOTES:

Each column reflects the coefficients from a different probit regression in which the dependent variable is whether each woman holds a specific graduate degree (*e.g.*, a JD). The sample used ($N = 829$) excludes those women that we cannot observe in the graduation yearbooks. We also include as right-hand side variables majoring in arts or cultural studies, or more generally in a small major, year of graduation, undergraduate dorm, private high school attendance, whether an individual grew up in a top-25 city or in a low-density state, or in the northeast, mid-Atlantic, the west (other than CA), or outside the U.S. We report the marginal effects (with standard errors in parentheses). Significance is defined as ***, **, and * significant at the 1%, 5%, and 10% level, respectively.

Table A-6: **Predicting a Pre-Birth Flexible Work Environment**

	All	JD	MBA	MA	None
Graduate degree		0.323	-	0.315	0.520**
(excluded = MBA)		(0.206)	-	(0.216)	(0.221)
Extra MA		0.036	0.330*	0.598***	-
		(0.138)	(0.176)	(0.187)	-
Undergraduate Major: (excluded = English)					
Sciences	0.082				
	(0.165)				
Arts	0.423***				
	(0.135)				
Economics		0.311*	-0.091	-0.095	-0.160
& social studies		(0.161)	(0.142)	(0.210)	(0.250)
Other social		0.252*	-0.082	0.293**	0.011
sciences		(0.133)	(0.180)	(0.133)	(0.156)
Played sports in college		-0.219*	0.022	-0.272**	0.089
		(0.119)	(0.122)	(0.122)	(0.169)
Race: (excluded = Caucasian)					
Asian	0.006				
	(0.100)				
Other minority	-0.022				
	(0.146)				
Region in High School: (excluded = Midwest)					
Massachusetts		-0.045	0.074	0.078	-0.576**
		(0.155)	(0.165)	(0.170)	(0.229)
New York City	-0.063				
	(0.175)				
Other mid-Atlantic	0.196				
	(0.122)				
California		-0.313	0.226	0.393*	-0.469*
		(0.213)	(0.211)	(0.209)	(0.247)
Big city	-0.128				
	(0.101)				
Low-density state	-0.130				
	(0.120)				

NOTES:

Results reflect coefficients from an OLS regression predicting the probability of working in a flexible environment 10 years after college, given one's graduate education and factors observed at college graduation. (Also included, but not shown here, include undergraduate dorm dummies, completing an additional (non-MA) degree, majoring in history or cultural studies or choosing a small major, attending a private high school, and growing up in Washington, D.C., outside the U.S., or in the the remainder of the northeast, the south, or the west, and graduation class interacted by degree.) The first column reports the marginal effect for factors that are not interacted by degree; the following four columns report the coefficient on the interaction term between the given control and each graduate degree. The sample included are the 286 women in the Harvard longitudinal sample. The R^2 and adjusted R^2 are 0.42 and 0.23, respectively. Statistical significance is indicated by * at 10%, ** at 5%, and *** at 1%.