Opt-Out Patterns Across Careers: Labor Force Participation Rates Among Highly Educated Mothers*

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Abstract

This paper examines the propensity of highly educated women to exit the labor force at motherhood. We focus on systematic differences across women with various graduate degrees to analyze whether these speak to differences in the capacity to combine children with work over a variety of high-education career paths. Working with a sample of Harvard alumnae observed 10 and 15 years after graduation, we find that the labor force attachment of mothers at the 15th year is highest among MDs (94 percent) and lowest among MBAs (72 percent) and women with no advanced degree (69 percent). We then use a rich set of biographical information on the alums, combined with data on their workplaces, to try to disentangle whether the working patterns observed reflect selection on the types of women pursuing different graduate degrees or variation in the difficulty of combining work with family along different career paths. While we ultimately cannot rule out all explanations based on selection, our results suggest that work environments contribute to women's decision to exit the labor force at motherhood.

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1 Introduction

Recent statistics suggest that the long and steady increase in female labor force participation over the second half of the 20th century began to level off in the late 1990s and early 2000s (Mosisa and Hippie, 2006; Goldin, 2007). This has led to considerable speculation as to whether the "natural" rate of female labor force participation had been achieved by this point, whether this was instead a temporary slow-down driven by current economic conditions, or whether there were remaining policy, cultural, or social changes that would help accommodate more women in the workforce.

Accompanying this slowdown in overall female labor force participation, recent media reports have highlighted the propensity of highly-educated women to exit the labor force at motherhood. This discussion hit the popular radar screen most prominently with the publishing of two cover articles, the "Opt-Out Revolution" in the *New York Times* magazine (2003) and "The Case for Staying Home" in *Time Magazine* (2004), which both focused on the choices of highly-educated 30-somethings (Belkin, 2003 and Wallis, 2004). In 2005 another *New York Times* front-page story focused on current female undergraduates at elite colleges, many of whom professed a desire to put their careers on hold once they had children (Story, 2005).

These reports have sparked heated debates. Some argue that these trends imply lower social returns to investment in female education, suggesting that fewer women should be admitted to elite colleges and professional schools. (See, for example, the online debate between Gary Becker and Richard Posner.[1]) Meanwhile, the number of women earning professional degrees and doctorates has grown much more quickly than the number of men.[2] Others have responded by calling for changes to policies that discourage women from combining motherhood with career (Hewlett, 2007).

[1]See http://www.becker-posner-blog.com/archives/2005/09/ for Posner's initial comments, and http://www.becker-posner-blog.com/archives/2005/09/comment_on_care.html for Becker's response.

[2]For instance, the number of males earning doctorates rose by 7 percent from 1995-96 to 2005-06, compared to 54 percent among women, and more women are projected to earn doctorates than men by 2010 (National Center for Education Statistics, 2007).

These varying reactions rest on fundamentally different views of the drivers of mothers' labor force participation. The central question underlying the debate is the extent to which women are inherently more likely to exit the labor force at parenthood, for instance because of a potentially higher taste for time at home, or whether there remain elements of the work environment, perhaps mutable with different policies or cultural norms, that are associated with higher female exit rates.

This paper uses a unique data set on highly-educated women to shed light on the factors influencing mothers' labor supply choices. Specifically, using detailed data on nearly 1,000 women who graduated from Harvard College in the late 1980s and early 1990s, we analyze their labor force participation rates at the time of their 15th college reunion, when they are approximately 37 years old.[3]

We begin with the observation that there are large differences in labor force participation rates across mothers based on the type of advanced degree they earned. For example, 94 percent of the women who completed MDs are still in the labor force, compared to 72 percent of the MBAs and 69 percent of the women with no advanced degree. We aim to assess the extent to which this pattern speaks either to inherent differences in the set of women who pursue a particular post-college career path (*i.e.*, selection), or to differences in the types of jobs to which these degrees lead (*i.e.*, treatment).

A benefit of our data set is the enormous richness in the individual-specific information available for these women. These data include information on each alumna's college and high-school experience, her post-graduate education, marital information including her spouse's education and occupation, and her family structure. Given the rich information we have on each mother's professional life, we also develop imputed (gender-neutral) salary estimates for

[3]Goldin and Katz (2008) report preliminary results from a large data collection effort on several cohorts of Harvard and Radcliffe graduates (the Harvard and Beyond study). Their study depicts broad trends in various schooling, family and work choices made by men and women graduating around 1970, 1980 and 1990. Our analysis relies on a different data source than the 'Harvard and Beyond' data, although our sample overlaps with their 1990 cohort of people who graduated from Harvard between 1989 and 1992. See Section 3 and Appendix A for a more detailed discussion of our data sources.

each woman and her spouse based on reported education, occupation, firm and geographic location.

After discussing a theoretical model of the elements that factor into each woman's labor supply decision at motherhood, we use the Harvard data to assess whether systematic differences across career paths can be explained by variation in women's characteristics. For example, MDs earn more than their counterparts, so they face a higher opportunity cost of exiting the labor force at motherhood. Yet because many MDs marry other MDs, their spouses' salaries are also high, which instead accentuates the difference in their propensity to work.

Ultimately, even controlling for a rich set of variables, some of which speak directly to observable differences across women that we expect to build into the labor supply decision, and others which may capture tastes for work or remaining at home, the level differences in labor force participation by advanced degree remain almost unchanged.[4] The large and statistically significant differences in the propensity to remain working across women who pursue different post-college career paths may speak to systematic differences in the family-friendliness of the jobs to which these careers lead.

We next directly address this question of how a woman's work environment affects her labor supply decision at motherhood by considering how variation in the family friendliness of jobs impacts women's propensity to exit the labor force. To do this, we focus on women who we observe at both the time of their 10th and 15th reunions, and who had their first child between the two. Given the rich professional information available, including occupation and firm, we build a measure of the family friendliness of a woman's work environment. For instance, for women with MBAs, JDs, or MAs and for those with no advanced degree, we define as family friendly those jobs in the public or nonprofit sectors, as well as positions in firms that have been labeled family-friendly within their field. Using this data, we show

[4]Because we are focusing on a very homogenous group of women – not only are they all college-educated, but they all attended the same elite school and are all observed exactly 15 years after graduation – our data by construction mitigate many of the selection problems at the individual level.

that women who worked in family friendly environments before motherhood are much more likely to remain in the labor force afterwards.

Several caveats are in order in interpreting our results. First, our analysis focuses on a very specialized subset of mothers. For example, because Harvard women tend to marry highly educated and well-paid men, many can afford to stay home, an option that is less feasible for the full population of mothers, even those on the same high-education career paths as these women. Yet even if our sample is more likely to *respond* to relative differences in family-friendliness by choosing to stay home, our results likely speak to general differences in the pressures faced by working mothers in these different career paths. Furthermore, we might expect Harvard-educated women to work in positions with greater benefits and professional standing, suggesting that they should have *greater* capacity to adjust their work environment in response to kids. And similarly, because they have higher earnings, and are potentially the primary wage earner in their families, they may also have greater parity with their spouses in home production.

Second, note that because we observe women in their late 30s, we are unable to address patterns in "opt-in", or re-entry into the labor force. As discussed in much of the popular press on this topic (*e.g.*, the *Time Magazine* article, Wallis, 2004), the majority of those women who leave the labor force at motherhood intend to return. Thus it is possible that the variation in labor supply patterns that we observe among women in their late 30's is associated with the ease with which women in different fields can re-enter the labor force. Yet as reported by Hewlett *et al.* (2005), it is much easier to leave the labor force than to return. Thus if women's expectations are overly-optimistic, labor force participation in the late 30s is likely a strong predictor of future employment outcomes.[5]

More importantly, it is extremely difficult to rule out explanations based on selection. While we benefit from a rich and diverse set of individual-specific controls, our data lack

[5]Several years of missed income can also have large effects on the returns to education. As reported by Hewlett *et al.* (2005), women who leave and then re-enter the labor force on average lose about 20 percent of their earnings power, a figure they suggest is higher among women in the business sector.

precision in some important areas. For instance, our salary figures are imputed, and because of the coarseness of our measure of family friendliness, it may indirectly capture other elements of the work environment that enter into women's labor supply decisions.

Nonetheless, considering both our inability to explain the observed differences in labor supply across advanced degree categories, and our results on the importance of the family friendliness of a woman's job in explaining work propensity after motherhood, our results are consistent with the view that a mother's work environment and job opportunities influence her decision about whether to remain in the labor force. Put more strongly, our results suggest that improved family friendly policies or changes to social norms could drive labor force participation of women closer to parity with men.

This paper proceeds as follows. We begin in Section 2 by laying out a framework for the female labor force participation decision, and the related selection decision across career paths. Section 3 then describes our data, including discussing the types of career paths observed among women with different graduate degrees. Sections 4 and 5 then follow with our main results. The first establishes that the significant differences in the labor force participation rates of mothers by advanced degree are robust to controlling for a large number of person-specific characteristics; the second describes results that include a measure of the family friendliness of a woman's work environment. Given these results, in Section 6 we discuss some possible interpretations of our findings, and in Section 7 we conclude.

2 Model of the Underlying Question

There is a vast literature on married women's labor supply, most of which focuses on estimating levels and changes in income and substitution effects (see, for recent examples, Goldin, 2007, and Blau and Kahn, 2005). Recent papers have also focused on variables outside of the traditional economic model, including gender role attitudes (Fortin, 2005), social learning (Fogli and Veldkamp, 2008) and inter-generational preference transmission (Fernandez and Fogli, 2005).

A small set of papers have analyzed the impact of a woman's work environment on her decision to remain in the labor force (see Nielsen, Simonsen and Verner, 2004 and Berg, Kalleberg, and Appelbaum, 2003), and another set focus on the effect of labor force interruptions for women in high-education career paths (for instance Judiesch and Lyness, 1999, and Schneer and Reitman, 1997). The underlying complication in each of these analyses is distinguishing the treatment effect of a woman's work environment, given underlying selection patterns.

To see this, following Heckman (1974), suppose a given woman i bases her labor supply decision on the relative value of her marginal hour at work (w_i) and her marginal hour at home (w_i^*):

$$w_i = b_0 + \textstyle\sum_j b_{1j} S_{ij} + b_2 Z_i + \nu_i,$$
$$w_i^* = \beta_0 + \beta_1 h_i + \beta_2 Y_i + \beta_3 A_i + \beta_4 K_i + \varepsilon_i.$$

In the wage equation, S_{ij} reflects her graduate degree of type j (e.g., MBA or MD) and Z_i reflects other factors that enter into her offered wage. And the elements of the reservation wage include hours worked (h_i), husband's salary (Y_i), non-earned income (A_i), and a vector reflecting the number and age structure of her children (K_i).

The general practice in comparing these relative values is to assume that a given woman works, $h_i > 0$, if the offered hourly wage is greater than the reservation wage assessed at $h = 0$, $w_i > w_i^*(0)$. Such a woman will then choose her optimal labor supply, h_i^*, where the two equations are just equal.

Yet this assumes that women have perfect control of their hours worked. Suppose, instead, that there exists a minimum hours requirement for a given career path, h_j^{min}, that varies across fields j. (In general we will be thinking of h_j^{min} as reflecting not just hours requirements, but overall job flexibility that may make certain high-education careers more family-friendly than others.) Thus under this assumption, a given woman will work only if

the offered wage is greater than her reservation wage at the minimum in her given field:

$$\begin{aligned} P(h_i > 0|S_{ij}) &= P\Big(w_i(S_{ij}) > w_i^*(h_j^{min})\Big) \\ &= P\Big(b_0 + b_{1j}S_{ij} + b_2 Z_i + \nu_i > \beta_0 + \beta_1 h_j^{min} + \beta_2 Y_i + \beta_3 A_i + \beta_4 K_i + \varepsilon_i\Big) \\ &= P\Big((\nu_i - \varepsilon_i) > (\beta_0 - b_0) + \beta_1 h_j^{min} + \beta_2 Y_i + \beta_3 A_i + \beta_4 K_i - b_{1j}S_{ij} - b_2 Z_i\Big). \end{aligned}$$

Now consider the observation that MDs are more likely to work than MBAs, $P(h_i > 0|S_{MD}) > P(h_i > 0|S_{MBA})$. If the relative salary coefficients are equal, $b_{1MD} = b_{1MBA}$, and all other factors of the wage and reservation wage equations are similarly distributed, this would suggest that $h_{MD}^{min} < h_{MBA}^{min}$ – namely, that being a doctor is more easily combined with family than working in the business world.

Yet we have no reason to believe that the underlying elements of the wage and reservation wage equations should be equal across women in different fields. First, we hardly expect the salary coefficients to be the same for PhDs as for either MDs or MBAs. And, since many women meet their spouse in graduate school, we would similarly expect systematic variation in their husbands' salaries, Y_i. We might also expect the number and timing of children to vary, either because of systematic variation in taste, because of the decision to time kids around schooling of different lengths, or because of variation in h_j^{min} itself.

More broadly, we know that women are not randomly assigned to their professional career path, but choose into graduate school based on their individual preferences. In particular, women will choose the path that maximizes their expected lifetime utility: $S_i = S_{ij}$ if and only if $U_{ij} > U_{ik}$ for all $k \neq j$. Let U_{ij} reflect the difference between a woman's expected lifetime benefits and costs of a given degree program S_j (and thus career path), where the costs include the tuition and years of schooling, and the benefits include her expected change in earnings, plus a factor ψ_{ij} that reflects her identity value received from following

that career path, multiplied by the years she anticipates working:

$$E[\text{Cost}|S_{ij}] = E[\text{tuition}_j|S_{ij}] + E[(\text{years in school})_j|S_{ij}] * (\text{lost wages while in school})_i,$$
$$E[\text{Benefit}|S_{ij}] = \Big(E[\Delta\text{earnings}_i|S_{ij}] + \psi_{ij}\Big) * E[(\text{years working})_i|S_{ij}].$$

Notice that we can therefore think of the error term in the reservation wage equation, ε_i, as a combination of two factors: ψ_{ij}, reflecting the value of her professional identity (which can only be enjoyed if working and will vary across fields), and ζ_i, reflecting her taste for time at home with her children.[6]

Looking at the equation for the estimated benefits associated with each potential career path, notice that the field-specific expectation of years worked is a function of h_j^{min}:

$$\begin{aligned} E[(\text{years working})_i|S_{ij}] &= E\Big[\textstyle\sum_{t=grad}^{R} P(h_{it}^* > h_j^{min})\Big], \\ &= E\Big[\textstyle\sum_{t=grad}^{R} P\Big((\nu_{it} + \psi_{ij} - \zeta_i) > \\ &\qquad (\beta_0 - b_0) + \beta_1 h_j^{min} + \beta_2 Y_{it} + \beta_3 A_{it} + \beta_4 K_{it} - b_{1j} S_{ij} - b_2 Z_i\Big)\Big], \end{aligned}$$

where R reflects retirement. Thus both h_j^{min} and ζ_i build into a given woman's decision of which career path, and thus graduate program, to choose.[7]

Given this selection equation, again consider women choosing into medical versus business school. Suppose that the change in per-year earnings is approximately equal, and for the moment assume that $h_{MD}^{min} = h_{MBA}^{min}$. But notice that the cost of the two degrees differ. On average, total tuition costs are higher for an MD, and medical school requires four years to business school's two. Under these conditions we can then consider the expected differences in unobservable characteristics between women observed to select the MD versus the MBA.

[6] Much of the popular press discusses the identity issue of leaving the labor force. For instance the *Time Magazine* article discusses the "sense of pride and meaning that women often gain from their work." (Wallis, 2004). We can also think of ψ varying across occupations within a field, for instance some lawyers may receive greater professional fulfillment working for a nonprofit organization than for a large corporation.

[7] It might be more appropriate to write $E[h_j^{min}]$ and $E[\zeta_i]$, since women may not be able to fully observe career-specific variation in family-friendly characteristics before the fact, and also may not know their own taste for time at home until their first child is born.

For instance, for a given level difference in identity associated with becoming a doctor rather than a businesswoman, $(\psi_{iMD} - \psi_{iMBA})$, we would expect a *lower* taste for time at home among those observed to select an MD: $E[\zeta_i|MD] < E[\zeta_i|MBA]$. All else equal, this lower propensity to stay home, and thus greater total work years, is necessary to offset the difference in costs of the two programs.

Similarly, for a given taste for time at home, ζ_i, and thus number of anticipated years worked, we would expect a higher value of ψ_i among those women who become doctors: $E[\psi_{iMD}|MD] > E[\psi_{iMBA}|MBA]$. If taste for time with kids is equally distributed across both groups, those women who choose an MD must gain greater professional identity associated with being a (working) doctor, than the professional identity provided by working in the business world among those who choose an MBA.

The purpose of this exposition is to highlight the problems inherent in interpreting the differences in observed labor supply among mothers in different professional careers as evidence of variation in family-friendliness. As noted above, differences in the proportion working may also stem from systematic variation in the observable elements of either the wage or reservation wage equations, X, or from differences in the unobservable elements, $\theta = (\zeta, \psi)$.

In the analysis that follows we will not be able to perfectly disentangle those factors that lead to women's choice across career paths and their subsequent labor supply. However, given the richness of the data available for Harvard graduates, we explore how much of the variation in the proportion working can be explained by variation in the observables X, and multiple possible factors that may proxy for the unobservables θ. After including these controls – and finding that the relative work patterns remain almost unchanged – this provides suggestive evidence that the remaining systematic differences reflect true differences in h_j^{min}.

As a second step, we then compare labor supply patterns *within* degree types, for women

working in family-friendly versus normal work environments, to allow for differences in h^{min} across jobs within a given degree j. Strong differences in labor supply associated with family-friendly status, among a population of women who selected into the same graduate program S_j, is again suggestive of the importance of variation in family-friendly work environment characteristics in explaining women's labor supply choices at motherhood.[8]

3 Data and Descriptive Statistics

In this section we begin by introducing the Harvard College data and describing how we define our variables. Because our analysis focuses on differences in labor supply choices across women holding different graduate degrees, we then provide detail on the types of careers observed among these Harvard women 15 years after graduation. Lastly, we present summary statistics for our sample, including those observable factors that build into the wage and reservation wage equations (X), and those that may be correlated with taste elements that influence labor supply choices (θ).

3.1 Harvard Graduate Data

To analyze variations in labor supply patterns of highly-educated mothers, we rely on data collected from the 10th and 15th anniversary reports for the Harvard College graduating classes of 1988 through 1991, supplemented with information from their graduation yearbooks.[9] (See Appendix A for a detailed discussion of the data sample and how we define our terms, and Appendix B for an assessment of possible selection into our sample by graduate degree, labor force participation, and parental status.[10])

The anniversary reports, associated with each 5-year reunion, provide rich professional

[8] Again, in interpreting our results we take into consideration the likely variation in unobservable taste between women who choose into family-friendly jobs and those who do not.

[9] Goldin and Shim (2004) also used the anniversary reports to analyze patterns in women's surname choices at marriage.

[10] If we include in our analysis in Section 4 a measure reflecting the predicted probability of being captured in our sample – those women observed at their 15th reunion who are married and have had a child by this point – it has no effect on our results and is not systematically related to labor supply status.

and demographic information for those who respond to the Harvard Alumni Association survey. The professional data include detailed information on post-graduate education (including the program attended as well as the institution and year of graduation), and current occupation and firm. The personal information include spouse's name, education and occupation, and children's age and gender. We supplement this with data collected from the yearbook, including college activities (undergraduate major and whether she participated in a varsity sport), and background information (where she grew up, whether she attended a private high school, and her race/ethnic origin.)

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 labor supply choices. From these comments, as well as those reporting their occupation as 'mother' or its equivalent, we can measure the current employment status of Harvard mothers.[11]

In addition to this self-reported data, we hired a career consultant to impute salaries, given individuals' education, location, occupation and firm. Because he did not observe gender or parental status, these estimates reflect 'normal' salary levels associated with a given career. Thus although these values may reflect changes in labor supply made in response to children at the extensive margin (*e.g.*, switching jobs), they will not reflect changes made at the intensive margin (*e.g.*, cutting back hours).

Lastly, using reported firm and occupation data we develop a set of variables to measure the family friendliness of the environment in which a subset of our women worked at the time of both the 10th and 15th reunions. Since career options vary by type of advanced degree, and since our main intention is to measure whether women within a broadly defined

[11]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 (*e.g.*, because of perceived stigma of leaving the labor force), or that at-home mothers are over-represented (*e.g.*, if non-working mothers have more time available to respond). As discussed in Appendix B.2, we find no evidence that at-home mothers are under-represented, and weak evidence that they may be slightly over-represented.

field (*e.g.*, lawyers) made choices driven by their work environment, our data sources and methodologies vary by graduate degree.

In particular, for MBAs, MAs and women with no graduate training, we code their work environment as family friendly if they were employed in the public or nonprofit sectors, or if their private sector firm was included in the list of "Best Places" for working mothers in the October 2001 issue of *Working Mother* magazine.[12] Our approach is broadly consistent with Nielsen, Simonsen, and Verner (2004), who consider all public sector jobs as family friendly.[13] Also, Preston (1990) documents different job characteristics for women across for-profit and nonprofit sectors.

Our approach for JDs is very similar: we code as family friendly those jobs in the public or nonprofit sectors, or at firms included in the list of "Top Ten Family-Friendly Firms", as compiled by the Yale Law Women.[14] (We code JDs who were no longer working as attorneys using the criteria for women with MBAs, MAs and no advanced degree.)

Notice, however, that for these four education groups our definition of family friendliness may also capture a systematic difference in ψ, reflecting a woman's passion for and identity associated with her career. For instance, women opting to work for a nonprofit organization over a corporate firm may do so because of the identity value it provides, rather than for its family-friendly setting. We take up this issue in Section 5.

To classify family-friendliness for MDs, we rely on information on average hours worked by medical specialty. Using hours data from Dorsey, Jarjoura and Rutecki (2003), we define as family friendly all specialties below the mean of 54 hours per week.[15] Lastly, we do not include PhDs in the family-friendly analysis. Among PhDs, a large proportion remain in

[12] As we aim to characterize the environment between the women's 10th and 15th reunions, we use 2001 as roughly representative of that time period for our cohorts.

[13] In practice, very few women worked for firms identified as family friendly, so this distinction between our coding of family-friendliness and that of Nielsen, Simonsen, and Verner is not important.

[14] Accessed at: http://media.gibsondunn.com/fstore/pubs/YaleTop10.pdf. This list is based on a 2004 student-run survey.

[15] Average hours varied from 61 per week for anesthesiologists and OB/gyn specialists, to 45 for dermatologists and pathologists.

graduate school at the time of the 10th reunion, leaving too few women with whom we could analyze labor supply choices across work environments. Further, as most PhDs work for a particular type of nonprofit (*i.e.*, universities), we lack a strong prior on how to characterize variations in family friendliness within this group.

3.2 Career Paths by Graduate Degree Among Harvard Women

As discussed above, our analysis focuses on the variation in labor supply choices across women who select into different career paths, as defined by their graduate degree. In the following section we therefore begin by highlighting variation in the costs of attending the various graduate programs considered here, which, as discussed in Section 2, should build into a woman's selection decision across possible careers. Then, given our sample of Harvard women, we outline the types of career paths observed among women holding each graduate degree.

Table 1 highlights variation in the costs of attending the various graduate programs considered here. The first line lists the average number of years of graduate school, followed by representative annual tuition costs for these programs during the early 2000s.[16] In the third line, we then estimate the full cost, including tuition and the opportunity cost of time, using the typical length of the graduate program and assuming a common $50,000 annual level of forgone wages.

As discussed in the example in Section 2, we see here the much greater cost of a typical

[16]For PhDs we assume an average length of 8 years for those in the humanities, 7 years in the sciences, 10 years in education, and 6 years in economics. 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 (Russo, 2004; Berger, 2007). For professional non-business masters we assume 2 years, except for architecture degrees (3 years), whereas for British masters we assume 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. Tuition information for MBAs, JDs and MDs reflect averages across 13 top programs. Information for MBAs comes from *Business Week* online, which has webpages for each school (*e.g.*, http://www.businessweek.com/bschools/01/full_time_profiles/chicago.htm), for MDs from the Association of American Medical Colleges, *Tuition First Year Medical Students 2001-2002*, and for JDs from the Law School Admission Council. We assume that PhDs on average pay no tuition, recognizing that there is a distribution and some students pay tuition, while others are paid stipends. For non-business MAs we assume an MBA-level tuition for those in professional programs, and no tuition for those potentially in PhD programs.

Table 1: **Graduate School Costs and Timing**

	MD	**PhD**	**JD**	**MBA**	**MA**
Years in school	4.0	7.0	3.0	2.0	2.2
Annual tuition cost ($, '000's)	27	0	25	23	23[1]
Total cost[2] ($, '000's)	308	350	225	146	127
Years between BA & advanced degree	1.9	1.6	1.9	3.9	3.3

NOTES:

1. Annual tuition for those in professional non-business masters programs. As with PhDs, we assume no tuition for those in PhD programs.
2. Assumes lost per-year income of $50,000.

MD program relative to an MBA, not because of a large difference in annual tuition, but because of the opportunity cost of the time of training.[17] Similarly, even though we assume no tuition costs for PhDs, given their long training time, by our back-of-the-envelope calculation this is the most expensive graduate degree to attain.

These calculations assume that the employment opportunities open to these women before they entered graduate school are equal. Yet because of differences in the norms in timing of these graduate programs, this assumption is systematically violated because women enter these programs with different post-college levels of work experience. The last line of Table 1 documents this, reporting the average number of years elapsed between college graduation and matriculation in graduate school. On average, MBAs go to school with almost four years' work experience, while JDs and MDs return to school less than 2 years out of college. (Nearly one quarter of JDs and one third of MDs go straight to graduate school.) Nonetheless, because earning an MBA takes half as long as earning an MD, MBAs would have to be earning more than twice as much as the MDs when they entered graduate school to generate a similar total cost of schooling.

Next we consider the extent to which different graduate degree programs determine career paths by comparing the type of work undertaken by women holding these different degrees:

[17]Note that MDs also do residency programs (lasting approximately 3 to 7 years, depending on specialty), and may continue with specialty-specific fellowships, during which salaries remain low (on the order of $50,000 to $80,000, depending on specialty, stage of training, and geographic location).

- **MDs:** Among those women with an MD who were working at the time of their 15th reunion, all but 3 (2 percent) are working as doctors. The majority work in specialties centered on women, children, and family: 31 percent in pediatric medicine, 13 percent in obstetrics/gynecology, and 8 percent in family medicine.[18] (Note that of these three specialties, only family practitioners are defined as family friendly, given average work hours.) The next largest specialties are psychiatry (6 percent), emergency medicine (5 percent), and surgery (5 percent).

- **PhDs:** Among the PhDs working at the 15th year, 47 percent are tenure-track professors. The next largest groupings are those with training in the sciences working outside of academia: psychologists (11 percent, the majority working in hospitals or medical centers), and those working in industry (10 percent) and non-industry research settings (11 percent). An additional 6 percent work in non-science industry jobs, 6 percent as writers, and 3 percent in non-tenure track academic positions.

- **JDs:** For JDs working at the 15th year, the majority work in law firms (43 percent, of which 55 percent work at one of the 250 largest law firms in the country) and as corporate counsels (14 percent). The remainder work primarily in nonprofit or public sector environments: 15 percent within government, 9 percent in academia (of which 54 percent are in tenure-track positions), and 11 percent for other nonprofit institutions.[19] Because many of these women may have adjusted their work choices at motherhood, we can also consider the occupational mix observed at the 10th reunion among those with no children by that point. Among this subset, 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.[20]

[18] We can only observe the specialty for 70 percent of these women, whereas in every other degree we see occupation or firm information to distinguish the field for over 90 percent of those working.

[19] Throughout this discussion we distinguish between those in education and those in other nonprofit sectors.

[20] We do not provide the 10th-year occupational distribution for MDs or PhDs, the former because they line up perfectly with the 15th-year specialty, and the latter because 34 percent were still in school.

- **MBAs:** Among those MBAs working at the time of the 15th reunion, the two most common occupations are in the financial sector (27 percent) and consulting (17 percent). This is followed by those working in industry: 13 percent in technology, 10 percent in biotechnology/pharmaceuticals, and 8 percent in other industry jobs. Thus 75 percent of MBAs work in finance, consulting or industry, whereas only approximately 20 percent work in nonprofit jobs: 7 percent in education (as teachers or otherwise associated with educational institutions), and 12 percent in other nonprofits. (Among those observed working at the 10th who had no children by this point, 92 percent 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.) In neither period do we see significant numbers of MBAs working for the government: only 1 percent at the 15th, and no one at the 10th.

- **MAs:** By comparison, among those with an MA who were working at the time of the 15th reunion, more than half 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 for the government. (Among non-parents observed at the 10th, a similar half work in the public or nonprofit sectors.) By comparison, only 7 percent work in consulting, 4 percent in finance, and 6 percent in other industry jobs. An additional 10 percent work as artists or writers, 6 percent work in news, 5 percent in architecture, and 5 percent in publishing.

- **No Degree:** The occupation and sector mix of women with no graduate degree who are working at the time of the 15th reunion includes a mix of those occupations observed primarily among MBAs and among 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, a large proportion (24 percent) work in nonprofit environments or the public sector, including 10 percent in education and 11 percent in other nonprofits. An additional 16 percent are artists or writers, 6 percent work in publishing, 6 percent in the news industry, and 5 percent

in advertising. (Among non-parents observed at the 10th, 37 percent work in finance, consulting or industry, 19 percent as writers, 16 percent in publishing, and only 19 percent in nonprofit or public sector jobs.)

3.3 Summary Statistics

The graduating classes of 1988 through 1991 included 2,767 women (41 percent of all graduates), 1,522 of whom we observe 15 years after their graduation (55 percent), when the women are approximately 37. Table 2 reports marital and fertility patterns for these 1,522 women, both for the sample as a whole and by their primary graduate degree.

Table 2: **Marriage and Fertility Patterns**

	All	**MD**	**PhD**	**JD**	**MBA**	**MA**	**None**
Married at 15th	0.77	0.81	0.74	0.77	0.78	0.76	0.78
If married, children by the 15th	0.80	0.85	0.73	0.82	0.85	0.77	0.76
Married and parent at 15th	0.61	0.69	0.53	0.63	0.66	0.58	0.59
Sample Size:	**1522**	**223**	**219**	**311**	**210**	**285**	**274**
(% of total):		**0.15**	**0.14**	**0.20**	**0.14**	**0.19**	**0.18**

Among these women, we see that 77 percent are married by the time of their 15th reunion survey, and 61 percent also have children. We also see that these percentages vary appreciably across fields, in terms of both marriage rates and fertility rates within marriage. For instance, for the latter we find the potentially surprising pattern that women in professional degrees are *most* likely to have children, whereas women with no degree are almost the least. (Women with PhDs are both the least likely to marry and the least likely to have children within marriage.) Thus in combination, whereas only a slight majority of women with PhDs are a (married) parent by the 15th reunion, almost 70 percent of MDs are married with kids.[21] Of these 1,522, we focus our analysis on the 934 who are married and have had their first child at the time of the 15th reunion survey.

[21] Appendix B.3 analyzes whether there are systematic differences between women who have children by their 15th reunion and those who do not. Based on a comparison of characteristics observable at graduation from college, we only find clear evidence of selection among MBAs. However, for MBAs, as well as MDs and JDs, we find no difference between mothers and non-mothers in the proportion who attended a top-10 graduate program. Thus, based on this admittedly noisy proxy, we find no evidence of ability differences by parental status.

Table 3 reports summary statistics for this sample of 934 married Harvard mothers. The first line shows that the proportion working at the time of the 15th reunion varies strongly by field. Among MDs 94 percent are working, compared to 72 to 73 percent of MBAs and MAs, and only 69 percent of those with no graduate degree.

In comparison to the average college-educated population of women, however, this mean labor force participation rate of 78 percent is still high. For instance, using as a comparison 2000 Census data on labor force participation rates of married women, aged 35 to 40, who held a bachelors degree or more, only 72 percent were in the labor force. Although these women in turn had slightly more children by this age (2.15 versus 1.88 in our sample), the youngest of these children were in turn much older (5.2 versus 2.8).[22] Thus these data call into question the media focus on the 'excessive' opt-out rates among highly educated mothers.

The next lines reflect elements that may drive the variation in labor force participation among our sample, including observable characteristics X commonly included in the wage and reservation wage equations, and factors that may proxy for the taste-based elements of the labor supply decision, θ. It is interesting to note that in several cases we see that these numbers go in the 'wrong' direction. For instance, MDs, with the highest labor force participation, have more children than PhDs or MAs, and higher earning spouses than any other group.

Given the differences in the timing and length of training per graduate degree discussed above, we also see that the average age at which women graduate varies considerably across degrees. For instance, with their relatively short training period falling almost directly after college, JDs are on average 27 years old at the completion of law school. By comparison, because of the long training time, PhDs are on average almost 31. We see then that this translates into fertility timing, with most women in all other degree programs waiting to

[22]In comparison to the general population of women, Boushey (2005) also points out that among the highly educated, having a child at home is the *only* reason women leave the labor force.

Table 3: **Summary Statistics**

	All	**MD**	**PhD**	**JD**	**MBA**	**MA**	**None**
Working at 15th:	0.78	0.94	0.85	0.79	0.72	0.73	0.69
Family Variables:							
Age at first birth	32.0	32.0	32.4	32.1	32.3	32.2	31.1
Total children (at 15th)	1.88	1.84	1.74	1.94	1.88	1.86	1.97
Age of youngest (at 15th)	2.80	2.74	2.60	2.65	2.73	2.65	3.40
Spouse holds same graduate degree[1]	0.42	0.44	0.41	0.49	0.46	0.21	0.53
School Variables:							
Missing yearbook data[2]	0.11	0.05	0.19	0.10	0.07	0.11	0.17
Matching graduate & undergraduate fields	0.35	0.44	0.64	0.25	0.29	0.24	-
Small concentration[3]	0.12	0.10	0.11	0.13	0.06	0.18	0.12
Attended public graduate institution	0.36	0.44	0.42	0.25	0.28	0.42	-
Attended top 10 graduate program	0.49	0.35	-	0.45	0.70	-	-
Played sports in college	0.31	0.30	0.18	0.27	0.39	0.38	0.33
Fertility Timing Relative to Graduate School:							
Age at completing graduate school	27.9	27.8	30.6	26.9	27.8	27.5	-
First child before school	0.03	0.01	0.01	0.05	0.03	0.06	-
First child during school	0.05	0.08	0.21	0.01	0.01	0.03	-
First child after school	0.92	0.91	0.78	0.94	0.96	0.91	-
Background Characteristics:							
Minority	0.17	0.24	0.12	0.17	0.21	0.12	0.13
Live in same region as grew up	0.36	0.40	0.31	0.36	0.33	0.37	0.38
Attended private high school	0.36	0.33	0.33	0.36	0.41	0.37	0.35
Salary Estimates (2000$):							
Salary at the 15th:	108.9	167.7	71.2	137.0	134.2	57.9	77.0
Imputed salary (if working)	114.5	166.5	70.0	136.1	138.6	64.3	79.8
Estimated salary (if at home)	92.7	149.7	71.0	138.3	120.9	44.6	73.5
Salary at the 10th:	97.1	151.5	48.7	129.1	105.6	57.5	75.2
Imputed salary (if working)	102.6	150.7	52.4	136.0	106.6	55.2	94.4
Estimated salary (if missing or at home)	87.8	153.3	39.7	115.4	103.8	61.3	58.8
Percent estimated salary	0.37	0.32	0.29	0.33	0.37	0.37	0.54
Spouse's salary at 15th	120.2	142.8	94.9	130.2	133.6	109.3	101.9
Sample Size:	**934**	**154**	**117**	**196**	**138**	**166**	**163**
(% of total):		**0.16**	**0.13**	**0.21**	**0.15**	**0.18**	**0.17**

NOTES:

1. Based on primary graduate degree.
2. Reflects those women that we could not match with a yearbook record, providing missing data for all background characteristics.
3. Any concentration with 50 or fewer graduates per year.

finish school before children, whereas more than 20 percent of PhDs have their first child in graduate school.[23]

The last panel of Table 3 lists salary estimates for both the 10th and 15th years.[24] The first line lists mean salaries at the 15th, which reflect imputed values for those working (as noted above, the imputation was done by a compensation consultant), and estimates for those at home. The next two lines then separate these values to allow a comparison between the 'observed' and estimated salaries for these two groups. Similarly, the following three lines provide mean 10th year salaries, and values separately for those observed working (imputed), and for those at home or missing from the 10th year reunion survey (estimated).

Note that in most studies of married women's labor supply, one worries that earnings estimated for non-working mothers – based on observed values for working women – will overstate their true potential income. Yet as discussed above, because we are using imputed salaries for those women who are working, they speak to the 'normal' salary level associated with a given career. This means that they will be unbiased by unobservable, individual-specific elements of the wage equation.

In that way we can think of these imputed salaries – and the estimated values built from them – as an instrument for true salaries, given the observables. Because we expect the unobserved element of the wage equation, ν_i, to be systematically larger among those working than among those at home, we should therefore expect the imputed salaries to understate potential income for those working, and the estimated salaries to overstate potential income for those at home.

Yet for those with 'observed' 10th-year salaries, the understatement of estimated 15th-year salaries should be tempered if this unobservable factor is in part a person fixed effect, and correlated with observable career choices made when working. We do see evidence to

[23] See Appendix C for greater discussion of the timing of marriage and children, both relative to one another, and relative to schooling.

[24] See Appendix A for a discussion of whether these values are systematically understated for this population of Harvard graduates.

this effect: 10th-year 'observed' salaries are lower for those who will be out of the labor force five years later than for those who remain working ($85,000 versus $106,000).[25] As we see in Table 3, these systematic differences translate into estimated 15th year salaries that are on average lower than 'observed' values for those working. Thus these estimated values for those at home at the 15th should provide a better gauge of their potential income if they entered the labor force.

4 Explaining Variation in Labor Force Participation

As Table 3 shows, the proportion of working Harvard mothers in the 15th-year sample varies strongly by graduate program, which may suggest systematic differences in the capacity to combine family with career. Yet as the remainder of Table 3 shows, women also vary in observable characteristics that we would expect to affect the labor supply decision, highlighting the discussion in Section 2 of the problems inherent in interpreting the difference in observed labor supply as evidence of variation in family friendliness. In the following section we explore the extent to which the variation by degree can be explained by these factors, beginning with the observable elements of the wage and reservation wage equations, X, and then considering factors that may measure taste-based elements, θ.

The first line of Table 4 lists the level differences, by graduate degree, in 15th year labor supply, as compared to Harvard graduate women who completed no additional schooling.[26] (The columns between the coefficients report whether the level differences between adjacent graduate programs are significantly different from one another.) As we see here, controlling for no other factors, MDs work appreciably more than PhDs (and thus more than all other groups), while the PhDs in turn work appreciably more than JDs. By comparison, we cannot reject that the labor supply levels are equal among JDs, MBAs and MAs, but we can reject that JDs are comparable to women with no additional schooling.

[25] These values are basically equivalent if we limit ourselves to those women without children by the 10th.

[26] These values reflect the coefficients on graduate degree dummies in a probit of the probability that a given woman is working (where we report marginal effects). Each line reflects the results from a different probit regression, the first when we include no other variables, and the following as we include an increasing number of controls.

Table 4: **Differences in Probability Working by Graduate Degree**

	MD		PhD		JD		MBA	MA
No controls:	0.213**	*	0.137**	+	0.079*		0.024	0.033
	(0.024)		(0.031)		(0.034)		(0.041)	(0.038)
Observable Elements of the Labor Supply Decision (X):								
+ Log salary at 15th ($000)	0.198**	+	0.128**	+	0.059		0.004	0.053
	(0.026)		(0.032)		(0.037)		(0.043)	(0.037)
+ Minority	0.197**	+	0.127**	+	0.062	+	0.005	0.059
	(0.026)		(0.032)		(0.036)		(0.043)	(0.036)
+ Number & age of kids	0.184**	*	0.097*		0.062	+	-0.014	0.033
	(0.025)		(0.034)		(0.035)		(0.044)	(0.038)
+ Log spouse's salary	0.200**	**	0.100*		0.089*	*	0.017	0.046
at 15th ($000s)	(0.022)		(0.033)		(0.032)		(0.041)	(0.036)
+ Private high school	0.200**	**	0.097*		0.090*	+	0.021	0.045
	(0.022)		(0.033)		(0.032)		(0.040)	(0.036)
+ Public graduate institution	0.196**	**	0.090*		0.085*	+	0.014	0.037
	(0.023)		(0.035)		(0.033)		(0.042)	(0.039)
+ Spouse's graduate degree	0.183**	**	0.087*		0.067+	+	-0.008	0.031
	(0.025)		(0.036)		(0.036)		(0.046)	(0.042)
Taste-Based Elements of the Labor Supply Decision, $\theta = (\zeta,\psi)$:								
+ Age at first birth	0.182**	**	0.086*		0.064	+	-0.011	0.030
	(0.025)		(0.036)		(0.037)		(0.046)	(0.042)
+ First child during school	0.181**	**	0.082+		0.064	+	-0.012	0.030
	(0.025)		(0.039)		(0.037)		(0.046)	(0.042)
+ First child before school	0.178**	**	0.077+		0.053	+	-0.023	0.020
	(0.026)		(0.040)		(0.038)		(0.048)	(0.043)
+ Undergraduate degree	0.165**	**	0.054		0.040	+	-0.041	0.009
matches graduate field	(0.029)		(0.046)		(0.040)		(0.051)	(0.045)
+ Small undergraduate major	0.164**	**	0.052		0.037	+	-0.040	0.003
	(0.029)		(0.046)		(0.040)		(0.051)	(0.046)
+ Undergraduate major	0.168**	**	0.063		0.039	*	-0.046	0.002
	(0.029)		(0.045)		(0.040)		(0.051)	(0.046)
+ Played sports in college	0.168**	**	0.059		0.037	+	-0.042	0.002
	(0.029)		(0.046)		(0.041)		(0.051)	(0.046)
+ Current region	0.162**	**	0.051		0.040	*	-0.053	-0.001
	(0.028)		(0.046)		(0.040)		(0.052)	(0.046)
+ Region in high school	0.161**	**	0.050		0.046	*	-0.050	-0.002
	(0.028)		(0.047)		(0.039)		(0.052)	(0.046)
+ Live in same region	0.160**	**	0.054		0.043	*	-0.050	-0.002
as grew up	(0.028)		(0.046)		(0.040)		(0.052)	(0.046)

NOTES: + = significant at 10%; * = significant at 5%; ** = significant at 1%

4.1 Controlling for Observable Elements

The next panel shows the effect on these degree-specific level differences in labor supply when we control for an increasing number of the observable elements, X, considered important in either the wage or reservation wage equations. We begin by controlling for factors that speak to a given woman's value of an hour of time at work. We then consider those observable characteristics considered important in determining the value of a woman's time at home.

We begin by controlling for imputed annual salary at the 15th year, or estimated salary for those currently at home.[27] As shown in Table 5, which lists the marginal effects of each control on women's labor supply, an increase in own potential salary is associated with the propensity to work.

We also see from Table 4 that in comparison to women with no graduate degree, controlling for the high potential salaries of MDs, JDs and MBAs appreciably lowers their level difference in the propensity to work. By comparison, because of their relatively low potential salaries, the level difference in work propensity between women with PhDs or MAs and women with no degree are much less strongly affected, with the coefficient for MAs in fact increasing. Yet the statistically significant differences in labor supply patterns across career paths remain. For instance, MDs remain more likely to work than any other group, signaling that their high labor supply participation rates are not driven exclusively by their high wages.

We next consider the effect of race by incorporating a control for minority status.[28] We include this here as a potential element of the wage equation, because the imputed salaries were built without a knowledge of a woman's race or ethnic origin. If women of minority status face lower potential salaries because of racial discrimination, including this

[27]Because we lack data on hours worked, we cannot translate these salary estimates into hourly wages. And as discussed in Section 3, because we expect imputed salaries to understate true potential salaries for those working, and because the estimated values may in turn overstate potential salaries for those at home, this variable may slightly understate the full importance of variation in potential income in explaining observed labor supply patterns.

[28]When we control separately for Asian women and for all other minorities (which includes primarily African-American women), the coefficients for the two groups are almost identical.

Table 5: **Effects of Additional Controls on Probability Working**

	Observables Alone (X)	**+ Taste-Based Elements (θ)**
Observable Elements of the Labor Supply Decision (X):		
Log salary at 15th	0.024^{+}	0.021^{+}
	(0.012)	(0.013)
Minority	0.064*	0.059
	(0.027)	(0.036)
2nd child, 3rd child	-0.123**, -0.142**	-0.088*, -0.116*
	(0.027, 0.42)	(0.037, 0.054)
Age of youngest child	-0.007	0.006
	(0.007)	(0.012)
Log spouse's salary at 15th	-0.076**	-0.078**
	(0.028)	(0.028)
Private high school	-0.054^{+}	-0.047
	(0.029)	(0.030)
Public graduate program	0.028	0.027
	(0.030)	(0.031)
Spouse's graduate degree (if different from own):		
MD	-0.139*	-0.153*
	(0.077)	(0.081)
PhD	0.058	0.069
	(0.047)	(0.043)
JD	-0.056	-0.067
	(0.057)	(0.059)
MBA	-0.089^{+}	-0.094*
	(0.052)	(0.053)
MA	0.040	0.038
	(0.049)	(0.049)
None	0.021	0.030
	(0.038)	(0.036)
Taste-Based Elements of the Labor Supply Decision, $\theta = (\zeta, \psi)$:		
Age at first birth		0.017
		(0.011)
First child during school		0.036
		(0.059)
First child before school		0.112^{+}
		(0.037)
Undergraduate degree matches graduate program		0.044
		(0.032)
Small undergraduate major		0.065
		(0.035)
Played sports in college		-0.041
		(0.031)
Live in same region as grew up		0.045
		(0.028)

NOTES: $^{+}$ = significant at 10%; * = significant at 5%; ** = significant at 1%

control may absorb systematic differences in potential salaries associated with race. As we see, however, this control has little effect on any of the degree-specific differences in labor supply. This holds, despite the fact that minority women systematically work *more* than white women (as we see in Table 5)[29], and the fact that minority women are more strongly concentrated among JDs, MBAs, and especially MDs.[30]

The next four factors speak to elements commonly included in the reservation wage equation to explain variation in the value of a woman's time at home. These include the number and age structure of her children, her husband's salary, and her non-income assets. Note that for the last, we are forced to rely on indicators of whether a woman attended a private high school and whether she attended a public university for graduate school to proxy for her family's asset levels. Note that the private high school indicator may also be correlated with elements of θ, if, for instance, there are different social norms about working outside of the home among women who attended private schools.

We begin with including controls for number of children and the age of the youngest. As we see from Table 5, the presence of a second and third child is strongly predictive of a woman's labor supply status, although the age of the youngest has no additional explanatory power. Because women with no degree have more children than any other education group, in all cases the degree-specific coefficients fall. This holds most strongly for PhDs, who have by far the fewest children, and least strongly for JDs, who in this regard look almost equivalent to women with no additional schooling.

By comparison, when we include controls for spouse's potential salary, the coefficients

[29]Note that if minority women faced wage discrimination that systematically *lowered* their potential salary, we would expect them to be less likely to work. The fact that the effect goes in the opposite direction suggests that race and ethnic status has a stronger effect through taste for work or other social norms driving higher work propensity rates.

[30]We also try controlling for year-of-graduation fixed effects (from both college and graduate school), to allow for long-term salary effects of the economic environment at the time of graduation. We do not include these factors because they are never jointly significant and do not change the relative labor supply levels observed across education groups. Along this same vein, we also try controlling for the calendar year of a woman's first birth, in case the economic environment affects her choice of whether to leave the labor force, but this, too, has no effect.

for women in the high-income fields rise again.[31] As we see in Table 5, husbands' income is highly significant in predicting women's labor force status: as expected, higher spouse's salary increases the probability that a woman stays at home.[32] Yet because of the high correlation in degrees across spouses (42 percent of our sample hold the same graduate degree as their husband), high earning men are systematically married to high earning women, hence all of the degree-specific coefficients rise relative to women with no advanced degree.

We then control for whether a woman attended a private high school, as a proxy for the household's asset levels. As we would anticipate, in Table 5 we see that women likely to have greater financial assets are systematically less likely to work. Because there is little variation in this factor across degree groups, including it has little effect on the coefficients in Table 4.

Similarly, we next control for whether a woman attended a public graduate institution, which may speak to variation in the level of household debt. Per the example in Section 2 comparing the choice of an MD versus an MBA, this will also speak to the total cost of the program chosen, and thus be part of the selection decision across career paths. Unfortunately we cannot control for the estimated per-degree costs listed in Table 1 because we have no variation in this variable for MDs, JDs, and MBAs.[33] Thus this variable reflecting whether the graduate school was public or private is our best means of controlling for this difference in the cost of graduate training.

[31]Notice that we are controlling for spouse's earnings after the first child is born, which may reflect labor supply adjustments on his part, especially among men married to women with a high taste for time at home, ζ. In this way we may be 'over-controlling' for the effect on women's labor supply associated with her husband's income, but in turn may be absorbing some of the effect of ζ on her participation decision.

[32]Notice the strikingly large coefficient on husband's salary in comparison to her own. (Despite the high correlation across fields and thus earnings, adding husband's salary has no effect on the coefficient on own salary.) This suggests that this sample of highly educated mothers are more responsive to their spouses' earnings than among mothers in the general population (See, for comparison, Blau & Kahn, 2005, who find a larger coefficient on own earnings than spouse's earnings, although their dependent variable is annual hours rather than participation).

[33]In a similar vein, whether a woman attended a top-10 graduate program may enter the selection decision by influencing the expected benefits of attaining the degree. However, because the variable is only defined within three of our five graduate school categories, we did not include it in the specifications reported in Tables 4 and 5.

As we see in Table 4, controlling for this factor has little effect on explaining the variation in labor supply across degrees, lowering all coefficients roughly equally. Furthermore, as we see from Table 5, the coefficient on this control is insignificantly different from zero. (Note that because this variable is undefined for women with no graduate degree, from this point forward the relevant comparison of differences in labor supply patterns are across women in varying graduate programs, rather than in comparison to women with no additional schooling.)

Lastly we control for the graduate degree held by each woman's spouse (if it differs from her own).[34] Although not a variable commonly included in the reservation wage, this factor may speak to systematically different time constraints for husbands that may translate into variation in the value of a wife'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 relatively less available for household responsibilities.

As we see in Table 5, even after controlling for husband's salary, these factors do affect the probability that a mother is working.[35] We see, for instance, that among women not themselves an MD, being married to an MD decreases the probability that she works, and likewise for non-MBA women married to men with MBAs. Table 4 also shows that controlling for the spouse's field leads to a strong drop in the degree-specific coefficients for women with MDs, JDs and MBAs, but has little effect for PhDs and MAs.[36]

Yet at the completion of including controls for these observable factors X that may build into women's wage and reservation wage equations, although the level differences in the propensity to work across women in varying career paths has dropped somewhat from their initial, uncontrolled values, the systematic differences remain. In particular, MDs are

[34]Because of the high correlation in degrees across spouses, if we simply control for husband's degree, this picks up much of the information of the degree held by his wife. We therefore use women married to men in the same field as the excluded category.

[35]Including these controls reduces the coefficient on husband's salary by approximately 10 percent, but leaves it strongly statistically significant.

[36]This effect for women in the high earning fields stems from a larger proportion being married to men with a PhD, MA, or no degree.

still significantly more likely to work than any other group, and MBAs are now clearly less likely to work than either JDs, PhDs, or MDs.[37]

4.2 Controlling for Taste-Based Elements

In the bottom panel of Table 4 we report the effect on the degree coefficients when we successively add various factors that may capture the taste-based elements that influence the labor supply decision, θ. As discussed in Section 2, these include ζ_i, which reflects a given woman's taste for time at home with her children, and ψ_{ij}, which reflects the psychic value she receives from her identity as defined by working in career path j.

The first element we consider is the age at which she had her first child, which may speak to her taste for children, and thus be correlated with her taste for time at home, ζ_i.[38] As we see in Table 5, women with later first births are more likely to work. Yet controlling for this factor has little power in explaining the variation in work propensity across fields. As we see in Table 3, this follows because there is fairly little variation in the timing of first births among Harvard female graduates: on average they have their first child at 32.[39]

We next consider whether women had their first child during graduate school. Similar to the factor above, if women with strong taste for kids are not willing to delay childbearing until they complete their schooling, this factor may also proxy for ζ_i. Yet as we see in Table 5, the effect goes in the other direction. Women who have their first child during school are in fact *more* likely to work, although the effect is insignificantly different from zero. Looking at which population of women this variable captures, we see that the majority are PhDs and MDs, those in relatively long training programs. Thus it may be that this factor instead acts as a proxy for ψ, if we regard the *completion* of the degree – after the transition into motherhood has changed her opportunity cost of time at home – as evidence of a strong

[37] The latter comparisons are significant at the 10 percent and 5 percent levels, respectively.

[38] We estimate a woman's age at first birth based on the calendar year that her first child was born and the assumption that she was 22 when she graduated from college.

[39] As another potential proxy for ζ we try controlling for fertility delay within marriage (see Appendix C) Including this has no effect on the degree coefficients and is itself completely insignificant in predicting labor supply at the 15th.

psychic value of the identity associated with being a PhD or MD.

For this reason, we next consider whether women had their first child *before* graduate school. In this case, these women have chosen into this career path after already entering motherhood, signalling a strong value associated with the identity of working in that field. As we see in Table 5, this factor is in fact strongly related with higher work propensities. Yet as shown in Table 4, although its inclusion lowers the coefficients on each of the graduate school dummies, it has little effect on their *relative* levels, and thus does not help explain the cross-field variation in labor supply. (If anything, its inclusion increases the level differences across fields, as the magnitude drop in the degree-specific coefficients is larger among the lesser-working groups of MAs, MBAs, and JDs.)[40]

The next factor, whether a woman's graduate program matches her undergraduate degree, may also act as a proxy for ψ if it signals a long-standing interest in the given field.[41] In the same vein, we also control for whether a woman selected into a small undergraduate field (defined as those with fewer than 50 students), which also may signal a strong taste towards the given specialty. As we see from our results, the coefficients on these controls are both positive, yet their inclusion again does not help explain the cross-field variation in labor supply.[42]

[40] As a last factor speaking to the timing of fertility relative to schooling, among women with their first birth after graduate school (89 percent of all women with a graduate degree; see Appendix C for more detail), we try controlling for the career timing of their first child, defined as the number of years into their post-graduate careers. If women with greater taste for kids, and thus potentially greater taste for time at home with them, delay less, this may also act as a proxy for ζ. (Alternatively, women who delay longer may have greater power to adjust their work environment at the point that they become mothers. Both interpretations suggest that greater delay should be positively correlated with labor supply at the 15th.) When we control for this factor, however, it has no effect on the coefficients by degree, and is itself small and completely insignificant.

[41] For MDs we define a match as students who studied biology as undergraduates; for MBAs economics and organizational behavior; and for JDs, social studies and political science. (Appendix B.1 documents the high correlation between these undergraduate and graduate fields.) For MAs and PhDs we can specify a match between graduate and undergraduate training only for those who report their graduate field of specialization.

[42] We similarly control for broad undergraduate major (defined as the sciences, social sciences, and arts or humanities), but these factors are completely insignificantly associated with the propensity to work. (We also tried a much more narrow grouping, but they similarly were uninformative.) And since their inclusion raises the coefficients for the high-working fields (MDs and PhDs), without affecting the coefficients for the other graduate degrees, these controls in fact increase the variation in labor supply across fields.

For the last college-specific control, we include a variable capturing whether the woman played varsity sports. This factor may capture women whose self-identity is tied to their athleticism and not their careers, so it may act as a (negatively correlated) proxy for ψ. As we see in Table 5, having played sports is in fact negatively related to the propensity to be in the labor force, but again this factor, as those above, does little to explain the systematic difference in labor force attachment across women in different career paths.

The last three elements included in Table 4 – where she currently lives, where she grew up, and whether the two are the same – may speak to variation in taste or circumstances that might be correlated with either ζ or ψ.[43] For instance, social norms on the acceptability of working once you have kids may vary systematically across regions of the country (Fogli and Veldkamp, 2008). (If so, it is unclear whether the norms of her current location are more relevant than those of the region where she grew up, and the effect may be stronger if the two are one and the same.) Controlling for current region may also capture differences in the availability, quality, or cost of child care, in which case this factor may be more appropriately grouped with the reservation wage variables, speaking to potential substitutes for her time at home. Finally, controls for current region could pick up any systematic errors in our compensation consultant's methodology which led him to impute salaries that are either systematically too high or too low in particular regions.

As we see from Tables 4 and 5, these factors again have little power in explaining the variation in labor supply patterns across degrees. When including controls for current region and her region of origin (where she went to high school), the gap in work propensity falls between MDs and JDs, but rises between JDs and MBAs. And although controlling for whether she lives in the same region in which she grew up has a positive (and approaching significant) effect on her propensity to work, it does nothing to explain the relative work levels across women in different career paths.[44]

[43]We include groupings for the northeast, middle Atlantic, the south excluding the DC area (DC, Virginia, Maryland, and Delaware), the DC area, the midwest, the west, and those living outside of the US.

[44]This last result may reflect the availability of family to provide a source of free, high-quality child care. Furthermore, since we also find that current region is strongly related to the propensity to work, whereas region of origin is not, these variables may more strongly reflect variation in child care rather than social

Overall, after including this full set of controls, some of which we expect to be correlated with a woman's taste for time at home, and others with the identity value she places on her career, these factors have done little to explain the systematic variation in labor supply across women in different fields.[45] In particular, MDs are still much more likely to work than any other group, and MBAs are still less likely.[46] The only groups now indistinguishable, who at first appeared statistically different, are women with PhDs and JDs.

Thus returning to the discussion in Section 2, a worry in relying on the mean differences in labor supply across career paths as a measure of their relative family-friendliness was that women's labor supply choice, and their selection across fields, is related to both variation in the observable factors X and the unobservable factors ζ and ψ. Yet when we control for a rich set of variables capturing these observables, and factors that may reasonably proxy for these unobservables, the relative labor supply propensities are almost unchanged. This suggests that some other factor, potentially the family-friendliness of a given field, may instead be driving these differences.

5 Labor Force Participation and Work Environments

To gain additional perspective on the extent to which female labor force participation decisions are driven by work environment, we next examine the relationship between the family-

norms regarding working mothers.

[45] A last, intriguing possibility is that some women use graduate school as a marriage market, and that women with high taste for time at home, ζ, systematically use this as a means to search for high earning spouses. If one then considers the three high-salary professions – doctors, lawyers, and businessmen – the least costly choice is to enroll in business school, which exposes women to a population of high-earning-potential men at the cost of only 2 years of schooling. We do see some suggestive evidence to support this possibility. For instance, among MBAs, women who by our estimate meet their spouse in graduate school are much more likely to be at home than those who were already paired when they began school (31 percent vs. 9 percent, where the latter include those already married and those who met their spouse in college). We do not see comparable differences for MDs (4 vs. 3 percent) or JDs (12 vs. 9 percent). Yet when we include controls for whether women met their spouse in graduate school or beforehand in the probit specifications reported in Tables 4 and 5, neither factor is at all relevant, and the degree-specific coefficients on labor supply propensities are completely unchanged.

[46] MBAs are significantly less likely to work than all other groups except the MAs, significant at the 5 percent level for JDs and at the 10 percent level for PhDs. If we run the full specification, but exclude all variables that are defined only for women who hold a graduate degree – thus allowing us to compare women with no graduate training to other education groups – we find that those with MDs, PhDs and JDs are significantly more likely to work than those with no additional schooling (with coefficients 0.178**, 0.089*, and 0.069^{+}, respectively), whereas those with MBAs and MAs are not (-0.016, 0.027).

friendliness of a woman's position and her decision to work. In Section 5.1 we examine the relationship between the family-friendliness of a woman's work environment at her 10th reunion, and the probability that she remains working at the 15th, focusing on those mothers who had their first child within these five years.[47] In Section 5.2, we then consider more broadly how a woman's access to family-friendly jobs is associated with her work choices at her 15th reunion, including whether she has transitioned to a family-friendly environment or chosen to leave the labor force.

Before we begin, however, it is important to note that women select into their jobs, and thus those who choose into family-friendly work environments may systematically vary from those who do not. For instance, as noted above, in several cases our definition of family-friendliness may directly capture an element of ψ if, for instance, women who select a nonprofit work environment over a corporate career do so because of the identity value it provides them. If we then observe higher labor force attachment of mothers who were working in a family-friendly environment before children, this may result only from a higher taste for work.

Alternatively, women who choose family-friendly environments may have systematically higher values for time at home once they have children, ζ. For instance, assuming that most Harvard women anticipate working for much of their adult lives, women with high values of ζ may choose into a family-friendly job if it allows them lesser work commitments at all stages of their career. (This may reflect both choosing a lower hours path for the long haul, and the decision to take a few years off during the most time-intensive child-rearing years.) If this holds, the relationship between family friendly work environment and the propensity to remain in the labor force may be biased downwards by this correlation with ζ.

To shed light on these two possibilities, we examine the correlation between our measure of family-friendliness and a subset of the controls discussed above which may capture one

[47] See Appendix B.4 for a discussion of the difference between mothers who had their first child by the 10th reunion versus those who did not.

or the other of these taste factors. In particular, based on the results in Section 4, we group those factors more likely to reflect ψ (such as variables related to her undergraduate major and her sports participation during college), weighted by their relative importance in influencing women's labor supply using coefficient estimates from Table 4, to build an estimated measure, $\hat{\psi}$. We similarly group those factors more likely to proxy for ζ, including variables related to her timing and number of children, to build an estimated measure $\hat{\zeta}$.

We find a positive and marginally significant correlation between the family-friendliness of a woman's 10th-year work environment and $\hat{\psi}$ ($\rho = 0.11$ with a t-statistic of 1.63).[48] By contrast, $\hat{\zeta}$ appears completely uncorrelated with the family friendly variable.[49] The weak positive correlation between our measure of family-friendliness and $\hat{\psi}$ suggests that the former may in part pick up remaining omitted characteristics (if our family-friendliness measure is correlated with that part of ψ not already captured by our other controls). Yet because this correlation is not particularly strong, we have confidence that our results below, which show a clear relationship between family-friendliness and the propensity to work, speak to a true causal effect of the work environment itself.

5.1 15th-Year Labor Supply by 10th-Year Work Environment

To assess the importance of a woman's work environment in driving her labor supply choice at motherhood, we begin by focusing on the relationship between 15th year labor supply and 10th year work environment for the set of women who had their first child in the intervening years. One possible approach would be simply to include our family-friendly measure in the probit specifications described in Section 4. Yet a complication is that our family-friendly variables are designed consistently *within* a career path, but not *across* groups. An exception is our measure for JDs, MBAs, MAs, and those women with no degree, where the definition of family friendly consistently includes women working in the public sector or for nonprofits

[48] Following our approach in Section 5.1 below, we test this in the subset of women with a JD, MBA, MA or no graduate degree who are working at the 10th and not yet parents.

[49] This result runs counter to worries that establishing a family-friendly work environment will attract women who are systematically more likely to leave the labor force. (See, for instance, comments by conservative career expert and columnist Dr. Marty Nemko, www.martynemko.com.)

or family-friendly firms. For this reason, we focus on this subgroup of women.

Table 6 reports the results of adding our family-friendly measure to the fully controlled probit of Section 4, when run on the subset of women within these four schooling categories who are observed working at the time of their 10th year reunion and who have no children by this point. If a woman's work environment affects her labor supply, we would expect two results: that the family friendly variable would be a strong predictor of remaining in the labor force, and that including it would attenuate the remaining level differences in labor supply across fields. Considering the higher labor force attachment of JDs than MBAs, this would be consistent with the idea that women who earn JDs remain in the labor force at higher rates because they are presented with more opportunities to work in family-friendly environments than women with MBAs.

To begin, the first column of Table 6 lists the degree-specific coefficients on the probit regression for this subset of women before controlling for family-friendliness.[50] The second column then includes the control for the family-friendliness of a woman's work environment at the time of her 10th-year reunion, before she had children. We see that this variable is positive and significantly related to a woman's labor supply at the time of the 15th reunion, suggesting that women in family-friendly environments are more likely to continue working. Furthermore, comparing the coefficients on each degree group across the first and second columns, we see that each is attenuated, suggesting that controlling for family-friendliness, even with our admittedly noisy measure, helps explain some of the labor supply differences across degrees.

In the third column we include an additional dummy variable to capture the 26 women working as school teachers, who by our definition are working in a family-friendly environment because they work in either a nonprofit or public sector job. We suspect, however, that women who select into teaching – working with other people's children – may have a strong

[50] As we can see from the comparison of these results to those in Table 4, limiting ourselves to those women who were observed working and not-yet parents at the 10th accentuates the differences between women with no advanced degrees and women with JDs and MAs.

Table 6: **Effect of Family-Friendly Environment**

Graduate Degree Controls:			
JD	0.106*	0.099^{+}	0.098*
	(0.052)	(0.052)	(0.050)
MBA	-0.023	-0.019	-0.004
	(0.071)	(0.070)	(0.064)
MA	0.048	0.020	0.041
	(0.056)	(0.063)	(0.056)
Family-Friendly Controls:			
Family-friendly dummy		0.080^{+}	0.112**
		(0.041)	(0.042)
School teacher dummy			-0.381^{+}
			(0.214)
Sample Size	**252**	**252**	**252**

NOTE: $^{+}$ significant at 10%; * at 5%; ** at 1%

desire to stay at home with their own, ζ. Consistent with this theory, as we see in the third column, the coefficient on this control is strongly negative, and in turn makes the coefficient on the family-friendly variable correspondingly larger and more clearly distinguishable from zero.

We also estimate labor supply equations using only the MDs. Based on our measure of family-friendliness (those in shorter-hour specialties), among the subset of MDs with known specialty there is no relationship between the family friendliness of their work environment at the 10th reunion and their subsequent labor supply at the 15th. Note, however, that of these 114 women, only 3 leave the labor force (two of these three from non-family friendly specialties), thus we have very little statistical power to make this comparison.

5.2 Work Environment Transitions Between the 10th and the 15th Reunions

To this point we have analyzed whether the family-friendliness of a woman's job when she became a mother influenced her decision to remain in the labor force. It is possible, however, that her pre-birth environment is unimportant, as long as she has opportunities to move to a job that allows her to combine work with family once she enters motherhood. To provide some insight on such transitions at parenthood, we therefore examine patterns of women's

work environment at the time of their 15th reunion as a function of their starting point.

Again focusing on women who are not yet parents by the time of their 10th reunion, the first segment of the top panel of Table 7 summarizes the proportion of women working in each type of environment before children.[51] As we see, among the four comparable education groups, MBAs are the least likely to be working in family-friendly environments at this stage, and MAs are the most.

The next three lines then summarize the proportion observed in each work environment at the time of their 15th reunion, once they have had children. Across all fields we see a surprisingly similar proportion of the full population working in family-friendly jobs at the 15th as at the 10th. As we see from the bottom panel, however, this does not reflect the same women at both times.[52] In particular we see that some women who begin in family-friendly positions shift to non-family-friendly jobs by the 15th (in larger proportions than those who quit). Thus, by our definition, choosing into a family-friendly position is not a one-way valve, at least among this population of mothers.

The second half of Table 7 describes the breakdown of 15th-year work environment depending on whether the woman began in a family-friendly or non-family-friendly job before having kids. As we see here, across all fields there is a strong correlation between work environment at the time of the 10th and the 15th reunions. Women working in family-friendly jobs at the former are most likely to remain in a family-friendly job at the time of the latter, and likewise for those who began in a non-family-friendly job. We also see the same result shown in Table 6 that women who began in family-friendly jobs are much less likely to leave the labor force.

But looking more closely at the results for those who began in non-family friendly jobs, we see another interesting pattern. Among JDs, women are equally likely to shift to a family-

[51] As noted above, we do not include PhDs in this part of the analysis.

[52] One exception is MDs, who must choose into their specialty early in their training, and thus have limited capacity to switch.

Table 7: **Work Transitions Between the 10th & 15th Reunions**

	MD	JD	MBA	MA	None
10th reunion:					
% Working in a non-family-friendly position	58	63	80	51	74
% Working in a family-friendly position	42	37	20	49	26
15th reunion:					
% Working in a non-family-friendly position	52	56	53	37	43
% Working in a family-friendly position	45	30	22	54	31
% At home	03	14	25	08	26
Sample Size	64	73	60	59	35
Working in a non-family-friendly position at 10th					
% Working in a non-family-friendly position	89	67	54	60	58
% Working in a family-friendly position	05	17	15	30	08
% At home	05	15	31	10	35
Working in a family-friendly position at 10th					
% Working in a non-family-friendly position	00	37	50	14	00
% Working in a family-friendly position	100	52	50	79	100
% At home	0	11	0	07	0

friendly job as to leave the labor force, while among MBAs they are instead twice as likely to quit. Similarly, among MAs, women are three times as likely to shift work environment as quit, whereas among women with no degree we find the opposite.[53] Comparing the outcomes for JDs and MBAs, for instance, these results suggest that women who selected into a JD face a larger set of family-friendly job alternatives, or that for MBAs the characteristics of the family-friendly options are especially unattractive.[54]

Although limited by small sample sizes, we can look to the career paths of women who quit versus those who shift jobs for some insight on the types of jobs more commonly leading to each choice. For instance, considering why the choices of women with no graduate

[53]The same pattern holds for MDs as for JDs, but as noted above, they have very little flexibility in changing specialties, and these percentages are based on a small number of women.

[54]Because maintaining a career presence becomes more difficult with the second child (as suggested by our results in Table 5), we also compared this pattern for women transitioning from one child to two or more. The results overall are surprisingly similar to those in Table 7. The only exception are MBAs, where we find that among those who have already opted to stay in a non-family-friendly job after one child, a larger proportion remain in a similar environment after two or more (although among those who do not, again we see that most choose to quit rather than to shift to a family-friendly job).

degree more closely follow those of MBAs (with high quit rates among people in non-family-friendly environments), we see that only 27 percent of those who stay were working in finance, consulting, or industry, compared to 70 percent of those who quit. We also see that among the stayers the proportion working in finance falls from 15 to 9 percent between the 10th and 15th reunions. We similarly see that the proportion in publishing falls from 18 to 9 percent, while the proportion working in nonprofits rises from 15 to 21 percent. Among MBAs, too, although the pre-child occupational distribution of those who quit versus those who stay are almost equal, among the latter the proportion working in nonprofits grows from 4 to 11 percent.

As with the MBAs, among JDs we find that the occupational distribution of those who stay versus those who quit are almost equal at the 10th. Among the former, however, we see a shift away from big firms and government jobs (32 to 23 percent and 22 to 14 percent, respectively), and a rise in the proportion working in education and in other nonprofits (5 to 13 percent and 7 to 13 percent). For the MAs, as discussed above, approximately half or more work in nonprofit or public sector jobs at the 10th, regardless of their labor supply choices at the 15th, although we do see that those who stay shift more towards jobs in education (16 to 25 percent).

6 Interpreting Our Results

We have shown above that significant differences in female labor force participation exist across women based on the type of advanced degree they earn, and that within an advanced degree, the family friendliness of the environment in which a woman works affects the likelihood that she is in the labor force in her late 30s. Thus our results provide suggestive evidence that the family-friendliness of a woman's work environment influences her labor supply choices at motherhood.

Yet our results are based on an admittedly noisy measure of a woman's work envi-

ronment that does not cover all career paths. Data limitations preclude us from developing a variable that consistently measures the family friendliness across jobs in different degree categories, and, even with more information, it is difficult to imagine a reasonable metric. For instance, a variable measuring whether or not a woman's firm had family-friendly policies in place (such as flextime and generous maternity leave) would not necessarily capture the *de facto* extent to which women feel they can take advantage of these benefits without jeopardizing their careers. We therefore turn to existing survey evidence to shed light on the family friendliness of work environments across the career paths considered here.

Hewlett *et al.* (2005) analyze many of the factors involved in women's decisions to leave the labor force, using results from a survey of nearly 2,500 US women aged 28 to 55 who had a college degree with honors or a graduate degree. They report results separately across four sectors, including medicine, academia, law, and business, roughly aligning with our categories based on post-graduate degree. Answers to some of their questions suggest that variation in family friendliness roughly works in the direction suggested by our results in Table 4, with doctors working in the most family-friendly environments and MBAs in the least.

The top panel of Table 8, which reports a subset of their results, lists factors that speak to the family-friendliness in each of these fields. For instance, we see that women in medicine are the most likely to have ever worked part-time, "in order to better balance work and personal life", while women in business, and especially those in finance or banking, are the least likely to have done so. (Note that in our analysis we cannot observe who is working part-time versus full-time, which may be an important factor in observing higher work rates among the MDs.)

We also see that women in business, and again especially those in finance, perceived greater barriers to using available family-friendly options. Whereas only 20 to 25 percent of women in other fields saw use of these options as a barrier to promotion, 30 to 40 percent of those in the business world saw them as such. Comparing these differences in the costs of

using family-friendly work options across those in law and business may also help explain our finding that JDs are more likely to switch work environment after children, whereas MBAs are more likely to quit.

Table 8: **Evidence on Variation in Work Environment and Career Identity**

	Medicine	**Academia**	**Law**	**Business**	**Finance & Banking**
	(%)	(%)	(%)	(%)	(%)
Variation in Family-Friendly Environment:					
Labor Supply Choices to Accommodate Work Balance:					
Worked part-time	37	32	30	26	12
Worked reduced hours (> PT)	38	25	27	26	30
Perceived Barriers to Using Available Work Balance Options:					
Reduced Hours	30	36	25	47	56
Flexible Hours	29	23	22	33	45
Part-time senior positions	35	32	46	36	75
Unspoken rule that those who used available options would not be promoted	24	20	24	32	41
Variation in Career Identity or Value (ψ):					
Chose career opportunities to provide meaningful work	83	81	53	64	67
Among Those Who Left Work, Reason:					
Career not satisfying/enjoyable	30	36	59	52	49
Felt stalled in career	21	33	53	26	16
Wanted to change careers	0	3	0	14	4
At Re-entry Into Labor Force, Changed:					
Industry/Sector	19	14	55	51	95
Profession/Field	30	25	37	47	97

NOTES: Data from Hewlett, et al. (2005).

As we noted above, however, women who work in environments that we have coded as family friendly might be more likely to remain in the labor force because of some other attributes of their work environments that happen to be correlated with family friendliness. For example, women who work for nonprofits might derive more satisfaction from their work than other women, independent of family friendliness. The second panel of Table 8 shows evidence to this effect, for instance showing that the ability to find satisfaction in their careers may be higher for MDs and PhDs than for MBAs.

For example, amongst women in their study who had taken time off from work, Hewlett

et al. find that a much larger 50 percent of those in business cited "career not satisfying/enjoyable" as a primary reason for exiting the labor force, compared to only 30 percent of those in medicine. Those in law, however, were the *most* likely to cite this reason, and also the most likely to feel stalled in their career (59 and 53 percent, respectively). They also find that a much larger percentage of those in medicine and academia reported making career choices to provide 'meaningful work' (81 to 83 percent, versus 53 to 67 percent).

Consistent with this, in our data women who have earned MDs are most likely to still be practicing medicine — all but three (98 percent) who are still in the labor force are working as doctors. By comparison, for women with JDs and PhDs, roughly 15 percent appear to be in jobs that do not draw on their graduate training.[55] (Unlike the other advanced degrees, MBAs are not all training for a particular vocation, so it is not as meaningful to report a similar metric.[56])

For those who left the labor force, Hewlett *et al.* also find that upon re-entry those from business and law were more likely to change their industry or field, including a potentially shocking 95 percent of those who had worked in finance and banking. This last factor may speak to variation in the *desire* to re-enter these fields, thus reflecting variations in ψ. But it may as easily speak to the *ability* to return after an absence, and thus pick up variation in the family-friendliness of the given field as a function of the price paid for time off.

Because the survey data discussed here provide evidence for the importance of both family friendliness and career identity in explaining women's labor supply choices, we cannot rule out either of these possible explanations for driving the variation in labor supply observed in our sample of Harvard women. For instance, although these data suggest that the medical profession may be inherently more attractive to women seeking satisfying and

[55]We coded women not practicing as PhDs if they appeared to hold a job that did not require the degree, such as small business owners or novelist. Note also that our category of those with PhDs includes a larger group than just women in academia, as in Hewlett *et al.*.

[56]This aspect of the business degree may partially explain why fewer women are remaining in the labor force. It is possible that having a well-established career path associated with a degree makes it easier to stay in the labor force, perhaps because with fewer points at which they need to decide how to advance their careers, women are less likely to decide to drop out completely.

fulfilling employment, they also show that doctors work in a more family-friendly environment.

Yet comparing these data for those in law versus business is more telling. For instance, we see that in most cases lawyers show equal or greater dissatisfaction with their careers as those in business, suggesting relatively low values of ψ. Yet we also see that they work in a more family friendly environment, with lower barriers to the use of flexible work schedules to combine family with career. Thus given our observation that among Harvard women JDs are less likely to quit at motherhood than MBAs, this suggests that this result arises from the difference in availability of family-friendly alternatives, rather than from variation in the satisfaction provided by their careers. Thus in combination, these data suggest that there are systematic differences across fields in the policies and professional norms that allow maintained career progression of women with small children.

7 Conclusion

In conclusion, our results provide insight into the labor supply decisions of a group of highly-educated women. In particular, this sample reflects a population who on average delayed fertility as they completed additional schooling and established their careers. Yet despite the large opportunity cost of doing so, we still see that a moderately large proportion leave work, at least temporarily, at the transition into motherhood.

More strikingly, however, we find that these labor supply propensities vary dramatically across career paths. In particular, we find that the significant differences in labor force participation – MDs work more than everyone else, and MBAs less – cannot be explained away. This holds, even when we consider a very rich set of observable differences across these women, some of which we expect to be correlated with unobservable taste factors important in both the labor supply decision and selection across careers. Furthermore, even after controlling for these many factors, adding a very noisy measure of the family-friendliness of a woman's work environment predicts the propensity to continue working after motherhood.

These results suggest that systematic variation in the work environment of different high-education career paths may be an important factor in explaining these labor supply patterns. In particular, we believe that our data suggest that women's work environments play a role in "pushing" them out of the labor force at motherhood. Thus our analysis suggests that female labor force participation might still rise with further shifts in policy or social norms in the more inflexible fields.

Whatever the underlying factors that create a family-friendly work environment, our results suggest that women with MDs, and to a lesser extent JDs and PhDs, face more appealing work choices at motherhood than either MBAs or women with no additional schooling. And our analysis suggests that systematic variation in the availability of family-friendly work environments can at least partly explain this higher propensity to remain working as mothers.

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Data Appendix

A Data and Variable Definitions

The graduating classes of 1988 through 1991 included 6,764 students, of which 41 percent were female. (Our starting sample size reflects those individuals who we observe in either their 10th or 15th reunion survey, which includes anyone for whom the alumni association had a known current or previous address.) Since we concentrate on career choices made in response to parenthood, we focus on the 3,456 who responded to the 15th-year anniversary survey (51 percent overall, with a larger 55 percent of women), when the graduates are approximately 37.[57] 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.

Of these 3,456 graduates observed at their 15th year after graduation, 1,522 (44 percent) are women. And of these, we focus on the 934 who are married and have had their first child at the time of the 15th reunion survey.[58] For 728 of these women (78 percent), we can supplement these data with additional information from their 10th year reunion survey. Furthermore, for those with their first child between their 10th and 15th reunions (424 women, or 58 percent of those observed at both the 10th and 15th), this provides a before and after snapshot of labor supply behavior.

For the purposes of our analysis we define a woman's current labor supply based on her self-reported occupation, supplemented by information provided in her narrative for the reunion survey. Note that we define 'at home' status based on *current* reported employment. Thus if a mother reports that she recently went back to work after two years off, or that she anticipates leaving her job when her next child is born, she is defined as 'at work'.[59] We also code as working those women who report that they are currently on maternity leave, but code as 'at home' those women who report that they are 'on leave' from their past position. For a small number of women, we also 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.

[57] Of those observed at their 15th, 62 percent have had at least one child, compared to only 27 percent at their 10th.

[58] We exclude the 27 mothers who are unmarried at the time of the 15th.

[59] See Goldin & Katz (2008) for insight into average lengths of non-employment spells due to children.

Our results overall suggest that 78 percent of Harvard graduate women are working at the time of their 15th reunion. In comparison to the Harvard & Beyond survey, this number is both higher than the 60 percent of women reported to be working full-time/full-year, and lower than the 90 percent categorized as not having 'no employment'. This result is unsurprising, since in most cases we cannot distinguish between part- and full-time work, and because we define as 'at home' women who report their primary (but not necessarily exclusive) activity as 'mother' or its equivalent.[60]

One piece of information we lack among the rich professional data provided in the reunion surveys are salaries. We therefore had a career consultant build imputed salaries, for both women and their spouses, based on self-reported education, location, occupation and firm.[61] In particular, 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, in determining the salary of a hedgefund manager living in Tokyo, he noted that he used the New York city average salary for 'International manager-vice president' among operations professionals at financial services firms, as reported in CareerJournal.com. All salaries are updated to year 2000 dollars using the Consumer Price Index for all urban consumers (U.S. city averages for all items).

Because these values are based on occupation-specific averages, one worry is that they will systematically understate the salaries received by this population of Harvard graduates. Yet if one compares our mean imputed salaries to the mean 2005 reported salary for women in the Harvard & Beyond sample who are working full-time/full-year, the values are surprisingly equal – $114,500 versus $112,500 – although our values reflect year 2000 dollars and the Harvard & Beyond value reflects the mean salary received across cohorts graduating in the 1970s, 1980s and 1990s.[62] This result is likely coincidental, with our gender-neutral estimates likely offsetting any systematic under-estimation of female Harvard graduate earnings.

This effect, however, will go in the opposite direction for the estimates of spouses' salaries. Comparing mean spouses' salaries for Harvard women married to Harvard men,

[60] Among women with two children, Goldin & Katz also find the same relative ranking of employment rates 15 year after college graduation by graduate degree as we report in Table 3 (switching only the order of MBAs and MAs), although these numbers reflect women of all cohorts, not just the 1990 sample.

[61] Note that while the surveys specifically ask for information on the graduate's occupation and firm, they ask only about the spouse's occupation. (Many graduates provide their spouse's firm regardless.) Because of this, and because many graduates provide richer occupational detail for themselves than their husband, our salary estimates are based on more detailed information for the female graduates than for their spouses.

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

our estimate is much lower than the 2005 mean salary reported for Harvard men in the Harvard & Beyond sample: $124,000 versus $187,000. Because the latter similarly includes men from all three cohorts, because the experience curve is steeper for men than for women, this likely overstates the earnings received by the youngest cohort. Yet because our values are still likely underestimated, with that understatement potentially varying by his graduate degree, this may explain some of the importance of controlling for spouse's graduate degree in our results in Section 4.

For those women out of the labor force, or for whom we otherwise lack 15th year imputed salaries, we create estimated values based on 10th-year salary and average wage growth gradients from the 10th to the 15th among those observed working at both times.[63] In particular, because we lack 10th year imputed salaries for 37 percent of our sample, we begin by predicting 10th year salaries based on graduate degree (interacted by top-10 graduate program status for MDs, JDs and MBAs, and interacted by broadly-defined undergraduate major for MAs and women with no graduate degree), years experience since completing graduate school, and region. In addition, because we expect 10th year salaries to be lower for those out of the labor force than for those working but unobserved, we cut the sample based on a woman's predicted probability of working (built from all controls excluding the salary estimates), and estimate salaries separately within each half of the distribution. This is similar to the methodology used by Blau & Kahn (2005) and Juhn & Murphy (1997) to estimate salaries for workers who are out of the labor force. We then build estimated 15th year salaries based on these imputed and estimated 10th year values, allowing different gradients by graduate degree (as interacted above), and again splitting the sample by predicted probability of working.

Lastly, for other variable definitions, we define gender, as well as race and ethnicity, as best estimated from yearbook photos and from the graduates' names. We similarly use the yearbook information on the high school attended to distinguish which graduates attended a private high school (using Peterson's *Private Secondary Schools*). And lastly, for women with more than one graduate degree, we categorized the professional degrees (JD, MBA or MD) as the primary degree or defined the primary degree based on its alignment with their occupation. For instance, women with an MD/PhD who are practicing doctors are categorized as an MD. (When building these categories, we group dentist and vets with MDs, and define an LLM, masters of law, as a JD for practicing lawyers with no additional law degree.)

[63]For 10 percent of those working, we lack 15th year imputed salaries because insufficient occupation data was provided.

B Sample Selection

The external validity of our analysis of the variation in labor supply patterns across women who select different career paths relies in part on the representativeness, among Harvard graduates, of the women who respond to the 15th-year reunion survey. We therefore begin in Section B.1 by comparing the background characteristics, as found in the graduation yearbooks, of those who do and do not respond to the survey. We focus first on women overall, and then on women in the primary 'feeder' undergraduate majors leading to specific graduate degrees.

Second, given our focus on the labor supply choices of mothers, a specific concern is that 'at-home' status is systematically related to reporting rates. For example, stay-at-home moms may have either more or less free time available to respond to the survey compared to their working counterparts; alternatively, women may be reluctant to report that they have left the labor force. In Section B.2 we assess these two possibilities using dual Harvard couples, comparing the propensity to report an at-home mom when the respondent is the husband versus the wife. Lastly, in Sections B.3 and B.4 we consider whether there are systematic differences within our sample between those who become parents and those who do not, and then among parents by whether they have children by the time of the 10th reunion.

In combination, we find some variation between these subsets of women, both in terms of who responds to the surveys and who have children by their 15th reunion. We also find that this level of variation differs across women in different graduate degree programs. As a check, we therefore build a predicted probability of being included in our final sample – those who respond to the 15th reunion 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, which varies very little across graduate degree types (from 0.39 for PhDs to 0.41 for MBAs). Furthermore, if we include this predicted probability as a control in Section 4, it has no effect on the labor supply variation across degrees, and is itself completely uncorrelated with labor supply status.

B.1 Sample Selection into the 15th-Year Reunion Survey

Table A-1 reports mean background characteristics available from the graduation yearbooks, comparing those who are and are not observed in the 15th reunion sample. The first columns compare this for all Harvard graduate women, and the following for the subsets of women who completed an undergraduate degree in biology, economics, or political science.[64]

[64]These data exclude the 18 percent who we could not match between the reunion surveys and yearbooks. These reflect people who opted not to be included in the yearbooks, people whose class affiliation differed

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. For instance 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: respondents are much more likely to be white.[65]

Because our analysis focuses on the comparison of women who select into different graduate programs, an important question is whether selection into the sample varies systematically among women of different education types.[66] Unfortunately this 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 those undergraduate majors that are the primary feeders for three of the graduate degrees considered: MDs, JDs and MBAs.[67]

For instance, among respondents who have an MD, 38 percent hold an undergraduate degree in biology. Similarly, among observed biology majors, 66 percent go on to get an MD. Thus taking biology majors as a proxy for future MDs, we can consider whether their self selection into the 15th-year sample varies from other graduates. We similarly focus on economics majors as a proxy for future MBAs, and political science majors as a proxy for future JDs. 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.[68]

The foot of Table A-1 compares the 15th-year response rates for all female graduates to the response rates for women in these three majors. As we see here, potential MBAs are the most likely to respond. Their response rate is significantly higher than all other majors combined (at the 5 percent level), and than either potential MDs or JDs (at the 10 percent

from the yearbooks to the reunion surveys or people whose names changed sufficiently so that we could not match them across data sets.

[65]We see the same pattern among those who respond to the 10th reunion survey, although the level differences are slightly smaller. (Because the 10th reunion is a more popular event, reporting rates are higher, providing a generally more representative sample.) At either the 10th or 15th, the racial differences are smaller among men, although still clearly significantly different.

[66]Note that among our sample of women observed at the 15th, only 14 percent have a primary degree of a PhD, whereas 19 percent of the 1990 cohort in the Harvard & Beyond sample hold a PhD. (The rates for MDs, MBAs, and JDs are surprisingly equal.) Some of this difference may be driven by women with multiple degrees, especially MD/PhDs, who for our purposes are grouped under the other degree.

[67]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.

[68]Among all observed JDs, a larger 23 percent studied English. Yet among observed English majors, 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 define an English undergraduate degree as a 'match' for a law degree.

Table A-1: **Characteristics of Responders vs. Non-Responders at 15th-Year Survey**

	All Women			**Biology Majors (potential MDs)**			**Economics Majors (potential MBAs)**			**Political Science Majors (potential JDs)**		
Characteristic:	Respond		Do Not Respond	Respond		Do Not Respond	Respond		Do Not Respond	Respond		Do Not Respond
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
NY Region	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	0.16		0.16	0.21		0.22	0.13	+	0.04	0.17		0.22
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
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	-		-	-		-	-		-
Other Sciences	0.05		0.07	-		-	-		-	-		-
Small Major	0.12		0.12	-		-	-		-	-		-
Sample size:	1,337		932	128		95	109		55	94		77
Percent observed:	0.59			0.57			0.66			0.55		
χ^2 **test of joint sig:**	0.00**			0.25			0.04*			0.01*		

and 5 percent level, respectively).[69] Yet this higher response rate does not translate into a more representative sample. We instead find that among potential MBAs these background characteristics can still predict who responds (significant at the 5 percent level), whereas among potential MDs we do not find this same result.

Thus, 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, our analysis is based on a sample that under-represents minorities. Furthermore, because minority women tend to work at higher rates (as evident among the observed sample), all else equal this suggests that our sample may include a higher proportion of at-home mothers than among the full population of female Harvard graduates.[70]

Our second result is that this level of selection likely varies across women who choose into different graduate degrees. 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 that these selection patterns will affect our overall results.

B.2 Sample Selection on Labor Supply Status

Another worry given our focus on women's labor supply patterns is that mothers who are out of the labor force may respond to the survey at systematically lower or higher rates. Similarly, response rates themselves may be uncorrelated with labor supply status, but at-home rates may be under-reported. For instance, women who are currently at home may report their previous occupation, or may leave the field blank.[71]

We consider these possibilities by comparing reported rates of at-home mothers among Harvard couples.[72] (We assume that reporting rates will be similar among those married to non-Harvard men.) First we consider couples where we observe both spouses. If at-home mothers are under-reporting when they have left the labor force, but their spouses are not, then a higher reported rate from the husbands suggests that our data reflect an underestimate of the proportion of mothers who have left the labor force.

[69] Among men, 51 percent of biology majors, 54 percent of economics majors, and 56 percent of political science majors respond, compared to 54 percent overall.

[70] This may be tempered somewhat by the lower response rates among those who attended a private high school, which we see is associated with lower labor force participation among the observed sample.

[71] In cases where women list no occupation but provide detailed occupation information for their spouse, we assume they are currently out of the labor force.

[72] Among married Harvard graduate women (for whom we know their spouses' undergraduate institution), 36 percent are married to Harvard men, whereas 26 percent of Harvard men are married to Harvard women.

Second we consider couples where we observe only one spouse. If we suppose that men's reporting rates are uncorrelated with their wives' labor supply status, then this comparison allows us to consider both possible sources of bias. If the mean reported rate of at-home mothers among husband-responding households is *higher* than the mean reported rate among wife-responding households, this suggests that at-home mothers systematically under-respond to the 15th year survey. But if the opposite holds, this suggests at-home mothers are instead *over*-represented in our sample.

Focusing on parents observed at the 15th, there are 158 Harvard couples for which we observe 15th-year responses for both spouses. Among these couples, 24.7 percent of the wives report being at home, whereas only 13.8 percent of the husbands report that their wives are at home.[73] (The level difference across couples with wives in different graduate degrees varies, but the pattern of equal or higher reported at-home rates by the wives holds in all groups.)

Thus this provides no evidence of stigma driving Harvard wives to under-report their at-home status. Furthermore, there is instead evidence that husbands tend to provide less rich information for their wive's occupation. (Among all respondents there is a systematic propensity to provide richer information for one's own occupation than for one's spouse, although this tendency is stronger among men than among women.) Yet if we infer a lack of a wife's reported occupation as an implicit response that she is at home, this raises the husband-reported rate by only 2 percentage points to 15.7 percent.

Next we consider the reported at-home rates among dual-Harvard households in which we observe only the husband or only the wife.[74] Among the wife-respondent households we see that 31.7 percent report that she is at home. By comparison, between 14.4 percent and 28.9 percent of husband's report that their wife is at home (with the smaller number reflecting the directly reported data, and the larger the inferred data if all non-responses reflect a wife at home.[75]) Thus again there is no evidence that at-home mothers *under*-respond to the survey.

It is less clear whether this comparison provides evidence that at-home mothers *over* respond. On the one hand, the 31.7 percent wife-reported rate is significantly higher than the lower-bound 14.4 percent husband-reported rate (at the 1 percent level), although the same

[73]These reflect self-reported values, thus we exclude from this measure inferred information, or information that was updated using the data from one spouse for the other.

[74]We see 201 such households: 104 wives and 97 husbands.

[75]By graduate degree, the sample sizes become too small to make any intelligent comparisons. (Only among MAs are the wife-reported rates significantly different from the husband's – 53 percent versus 10 percent to 16 percent – based on a comparison of only 38 individuals.)

does not hold using the upper-bound 28.9 percent rate.[76] If we use the 11 percentage point difference in report rates across spouses from the same household as a back of the envelope correction for the under-reporting of husbands (comparing the 24.7 percent rate reported by the wives to the lower-bound 13.8 percent reported by the husbands), this suggests that the remaining 6 percentage point difference observed in this second comparison may reflect a slight over-representation of at-home wives. Overall, however, these comparisons provide no strong evidence of either systematic under- or over-representation of at-home mothers in our sample.

B.3 Selection into Parenthood

Taking the sample of women in our data set as representative of the population of Harvard women, we next consider the possibility that the characteristics of women who become parents are systematically different from the women without children, and that these differences vary across graduate degree programs. If this is the case, it would suggest that some of the patterns we see in labor force participation across degree types are driven by variations in the types of women who become parents in that field.

To address this, Table A-2 compares, by graduate degree, several background and 15th-year characteristics of mothers to non-mothers.[77] To begin, as we can see from the foot of the table the proportion of female graduates who have had at least one child by the 15th year varies strongly across degrees. For instance, whereas 72 percent of MDs have had kids, only 52 percent of PhDs are mothers.[78]

Yet this low motherhood rate among PhDs is not associated with stronger selection into parenthood. Using the background characteristics listed here, we cannot reject that PhD mothers and non-mothers are equivalent.[79] By comparison, among MBAs – where almost 70 percent have had at least one child – we see very strong differences by parental status.[80] Yet despite the fact that MBA mothers are systematically different from non-mothers, we

[76] A small part of this difference reflects the systematic difference in age structure in these households, since men tend to marry women who are slightly younger than themselves. This translates into slightly fewer children by the 15th reunion among husband-reported households (1.9 vs. 2.1). Running a probit to allow for differences in the number and age structure of kids, we find a 15.1 percentage point difference in reported at-home rates if we use the lower-bound husband-reported rate, and no difference if we use the upper-bound.

[77] For the sample overall, 63 percent of women observed at the 15th year have had at least once child.

[78] Note that these percentages vary slightly from those in Table 3 because these only include those women who we can match to a yearbook record.

[79] We do not include the 15th year characteristics because they may be endogenous to motherhood.

[80] It is interesting to note that among MBAs these statistical differences are driven by variation in where they grew up and their undergraduate major, rather than by race, which varies more clearly between mothers and non-mothers among MDs, PhDs, and women with no additional degree.

Table A-2: **Characteristics of Parents vs. Non-Parents by Graduate Degree Type**

	MD			**PhD**			**JD**			**MBA**			**MA**			**No Degree**		
	Kids		None	Kids		None	Kids		None	Kids		None	Kids		None	Kids		None
Race:																		
White	0.76	**	0.58	0.88	+	0.78	0.81		0.77	0.78		0.70	0.88		0.86	0.87	**	0.73
Asian	0.17		0.24	0.11		0.12	0.13		0.11	0.14		0.17	0.07		0.05	0.06	+	0.13
Other	0.07	**	0.19	0.01	*	0.09	0.05	*	0.13	0.08		0.13	0.05		0.08	0.06	*	0.14
Private High School	0.32		0.27	0.33		0.28	0.35		0.29	0.41		0.35	0.36		0.31	0.35		0.30
Region in High School:																		
New England	0.23		0.17	0.16		0.17	0.23		0.21	0.29		0.33	0.33	*	0.21	0.27		0.22
NY/Tri-State	0.27		0.31	0.23		0.28	0.24		0.24	0.27		0.29	0.26		0.33	0.27		0.34
DC Area	0.04		0.07	0.08		0.06	0.10	+	0.04	0.05		0.08	0.09		0.06	0.03		0.06
South	0.09		0.08	0.13		0.12	0.14		0.15	0.11	+	0.03	0.04	*	0.11	0.06		0.10
Midwest	0.13		0.19	0.18		0.17	0.15		0.12	0.13	+	0.05	0.08		0.13	0.11		0.09
West	0.19		0.15	0.13		0.15	0.11		0.17	0.12	+	0.22	0.19		0.14	0.20		0.16
Outside of US	0.06		0.03	0.09		0.05	0.03		0.07	0.02		0.00	0.02		0.03	0.06		0.03
Undergraduate Major:																		
Arts	0.01		0.00	0.04		0.03	0.02		0.02	0.05		0.06	0.08		0.06	0.06		0.09
English	0.13		0.07	0.22		0.22	0.26		0.24	0.15		0.10	0.23	*	0.35	0.27	+	0.38
Cultural Studies	0.04		0.07	0.12		0.08	0.10		0.06	0.08	+	0.16	0.12		0.15	0.09		0.06
Anthropology	0.11		0.17	0.04		0.05	0.02		0.03	0.02	**	0.11	0.16	**	0.05	0.06		0.09
History	0.11		0.07	0.08		0.10	0.15		0.15	0.11		0.11	0.07		0.09	0.12		0.06
Political Science	0.02		0.03	0.02		0.07	0.17		0.15	0.08		0.05	0.03		0.05	0.05		0.05
Social Studies	0.02		0.00	0.03	*	0.10	0.09	+	0.16	0.11	+	0.03	0.06		0.06	0.07		0.09
Economics	0.03		0.00	0.02		0.06	0.07		0.06	0.27		0.21	0.04		0.05	0.11		0.06
Psychology	0.10		0.08	0.11		0.06	0.08		0.08	0.11		0.08	0.13	*	0.05	0.10		0.05
Biology	0.39		0.44	0.12		0.08	0.01	*	0.05	0.03		0.03	0.03		0.02	0.02		0.03
Other Sciences	0.04		0.07	0.20		0.13	0.02		0.02	0.01	*	0.06	0.04		0.04	0.04		0.04
Region at 15th Year:																		
New England	0.30		0.20	0.19		0.10	0.15		0.12	0.25	+	0.14	0.28		0.26	0.28		0.22
NY/Tri-State	0.15		0.19	0.19		0.24	0.25		0.30	0.23	+	0.35	0.24		0.26	0.18		0.27
DC Area	0.04		0.03	0.04		0.10	0.18		0.16	0.04		0.00	0.07		0.08	0.08	+	0.03
South	0.13		0.08	0.08		0.10	0.07		0.08	0.07		0.08	0.05		0.05	0.06		0.09
Midwest	0.13		0.08	0.17	*	0.06	0.10		0.05	0.08		0.05	0.05		0.01	0.08	*	0.01
West	0.21	*	0.37	0.23		0.23	0.19		0.19	0.18	*	0.32	0.22		0.19	0.23	+	0.33
Outside of US	0.04		0.02	0.08		0.07	0.03		0.06	0.11		0.05	0.09		0.12	0.07		0.05
Top-10 Program	0.35		0.33	-		-	0.45		0.46	0.69		0.68	-		-	-		-
Sample size:	150		59	95		86	182		103	131		63	152		95	142		79
Percent parents:		0.72			0.52			0.64			0.68			0.62			0.64	
χ^2 **test of joint sig:**		0.40			0.25			0.25			0.00**			0.11			0.20	

find no evidence of differences in the ranking of the graduate degree institution by parental status. In particular, among MDs and JDs, as well as MBAs, the proportion of mothers and non-mothers who went to a top-10 graduate program are surprisingly equal.

Given the high opt-out rates among MBA mothers observed in our analysis, suggesting that business career paths are relatively less family friendly, it is not surprising that this induces a stronger selection into motherhood in the first place, at least by the age of 37. In turn, however, this stronger selection may create an observed sample of MBA mothers with systematically higher taste for time at home with their kids, ζ. If the proxies included in Table 4 do not fully absorb this factor, this may explain some of the remaining level difference in observed labor supply patterns across women who have selected into different graduate programs.

B.4 Selection into First-Time Parenthood Between the 10th & 15th Reunion

Given our focus in Section 5 on mothers who have their first child between their 10th and 15th reunion, we can consider whether this group varies significantly from those with their first child by the 10th, and if that difference in turn varies across women who select into different graduate degrees.

Table A-3 begins by comparing the background characteristics between these early and late mothers, including only those observed at both their 10th and 15th reunions. As we see, there are fairly few significant differences between these women, and these factors cannot predict who will have their first child by the 10th reunion. Even if we group all women, background factors cannot predict who will have their first child by the 10th.[81]

For women with a professional degree we also compare the proportion who attended a top-10 graduate program. What we find is a strong and significant difference among the MBAs. Whereas only 59 percent of women who had their first child by the 10th attended a top-10 program, fully 80 percent of later mothers did. Because 97 percent of MBAs had their first child after finishing their training, this suggests that women from higher prestige schools, who may have systematically gone on to higher-pressure careers, are more likely to delay having children.[82] By comparison, we see no significant difference in top-10 attendance rates among MDs and JDs, when we compare early and late mothers.

[81] It is interesting to note that if we compare the age at first birth, those with their first child by their 10th reunion are mechanically younger – approximately 29 compared to 33 or 34 among the later mothers. Thus the comparison is between women with their first child 4 or 5 years apart, not simply women with their first just before versus just after the 10th reunion.

[82] Among all MBAs observed at their 10th and 15th who did not have a child by the former, 45 percent of those who did not attend a top-10 program were in a family-friendly job at the time of their 10th reunion, compared to only 12 percent of those who did.

Table A-3: **Characteristics of Parents by 10th vs. Parents by 15th**

	MD			**PhD**			**JD**			**MBA**			**MA**			**No Degree**		
	10th		15th	10th		15th	10th		15th	10th		15th	10th		15th	10th		15th
Race:																		
White	0.84		0.71	0.96		0.86	0.84		0.83	0.71	+	0.85	0.85		0.87	0.88		0.91
Asian	0.10		0.21	0.04		0.12	0.09		0.14	0.12		0.12	0.11		0.06	0.05		0.05
Other	0.06		0.08	0.00		0.02	0.07		0.03	0.17	*	0.03	0.04		0.06	0.07		0.02
Private High School	0.29		0.30	0.19		0.36	0.35		0.32	0.44		0.38	0.28		0.43	0.33		0.36
Region in High School:																		
New England	0.27		0.21	0.19		0.18	0.25		0.24	0.24		0.37	0.37		0.30	0.23		0.20
NY/Tri-State	0.27		0.27	0.15		0.26	0.30	+	0.17	0.24		0.25	0.17		0.30	0.30		0.27
DC Area	0.02		0.06	0.04		0.08	0.09		0.10	0.05		0.06	0.07		0.09	0.02		0.07
South	0.06		0.06	0.08		0.18	0.14		0.13	0.15		0.08	0.04		0.04	0.12	+	0.02
Midwest	0.14		0.14	0.19		0.18	0.12		0.17	0.17		0.09	0.11		0.08	0.11		0.16
West	0.16		0.23	0.27	**	0.06	0.09		0.14	0.12		0.14	0.22		0.18	0.18		0.23
Outside of US	0.08		0.03	0.08		0.06	0.02		0.05	0.02		0.02	0.02		0.01	0.05		0.05
Undergraduate Major:																		
Arts	0.00		0.02	0.00		0.06	0.02		0.03	0.05		0.06	0.02	+	0.10	0.05		0.07
English	0.10		0.17	0.27		0.16	0.25		0.29	0.10		0.18	0.15		0.25	0.25		0.34
Cultural Studies	0.02		0.05	0.04		0.10	0.11		0.10	0.10		0.06	0.17		0.10	0.11		0.07
Anthropology	0.24	**	0.05	0.08		0.02	0.00		0.03	0.05	+	0.00	0.17		0.18	0.04		0.11
History	0.14		0.09	0.08		0.08	0.16		0.16	0.10		0.12	0.07		0.06	0.12		0.09
Political Science	0.00		0.03	0.00		0.00	0.25	+	0.13	0.07		0.08	0.04		0.01	0.04		0.07
Social Studies	0.02		0.02	0.04		0.02	0.05		0.07	0.10		0.12	0.04		0.09	0.11		0.09
Economics	0.04		0.02	0.00		0.04	0.05		0.09	0.27		0.28	0.02		0.04	0.16	+	0.05
Psychology	0.08		0.12	0.12		0.14	0.09		0.06	0.15		0.06	0.24	**	0.08	0.05		0.11
Biology	0.31		0.41	0.15		0.14	0.00		0.01	0.02		0.03	0.00		0.04	0.02		0.00
Other Sciences	0.04		0.05	0.23		0.24	0.02		0.02	0.00		0.00	0.04		0.05	0.07	+	0.00
Top-10 Graduate Program	0.31		0.39	-		-	0.46		0.44	0.59	*	0.80	-		-	-		-
Sample Size:	49		66	26		50	57		87	41		65	46		79	57		44
% Mother by 10th:		0.43			0.34			0.40			0.39			0.37			0.56	
χ^2 test of joint sig:		0.47			0.42			0.78			0.81			0.63			0.60	

C Patterns of Fertility and Marriage Timing

The following section highlights patterns in the timing of fertility among our sample of 934 married Harvard mothers, both relative to the timing of marriage and relative to the timing of schooling. The first panel of Table A-4 highlights the patterns of fertility timing relative to marriage. For instance, we see that on average women in our sample married between the ages of 28 and 29. The average age is slightly younger for those who did not attend graduate school, and among those with a graduate degree, the youngest group were the PhDs. (These differences may in part reflect the point at which women met their spouse: the following lines list our best estimate of the proportion who met their husband at Harvard versus in graduate school.[83])

Table A-4: **Marriage, Fertility, and Schooling Timing**

	All	MD	PhD	JD	MBA	MA	No Degree
Timing of First Birth versus Marriage:							
Age at first marriage	28.5	28.5	28.2	28.7	28.9	28.8	27.9
Met spouse at Harvard	0.28	0.31	0.32	0.23	0.19	0.31	0.33
Met spouse in graduate school	0.19	0.18	0.25	0.26	0.26	0.02	-
Age at first birth	32.0	32.0	32.4	32.1	32.3	32.2	31.1
Fertility delay within marriage	3.5	3.6	4.2	3.4	3.4	3.4	3.1
Timing of Marriage Relative to Graduate School:							
Age began graduate school	24.5	23.9	23.6	23.9	25.9	25.3	-
Age completed graduate School	27.9	27.8	30.6	26.9	27.8	27.5	-
Married before school	0.14	0.13	0.15	0.10	0.22	0.14	-
Married during school	0.18	0.24	0.53	0.09	0.06	0.10	-
Married after graduation	0.59	0.50	0.26	0.76	0.68	0.61	-
Married immediately after graduation	0.21	0.20	0.13	0.28	0.24	0.16	-
Years beyond graduation (if after)	3.1	3.0	2.5	3.0	2.8	3.8	-
Timing of Kids Relative to Graduate School:							
First birth before school	0.03	0.01	0.01	0.05	0.03	0.06	-
First birth during School	0.06	0.08	0.21	0.01	0.01	0.03	-
First birth after graduation	0.89	0.89	0.75	0.93	0.96	0.89	-
First birth immediately after	0.08	0.05	0.21	0.03	0.05	0.08	-
Years after graduation (if after)	5.0	4.7	3.2	5.7	4.8	5.5	-

The next two lines list the average age at first birth, and the corresponding average delay within marriage till that first child. For instance, just as we see that women with no graduate degree married on average one year earlier, they similarly had their first child

[83] We assume that a woman met her spouse at Harvard if he is also a Harvard graduate, from a graduating class within two years on either side of her own graduation year.

one year sooner, at the age of 31 rather than 32. By comparison, we see that even though PhDs married younger than women with other graduate degrees, they in turn delayed longer within marriage, and thus are the oldest group at first birth.

For those with some graduate training, the next panel highlights patterns of marriage timing relative to schooling. Per our discussion in Section 3, because of variation in the norms of the timing of graduate school and relative training lengths, we begin by listing the average age at the start and end of graduate school by degree type. For instance we see that women with an MD, JD and PhD are approximately 24 when they begin school, whereas MBAs are a full 2 years older. Yet by graduation MBAs are exactly the same age as MDs because of their shorter training time. By comparison, given their long training time, the oldest group at completion is by far the PhDs, who are almost 31 at graduation.

The proportions who are married by the time they enter graduate school line up with the average age at matriculation: MBAs are most likely to be married and JDs the least. We similarly see that the proportion who marry *during* school lines up with the average length of training: for instance, almost half of all PhDs marry during graduate school. Given these values, we see that the smallest proportion of PhDs marry after they complete their schooling, 26 percent, compared to 76 percent of JDs. We also see that among those with professional degrees, between 20 and 30 percent marry *immediately* after graduation (defined as that calendar year or the following). Thus it appears that many women delay marriage until they have completed their schooling.

The last panel considers the timing of women's first birth relative to their schooling. Because for most of these women their career choices are more strongly influenced by the arrival of their first child, and not by marriage itself, women may more strongly time their first child around their schooling. The first three lines of the last panel of Table A-4 lists the proportion who have their first child before, during, and after graduate school. As we would expect, these values line up with the average age at which women began school, and the average training time.

Across all groups, however, we see a much higher propensity to delay children till after graduate school. For instance, among those with a professional degree 89 to 96 percent have their first child after completing school. And even among PhDs, who are on average almost 31 at graduation, 75 percent have their first child only after they finish their degree.

Because of their older age, however, among all women who delay fertility till after graduate school, PhDs tend to have their first child soonest within their post-graduate career: 3 years after graduation versus almost 6 years among the JDs. Yet returning to the

first panel we see that this variation in the timing of first birth relative to the starting point of their post-graduate degree career is driven mostly by differences in the timing and length of graduate school. Overall, we see that the *age* at first birth is surprisingly consistent across women, regardless of their schooling choices.