

Optimal Parental Leave with Cost Differentials across University Faculties

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Abstract

We model the optimal length of parental leave for universities with clinical and nonclinical faculties. An optimal policy minimizes their total costs by balancing the direct costs and indirect cost savings of additional leave. The former include additional pay for replacement instructors and more grant and clinical revenue lost during leave; the latter come from reduced faculty turnover and search costs. Using data for a large public university with a medical school, we explore (1) optimal leave lengths by division, (2) cost differences between separate policies by division and a uniform policy, and (3) how changes in the parameters affect the results.

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1. Introduction

As recently as the 1990s, many American universities had no formal leave policies, especially for family-related issues. Colleagues of female faculty absent for childbirth might cover their classes through informal arrangements.¹ Male faculty absent due to an extended illness could have their classes covered by similar arrangements. But a substantial increase in the proportion of female faculty members at many universities put these arrangements under greater strain. Furthermore, female faculty – still carrying disproportionate responsibilities for child care in the home – had concerns about how an extended absence in the formative stage of an academic career would be interpreted by colleagues and administrators.²

Such concerns, together with medical ones, created interest in mandated leave legislation. Debates over mandated parental leave played a major role in the presidential election campaign in 1988 (Summers, 1989, 177). The debates continued on the floor of the U.S. Congress into the 1990s, leading to family and medical leave legislation that passed both the House and the Senate twice, but each time President Bush vetoed the legislation (Trzcinski and Alpert, 1994, 543). In the 1992 presidential election, Bill Clinton took issue with President

¹ Corresponding policies in alternative occupations were often less accommodating for women. Trzcinski and Alpert, (1994, 538) point out that, “In the early 1970s in the United States, it was common for pregnancy-related conditions to be excluded from programs insuring workers against earnings losses. The Supreme Court ruled that this, and other related practices, did not constitute discrimination against women.” They also note, however, that in a 1977 case where the Nashville Gas Company stripped all job seniority from women who had babies, the Court ruled against the company.

² In a national survey of 4,188 English and chemistry faculty at 507 U.S. colleges and universities, “18 percent of men and 32.8 percent of women did not ask for a reduced teaching load when they needed it for family reasons, because it would lead to adverse career repercussions” (Drago, *et. al.*, 2005, 23).

Bush over these and other decisions and emerged victorious. Indeed, the Family and Medical Leave Act (FMLA) was the first piece of legislation signed into law by President Clinton after his inauguration (Ruhm, 1997, 175).

Ruhm (1997, 176) distills the essential provisions of the FMLA, which took effect in 1993:

Under the act, eligible employees are entitled to 12 weeks of job-protected leave in a 12-month period to care for newborn or adopted children, relatives with serious medical conditions, or their own health problems. The legislation covers private establishments employing 50 or more persons within 75 miles of the worksite during at least 20 weeks of the current or previous year. Government employers are generally covered regardless of size. Individuals are eligible for FMLA leave if they have been with a covered employer for at least 12 months and worked for the employer 1,250 or more hours during that time. The employer is not required to pay wages during the job absence but must continue health insurance benefits on the same terms as if the worker had not taken leave.³

Prompted by the FMLA, universities began to develop formal parental leave policies, with considerable variation across institutions. In a study of parental leave and modified duties

³ Some researchers distinguish between maternity and parental leave. Maternity leave accommodates only the physical demands of childbirth, and “the length of period considered adequate for physical recovery from normal pregnancy and childbirth in the United States is six weeks” (Trzcinski and Alpert, 1994, 536). Parental leave aims to capture both physical (e.g., breastfeeding) and psychological (bonding time) benefits for the parent and child. Title VII of the Civil Rights Act of 1964 requires that any parental leave benefits provided by employers must treat male and female employees the same (Trzcinski and Alpert, 1994, 542). Our use of parental leave encompasses both considerations.

policies at eight Big Ten institutions for the Penn State Commission for Women, Drago and Davis (2009) find that the leave length (covering most situations) varies from 12 weeks to 12 months, with the portion of leave for which the employee is paid ranges from 6 to 12 weeks.⁴ The lower bound on the length of leave matches the FLMA requirement exactly; however, *paid* leave – which is not required by the FMLA – can be smaller. The modification of faculty duties during the leave might include a full semester (or quarter) of relief from teaching, and sometimes from committee service.

A university making a parental leave policy has several considerations to balance. Departures from prevailing practices at other universities (reducing the length of leave or granting leave without pay) might raise both its turnover rate and search costs substantially. On the other hand, replacement instructors and forgone grant revenue become increasingly costly the longer the leave. For universities with a medical campus, a faculty absence can also involve lost clinical revenue. We treat the university's choice of faculty leave length as a cost-minimization problem, given fixed employment levels in each division. The importance of cost containment has been pressed upon universities, especially public ones, by severe state budget crises created by the recession of 2007-2009. At many universities, administrators have had to make deep budget cuts, which triggered reviews of policies, including parental leave benefits.

We organize the paper as follows. Section 2 presents in more detail the various considerations that universities must take into account in setting the optimal length of leave,

⁴Two weeks plus accrued time at the University of Illinois – Urbana-Champaign.

and specifies a formal cost-minimization problem. Section 3 derives the optimal leave lengths (separately by division and uniform across divisions), shows how changes in parameter values affect these results, and computes the cost differences between alternative policies. Section 4 calibrates the parameters for our specification using data from East Carolina University (ECU), the third-largest institution in the University of North Carolina (UNC) system, measured by total (undergraduate and graduate) enrollment (UNC, 2009). We calculate the optimal leave lengths for each division and their sensitivity to the proportion of leave that is paid. We also calculate cost differences to the university of implementing separate leave policies or a uniform policy across divisions, and in the case of uniform leave lengths, cost differences with and without some unpaid leave. Section 5 summarizes our main findings.

2. Specification of the Problem

Consider a university that employs two separate faculties, clinical and nonclinical. To keep the problem manageable we focus on the determination of the length of parental leave, which may differ across faculties (x for clinical and y for nonclinical). We treat the proportion of leave that is paid as a parameter, but we explore how changes in its value affect the optimal length of leave. We assume that the length of leave influences several variables that affect the university's costs: its turnover rate (some faculty value parental leave benefits – especially the fraction that is paid), its search costs (again, some applicants value these benefits),⁵ the wage

⁵ There is growing evidence of beneficial effects of parental leave on the physical and mental development of children: lower death rates for infants and young children – perhaps due to breastfeeding (Ruhm, 2000), higher

bill for regular faculty and replacements, and clinical and grant revenues forgone while faculty are on leave. Taking all these considerations into account, we ask, what leave lengths in each division minimize the institution's total costs?

We separate its total costs into five components. First, it has an annual wage bill for regular faculty, which we represent as $w_c E_c (52 - \gamma_c p_c x)$ and $w_n E_n (52 - \gamma_n p_n y)$, where w denotes the average weekly wage or salary for faculty, E is the number of faculty positions in each division (c for clinical and n for nonclinical), γ denotes the proportion of leave that is not paid and differs across divisions, and $0 < p < 1$ is the proportion of faculty who take parental leave, which may also differ across divisions.⁶ Second, it has annual wage or salary bills for the replacement instructors in each division, written as $\alpha_c w_c \cdot p_c E_c \cdot x$ and $\alpha_n w_n \cdot p_n E_n \cdot y$, where $0 < \alpha < 1$ represents the fraction of regular wages required to secure replacement instructors, which may differ across divisions.⁷

Third, it has turnover costs in each division, written as $s[(1 - \gamma_c)x]t[(1 - \gamma_c)x]E_c$ and $s[(1 - \gamma_n)y]t[(1 - \gamma_n)y]E_n$, where s is search costs per regular faculty position, t is the faculty

rates of immunizations and cognitive and behavioral test scores at ages 3 and 4 (Berger, Hill, and Waldfogel, 2005), and higher verbal and mathematics achievement at ages 5 and 6 (Ruhm, 2004).

⁶ Here we ignore other benefits (health insurance, retirement) because they are invariant to the university's decision about the length of leave. We have already mentioned that covered employers are required by law to continue health insurance benefits on the same terms as if the worker had not taken leave. We assume that the length of leave is also independent of retirement benefits.

⁷ For simplicity, we treat p as a parameter. Using CPS data, Han, Ruhm, and Waldfogel (2009, 29) find a positive, but small, relationship between the duration of leave (represented by x or y) and leave-taking (represented by p): "Our main finding is that leave extensions are associated with increased leave-taking by both mothers and fathers. The magnitudes of the changes are small in absolute terms but large relative to the baseline for men and much greater for college-educated or married mothers than for their less-educated or single counterparts." In an earlier study using CPS data, Waldfogel (1999, 294) also found increases in leave-taking among women with infants after the FMLA, with the most substantial responses from those employed in medium-size firms.

turnover rate, and $(1 - \gamma)$ is the proportion of leave that is paid. Fourth, it loses revenue while faculty are on leave, written as $r_c \cdot p_c E_c \cdot x$ and $r_n \cdot p_n E_n \cdot y$, where r_c and r_n stand for average weekly clinical and grant revenues per regular clinical and nonclinical faculty member. Fifth, it has costs (buildings, equipment, supplies, etc.) that are independent of x and y , and thus, can be represented by a constant K . We combine all five cost components to obtain the university's annual total cost function, $C(x, y)$,

$$(1) \quad C(x, y) = C_c(x) + C_n(y) + K,$$

where $C_c(x) = w_c E_c (52 - \gamma_c p_c x) + [\alpha_c w_c + r_c] p_c E_c x + s[(1 - \gamma_c)x]t[(1 - \gamma_c)x]E_c$ and $C_n(y) = w_n E_n (52 - \gamma_n p_n y) + [\alpha_n w_n + r_n] p_n E_n y + s[(1 - \gamma_n)y]t[(1 - \gamma_n)y]E_n$ are costs associated with the clinical and nonclinical divisions, respectively. The optimization problem is to choose the values of x and y that minimize $C(x, y)$, subject to the constraints $x \geq 12$ and $y \geq 12$ imposed by the FMLA. The costs represented by K are fixed costs for our purposes. Therefore, they are irrelevant to the solution of the problem.

3. Implications of the Analysis

Optimal Leave with Separate Policies by Division

Minimizing (1) subject to $x \geq 12$ and $y \geq 12$ yields the first-order conditions⁸:

$$(2) \quad \frac{\partial C}{\partial x} = [\alpha_c w_c + r_c] p_c E_c + \{s_c^* t'[(1 - \gamma_c)x^*] + s'[(1 - \gamma_c)x^*]t_c^*\} E_c \geq 0$$

$$(3) \quad \frac{\partial C}{\partial y} = [\alpha_n w_n + r_n] p_n E_n + \{s_n^* t'[(1 - \gamma_n)y^*] + s'[(1 - \gamma_n)y^*]t_n^*\} E_n \geq 0$$

$$(4) \quad (x^* - 12) \left[\frac{\partial C(x^*, y^*)}{\partial x} \right] = 0$$

⁸ The second-order conditions are satisfied because the relevant Hessian matrix is positive definite.

$$(5) \quad (y^* - 12) \left[\frac{\partial C(x^*, y^*)}{\partial y} \right] = 0$$

$$(6) \quad x^* \geq 12$$

$$(7) \quad y^* \geq 12,$$

where x^* and y^* are the optimal (cost-minimizing) values for x and y , $s_c^* = s[(1 - \gamma_c)x^*]$ and $s_n^* = s[(1 - \gamma_n)y^*]$ are the optimal search costs for the clinical and nonclinical faculties, $t_c^* = t[(1 - \gamma_c)x^*]$ and $t_n^* = t[(1 - \gamma_n)y^*]$ are the optimal turnover rates for the clinical and nonclinical faculties, t' is the first derivative of the turnover function, and s' is the first derivative of the search cost function.

The complementary-slackness condition (4) implies that $x^* - 12 = 0$, $\frac{\partial C(x^*, y^*)}{\partial x} = 0$, or both. If $x^* - 12 > 0$, it follows from the second implication that

$$(8) \quad [(\alpha_c w_c + r_c) - \gamma_c w_c] p_c E_c = -\{s_c^* t'[(1 - \gamma_c)x^*] + s'[(1 - \gamma_c)x^*] t_c^*\} E_c$$

Likewise, condition (5) implies that $y^* - 12 = 0$, $\frac{\partial C(x^*, y^*)}{\partial y} = 0$, or both. Again, $y^* - 12 > 0$ implies that

$$(9) \quad [(\alpha_n w_n + r_n) - \gamma_n w_n] p_n E_n = -\{s_n^* t'[(1 - \gamma_n)y^*] + s'[(1 - \gamma_n)y^*] t_n^*\} E_n.$$

The terms on the left sides of (8) and (9) are net direct marginal costs of additional parental leave for each division (the wages for replacement instructors plus forgone grant and clinical revenues, each for a longer period, minus a portion of the wage bill for regular faculty if some leave is unpaid). The terms on the right sides of (8) and (9) are the marginal cost savings to the university from parental leave due to lower turnover and search costs⁹ in each division.¹⁰ That

⁹ A full accounting of the search costs of replacing workers who terminate employment would include the time costs for administrators, faculty, and staff (e.g., managing and screening applications, conducting off-campus and campus interviews, reaching decisions about the merits of the candidates, etc.), in addition to the monetary costs. This point applies in principle to finding short-term replacement instructors for faculty on leave, but those searches are usually far less time-consuming.

is, conditions (8) and (9) equate the marginal costs and marginal cost savings *within each division*, as divisional costs are fully independent.

To derive unique optimal leave policies for each division (x^* and y^*), we assume that the turnover and search cost functions are both strictly convex. For the turnover function, this means that $t' < 0$ (the faculty turnover rate declines as parental leave increases, reflecting the marginal benefit to faculty members) and $t'' > 0$ (the turnover rate declines less and less as parental leave increases). The strict convexity of the search cost function means that $s' < 0$ (search costs for regular faculty decline as parental leave increases) and that $s'' > 0$ (search costs decline less and less as parental leave increases).

To analyze the optimal policies, we use parameterizations of $t[(1 - \gamma_c)x]$ and $s[(1 - \gamma_c)x]$, chosen to satisfy the assumptions above. We specify the turnover function as $t[(1 - \gamma_c)x] = De^{-\delta(1-\gamma_c)x}$ and the search cost function as $s[(1 - \gamma_c)x] = Be^{-\beta(1-\gamma_c)x}$, where $0 < D < 1$, $B > 0$, $\delta > 0$, and $\beta > 0$ are parameters. Note that $t(0) = D$ and $s(0) = B$, so we could interpret D and B as the university's turnover rate and search costs, respectively, with no parental leave.¹¹ The parameter δ affects the rate at which turnover changes as x changes, and the parameter β affects the rate at which search costs change as x changes. We can replace γ_c and x with γ_n and y in each function to obtain $t[(1 - \gamma_n)y]$ and $s[(1 - \gamma_n)y]$.

¹⁰ Our analysis captures only the costs and benefits of parental leave for one employer. For an analysis of the broader labor market consequences of parental leave, see Mitchell (1990), Ruhm (1998), Waldfogel (1999), Waldfogel, Higuchi, and Abe (1999), and Han, Ruhm, and Waldfogel (1999).

¹¹ Such a policy was feasible only in the years prior to the restrictions $x \geq 12$ and $y \geq 12$ imposed by the FMLA. Of course, turnover and search costs depend on factors other than the length of parental leave (x), such as the wages and various forms of compensation at this university relative to others. We assume these factors remain constant throughout our analysis (i.e., we neutralize their effects) but they can be thought of as determining the intercepts (D and B) in the turnover and search cost functions.

Dividing both sides of (8) by E_c , substituting the search and turnover functions above, and solving for x^* , we obtain

$$(10) \quad x^* = \frac{\ln \left\{ \frac{(1-\gamma_c)(\delta+\beta)DB}{[\alpha_c w_c + r_c - \gamma_c w_c]p_c} \right\}}{(1-\gamma_c)(\delta+\beta)}.$$

Equation (9) yields an equivalent expression for the nonclinical division,

$$(11) \quad y^* = \frac{\ln \left\{ \frac{(1-\gamma_n)(\delta+\beta)DB}{[\alpha_n w_n + r_n - \gamma_n w_n]p_n} \right\}}{(1-\gamma_n)(\delta+\beta)}.$$

Equation (10) implies that a university would offer some parental leave ($x^* > 0$) in the clinical division, apart from the FMLA, only if $(1 - \gamma_c)(\delta + \beta)DB > [\alpha_c w_c + r_c - \gamma_c w_c]p_c$. From our interpretation of equation (8), $[\alpha_c w_c + r_c - \gamma_c w_c]p_c$ is the net direct cost of additional parental leave to the university, expressed per position. Similarly, $(1 - \gamma_c)(\delta + \beta)DB$ gives the turnover and search cost savings to the university from additional parental leave, expressed per position, when $x = 0$ (there is no leave). Thus, apart from the FMLA, the university would provide some parental leave only if the indirect marginal cost savings exceed the net direct marginal costs for small values of x or y .

Figures 1a and 1b illustrate this finding by plotting net direct marginal costs (MC) and indirect marginal cost savings (MCS) of parental leave to the university as functions of x (or y). Net direct marginal costs per position, $[\alpha w + r - \gamma w]p$, are constant – they do not depend on the length of leave – while marginal cost savings per position, $(1 - \gamma)(\delta + \beta)DB e^{-(\delta+\beta)(1-\gamma)x}$, decline as x (or y) increases. Figures 1a and 1b show us that, apart from the FMLA, universities would offer parental leave ($x^* > 0$) only if $(1 - \gamma)(\delta + \beta)BD > [\alpha w + r - \gamma w]p$. In situations where the constraint imposed by the FMLA is not binding ($x^* > 12$), as in Figure 1a, the optimal

parental leave (x^*) is given by the intersection point of the MC and MCS curves. In those cases where the constraint is binding, as in Figure 1b, we can gauge the degree of imposition by the distance $MC - MCS(12) = [\alpha w + r - \gamma w]p - (1 - \gamma)(\delta + \beta)DB e^{-(\delta + \beta)(1 - \gamma)12}$.

Comparing the optimal parental leave policies across the clinical and nonclinical divisions is interesting, because the parameters in (10) and (11) can vary substantially across these divisions. We make such comparisons in our simulations, but we can gain insight into this issue without imposing specific functional forms on the turnover and search cost functions. If we divide (8) by (9) and multiply both sides of the resulting expression by $\frac{E_n}{E_c}$, we obtain:

$$(12) \quad \frac{[\alpha_c w_c + r_c - \gamma_c w_c]p_c}{[\alpha_n w_n + r_n - \gamma_n w_n]p_n} = \frac{-\{s_c^* t'[(1 - \gamma_c)x^*] + s'[(1 - \gamma_c)x^*]t_c^*\}}{-\{s_n^* t'[(1 - \gamma_n)y^*] + s'[(1 - \gamma_n)y^*]t_n^*\}}$$

Suppose that $[\alpha_c w_c + r_c - \gamma_c w_c]p_c > [\alpha_n w_n + r_n - \gamma_n w_n]p_n$ (the net direct marginal costs of leave per position are greater for clinical than for nonclinical faculty). Then, (12) implies that the marginal cost savings per faculty position must be greater in the clinical than in the nonclinical division, which can be written as

$$(13) \quad s_c^* \{-t'[(1 - \gamma_c)x^*]\} + \{-s'[(1 - \gamma_c)x^*]\}t_c^* > s_n^* \{-t'[(1 - \gamma_n)y^*]\} + \{-s'[(1 - \gamma_n)y^*]\}t_n^*.$$

For $x^* < y^*$, $s_c^* > s_n^*$ and $t_c^* > t_n^*$. Given that $t' < 0$, $s' < 0$, $t'' > 0$, and $s'' > 0$ by assumption, it also follows that $-t'[(1 - \gamma_c)x^*] > -t'[(1 - \gamma_n)y^*]$ and $-s'[(1 - \gamma_c)x^*] > -s'[(1 - \gamma_n)y^*]$. Thus, for $x^* < y^*$, (13) is satisfied. Figures 2 and 3 illustrate this reasoning. Using similar reasoning, we can see that setting $x^* > y^*$ would violate (13). Thus, if the direct marginal costs of leave per faculty position are greater for clinical than for nonclinical faculty, it must be that $x^* < y^*$ at the cost minimum, given our assumptions. That is, the logic of cost

minimization implies that parental leave be *shorter* for clinical faculty than for nonclinical faculty.

Optimal Uniform Leave Policy across Divisions

In section 4, where we calibrate the model and conduct simulation exercises, we use data from East Carolina University, a member of the UNC system with a *uniform* parental leave policy across the clinical and nonclinical divisions. We can adapt our specification of the cost function to this situation by substituting $x = z = y$ and $\gamma_c = \gamma = \gamma_n$ into (1) to obtain

$$(14) \quad C(z) = C_c(z) + C_n(z) + K.$$

Minimizing (14) subject to the constraint $z \geq 12$ yields the following first-order conditions¹²:

$$(15) \quad \frac{dC}{dz} \geq 0$$

$$(16) \quad (z^* - 12) \left[\frac{dC(z^*)}{dz} \right] = 0$$

$$(17) \quad z^* \geq 12.$$

The complementary slackness condition (16) implies that $z^* - 12 = 0$, $\frac{dC(z^*)}{dz} = 0$, or both. If $z^* - 12 > 0$, it follows from the second implication that

$$(18) \quad (\alpha_c w_c + r_c - \gamma w_c) p_c f_c + (\alpha_n w_n + r_n - \gamma w_n) p_n f_n = \{s^* t'[(1 - \gamma)z^*] + s'[(1 - \gamma)z^*] t^*\},$$

where $f_c = \frac{E_c}{E_c + E_n}$ and $f_n = \frac{E_n}{E_c + E_n}$ are the fractions of the faculty employed in the clinical and nonclinical divisions, respectively.

¹² The second-order conditions are satisfied because (14) is strictly convex.

To calculate the optimal uniform leave length when $z^* > 12$, we use our specifications of the turnover and search cost functions to rewrite equation (18) as

$$(19) \quad (\alpha_c w_c + r_c - \gamma w_c) p_c f_c + (\alpha_n w_n + r_n - \gamma w_n) p_n f_n = (1 - \gamma)(\delta + \beta) DB e^{-(\delta + \beta)(1 - \gamma)z^*}.$$

Solving (19) for z^* yields

$$(20) \quad z^* = \frac{\ln \left\{ \frac{(\delta + \beta) DB}{(\alpha_c w_c + r_c - \gamma w_c) p_c f_c + (\alpha_n w_n + r_n - \gamma w_n) p_n f_n} \right\}}{(1 - \gamma)(\delta + \beta)}.$$

This expression is similar to equation (10) except that in the denominator of the logarithm, we obtain a *weighted average* of the net direct marginal costs per position of a longer leave in the clinical and nonclinical divisions. Apart from the FMLA, a university would offer some parental leave ($z^* > 0$) if $(\delta + \beta) DB > (\alpha_c w_c + r_c - \gamma w_c) p_c f_c + (\alpha_n w_n + r_n - \gamma w_n) p_n f_n$, that is, if the weighted average of net direct marginal costs across divisions were less than the marginal cost savings at $z = 0$ (no leave). Figure 4, where the dashed line represents the weighted average of marginal costs, illustrates this result. It also shows that the optimal uniform policy (z^*) and the optimal separate policies by division (x^* and y^*) must be related such that $x^* \leq z^* \leq y^*$.

Effects of Changes in the Parameter Values

In equations (10), (11), and (20), the optimal length of parental leave depends on a number of parameter values. This section investigates how changes in the parameter values affect the optimal leave lengths in the nonclinical units, where the constraints imposed by the FMLA are less likely to be binding. Using equation (11), we can compute partial derivatives of y^* with respect to each of the parameters. We report these results in Table 1.

The first parameter, the fraction of leave that is unpaid (γ_n), is of particular interest in this study. Note that it appears in both the MC and MCS curves in Figures 1a and 1b. Increases in γ_n lower both curves, so it is not surprising that the sign of $\partial y^*/\partial \gamma_n$ is ambiguous in Table 1. To see how the expression could be negative, let $r_n = 0$ and $\gamma_n > \alpha_n$.

We next consider the effects of the parameters from the turnover and search cost functions. Notice here that δ and β affect both the intercept and slope of the MCS curve in Figures 1a and 1b. Table 4 shows that both $\partial y^*/\partial \delta$ and $\partial y^*/\partial \beta$ have ambiguous signs, but they are positive if $R < e$, where R represents the ratio inside the logarithm in (11).¹³ Unlike the parameters δ and β , D and B affect only the intercept of the MSC curve. Increases in D or B raise this curve, and therefore, increase the optimal length of leave. We can see then why $\partial y^*/\partial D$ and $\partial y^*/\partial B$ are both positive in Table 1.

The remaining parameters in Table 1 all appear in the MC curve in Figures 1a and 1b. Increases in three of these parameters (α_n , r_n , and p_n) unambiguously raise the curve, which explains the finding in Table 1 that $\partial y^*/\partial \alpha_n$, $\partial y^*/\partial r_n$, and $\partial y^*/\partial p_n$ are all negative. Things become more complicated for the parameter w_n . Notice that it appears twice in the MC curve in Figures 1a and 1b, and that its effects on MC work in opposite directions. Not surprisingly, the sign of $\partial y^*/\partial w_c$ is ambiguous in Table 1, but it is negative if $\gamma_n < \alpha_n$.

¹³ Using the calibrated parameter values in Table 2 below, $R = 10.73 > e$, so $\frac{\partial y^*}{\partial \delta} < 0$ and $\frac{\partial y^*}{\partial \beta} < 0$.

Cost Comparisons of Alternative Parental Leave Policies

In the post-recession budget environment, university administrators have a natural interest in the costs of alternative parental leave policies. We have considered two kinds of policies: separate policies by division and a uniform policy across divisions. Under the former, the university's costs can be written as $C(x^*, y^*) = C_c(x^*) + C_n(y^*) + K$. Under the latter, the university's costs become $C(z^*) = C_c(z^*) + C_n(z^*) + K$. We have not calibrated K , but we can compute the difference in costs between separate policies and a uniform policy as:

$$(21) \quad C(z^*) - C(x^*, y^*) = C_c(z^*) + C_n(z^*) - C_c(x^*) - C_n(y^*),$$

where the terms involving K cancel. Rewriting (21) in terms of the parameters of the model, setting $\gamma_c = \gamma = \gamma_n$, and simplifying the resulting expression, we obtain:

$$(22) \quad C(z^*) - C(x^*, y^*) = [(\alpha_c - \gamma)w_c + r_c]p_c E_c(z^* - x^*) + BD[e^{-(\delta+\beta)(1-\gamma)z^*} - e^{-(\delta+\beta)(1-\gamma)x^*}]E_c + [(\alpha_n - \gamma)w_n + r_n]p_n E_n(z^* - y^*) + BD[e^{-(\delta+\beta)(1-\gamma)z^*} - e^{-(\delta+\beta)(1-\gamma)y^*}]E_n.$$

Note that terms involving $(z^* - x^*)$ or $(z^* - y^*)$ in (22) will vanish when separate and uniform leave policies by division are both at the minimum set by the FMLA (e.g., $x^* = 12 = z^*$).

Other cost differences of interest to universities arise from variations in γ , the proportion of leave that is unpaid. With a uniform policy, we can express such cost differences as

$$(23) \quad C(z^*; \gamma_1 = 0) - C(z^*; \gamma_2 \neq 0) = \gamma_2 p_c w_c E_c z^* + BD[e^{-(\delta+\beta)z^*} - e^{-(\delta+\beta)(1-\gamma_2)z^*}]E_c + \gamma_2 p_n w_n E_n z^* + BD[e^{-(\delta+\beta)z^*} - e^{-(\delta+\beta)(1-\gamma_2)z^*}]E_n.$$

Expression (23) contains terms of two kinds: lower wage bills for each faculty group because a portion of parental leave is unpaid, and higher turnover and search costs in each faculty group because leave is

less attractive to both the faculty and applicants for vacant positions. That is, the factors involving the differences in exponential expressions in (23) are negative. The net effect of these two kinds of terms determines whether higher values for γ lower costs for universities.

4. Calibration and Simulations

To calibrate the parameters in the model, we use data from East Carolina University (ECU), which is now the third-largest institution in the UNC system. We find the data for most of the parameters in the ECU Fact Book (2009, 2010). The issues investigated in this paper arise at ECU because it has three units in the Division of Health Sciences that provide clinical services: the Brody School of Medicine, the College of Nursing, and the College of Allied Health Sciences. The other colleges and schools at ECU comprise the nonclinical division for the purposes of the study. While ECU offers an excellent setting for the calibration of the model, this section aims to show how the model can be applied to any institution with clinical and nonclinical divisions. We first calculate optimal parental leave lengths separately by division. Then we calculate the optimal uniform leave length across divisions. The last part of this section computes the cost difference between separate and uniform leave policies across divisions, and in the case of uniform policies, between those with and without some unpaid leave.

Optimal Leave Policies by Division

In 2009-10, ECU had 1,743 full- and part-time faculty members, of which 602 were employed in the clinical division.¹⁴ In that group, 346 were credentialed providers of clinical services. We found substantial differences between the faculty in clinical medicine (the Brody School) and other clinical units (nursing and allied health sciences) in weekly wages and clinical revenues generated, so we treat these groups separately in the analysis to follow. Employment shares for ECU faculty were 24.8% in clinical medicine, 9.8% in other clinical units, and 65.4% in the nonclinical units. 44 percent of faculty members were female, with higher percentages among assistant professors and instructors, for whom parental leave is most relevant.

The weekly faculty wages or salaries varied substantially: \$2,282 in clinical medicine, \$1,384 in other clinical units, and \$1,248 in the nonclinical units. There is also variation across units in the fraction of regular wages paid to instructors (our proxies for replacements): 0.412 in clinical medicine, 0.691 in other clinical units, and 0.931 in the nonclinical units. The clinical and grant revenues per faculty member are higher in clinical medicine (\$6,552) than in other clinical units (\$292) or nonclinical units (\$222). For confidentiality reasons, the data on the proportion of faculty taking parental leave could only be broken down to clinical and nonclinical divisions. In the clinical division, 12.29 percent of faculty took leave for child-related reasons (maternity or to care for a sick child).¹⁵ In the nonclinical division, the figure was only 1.93 percent. At

¹⁴ In our formulation of the problem, the parental leave policy (x) applies to the entire Health Sciences Division, so we use the number of Health Science faculty (602) rather than the number of clinical service providers (346) when calculating f_c .

¹⁵ We do not count leave taken for other reasons covered by the FMLA, such as caring for a parent or to deal with their own health problems.

ECU, all parental leave is paid, so we set $\gamma = 0$. Later, we explore the consequences of changing this parameter.

These data imply that the marginal (weekly) cost per position of providing parental leave is greater in clinical medicine, $[(0.412)(\$2,282) + \$6,552]0.1229 = \$920.79$, than in the other clinical units, $[(0.691)(\$1,384) + \$292]0.1229 = \$153.42$, or the nonclinical units, $[(0.931)(\$1,248) + \$222]0.0193 = \$26.71$. We can trace these differences to larger forgone revenues in the clinical division and a larger proportion of clinical faculty taking parental leave. The remaining parameters that we calibrate in this section are embedded in the turnover and search cost functions on the right-hand side of equations (8) and (9), which give the marginal cost savings from providing leave. We now turn our attention to these parameters.

The ECU Fact Book (2009) provides data on the annual faculty turnover rate. ECU employed 1,804 full- and part-time faculty in 2008 and 1,671 (92.6 percent) returned in 2009, yielding a turnover rate of 7.4 percent. In that period ECU offered 15 weeks of parental leave, fully paid and applied uniformly across all units.¹⁶ Thus, our turnover function can be written as $t(z) = 0.074 = De^{-\delta 15}$, where D is the turnover rate with no leave ($x = 0$) and the parameter δ determines the rate at which turnover changes as z changes. As noted above, we can only contemplate such a policy as a thought experiment (removing the FMLA).

To imagine a turnover rate with no parental leave, we look at the make-up of ECU's faculty. Those most likely to terminate employment under such a policy would be women of

¹⁶ The policy changed on July 1, 2011. Under the new policy, the length of paid leave has been reduced to 12 weeks. The policy change emerged during cost management reviews triggered by the financial and state budget crises beginning in 2007.

younger ages. In 2009, 910 faculty members (51 percent) at ECU were age 49 or below. With females outnumbering males at the lower ranks (the instructor and assistant professor levels), there could be as many as 500 women age 49 or below on the faculty (28 percent of the total). Some of these women had neither children nor future plans for having children and thus might not have responded to the elimination of parental leave. Hence, a realistic *upper bound* for D might be 0.148, twice the existing turnover rate. We also consider $D = 0.111$ and $D = 0.081$, which imply 50-percent and 10-percent increases in turnover. Plugging the middle value into the turnover function, we obtain $\delta = 0.027$.¹⁷ In our analysis below, we check whether the results are sensitive to the choice of D and the value of δ implied by that choice.

The remaining parameters that determine the marginal cost savings of leave emerge from the search cost function, $s(x) = Be^{-\beta x}$, where B stands for the university's search costs when there is no parental leave ($x = 0$), β influences the rate at which search costs change as x changes, and we continue to set $\gamma = 0$. If the university eliminated this fringe benefit, some job candidates would reject offers that they would have otherwise accepted, hence raising the number of campus interviews required to fill a regular faculty position. We present results for one, three, and six extra campus interviews.¹⁸ We consider both the explicit costs (outlays for mileage or airfare, hotel rooms, meals, etc.) and the implicit costs (value of time invested by department chairs, faculty, and staff) of conducting the additional campus searches.

¹⁷ We can use this specification to estimate the impact of the reduction in paid parental leave from 15 weeks to 12 weeks, which went into effect at ECU on July 1, 2011. As the reader can verify, with $\gamma = 0$, $t(12) = 0.08$ using this specification. At the turnover rate associated with $t(12)$, the number of vacated positions would have been $144 = 0.08(1,804)$ under the 12-week policy, rather than $133 = 0.074(1,804)$ under the 15-week policy.

¹⁸ If the university wanted to maintain the current gender ratio among faculty members, a number toward the higher end of this range may be necessary.

The explicit and implicit search costs of filling a regular faculty position amount to \$15,900 (assuming three campus visits after interviews at a national conference) under the actual 15-week paid leave policy. About two-thirds of the costs are implicit – 20 department chair hours at \$59 per hour, 200 faculty hours at \$53 per hour, and 49 secretarial staff hours at \$21 per hour. Our calculations of search costs under the actual policy establish point A on the search cost curve shown in Figure 4. To determine the shape of this curve, we need one more point, such as the vertical intercept, represented by the parameter B (search costs per vacancy when $x = 0$). Here we use a range of numbers (\$18,983 to \$34,403, counting the implicit costs) associated with alternative assumptions about how many additional campus visits – one, three, or six – would be needed to fill a vacancy under a policy of no leave. By combining point A and any of the vertical intercepts in Figure 4, we can infer values for the parameter β (the shape of the function). Given our range of intercept values, the implied values of β range from 0.012 to 0.051. Note that including the implicit search costs increases the values of both parameters in the search cost function, B and β . A list of calibrated values for the parameters in the model that affect optimal parental leave appears in Table 2.

The values in Table 2 allow us to compute optimal leave lengths by division: x_{cm}^* for clinical medicine, x_{oc}^* for other clinical units, and y^* for nonclinical units. For the first two, we use variations on equation (11); for the third, we use equation (12). We organize the results in Tables 3a and 3b. In Table 3a, leave is fully paid ($\gamma = 0$), which is the policy at ECU. In Table 3b, half of leave is unpaid ($\gamma = 0.5$). In both tables, we group results by our assumptions about the sensitivity of faculty turnover to changes in the length of leave. We consider three possibilities: eliminating parental leave – treated as a thought experiment, as the FMLA mandates 12 weeks

of leave – would increase faculty turnover by 10-percent, 50-percent, or 100-percent. Within each of these possibilities, we consider a range of assumptions about the additional campus visits it would take to fill a job opening: one, three, or six.

Regardless of which combination of assumptions we use, Table 3a shows that the optimal length of leave in clinical medicine and other clinical units is 12 weeks, which is the amount mandated by the FLMA. By comparing the marginal costs (MC) and the marginal cost savings (MCS) at $x = 12$, we can also see that the FMLA constraint is binding in all cases except the last row for the other clinical units, where $MC_{oc} - MCS(12) < 0$. This exception fits Figure 1a, whereas all the other cases fit Figure 1b. For the nonclinical units in Table 3a, however, we obtain the opposite results. For all combinations of assumptions except one (in the first row, where $MC_n - MCS(12) > 0$), the optimal length of leave is about 30 weeks.

In Table 3b, where only half of the leave is paid, the results for clinical medicine are similar. For the other clinical units, there are cases in which it is optimal for the university to go beyond the legal mandate (12 weeks of leave). We find these cases where faculty turnover and search costs are more sensitive to the fraction of leave that is paid, $(1 - \gamma)$. In nonclinical units, the optimal leave doubles to about 60 weeks when only half of the leave is paid. These results show that from the perspective of cost minimization, the optimal leave policies for the clinical and nonclinical units are quite different.

We can trace the differences to a few key parameters. Relative to the other units, clinical medicine has higher wages and much higher forgone clinical and grant revenues per faculty member, though the nonclinical division pays a higher fraction of its regular wages to replacement instructors. Relative to the nonclinical division, the clinical units have a far higher

proportion of faculty who take parental leave. All of these parameters appear in the MC curves in Figures 1a and 1b, and therefore, influence the optimal length of leave. The first two (w and r) distinguish clinical medicine from the other clinical units (nursing and allied health sciences), while the third (p) distinguishes the clinical division from the nonclinical division.

Optimal Uniform Leave Policy

Table 4 reports optimal leave lengths for a uniform policy (z^* for all units), with the leave fully paid ($\gamma = 0$). We get these results from equation (20), adapted to include clinical medicine, other clinical units, and nonclinical units. Here, for all combinations of assumptions about how faculty turnover and search costs respond to changes in parental leave, the optimal leave length is $z^* = 12$, the amount mandated by the FMLA. Given that $MC_w - MCS(12) > 0$ in all cases, the FMLA constraint is binding everywhere. Table 4 also shows the cost differences between a uniform leave policy and separate policies by division. For all possible combinations of assumptions, except those in the first row (the sole combination for which the FMLA was a binding constraint for all units in Table 3a, including the nonclinical ones), a uniform policy is more costly. The cost differences range from approximately \$175,000 to \$950,000 per year. For the intermediate combination of assumptions (middle row in Table 4), we find a cost difference of nearly half a million dollars per year.

This finding suggests that, if the parameters determining the optimal length of leave (e.g., the amount of clinical revenue generated) vary substantially among individual colleges and schools within a university, then cost savings may be realized by giving the deans a larger role in shaping parental leave policy, subject to the approval of a higher administrator. At the

University of Michigan, we find some evidence of movement in this direction in the Faculty Handbook (6.D.2 Modified Duties for New Parents),

To provide time to adjust to the demands of parenting newly born or adopted children, Standard Practice Guide 201.93 ... entitles professorial faculty members who meet the criteria below, upon request, to a period of modified duties without a reduction in salary ... The relevant dean (or his or her designee), in consultation with the eligible faculty member, will determine the ways in which the faculty member's duties will be modified. At a minimum the relevant school or college will make arrangements that relieve the faculty member from direct teaching responsibilities for the period of modified duties.

For faculty members with significant direct clinical responsibilities or limited teaching obligations, other modifications will be provided appropriate to their circumstances.

Note here that the parental leave policy is not imposed uniformly across colleges and schools. Instead, the modifications are “appropriate to their circumstances.” In terms of our analysis, decision makers can take into consideration the values of the key parameters in the relevant school or college.

If campus politics make separate policies by division, college, or school infeasible, can cost savings be realized by making uniform leave partially paid (say, $\gamma = 0.5$) rather than fully paid ($\gamma = 0$)? From the information provided in the introduction, it is apparent that some Big-10 institutions have adopted such a policy. Table 5 presents these cost comparisons, obtained from equation (23), with $\gamma = 0.5$. We report the cost differences by division to reveal that the findings are quite different. In clinical medicine and the other clinical units, partially paid leave yields cost savings in every row. In the nonclinical units, however, the opposite is true in every row except the first, where the sensitivity of faculty turnover and search costs to leave policies is weakest. For the whole university, the cost savings from adopting partially paid leave can be

either positive or negative, with the latter occurring where the sensitivity of faculty turnover and search costs to the fraction of paid leave is strongest.

What can account for these findings? Recall that a much larger proportion of faculty members in the clinical division take parental leave, and that they have higher wages than the nonclinical faculty. Therefore, a policy of partially paid leave can generate large savings. In the nonclinical division, a small proportion of faculty members take parental leave, and their wages are lower, both of which reduce the cost savings from partially paid leave. Moreover, *all* faculty members respond to the policy change, thus raising turnover and search costs, so the net effect on the university's total costs can be in the wrong direction. Here again, cost minimization calls for separate policies – the proportion of leave paid – by division, with a smaller fraction of paid leave in the clinical division.

5. Conclusions

With many states facing severe budget crises, public universities find it necessary to manage costs more carefully. Parental leave, along with other policies and procedures, come under review. We model the optimal length of parental leave for a university with clinical and nonclinical faculties, which depends on the marginal benefits (i.e., reduced turnover and search costs) and marginal costs (i.e., higher wage bills for replacement instructors and lost clinical and grant revenues) of additional leave. We show that if leave is more costly in the clinical division (due to lost clinical revenues, among other things), then cost minimization implies that the optimal length of paid leave must be shorter in the clinical division.

Using data for East Carolina University (a large public university with a medical school and colleges of nursing and allied health sciences), we find that the optimal policy is to provide the FMLA-mandated 12 weeks of parental leave in clinical medicine, the same for other clinical units under most sets of assumptions, and offer more than the legal mandate in the nonclinical division. Under the additional constraint of a uniform policy across divisions, the optimal policy is to satisfy the legal mandate. We find that this additional constraint raises university costs by an amount ranging from approximately \$175,000 to \$950,000 per year, depending upon how faculty turnover and search costs respond to changes in the length of leave.

We also investigate the consequences of offering partially paid leave. Here too, important differences emerge between the clinical and nonclinical divisions. In the former, reducing the fraction of leave that is paid has little or no effect on the optimal length of leave. In the latter, the optimal length of leave doubles when only half of leave is paid. Finally, within the uniform policy environment, offering partially paid leave reduces total costs in the clinical division, but *raises* total costs in the nonclinical division, because key parameter values (the proportion of faculty member who take leave, and their wages) differ across divisions.

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Figure 1a
Optimal Length of Parental Leave:
FMLA Constraint Not Binding

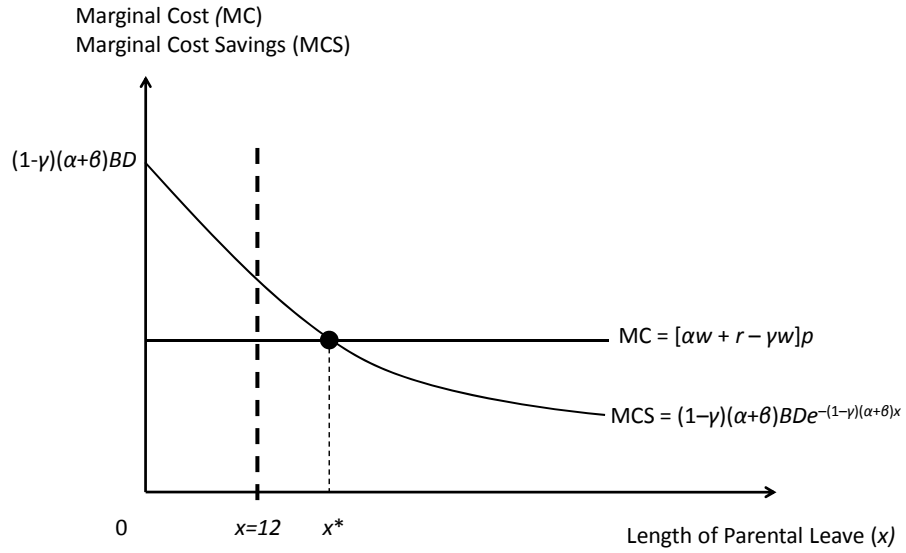


Figure 1b
Optimal Length of Parental Leave:
FMLA Constraint Binding

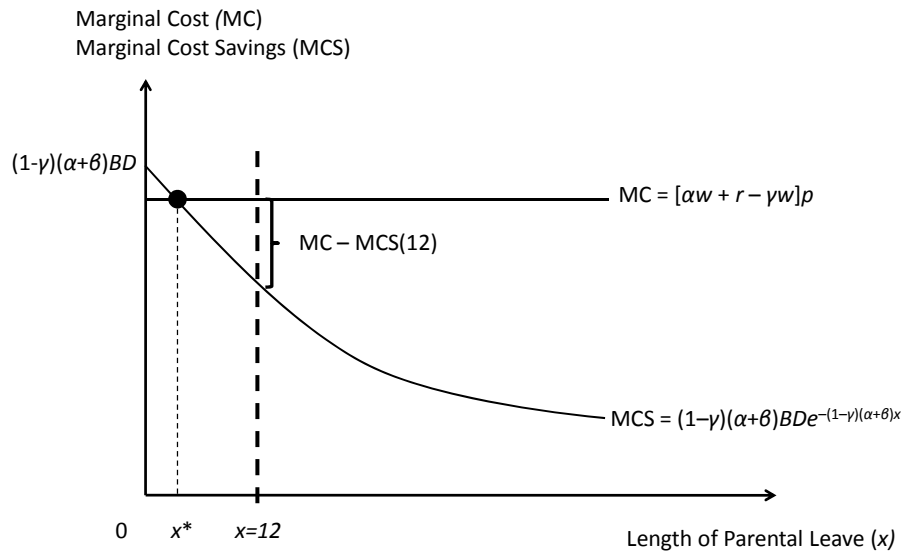


Figure 2:
Faculty Turnover as a Function of the Length of Parental Leave

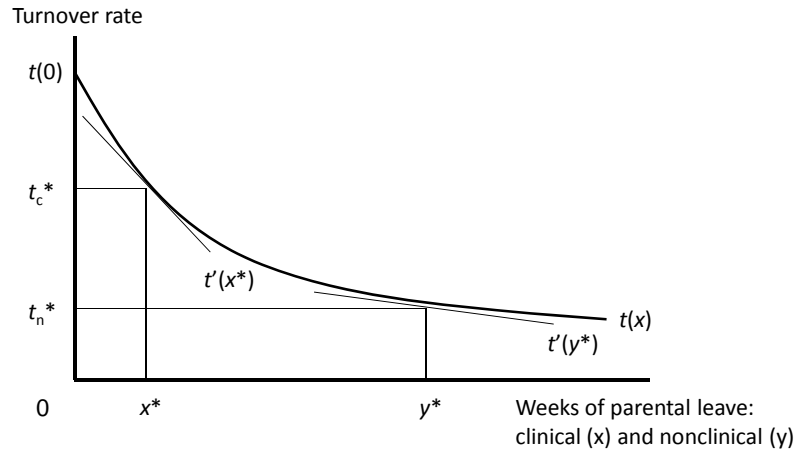


Figure 3:
Search Costs as a Function of the Length of Parental Leave

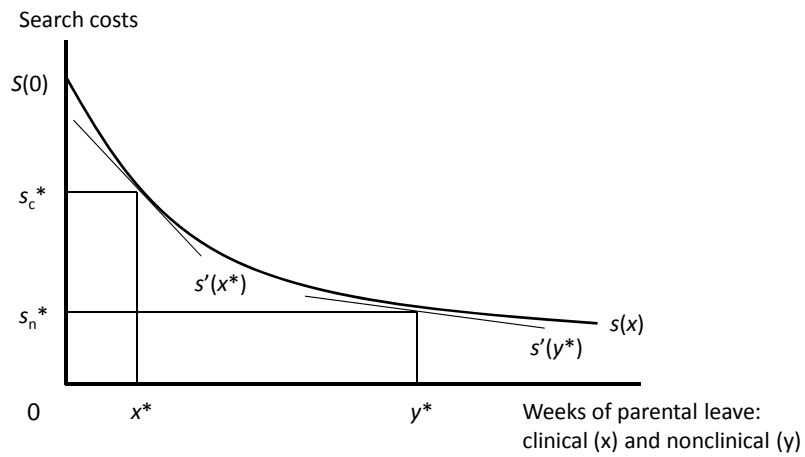


Figure 4
Optimal Length of Parental Leave
(Uniform Policy across Divisions)

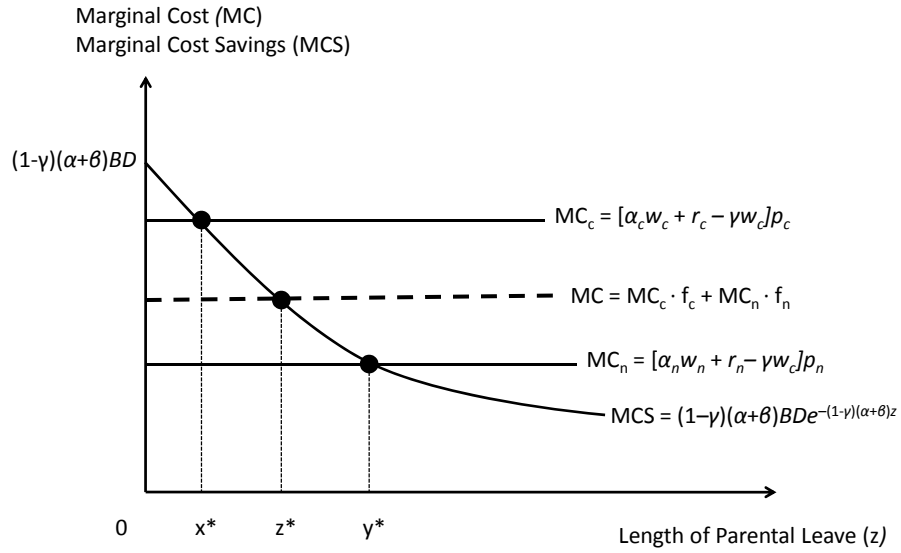


Figure 5
Alternative Specifications of the Search Cost Function

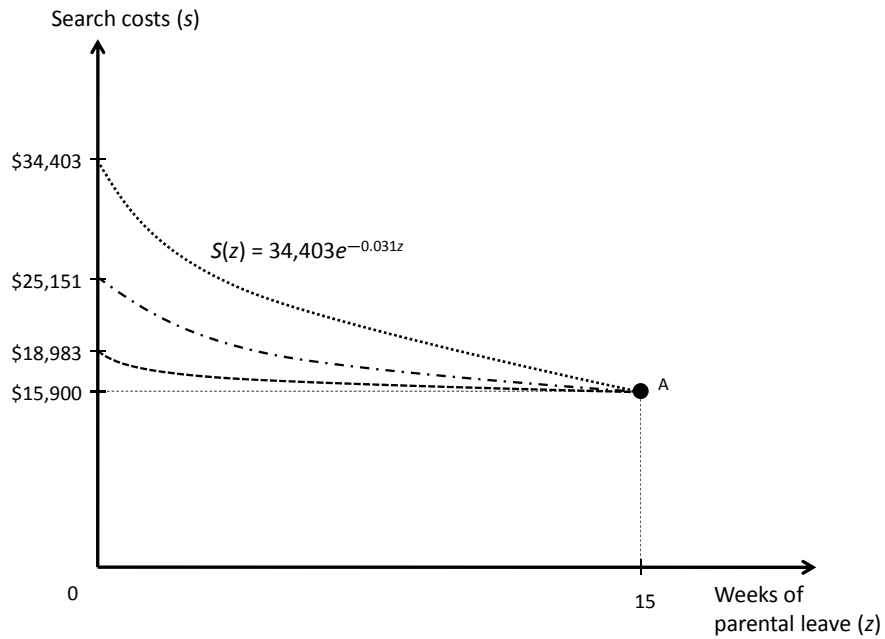


Table 1
How Optimal Nonclinical Parental Leave Responds to Changes in the Parameters

Parameter	Partial Derivative
	Let $R = \frac{[(1-\gamma_n)(\delta+\beta)DB]}{[\alpha_n w_n + r_n - \gamma_n w_n] p_n}$
γ_n	$\partial y^* / \partial \gamma_n = -[(\alpha_n - 1)w_n + r_n] / \{(1 - \gamma_n)[(\alpha_n - \gamma_n)w_n + r_n]\} \leq 0$
δ	$\partial y^* / \partial \delta = [1 - \ln(R)] / [(1 - \gamma_n)(\delta + \beta)^2] > 0$ if $R < e$
β	$\partial y^* / \partial \beta = [1 - \ln(R)] / [(1 - \gamma_n)(\delta + \beta)^2] > 0$ if $R < e$
D	$\partial y^* / \partial D = 1 / [(1 - \gamma_n)(\delta + \beta)D] > 0$
B	$\partial y^* / \partial B = 1 / [(1 - \gamma_n)(\delta + \beta)B] > 0$
α_n	$\partial y^* / \partial \alpha_n = -w_n / [(1 - \gamma_n)(\delta + \beta)(\alpha_n w_n + r_n - \gamma_n w_n)] < 0$
w_n	$\partial y^* / \partial w_n = (\gamma_n - \alpha_n) / [(1 - \gamma_n)(\delta + \beta)(\alpha_n w_n + r_n - \gamma_n w_n)] < 0$ if $\gamma_n < \alpha_n$
r_n	$\partial y^* / \partial r_n = -1 / [(\delta + \beta)(1 - \gamma_n)(\alpha_n w_n + r_n - \gamma_n w_n)] < 0$
p_n	$\partial y^* / \partial p_n = -1 / [(1 - \gamma_n)(\delta + \beta)p_n] < 0$

Table 2
Calibrated Parameter Values

Parameter	Interpretation	Calibrated Value
α_{cm}	Fraction of regular wages paid to clinical medicine replacements	0.412
α_{oc}	Fraction of regular wages paid to other clinical replacements	0.691
α_n	Fraction of regular wages paid to nonclinical replacements	0.931
w_{cm}	Average weekly clinical medicine wage (salary)	\$2,282
w_{oc}	Average weekly other clinical wage (salary)	\$1,384
w_n	Average weekly nonclinical wage (salary)	\$1,248
r_{cm}	Weekly clinical & grant revenue per clinical medicine faculty member	\$6,552
r_{oc}	Weekly clinical & grant revenue per other clinical faculty member	\$292
r_n	Weekly grant revenue per nonclinical faculty member	\$222
p_c	Proportion of clinical faculty who take parental leave	0.1229
p_n	Proportion of nonclinical faculty who take parental leave	0.0193
δ	Change in the turnover rate as paid parental leave changes	0.046*
β	Change in search costs as paid parental leave changes	0.031*
D	Faculty turnover rate with no paid parental leave	0.148*
B	Search costs per faculty position with no paid parental leave	\$25,151*
f_{cm}	Share of faculty employed in clinical medicine	0.248
f_{oc}	Share of faculty employed in other clinical units	0.098
f_n	Share of faculty employed in nonclinical units	0.654
γ	Fraction of leave that is unpaid	0**
<p>* Higher and lower values used in the sensitivity analysis</p> <p>** Higher values used in the sensitivity analysis</p>		

Table 3a
Optimal Weeks of Parental Leave by Division:
Full Leave Paid ($\gamma=0$)

<i>B</i> Value	β Value	Additional Campus Visits	Optimal Leave in Clinical Medicine / $MC_{cm} - MCS(12)$	Optimal Leave in Other Clinical Units / $MC_{oc} - MCS(12)$	Optimal Leave in Nonclinical Units / $MC_n - MCS(12)$
$D = 0.081$ and $\delta = 0.006$ (eliminating parental leave raises the faculty turnover rate by 10-percent)					
\$18,983	0.012	1	12 / \$898.59	12 / \$131.10	12 / \$4.40
\$25,151	0.031	3	12 / \$872.54	12 / \$105.04	28 / -\$21.65
\$34,403	0.051	6	12 / \$840.74	12 / \$73.25	31 / -\$53.45
$D = 0.111$ and $\delta = 0.027$ (eliminating parental leave raises the faculty turnover rate by 50-percent)					
\$18,983	0.012	1	12 / \$869.43	12 / \$101.93	29 / -\$24.76
\$25,151	0.031	3	12 / \$840.16	12 / \$72.67	31 / -\$54.03
\$34,403	0.051	6	12 / \$804.07	12 / \$36.58	31 / -\$90.12
$D = 0.148$ and $\delta = 0.046$ (eliminating parental leave raises the faculty turnover rate by 100-percent)					
\$18,983	0.012	1	12 / \$839.65	12 / \$72.15	31 / -\$54.54
\$25,151	0.031	3	12 / \$807.12	12 / \$39.63	31 / -\$87.06
\$34,403	0.051	6	12 / \$766.68	12 / -\$0.81	30 / -\$127.51
<p>MC_{cm}, MC_{oc}, and MC_n are the marginal costs of providing parental leave in clinical medicine, other clinical units, and nonclinical units. $MCS(12)$ is the marginal cost savings of parental leave to the university evaluated at 12 weeks of leave, the constraint imposed by the FMLA. When $MC - MCS(12) > 0$, the FMLA constraint is binding.</p> <p>See Table 2 for the interpretation of the turnover function parameters D and δ, and the search cost function parameters B and β.</p>					

Table 3b
Optimal Weeks of Parental Leave by Division:
Half of Leave Paid ($\gamma=0.5$)

<i>B</i> Value	β Value	Additional Campus Visits	Optimal Leave in Clinical Medicine / $MC_{cm} - MCS(12)$	Optimal Leave in Other Clinical Units / $MC_{oc} - MCS(12)$	Optimal Leave in Nonclinical Units / $MC_n - MCS(12)$
$D = 0.081$ and $\delta = 0.006$ (eliminating parental leave raises the faculty turnover rate by 10-percent)					
\$18,983	0.012	1	12 / \$768.25	12 / \$55.95	12 / \$2.24
\$25,151	0.031	3	12 / \$750.49	12 / \$38.18	59 / -\$15.53
\$34,403	0.051	6	12 / \$724.26	12 / \$11.95	59 / -\$41.76
$D = 0.111$ and $\delta = 0.027$ (eliminating parental leave raises the faculty turnover rate by 50-percent)					
\$18,983	0.012	1	12 / \$748.16	12 / \$35.85	53 / -\$17.86
\$25,151	0.031	3	12 / \$723.51	12 / \$11.20	59 / -\$42.51
\$34,403	0.051	6	12 / \$687.41	19 / -\$24.90	60 / -\$78.16
$D = 0.148$ and $\delta = 0.046$ (eliminating parental leave raises the faculty turnover rate by 100-percent)					
\$18,983	0.012	1	12 / \$723.15	12 / \$10.84	59 / -\$42.87
\$25,151	0.031	3	12 / \$690.39	19 / -\$21.92	59 / -\$75.63
\$34,403	0.051	6	12 / \$642.69	26 / -\$69.62	59 / -\$123.33
<p>MC_{cm}, MC_{oc}, and MC_n are the marginal costs of providing parental leave in clinical medicine, other clinical units, and nonclinical units. $MCS(12)$ is the marginal cost savings of parental leave to the university evaluated at 12 weeks of leave, the constraint imposed by the FMLA. When $MC - MCS(12) > 0$, the FMLA constraint is binding.</p> <p>See Table 2 for the interpretation of the turnover function parameters D and δ, and the search cost function parameters B and β.</p>					

Table 4
Optimal Weeks of Uniform Parental Leave:
Full Leave Paid ($\gamma = 0$)

<i>B</i> Value	β Value	Additional Campus Visits	Optimal Uniform Leave / $MC_w - MCS(12)$	Cost Difference $C(z^*) - C(x_{cm}^*, x_{oc}^*, y^*)$
$D = 0.081$ and $\delta = 0.006$ (eliminating parental leave raises the faculty turnover rate by 10-percent)				
\$18,983	0.012	1	12 / \$221.63	-
\$25,151	0.031	3	12 / \$195.58	\$176,423
\$34,403	0.051	6	12 / \$163.78	\$480,451
$D = 0.111$ and $\delta = 0.027$ (eliminating parental leave raises the faculty turnover rate by 50-percent)				
\$18,983	0.012	1	12 / \$192.47	\$210,832
\$25,151	0.031	3	12 / \$143.42	\$480,196
\$34,403	0.051	6	12 / \$107.32	\$740,046
$D = 0.148$ and $\delta = 0.046$ (eliminating parental leave raises the faculty turnover rate by 100-percent)				
\$18,983	0.012	1	12 / \$162.69	\$486,773
\$25,151	0.031	3	12 / \$130.16	\$715,180
\$34,403	0.051	6	12 / \$89.72	\$948,193
<p>MC_w is a weighted average of the marginal costs of providing parental leave across clinical medicine, other clinical units, and nonclinical units. $MCS(12)$ is the marginal cost savings to the university of parental leave evaluated at 12 weeks of leave, the constraint imposed by the FMLA. When $MC - MCS(12) > 0$, the FMLA constraint is binding.</p> <p>See Table 2 for the interpretation of the turnover function parameters D and δ, and the search cost function parameters B and β.</p>				

Table 5
Cost Differences between Uniform Policies:
Fully Paid Leave ($\gamma = 0$) versus Partially Paid Leave ($\gamma = 0.5$)

<i>B</i> Value	β Value	Additional Campus Visits	Cost Difference: $C(z^*; \gamma_1 = 0) - C(z^*; \gamma_2 = 0.5)$		
			Clinical Medicine & Other Clinical Units	Nonclinical Units	Total
$D = 0.081$ and $\delta = 0.006$ (eliminating parental leave raises the faculty turnover rate by 10-percent)					
\$18,983	0.012	1	\$816,157	\$3,686	\$819,843
\$25,151	0.031	3	\$705,482	-\$205,550	\$499,932
\$34,403	0.051	6	\$555,621	-\$488,869	\$66,752
$D = 0.111$ and $\delta = 0.027$ (eliminating parental leave raises the faculty turnover rate by 50-percent)					
\$18,983	0.012	1	\$691,573	-\$231,844	\$459,729
\$25,151	0.031	3	\$552,007	-\$495,702	\$56,305
\$34,403	0.051	6	\$362,389	-\$854,183	-\$491,794
$D = 0.148$ and $\delta = 0.046$ (eliminating parental leave raises the faculty turnover rate by 100-percent)					
\$18,983	0.012	1	\$549,789	-\$499,894	\$49,895
\$25,151	0.031	3	\$378,160	-\$824,183	-\$446,206
\$34,403	0.051	6	\$144,401	-\$1,266,300	-\$1,121,899
See Table 2 for the interpretation of the turnover function parameters D and δ , and the search cost function parameters B and β .					