

## Is the Clock Still Ticking?

### The Effect of Stopping the Tenure Clock on Career Outcomes

Colleen Flaherty Manchester, Lisa M. Leslie, and Amit Kramer\*

#### Abstract

Using administrative data from a large research university, we empirically evaluate the effect of stopping the tenure clock on the careers of tenure-track faculty. Stop the clock (STC) policies—policies that allow tenure-track faculty members to delay their tenure review—were first introduced approximately 40 years ago, yet surprisingly little is known regarding how use of these policies affects career outcomes, including salary and promotion. We assess if the career consequences following STC policy use are consistent with the explanation that evaluators interpret policy use as a signal that a faculty member lacks commitment (i.e., commitment hypothesis), or if these consequences can be explained by productivity differences between faculty members who do and do not use STC policies (i.e., productivity hypothesis). We present a model that provides an economic underpinning for the commitment hypothesis and we disentangle the two competing hypotheses by evaluating the empirical implications of the model.

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\* Colleen Flaherty Manchester, Corresponding Author, e-mail: cmanch@umn.edu, phone: (612) 625-9667; fax: (612) 624-8360. Assistant Professor, University of Minnesota, Carlson School of Management; 321 19<sup>th</sup> Avenue S., Suite 3-300; Minneapolis, MN 55455. Lisa M. Leslie, Assistant Professor, University of Minnesota, Carlson School of Management; Minneapolis, MN 55455. Amit Kramer, Assistant Professor, University of Illinois, School of Labor and Employment Relations; Champaign, IL 61820.

## **1. Introduction**

Stop the clock (STC) policies are policies that allow tenure-track faculty members to delay their tenure review if they experience events that are likely to negatively affect their research productivity. These policies typically delay the tenure decision in increments of one year and aim to “even the playing field” at the time of promotion, when tenure-track faculty members are evaluated to determine if their accomplishments demonstrate a level of productivity worthy of lifelong employment. Because the tenure clock often coincides with faculty members’ prime childbearing years, a primary reason for STC policy eligibility is the birth or adoption of a child. While initially aimed at female faculty members, the increasing involvement of men in caregiving (Bianchi et al., 2000; Gornick and Meyers, 2003; Sayer, 2005; Bianchi and Milkie, 2010) implies that STC policies are potentially beneficial to male and female faculty members alike. Although these policies have existed for approximately 40 years and are currently available at nearly 90 percent of research institutions (Hollenshead et al., 2005), there is a surprising lack of empirical evidence on how STC policies affect the career outcomes of tenure-track faculty members.

STC policies are intended to help faculty members achieve success in academia, yet one of the main findings from the limited existing literature on STC policies is that eligible faculty members are often hesitant to use STC policies (Hollenshead et al., 2005; Mason, Goulden, and Wolfinger, 2006). Drago et al. (2006) argue that this hesitancy stems from a constant pressure to keep family responsibilities from interfering with work, due to the expectation that faculty members should meet the ideal worker norm by showing uncompromising dedication to their jobs (Williams, 2000; Ward and Wolf-Wendel, 2004). Family responsibilities are seen as limiting the time and energy available for academic work because evaluators tend to view these

resources as fixed (e.g., Becker, 1985; Marshall and Barnett, 1993), instead of considering the possibility that commitment to work and family may have positive synergies (Rothbard, 2001; Wayne, Grzywacz, Carlson, and Kacmar, 2007). As a result, evaluators may infer that faculty members who have significant family responsibilities are not sufficiently committed to their academic pursuits, and thus are undeserving of pay increases and promotion. Drago et al. (2006) find that faculty members therefore attempt to delay, minimize, or hide their family responsibilities, for example by not taking advantage of STC policies after the birth of a child, in an effort to avoid negative career consequences that may stem from perceptions that caregivers lack career commitment.

Evidence suggests that there is a perception among faculty members that using STC policies for family-related reasons is interpreted as a signal of low commitment and thus has negative consequences for career outcomes, but surprisingly little research has investigated if this perception holds empirically. Manchester, Leslie, and Kramer (2010) did conduct a descriptive study on STC policy use and career success and find a negative effect of using STC for family reasons on one career outcome, namely salary. Although suggestive that STC use for family reasons is interpreted as a signal of low commitment, their analysis does not include a measure of productivity. A standard assumption in economics is that wage differences reflect marginal productivity. As a result, the observed negative impact of STC policy use on salary may reflect productivity differences between faculty members who do and do not use STC policies for family reasons, and does not necessarily indicate that STC use is interpreted as a signal of low commitment.

The goal of this paper is to disentangle the two competing explanations for why use of STC policies for family reasons may have a negative impact on the career outcomes of tenure-

track faculty members. Specifically, we assess if the career consequences following STC policy use for family reasons are consistent with the explanation that evaluators interpret policy use as a signal that a faculty member lacks commitment (i.e., commitment hypothesis), or if these consequences can be explained by productivity differences between faculty members who do and do not use STC policies (i.e., productivity hypothesis). We consider the two competing explanations by first developing a model that provides an economic underpinning for the commitment hypothesis. By evaluating the empirical implications of the model, we test the commitment hypothesis against the standard economic explanation that differences in the career outcomes of faculty members who do and do not use STC policies are due to productivity differences.

Our theoretical framework incorporates insights from statistical discrimination and signaling theories. First, based on a major tenet of statistical discrimination models (Aigner and Cain, 1977; Lundberg and Startz, 1983) and the expectation that success in academia requires unwavering commitment to one's work (Williams, 2000; Ward and Wolf-Wendel, 2004; Drago et al., 2006), we propose that indicators of a faculty member's underlying productivity are seen as less precise (i.e. more noisy) for individuals who are deemed as having low commitment to their academic work. As a result, these individuals are undercompensated based on their measured productivity. Second, we draw from signaling theory (Spence, 1973) and propose that evaluators make inferences about a faculty member's commitment from readily observable behaviors, namely STC policy use, such that faculty members who use STC policies for family reasons are perceived as less committed to their academic careers. Taken together, our propositions suggest that faculty members who use STC policies will have lower career outcomes than those who do not, controlling for measured productivity.

We evaluate the model's empirical implications using data on tenure-track faculty members employed at a large, public research institution who were hired between 1998 and 2002. We use publications as a measure of productivity and test whether publications are interpreted as a less precise measure of productivity for faculty members who use the STC policy for family reasons by evaluating the return to publications in terms of salary. We find that the return is significantly *lower* for faculty members who use STC policy for family reasons relative to faculty members who do not use the policy. Stated differently, publications are a weaker predictor of salary among STC policy users. The lower return explains the overall wage gap between faculty members who do and do not use STC policies for family reasons. We conclude that the findings for salary are consistent with the commitment hypothesis, but inconsistent with the productivity hypothesis.

We also investigate the consequences of STC policy use for a second career outcome, namely promotion, but expect that the signal of low commitment hypothesis is less applicable for promotion decisions. At this institution, salary decisions are decentralized and implemented at the local- or department-level and evaluators are therefore likely to know if a faculty member used the STC policy for family reasons. Alternatively, the promotion process involves multiple sets of dispersed evaluators within the institution as well as external reviewers, who have limited information about STC policy use. As a result, inferences that faculty members who use STC policies for family reasons lack commitment are less likely to influence promotion outcomes. Indeed, we find no significant promotion difference for faculty members who did and did not stop their clock for family reasons, regardless of whether we control for productivity. In addition, we find that the research output at the time of tenure review of faculty members who use the STC policy for family reasons is not significantly different from non-users, which provides

suggestive evidence that STC policies are effective at their primary goal of evening the playing field at time of promotion. Because we find no evidence of a negative effect of policy use on promotion, we conclude that neither the commitment hypothesis nor the productivity hypothesis is operating for promotion outcomes.

The remainder of the paper is organized as follows. The next section presents the theoretical framework, which we develop by incorporating insights from statistical discrimination models, signaling theory, and higher education research. The sample used in the paper is described in Section 3. The empirical specification and results from the salary analysis are presented in Section 4, while Section 5 contains the promotion analysis. Section 6 concludes the paper.

## **2. Competing Hypotheses: Productivity versus Commitment**

This paper investigates two plausible, yet very different, explanations for the possible negative effects of STC policy use for family reasons (e.g., birth or adoption of a child) on salary and promotion. The productivity hypothesis stems from a standard assumption in economics that any negative effect of policy use can be explained by drops in productivity (i.e., output). In particular, the traditional competitive paradigm in economics, in which salary reflect marginal productivity, implies a negative effect of policy use on salary to the extent that users experience a drop in productivity relative to non-users. For the case of promotion, if faculty members who use STC policies for family reasons experience shocks to productivity that cannot be fully compensated for by a one-year delay in the tenure review process, then those who use STC policies would have less output and, in turn, lower promotion chances relative to non-users.

Literature on the effect of children on scholarly productivity substantiates an association between family commitments and lower productivity. Several studies found that the presence of young children has a negative effect on productivity, at least among female academics (e.g., Kyvik, 1990; Long, 1990; Stack, 2004).

Alternatively, the commitment hypothesis states that STC policy use results in negative career consequences because evaluators infer that faculty members who use STC policies lack commitment to their careers. Evidence supports that an ideal worker norm, which dictates that faculty members should show unwavering commitment to their careers, permeates academia (Williams 2000; Ward and Wolf-Wendel, 2004; Drago et al., 2006). Use of STC policies for family reasons may suggest that a faculty member has personal life demands that interfere with the ability to be fully committed to work and may cast doubt on whether a faculty member can succeed in academia (Drago et al., 2006). Identifying which hypothesis holds, commitment or productivity, is important for evaluating if STC policies are effective in their stated goal of facilitating faculty members' career success.

We develop an economic framework for the low commitment hypothesis by combining insights from statistical discrimination and signaling theories. The model has two sources of imperfect information: a faculty member's true productivity, and his or her level of commitment to academic work. Consistent with a major tenet of statistical discrimination theory (Aigner and Cain, 1977; Lundberg and Startz, 1983), we propose that commitment is relevant in reward allocation decisions because publications are interpreted as a more or less precise indicator of true productivity by evaluators depending on a faculty member's group membership (i.e., high or low commitment, respectively). Furthermore, because commitment is not readily observable, we propose that evaluators use other behaviors, such as use of STC policies for family reasons, to

infer commitment. As a result, the model provides a basis for the prediction that faculty members' who use STC for family reasons receive lower career outcomes (e.g., salary, promotion chances) for a given level of publications.

A key assumption of the model is that publications are an imprecise measure of productivity. In order for the low commitment hypothesis to explain negative career consequences, individuals with the same measured productivity must be rewarded differently depending on whether they are categorized as low- vs. high-commitment types. Stated differently, ambiguity in the extent to which publications reflect true annual productivity makes it possible for systematic differentials in career outcomes to exist between faculty members who do and do not use STC for family reasons, controlling for publications. If publications are a perfect measure of productivity, then there is no channel through which the low commitment hypothesis can operate. There are at least two reasons to believe that publications are an imperfect measure of productivity and that the assumption is therefore plausible. First, an initial assessment of the contribution of a newly accepted article or book is uncertain; such information is only available years later when citations and realized impact can be assessed. Second, for research that results from coauthorship, there is uncertainty regarding the extent to which each author contributed to the development and execution of the manuscript. For these reasons, there is the potential for noise in both salary and promotion decisions of tenure-track faculty members. While the nature of academic work provides theoretical support for the assumption that publications are an imprecise measure of a faculty member's true productivity, we empirically evaluate this assumption when we test the implications of the model.

We begin by assuming that a faculty member has *true* annual productivity given by  $\rho_{it}$ , which is normally distributed with mean  $\bar{\rho}$  and a constant variance  $\sigma^2$ . However, an individual's

$\rho_{it}$  is not observable to evaluators. Instead, evaluators only have access to  $q_{it}$  (i.e. publications), which is an imperfect indicator of  $\rho_{it}$ , or:

$$q_{it} = \rho_{it} + \varepsilon_{it} \quad (1)$$

where  $\varepsilon_{it}$  is a mean-zero, normally distributed error term that is independent of  $\rho$  and has a variance equal to  $\sigma_\varepsilon^2$ . Due to the joint normality assumption, Aigner and Cain (1977) show that an individual's expected true productivity given the imperfect indicator (i.e. publications) is a weighted average of  $\bar{\rho}$  and the individual's value of  $q_{it}$ , or:

$$E(\rho | q) = \frac{\sigma_\varepsilon^2}{\sigma^2 + \sigma_\varepsilon^2} \bar{\rho} + \frac{\sigma^2}{\sigma^2 + \sigma_\varepsilon^2} q_{it} \quad (2)$$

where the weights depend on the relative variance of  $\rho$  and  $\varepsilon$ . Expected productivity directly determines salary (Aigner and Cain 1977) and the probability of promotion.

Analogous to the classic Black-White or male-female cases examined in standard models of statistical discrimination, we suppose that there are two types of faculty members: those who have high commitment ( $\theta_H$ ) and those who have low commitment ( $\theta_L$ ) where  $\lambda$  is the fraction of high-commitment types in the population. Due to the expectation that success in academia requires that faculty members achieve the ideal worker norm of unwavering commitment, we propose that evaluators assume: 1)  $\bar{\rho}^L < \bar{\rho}^H$ , or mean productivity is lower for low commitment types; and 2)  $q_{it}$  (i.e. publications) is a noisier measure of true productivity for faculty members with low commitment, or

$$q^L = \rho^L + \varepsilon^L \text{ and } q^H = \rho^H + \varepsilon^H \text{ where } \sigma_{\varepsilon,H}^2 < \sigma_{\varepsilon,L}^2 \quad (3)$$

This implies that we can rewrite Equation 2 for each group, high- and low-commitment, where the relative weight of mean productivity and  $q_{it}$  differs by the faculty member's commitment level. The empirical implications of these assumptions are that, 1) career outcomes, such as salary and probability of promotion, are lower for faculty members who are low commitment types controlling for  $q_{it}$ , and 2) the return to  $q_{it}$  in terms of career outcomes are lower for faculty members who are low commitment types.

Unlike race or gender, however, commitment is an individual characteristic that is not readily observable to evaluators. Instead, we propose that evaluators use observable behaviors to make inferences about commitment and update their assessment of the faculty member's commitment level over time. Based on the ideal worker norm, faculty members with low commitment are assumed to be more likely to use STC for family reasons relative to those with high commitment because the former reap greater benefits from policy use. According to signaling theory, use of STC policies for family reasons then results in evaluators placing a higher probability on the faculty member having low commitment, or

$\Pr(\theta = \theta_L | STC = 1) > 1 - \lambda$ .<sup>1</sup> Because use of STC policies for family reasons is an indicator of low commitment in our model, the two empirical implications become, 1) career outcomes are lower for faculty members who use STC for family reasons relative to non-users controlling for publications, and 2) the return to publications in terms of career outcomes are lower for faculty members who use STC for family reasons relative to non-users. If these empirical implications are supported by the data, then this provides evidence that STC policy use is viewed as a signal of low commitment. The implications support the commitment hypothesis, but not the

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<sup>1</sup> It is likely that evaluators also use other observable behaviors, such as absenteeism (Ichino and Moretti 2009) or hours (Landers, Rebitzer, and Taylor 1996), in their assessment of commitment; however, only policy use if observed by the researchers.

productivity hypothesis, because the latter predicts no difference in career outcomes between users and non-users once productivity is controlled for.

It is possible that the inference of low commitment based on use of STC policies for family reasons differs systematically by gender, although there are reasons to believe that STC policy use may be interpreted as a stronger signal of low commitment for either women or men. On the one hand, the signal of low commitment may be stronger for women who use STC policies, as compared to men who use STC policies, because women are generally more likely to reduce their work hours or step out of the workforce entirely to meet caregiving responsibilities. Consistent with this possibility, evidence supports that mothers are viewed as less committed to work and less deserving of work-related rewards as compared to fathers (Correll, Benard, and Paik, 2007). On the other hand, men who use STC policies for family reasons may be viewed as violating traditional gender roles, and family-related use of STC policies may therefore send a stronger signal of low commitment for men as compared to women—a possibility that is consistent with a related literature on parental leaves of absences, in which researchers have found that parental leaves are interpreted as a stronger signal of low commitment for men than for women (Albrecht et al., 1999; Allen and Russell, 1999). Given these competing rationales, we do not build a specific gender prediction into our model. Instead, we empirically explore if the effect of policy use on career outcomes differs by gender.

### **3. Data Description**

We used various administrative records from a large, public research institution to construct an original dataset that includes five cohorts of tenure-track faculty members hired between 1998

and 2002.<sup>2</sup> For each faculty member, the dataset includes age, gender, academic college, annual salary, promotion outcome, and history of STC use, including the year of policy use and the reason for use. The dataset includes data for each year a faculty member remained at the institution from the time of hire through 2008, and contains 383 tenure-track faculty members. We supplement these data with publicly-available publication records. We evaluate the effect of STC use on two career outcomes: annual salary and promotion to associate professor (with tenure).

At this institution, tenure-track faculty members can stop the tenure clock for family reasons, including the birth or adoption of a child and caring for an ill family member. In addition, faculty members can use STC for non-family reasons, including personal illness, unanticipated research delays (e.g., laboratory explosions, IRB delays), contractual stipulations (e.g., hired without Ph.D.), and taking a leave of absence. Because family responsibilities represent a clear challenge to the ideal worker norm, we test the low commitment hypothesis by comparing faculty members who use STC for family reasons to non-users. We control for STC use for non-family reasons in the analysis to separate these individuals from non-users; however, we do not hypothesize about the effect of non-family STC use on career outcomes due to the variety of reasons for eligibility under this category.

To construct our indicator of productivity, we collected data on number of annual research publications for faculty members in the sample using information from publicly available curricula vitae. Although data limitations preclude us from incorporating measures of teaching and service productivity, research accomplishments are the most important criteria for

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<sup>2</sup> The sample does not include medical school faculty members because their records are part of a separate administrative system.

evaluation at research institutions. One of the challenges in constructing a measure of research productivity is that disciplines vary in how different types of publications are weighted (e.g., relative weights of books versus articles). Based on each faculty member's discipline, we categorized faculty members into groups with different primary modes of evaluation: articles, books, or performances/exhibitions.<sup>3</sup> Only publications in a faculty member's primary mode of evaluation were collected. Our final measure of productivity, cumulative publications, was constructed by aggregating annual publications through year  $t$  for each individual, for the years 1998 through 2008.

As is often the case in academic studies that include faculty members that span a variety of disciplines, our measure of research output does not include a measure of publication quality. Indeed, most studies that measured faculty productivity across disciplines use number of publications as the measure of productivity (Kyvik and Teigen, 1996; Pfeffer and Langton, 1993; Sax et al., 2002; Ginther and Hayes 2003). To the extent that quality is a time-invariant feature of a faculty member's research output, we are able to control for quality in the salary analysis using fixed effects estimation. Alternatively, we are unable to control for a time-invariant or time-varying dimension of quality in the promotion analysis. We consider the limitation of omitting a time-varying measure of quality in more detail in Section 4.2 when we discuss the results from the salary analysis.

One potential concern is that publications in terms of type and quantity cannot be equated across disciplines (i.e., the number of publications needed to meet tenure requirements differs by disciplines). For the salary analysis, we have multiple years of data per faculty member and can therefore control for individual-level differences across faculty members using fixed effects

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<sup>3</sup> Primary mode was determined based on all publicly available curricula vitae for the department and through contacting the department chair.

estimation, which allows us to sidestep the issue of finding comparable measures of publications across disciplines because estimation occurs within persons. Alternatively, fixed effects estimation is not possible for the analysis of promotion because this is a one-time decision. We therefore standardize the total number of publications at the time of promotion using eight discipline areas as defined by Smart and McLaughlin (1978), which stems from combining the following three dimensions of research: 1) Applied versus Pure; 2) Hard versus Soft; and 3) Life versus Non-life. As a result, each faculty members' productivity is compared to the normative publication base rates within his or her disciplinary area. We combined these groupings with information on primary mode of evaluation (i.e. books versus articles) to create twelve groups and standardized publications at time of promotion within each group to construct one measure of productivity per faculty member.<sup>4</sup> We confirm that our measure of productivity is valid by showing that it is a significant predictor of annual salary and probability of promotion (see Section 4.2 and Section 5).

From the original 383 tenure-track faculty members, 40 faculty members were dropped due to missing data on publications because we were unable to locate their curricula vitae.<sup>5</sup> Due to challenges in quantifying performances and exhibitions, we dropped faculty members who had these as their primary mode of evaluation (22 faculty members). One additional faculty member was dropped from the salary analysis because of missing information on the year this individual used the STC policy; this individual was retained for the promotion analysis. A total of 321 faculty members are used for the promotion analysis, while the salary analysis includes 320 faculty members with multiple observations per person ( $N = 2,429$ ).

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<sup>4</sup> We subtract the group mean and divide by the group standard deviation for each of the twelve discipline-based groups.

<sup>5</sup> Of those with missing publication data, 1 had used STC for family reasons and two had used STC for non-family reasons.

Table 1 displays the frequencies of STC policy use in the sample. Of the 321 faculty members, 50 used the STC policy at least one time and 12 used the STC policy more than once. Approximately half of the users were female faculty members ( $N = 27$ ). Including multiple spells of STC policy use by the same individuals, the STC policy was used 43 times for family reasons and 20 times for non-family reasons. Both male ( $N = 18$ ) and female ( $N = 25$ ) faculty members used the STC policy for family reasons.

Descriptive statistics for the sample are displayed in Table 2. Faculty members who used STC for family and non-family reasons are separately compared to non-users. There are two significant differences between faculty members who used STC for family reasons and non-users. First, among faculty members who use STC for family reasons, women comprise 58 percent of users, while they comprise just 35 percent of non-users. Therefore, while the frequencies are roughly comparable, female faculty members have a higher rate of STC use for family-reasons relative to males. Second, faculty members who used STC for family reasons are less likely than non-users to have been over age 40 when hired, which is not surprising given that the majority of STC policy use for family reasons were for the birth of a child.

#### **4. Effect of STC Policy Use on Salary**

We evaluate the productivity and commitment hypotheses using salary as the career outcome of interest. This section outlines the empirical specifications used to differentiate the low commitment hypothesis from the productivity hypothesis and then presents the results of the salary analysis.

## 4.1 Empirical Specification for Salary Analysis

We model annual salary at time  $t$  assuming a standard log-linear specification:

$$\ln \text{Salary}_{it} = \varphi \text{STC}_{i,t-1}^F + \beta X_{i,t-1} + \pi_i + \mu_{i,t-1} \quad (4)$$

where  $\text{STC}^F$  is an indicator for STC use for family reasons in the prior year (or in time  $t-1$ ). In years other than  $t-1$ , individuals who use the STC policy are treated as non-users in the estimation. We include an indicator for STC policy use for non-family reasons in the analyses in order to compare STC use for family reasons to non-users.<sup>6</sup> We control for time-varying covariates  $X_{i,t-1}$ , including year of service, position, use of STC for non-family reasons, and calendar year dummies; controlling for position takes into account the salary increase received upon promotion to associate professor, which is attained at different years of service depending on if the STC policy was used. We also control for time-invariant characteristics,  $\pi_i$ , by estimating equation 4 using fixed effects estimation. With this technique, we use within person differences to identify the effect of STC policy use on salary. As a result, the estimates are identified from comparing the salary of STC users after policy use relative to that among non-users.

Fixed effects estimation has several advantages in this context. First, it allows us to sidestep the issue of having comparable measures of research productivity across disciplines because we estimate the effect on salary within persons. Second, we estimate the effect of policy use on salary controlling for fixed characteristics like gender, discipline, caliber of Ph.D.

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<sup>6</sup>Our model has no clear empirical prediction for the effect of using the STC policy for non-family reasons on salary.

institution, and underlying ability, as well as general quality of research and overall commitment to an academic career.

We begin by testing if faculty members who used the STC policy for family reasons experience lower salary rewards without controlling for productivity by estimating equation 4. Conditional on finding a negative effect of policy use on salary, we use two tests to differentiate the competing hypotheses for why use of STC policies for family reasons results in a salary penalty. For our first test, we evaluate whether faculty members who use the STC policy for family reasons receive lower salary rewards than expected given time-invariant and time-varying measures of productivity (i.e. publications). We control for a quadratic in cumulative publications,  $\sum_{\tau=1}^{t-1} p_{\tau}$ , through time t-1 in the salary equation, which allows the influence of publications on salary to diminish at high levels of accomplishments:

$$\ln \text{Salary}_{it} = \varphi^R \text{STC}_{i,t-1}^F + \beta X_{i,t-1} + \gamma_1 \sum_{\tau=1}^{t-1} p_{\tau} + \gamma_2 \sum_{\tau=1}^{t-1} p_{\tau}^2 + \pi_i + \mu_{i,t-1}. \quad (5)$$

Including a quadratic term is consistent with wage compression in academia (e.g., Pfeffer and Davis-Blake, 1990) and salary setting practices at the institution of interest: additional publications correspond to additional salary to a point, but once a ceiling is reached additional publications do not result in additional salary. We test whether  $\varphi^F < 0$  by estimating equation 5.

The second test is grounded in the theory of statistical discrimination and explicitly tests the proposition that publications are a less precise measure of underlying productivity for faculty members who use STC for family reasons. To implement the test, we allow the return to publications to vary based on use of the STC policy:

$$\ln \text{Salary}_{it} = \varphi^R \text{STC}_{i,t-1}^F + \beta X_{i,t-1} + \gamma_1 \sum_{\tau=1}^{t-1} p_{\tau} + \gamma_2 \sum_{\tau=1}^{t-1} p_{\tau}^2 + \gamma_3 S_{i,t-1}^R \sum_{\tau=1}^{t-1} p_{\tau} + \gamma_4 \text{STC}_{i,t-1}^F \sum_{\tau=1}^{t-1} p_{\tau}^2 + \pi_i + \mu_{i,t-1}. \quad (6)$$

We evaluate whether the returns to publications are lower for faculty members who use the STC policy for family reasons relative to non-users, or  $\gamma_3 + 2\gamma_4 \sum_{\tau=1}^{t-1} p_{\tau} < 0$ , by estimating equation 6.

One limitation of the first test is that it requires that we fully capture all time-varying dimensions of output that are valid determinants of salary (i.e. any wage discrepancy between users and non-users could be attributed to unmeasured differences in productivity). Although we use publications in the faculty member's primary mode of evaluation to capture productivity, we acknowledge that this is an incomplete measure of output because it does not contain information on teaching, service, or publications in secondary modes of evaluation (e.g., number of books published when articles is the primary mode of evaluation). An advantage of the second test is that it is robust to concerns that our measure of productivity is not comprehensive. In particular, the return to any valid indicator of productivity, such as publications, should not vary by STC policy use if the productivity hypothesis is operating.<sup>7</sup> Therefore, finding that returns to productivity systematically differ between STC users and non-users provides support for the commitment hypothesis, and is inconsistent with the explanation that wage discrepancies reflect differences in productivity.

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<sup>7</sup> Even if there were a systematic change in evaluation standards (i.e., reweighting of research productivity versus other duties), this would affect all faculty members in a given year and not differentially affect STC users relative to non-users.

## 4.2 Salary Results

The first column of Table 3 reports the salary results without controlling for publications. We estimate that use of STC for family reasons has a significant, negative effect of using the STC policy for family reasons on annual salary. Thereby, we conduct our first test of the two hypotheses by adding cumulative publications and its quadratic to the estimated model (Column 2). We confirm that cumulative publications are a significant predictor of salary, and therefore a valid measure of productivity. In terms of STC policy use, we find that the negative effect persists after controlling for measured productivity: faculty member who use STC for family reasons have 2.3 percent lower salary in the year following use relative to non-users.<sup>8</sup> This provides evidence against the null hypothesis that the penalty stems from reduced productivity.

One may be concerned, however, that our indicator of productivity is incomplete. We sidestep this issue by testing whether the return to publications is systematically lower following policy use for family reasons. Column 3 of Table 3 reports the results from our second test, which evaluates whether publications are treated as a noisier indicator of productivity for faculty members following use of STC for family reasons as compared to non-users. The coefficients on the interaction terms between cumulative publications and use of the STC policy by reason imply a distinct pattern of returns by policy use. We find that returns to publications are significantly different for faculty members who use the STC policy for family reasons relative to non-users. The relationship between cumulative publications and salary is concave for non-users and non-family users, but flatter and eventually convex following use of the STC policy for family reasons. It is important to note that, with the addition of the interaction term between

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<sup>8</sup> These results are robust to restricting the sample only to faculty members who did not leave the university prior to their tenure review (N = 251).

publications and use of the STC policy by reason, the main effect of using the policy for family reasons is no longer significant. This implies that the channel through which faculty members incur a penalty from using the STC policy is the discounting of their publications.

Figure 1 plots the returns to cumulative publications using the coefficients reported in the third column of Table 3 for each group holding constant year of service, position, and calendar year. This figure shows that for faculty members with fewer than 15 cumulative publications, following use of the STC policy for family reasons, faculty are rewarded less for their publications as compared to those who do not use the STC policy or who use the STC policy for non-family reasons. However, when faculty members' cumulative publications exceed 15, the salary return to publications is higher (i.e., the plot is steeper) following use of the STC policy for family-reasons relative to non-users. In the sample, the average cumulative publications at the time of promotion review is 10 with a median of 7. Thus, for the majority of faculty members, using the STC policy for family reasons resulted in the discounting of publications and, in turn, lower salary.

This finding is consistent with the notion that evaluators treat use of STC policies for family reasons as a signal of low commitment, which in turn affects returns to publications. For faculty members with publications below a certain threshold, STC policy use for family reasons is seen as a signal of low commitment and the faculty member is therefore assessed as having lower potential for success in academia due to an inability to meet the ideal worker norm of unwavering commitment. After a certain point, however, research output seems to outweigh any signal of low commitment to academic work that STC policy use for family reasons imparts. Indeed, faculty members who have published well above a certain threshold may be deemed to have what it takes to succeed in academia and are therefore not penalized, but instead given a per

publication pay premium, relative to non-users. It is possible that faculty members who are successful in meeting the social and values-based demands of both academic career and family are regarded as “super-employees” who can juggle career and family successfully (Blair-Loy, 2003; Jacobs and Winslow, 2004; Rothbard, 2001), and are therefore compensated at a higher rate.

An additional result worth noting is that, although not statistically significant, faculty members who use the STC policy for non-family reasons receive a higher return to research output relative to non-users. This could be due to policy use being seen as a signal of high commitment in that the faculty member is able to produce scholarship despite their unexpected circumstances, such as illness or research delays.

To better understand the salary results, we conduct additional analyses by allowing policy use to affect salary over a longer time horizon. We report these results in Table 4. We allow STC use to affect annual salary for up to four lags and find that the penalty for using the STC policy for family reasons starts immediately and peaks two years following use: Two years after using the STC policy for family reasons, users have an annual salary that is 4.1 percent lower relative to non-users. While the penalty persists through the fourth lag, the magnitude becomes lower. Because the salary difference begins to diminish, this suggests that faculty members who use the STC policy for family reasons begin to catch-up to their peers after several years. The salary pattern following use of the STC policy for non-family reasons is distinct from that following use for family reasons. Across nearly all lags, the effect of using the STC policy for non-family reasons on annual salary is practically and statistically non-significant. Interestingly, we find a positive and significant effect of stopping the clock for non-family reasons on salary four years after use.

We also investigate whether the penalty differs by gender and present the results in Table 5. We find that both men and women experience a negative salary effect following STC use for family reasons. The point estimate for men are actually slightly larger than that for women, which is consistent with research on parental leaves, which finds a larger penalty for men who take parental leave relative to women (Albrecht et al., 1999; Allen and Russell, 1999). It is important to note, however, that the gender difference is not significant in our dataset. Similar to recent work by Carlin et al. (2010), we also find that the relationship between publications and annual salary is essentially non-existent for female faculty members. Given that both men and women use STC for family reasons, this does not explain the findings regarding STC use and salary. Regardless, this gender difference is an important area for future work.

One may be concerned that the results are driven by a reduction in research output following use of STC for family reasons. While we control for publications in the analysis, we also further investigate this possibility by plotting average output in the years leading up to and following STC policy use by reason for use in Figure 2. This graph shows that there is no discernable drop in research output following STC policy use for family reasons. In fact, publications are higher following policy use. This evidence further supports our conclusion that productivity differences do not account for the observed salary differences between faculty members who do and do not use the STC policy for family reasons.

We used fixed effects in the salary analysis, a methodology that controls for stable individual differences and identifies the estimates from within person variation. This addresses concerns of selection, or the possibility that the results are due to inherent differences between policy users and non-users. In particular, this rules out the possibility that faculty members who use STC policies for family reasons are generally less committed to academic work than faculty

members who do not use these policies as an alternative explanation for our findings. At the same time, it is possible that faculty members who use STC policies for family reasons experience a *temporary* reduction in their commitment, and that evaluators' assumptions that these faculty lack commitment are therefore correct. Although we cannot rule out this possibility, we also find that faculty members who use STC policies for family reasons do not experience a temporary drop in research productivity. Thus, in order for this explanation to be plausible, one has to assume that commitment and productivity are unrelated. Furthermore, the fact that the salary gap appears to narrow over time suggests that any inference that faculty members who use the STC policy for family reasons have low commitment and are unable to succeed in academia is not valid. Finally, a recent study on flexible work practices (e.g., telecommuting, flexible schedules) finds that use of these practices for family-reasons has a negative impact on managers' perceptions of employee commitment, controlling for employees' self-reported commitment (Leslie et al., 2010). Thus, there is reason to believe that evaluators overestimate the extent to which faculty members who use STC policies for family reasons experience a drop in commitment.

A notable concern in interpreting the results is the absence of measures of research quality in the analysis. One potential interpretation of the results is that the salary penalty from using the STC policy for family reasons reflects a reduction in the quality of output produced. However, there are several reasons why these results are likely not due to a systematic change in quality of research. First, we find an immediate, negative effect of policy use on salary. Given the lags inherent in the publication process, if the quality of a faculty member's research discontinuously dropped due to an increase in family demands, we would expect that the wage penalty following use would be delayed because the research published immediately following

policy use likely reflects work that was on-going several years before STC use. Second, we find that the difference in salary between faculty members who used the STC policy for family reasons and non-users appears to peak in the second year following use, but then begins to diminish. In other words, these faculty members catch up to their peers. If faculty members who used the STC policy decided to pursue a strategy of maintaining quantity of publications at the expense of quality, we would not expect this convergence. Finally, we find that the negative effect of using STC for family reasons on salary does not significantly differ by gender. Because family responsibilities often fall disproportionately on women, if research quality were to be affected by family demands, we would expect it to have a larger impact on women.

In summary, the findings for salary are consistent with the commitment hypothesis, but not the productivity hypothesis. STC policies seem to have unintended career consequences in that faculty members who use STC policies for family reasons receive a salary penalty that cannot be accounted for by changes in measured productivity.

## **5. Effect of STC Policy Use on Promotion**

In addition to salary, we also investigate whether using STC policies for family reasons has negative consequences for promotion. However, while salary decisions are made at the department-level where STC use for family reasons is likely transparent, promotion decisions involve a centralized process and multiple sets of evaluators, who likely have little information about STC policy use. Therefore, any effect of using STC for family reasons due to inferences of low commitment is likely dissipated in promotion outcomes in this context.

We apply the empirical specification from the salary analysis to promotion except that we estimate the model using OLS instead of fixed effects given the one-time nature of the outcome.<sup>9</sup> We estimate the effect of using the STC policy for family reasons on the probability of promotion using two different samples. First we evaluate the effect among the full sample, which has an overall promotion rate of 69 percent (Table 6, Columns 1 to 3) and then limit the sample to those faculty members who went up for tenure review (with an overall promotion rate of 92 percent; Table 6, Columns 4 to 6).

The full sample analysis includes faculty members who left the University before their promotion review; these individuals are coded as not receiving a promotion. Without controlling for standardized publications we find that faculty members who use STC for family reasons have a significantly higher probability of promotion relative to non-users (Column 1). This positive effect is likely due to a confound between policy use, retention, and promotion chances (i.e. there is a positive relationship between policy use, retention, and promotion chances because most faculty members who use STC policies for family reasons do so after being employed for a few years). When we add standardized publications to the model, we confirm that this is a significant predictor of promotion success (Column 2), and therefore a valid measure of productivity. In terms of STC policy use, adding this measure of productivity does not change the results (Column 2). In addition, we assess whether the return to publications is lower for those who use STC for family reasons but find no support (Column 3). While the estimate is negative, it is neither statistically nor economically significant.

Among the sample restricted only to faculty members who went up for tenure review, STC use for family reasons has no effect on promotion regardless of whether standardized

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<sup>9</sup> Because there is an interaction term in the empirical specification, we use OLS instead of a probit model for the estimation to better facilitate interpretation of the coefficients.

publications are included in the estimation (Table 6, Columns 4 to 6).<sup>10</sup> The results do not change when we separate the sample by gender (Table 7).

Because we do not find a negative effect of STC policy use for family reasons on promotion outcomes regardless of whether we control for standardized publications, promotion does not provide insight into the competing explanations for why policy use for family reasons may have a negative effect on career outcomes. This is not surprising given the institutional features of the promotion evaluation process at this institution, which limit the influence of internal evaluators and thereby reduces the applicability of the commitment hypothesis.

We also investigated the effectiveness of STC policies at achieving their primary goal of “evening the playing field” by estimating the effect of policy use on research output at time of tenure review. Given that STC policies delay review in one-year blocks of time, which is uniformly applied to faculty members who meet a wide variety of eligibility criteria, it is important to consider how well these policies meet their primary aim. For example, a one-year delay in promotion review may more than compensate a faculty member for lost time due to Institutional Review Board (IRB) delays, but may grossly undercompensate a faculty member whose research laboratory and specimens were destroyed in an accident. In addition, whether a one-year delay undercompensates, equalizes, or overcompensates may differ by gender. For example, eligibility due to the birth of a child may be more likely to undercompensate women, as compared to men, due to the physical burdens of childbirth as well as evidence that women typically take the predominant role in childcare for infants (Drago, 2009). Because the STC policy is a relatively crude policy tool in that it delays the tenure review in increments of one-year, it is unclear how use of the STC policy will relate to research output at the time of review.

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<sup>10</sup> Faculty members who left prior to their tenure review had significantly lower standardized publications than those who remained at the institution (difference of 0.33 standard deviations).

When we estimate the effect of STC policy use on standardized total publications at the time of tenure review, we find no significant difference between faculty members who used the STC policy relative to non-users (Table 8). Regardless of reasons for use, STC policy users have slightly higher standardized publications at time of promotion relative to non-users, although the difference is not significant (Column 1). When we split the sample by gender (Columns 2 and 3), we continue to find no significant differences in publications at time of tenure review between users and non-users. Overall, these findings suggest that STC policies are generally effective in that they appear to put STC users and non-users on equal footing at tenure review.

To summarize, we find that use of STC for family reasons does not have a negative effect on promotion outcomes even after controlling for measures of research productivity. The lack of penalty implies that neither the productivity nor commitment hypothesis is applicable for this outcome at this institution. We find suggestive evidence that STC policies are effective at helping faculty members meet the criteria for promotion in terms of research output. It is important to note that the analysis of promotion and research output are limited by the one-time nature of these outcomes, which precludes us from controlling for time-invariant differences between users and non-users. This limitation implies that these results should be considered suggestive rather than conclusive.

## **6. Conclusion**

Despite the fact that institutions have offered STC policies for four decades, there is a lack of empirical evidence on the career consequences of these policies. The lack of research on STC policies is particularly surprising, given perceptions that use of STC policies may result in career

penalties and thus have the opposite of their intended impact on faculty members' careers. In the present paper, we empirically examine whether any career penalties associated with STC policy use can be explained by drops in the productivity of faculty members who use STC relative to non-users or whether the penalties stem from evaluators inferring that policy users lack the commitment required for success in academia, which we model by combining statistical discrimination and signaling theories.

We test these competing explanations using data on annual salary, STC use, and publications, and find that faculty members who use STC policies for family reasons receive a wage penalty following use that cannot be explained by a change in publications. Furthermore, we find that the return to publications for faculty members following use of the STC policy for family reasons are systematically lower than non-users, with the exception of users with extremely high research output. These findings are consistent with use of STC policies for family reasons acting as an observable behavior that evaluators use to infer a faculty member's commitment level. In the absence of overwhelming evidence of a successful fit in academia (i.e. extremely high number of publications), we find evidence that use of STC policies for family reasons is viewed as a signal that the faculty member lacks the commitment necessary to succeed in academia, and thus they are evaluated as less productive and less deserving of salary increases.

In contrast to salary, we find no evidence of a negative effect of using STC policies for family reasons on promotion outcomes. In addition, we assess the relationship between use of STC policies and research output at the time of promotion to provide insight into the effectiveness of STC policies at tenure review. We find suggestive evidence that STC policies are effective at equalizing the chances of promotion at tenure review: Faculty members who use

STC policies for family reasons do not have significantly lower or higher research output at tenure review relative to non-users.

While we consider the effect of STC use on both promotion and salary outcomes, the conclusions we are able to draw from the two analyses are markedly different. First, the different institutional arrangements that govern salary and promotion at the institution under examination are distinct and the commitment hypothesis is more applicable to salary setting due to its decentralized structure. Second, annual data on salary enables us to control for time-invariant characteristics of faculty members to provide a more robust test of the low commitment hypothesis. This is not possible in the promotion analysis given the one-time nature of the decision.

Our model and findings contribute to the existing literature on statistical discrimination in the workplace (e.g., Landers et al., 1996; Altonji and Pierret, 2001; Ichino and Moretti, 2009). Although our model is the first to explicitly consider the effects of STC policy use for family reasons on career rewards, many of the tenets of our model are consistent with literature in other fields. For instance, recent work in psychology finds that when evaluators perceive workers' characteristics as a poor fit with their work roles, their performance is discounted. For example, women in stereotypical male positions receive lower performance ratings than females in stereotypical female positions, regardless of any actual differences in objective indicators of their performance (Lyness and Heilman, 2006).

The findings of this paper should be interpreted with care due to the limitations of the analyses. First, the paper uses a sample of tenure-track faculty members employed at a single research institution, which limits the external validity of the findings. Second, the analyses of

promotion chances and research output at time of promotion do not address possible selection into the policy due to the one-time nature of the decision. Finally, while the salary analysis controls for time-invariant characteristics as well as time-varying publications, it does not include a measure of quality of publications. We argue that a number of features of the salary results suggest that the results are not likely driven by this omission (see Section 4.2 for a discussion). Perhaps the strongest evidence against this alternative explanation is the finding that use of STC for family reasons does not have a negative effect on promotion outcomes. If the quality of scholarship for faculty members who used STC for family reasons was systematically reduced, then this would be reflected in the promotion outcome with lower promotion rates for policy users. Nevertheless, we cannot completely rule out the possibility that salary effects stem from changes in quality.

In conclusion, we find evidence that STC policies are effective, yet imperfect. More specifically, these policies appear to be effective at helping to even the playing field for faculty members at the time of promotion, but have unintended consequence for salary. Despite their intended goal of supporting the career advancement of tenure-track faculty members, these policies appear to provide evaluators with a means of differentiating faculty members, which results in systematically lower salary for those who use STC policies for family reasons. Interestingly, we find that the negative effect of STC policy use for family reasons affects both men and women, indicating that policy use has negative salary consequences for caregivers in general, rather than being limited solely to women. However, because female faculty members are more likely to use the policy for family reasons, STC policies may contribute to the gender pay gap in academia. In terms of implications for universities, our findings suggest that efforts to

enhance the objectivity of salary setting by increasing oversight or limiting local autonomy in salary setting may ameliorate the wage penalty experienced by policy users.

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Table 1: Frequency of STC Policy Use in Sample

	Frequency		
	Total	Males	Females
Never Used STC	271	177	94
Used STC	50	23	27
Used 1 Time	38	17	21
Used 2 Times	11	6	5
Used 2+ Times	1	0	1

*By Reason (includes multiple spells)*

Family Reasons	43	18	25
Non-Family Reasons	20	11	9

Note: Use of STC by faculty members in the sample. 50 faculty members used the policy for a total of 63 spells.

Table 2: Descriptive Statistics by STC Policy Use

Faculty Characteristic	Non-users		STC Family		STC Non-Family	
	Mean	St. Dev.	Mean	St. Dev	Mean	St. Dev
Female	0.347	-	0.579**	-	0.412	-
White	0.753	-	0.711	-	0.882	-
Hire Age: < 30	0.210	-	0.211	-	0.235	-
Hire Age: 30 to 34	0.402	-	0.526	-	0.412	-
Hire Age: 35 to 39	0.199	-	0.211	-	0.176	-
Hire age: 40 or Over	0.188	-	0.053*	-	0.176	-
Hire Year: 1998	0.199	-	0.158	-	0.000*	-
Hire Year: 1999	0.196	-	0.237	-	0.235	-
Hire Year: 2000	0.251	-	0.263	-	0.176	-
Hire Year: 2001	0.203	-	0.132	-	0.294	-
Hire Year: 2002	0.151	-	0.211	-	0.294	-
Starting Salary	\$49,661	\$13,499	\$49,505	\$15,746	\$55,684*	\$5,333
Publications at Promotion	10.705	11.875	9.526	13.655	9.941	13.207
Observations	271		38		17	

Note: Statistical significance is evaluated relative to non-users; STC Family and STC Non-family columns include 5 of the same faculty members due to multiple spells of STC use.

\* p<0.10, \*\* p<0.05, \*\*\* p<0.01

Table 3: Testing Hypotheses Using the Effect of STC on Annual Salary

	1	2	3
Used STC in t-1 (Non-Family)	-0.0054 (0.0168)	-0.0024 (0.0158)	-0.0266 (0.024981)
Used STC in t-1 (Family)	-0.0230*** (0.0067)	-0.0229*** (0.0066)	-0.0109 (0.0068)
Publications through time t		0.0036*** (0.0013)	0.0038*** (0.0012)
Publications through time t, Squared		-0.00002* (0.00001)	-0.00003* (0.00001)
Used STC in t-1 (Non-Family) x Publications			0.00988 (0.00647)
Used STC in t-1 (Non-Family) x Publications Squared			-0.00029 (0.00021)
Used STC in t-1 (Family) x Publications			-0.00567*** (0.00192)
Used STC in t-1 (Family) x Publications Squared			0.00018*** (0.00006)
Year of Service	-0.0013 (0.0131)	0.0013 (0.0126)	0.0085 (0.0086)
Associate Professor	0.0442*** (0.0075)	0.0415*** (0.0072)	0.0412*** (0.0071)
Year Dummies	Included	Included	Included
Constant	10.7038*** (0.0071)	10.6940*** (0.0078)	11.3821*** (0.1317)
R-squared	0.858	0.861	0.861
N	2429	2429	2429

Notes: Dependent variable is natural log of annual salary at time t. Estimated using fixed effects to control for time invariant aspects of productivity. Publications are total works in primary medium of evaluation, books or articles, published as of time t. Standard errors clustered at individual-level.

\* p<0.10, \*\* p<0.05, \*\*\* p<0.01

Table 4: Effect of Lagged STC Policy Use on Annual Salary

	1	2
Used STC in t-1 (Non-Family)	0.0021 (0.0264)	0.0033 (0.0247)
Used STC in t-2 (Non-Family)	-0.0156 (0.0311)	-0.0176 (0.0279)
Used STC in t-3 (Non-Family)	0.0275 (0.0281)	0.0278 (0.0261)
Used STC in t-4 (Non-Family)	0.0668** (0.0334)	0.0692** (0.0334)
Used STC in t-1 (Family)	-0.0221* (0.0122)	-0.0251** (0.0114)
Used STC in t-2 (Family)	-0.0381*** (0.0115)	-0.0410*** (0.0112)
Used STC in t-3 (Family)	-0.0298*** (0.0102)	-0.0326*** (0.0099)
Used STC in t-4 (Family)	-0.0167* (0.0096)	-0.0167* (0.0092)
Publications through time t		0.0047*** (0.0015)
Publications through time t, Squared		-0.0000*** (0.0000)
Year of Service	-0.0225 (0.0150)	-0.0263* (0.0150)
Associate Professor	0.0267*** (0.0078)	0.0236*** (0.0075)
Year Dummies	Included	Included
Constant	11.3821*** (0.1317)	11.3761*** (0.1322)
R-squared	0.82	0.823
N	1486	1486

Notes: Dependent variable is natural log of annual salary at time t. Estimated using fixed effects to control for time invariant aspects of productivity. Publications are total works in primary medium of evaluation, books or articles, published as of time t. Standard errors clustered at individual-level.

\* p<0.10, \*\* p<0.05, \*\*\* p<0.01

Table 5: Effect of STC on Annual Salary by Gender

	Females	Males
	1	2
Used STC in t-1 (Non-Family)	-0.0203 (0.0203)	0.0160 (0.0229)
Used STC in t-1 (Family)	-0.0180** (0.0078)	-0.0241** (0.0109)
Publications through time t	-0.0015 (0.0021)	0.0057*** (0.0015)
Publications through time t, Squared	0.0000 (0.0000)	-0.0000** (0.0000)
Year of Service	0.0139 (0.0161)	-0.0049 (0.0187)
Associate Professor	0.0639*** (0.0160)	0.0317*** (0.0069)
Year Dummies	Included	Included
Constant	10.6636*** (0.0101)	10.7113*** (0.0107)
R-squared	0.861	0.866
N	914	1515

Notes: Dependent variable is natural log of annual salary at time t. Estimated using fixed effects to control for time invariant aspects of productivity. Estimation also includes position, year of service and quadratic in publications as of time t. Standard errors clustered at individual-level.

\* p<0.10, \*\* p<0.05, \*\*\* p<0.01

Table 6: Relationship between STC Use and Promotion

	All Hires			Faculty who went up for promotion		
	1	2	3	4	5	6
Used STC (Family)	0.243*** (0.074)	0.237*** (0.074)	0.243*** (0.078)	0.023 (0.046)	0.022 (0.045)	0.033 (0.048)
Used STC (Non-Family)	0.067 (0.106)	0.052 (0.105)	0.057 (0.110)	-0.09 (0.066)	-0.097 (0.066)	-0.112 (0.069)
Female	-0.047 (0.051)	-0.027 (0.051)	-0.028 (0.051)	-0.014 (0.033)	-0.001 (0.033)	-0.002 (0.034)
Start Age < 30 years	-0.152* (0.079)	-0.142* (0.078)	-0.142* (0.079)	0.025 (0.051)	0.032 (0.051)	0.036 (0.052)
Start Age 31 to 35 years	-0.01 (0.069)	0.003 (0.069)	0.005 (0.069)	0.057 (0.043)	0.065 (0.043)	0.065 (0.043)
Start Age 36 to 40 years	-0.057 (0.077)	-0.061 (0.077)	-0.059 (0.077)	0.037 (0.048)	0.033 (0.048)	0.034 (0.049)
Ln(Wage) in first year	0.037 (0.156)	0.037 (0.155)	0.035 (0.156)	-0.08 (0.105)	-0.082 (0.104)	-0.078 (0.105)
Std. Publications		0.057** (0.024)	0.059** (0.025)		0.030** (0.015)	0.028* (0.016)
STC (Family) X Std. Publications			0.001 (0.108)			0.052 (0.064)
STC (Non-Family) X Std. Publications			-0.045 (0.133)			-0.044 (0.078)
College Controls	Included	Included	Included	Included	Included	Included
Hire Year Controls	Included	Included	Included	Included	Included	Included
Constant	0.521 (1.662)	0.509 (1.649)	0.521 (1.657)	1.757 (1.111)	1.768 (1.105)	1.72 (1.110)
R-squared	0.13	0.146	0.146	0.049	0.065	0.067
N	321	321	321	259	259	259

Notes: Dependent variable is dummy variable for promotion to associate professor with tenure. Estimated using OLS. Standardized total publications are total publications at time of promotion, standardized by discipline and primary mode of evaluation (12 groups).

\* p<0.10, \*\* p<0.05, \*\*\* p<0.0

Table 7: Relationship between Promotion & STC Use, By Gender

	Females		Males	
	All 1	Went Up 2	All 3	Went Up 4
Used STC (Family)	0.210*	0.006	0.243**	0.056
	(0.109)	(0.075)	(0.118)	(0.069)
Used STC (Non-Family)	0.124	-0.138	-0.044	-0.126
	(0.177)	(0.114)	(0.148)	(0.097)
Std. Publications	0.071	0.042	0.060**	0.035**
	(0.061)	(0.044)	(0.028)	(0.017)
STC (Family) X Std. Publications	-0.003	0.107	-0.032	-0.027
	(0.161)	(0.106)	(0.156)	(0.089)
STC (Non-Family) X Std. Publications	-0.214	-0.148	0.066	0.031
	(0.284)	(0.186)	(0.181)	(0.103)
Start Age < 30 years	-0.365***	-0.177*	0.012	0.153**
	(0.122)	(0.096)	(0.105)	(0.064)
Start Age 31 to 35 years	-0.063	-0.013	0.081	0.138**
	(0.106)	(0.072)	(0.092)	(0.055)
Start Age 36 to 40 years	0.051	-0.039	-0.084	0.110*
	(0.117)	(0.077)	(0.103)	(0.064)
Ln(Wage) in first year	0.047	-0.099	-0.03	-0.114
	(0.255)	(0.207)	(0.198)	(0.124)
College Controls	Included	Included	Included	Included
Hire Year	Included	Included	Included	Included
Constant	0.365	2.091	1.13	2.054
	(2.798)	(2.327)	(2.112)	(1.327)
R-squared	0.325	0.168	0.157	0.135
N	121	96	200	163

Notes: Dependent variable is indicator for promotion to associate professor with tenure. Estimated using OLS. Standardized total publications are total publications at time of promotion, standardized by discipline and primary mode of evaluation (12 groups).

\* p<0.10, \*\* p<0.05, \*\*\* p<0.01

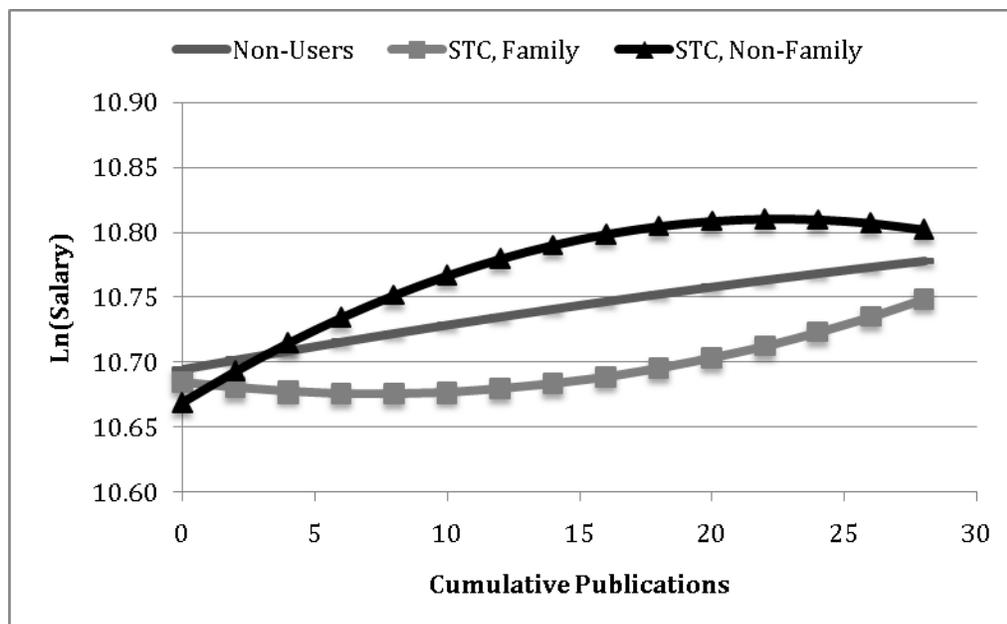
Table 8: Relationship between Total Publications at Tenure Review and STC Use

	All	Females	Males
	1	2	3
Used STC (Family)	0.054 (0.205)	-0.011 (0.202)	0.125 (0.352)
Used STC (Non-Family)	0.389 (0.335)	-0.243 (0.382)	0.769 (0.512)
Female	-0.453*** (0.143)		
Hire Age: < 30	-0.2 (0.221)	-0.032 (0.273)	-0.35 (0.325)
Hire Age: 30 to 34	-0.279 (0.184)	-0.061 (0.205)	-0.431 (0.281)
Hire Age: 35 to 39	0.166 (0.207)	0.169 (0.217)	0.046 (0.328)
Hire Year: 1999	-0.272 (0.201)	-0.088 (0.244)	-0.388 (0.293)
Hire Year: 2000	-0.068 (0.197)	-0.038 (0.219)	-0.149 (0.295)
Hire Year: 2001	0.213 (0.205)	0.485* (0.244)	0.054 (0.303)
Hire Year: 2002	-0.233 (0.227)	-0.295 (0.279)	-0.267 (0.327)
Ln of Starting Salary	0.058 (0.449)	-0.002 (0.588)	0.14 (0.628)
College Controls	Included	Included	Included
Constant	-0.292 (4.758)	-0.301 (6.221)	-0.935 (6.672)
R-squared	0.118	0.187	0.114
N	251	91	160

Notes: Estimated using OLS on sample of faculty who went up for tenure review. Dependent variable is standardized total publications in primary medium of evaluation at time of promotion, standardized by discipline and primary mode of evaluation (12 groups).

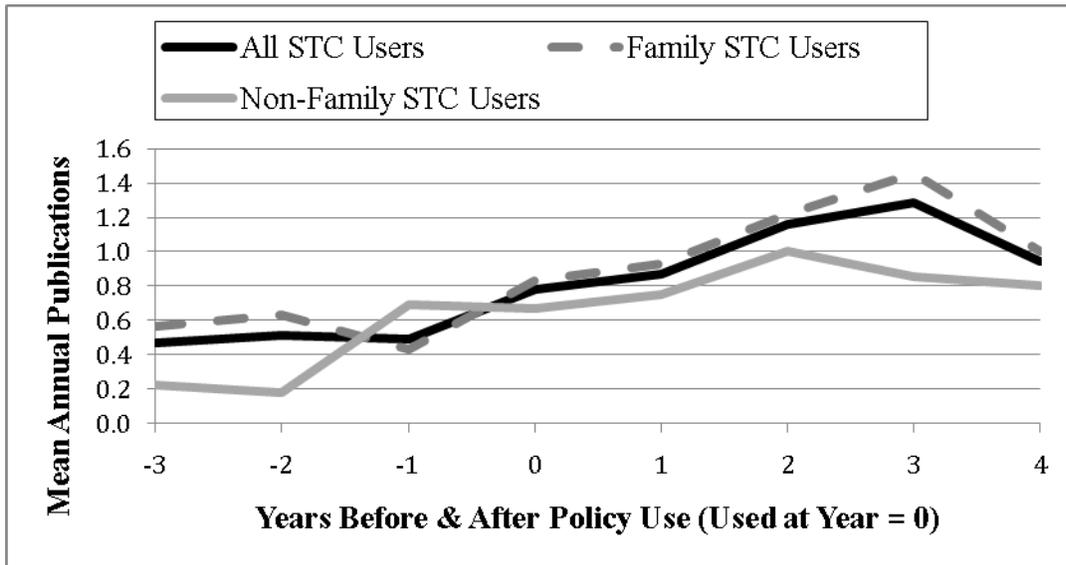
\* p<0.10, \*\* p<0.05, \*\*\* p<0.01

Figure 1: Return to Publications by STC Policy Use



Notes: Figure plots relationship between quadratic in publications and natural log of salary using coefficients from Table 3.

Figure 2: Average Research Output Before and After STC Use



Notes: Figure plots average annual research output in years before and after STC policy use.