Equal but Inequitable: Who Benefits from Gender-Neutral Tenure Clock Stopping Policies?

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Abstract

Many skilled professional occupations are characterized by an early period of intensive skill accumulation and career establishment. Examples include law firm associates, surgical residents, and untenured faculty at research-intensive universities. High female exit rates are sometimes blamed on the inability of new mothers to survive the sustained negative productivity shock associated with childbearing and early childrearing in these environments. Gender-neutral family policies have been adopted in some professions in an attempt to "level the playing field." The gender-neutral tenure clock stopping policies adopted by the majority of research-intensive universities in the United States in recent decades are an excellent example. But to date, there is no empirical evidence showing that these policies help women. Using a unique data set on the universe of assistant professor hires at top-50 economics departments from 1985-2004, we show that the adoption of gender-neutral tenure clock stopping policies substantially reduced female tenure rates while substantially increasing male tenure rates.

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1 Introduction

Women are under-represented in many high-skilled professions at labor market entry, and they generally leave these professions at higher rates than men as they age. Figure 1 documents female representation among physicians, lawyers, professional business occupations, and postsecondary teachers with advanced degrees. Despite the fact that they earn the majority of post-baccalaureate degrees, women are underrepresented in these occupations at entry, more under-represented as they age, and the decline with age is particularly pronounced among top-earners.[1] The widening gender gap in the share of top-earners over the period when many professionals have children can be interpreted as a "family gap," and suggests that even highly educated professional women appear to have trouble maintaining a successful career while raising a family.

Family-friendly policies may be an important way to mitigate these family gaps, but very little is known about the causal effects of these policies for high skill women in particular. High skill women are more likely to have access to family leave and other flexible family policies through their employers than are lower skill women, but take-up is often low. One of the most common reasons high skill women give for not being able to take family leave is "too much work."[2] But they may also be hesitant to make use of these benefits because there is generally a high wage penalty associated with taking time off in high skill occupations (Goldin and Katz, 2011). A particular concern with female-specific policies is that women may believe their managers and colleagues will view them as less committed to the job or less productive if they use them. Some policy makers have argued that gender-neutral family policies may mitigate the reluctance of women to take advantage of available family leave opportunities (Rehel and Baxter, 2015). Gender-neutral policies directly benefit men, but there also may be additional benefits to women if men can use them as well. For example, male take-up may decrease the social stigma against leave-taking and hence make it less costly for females to take leave (Lazear and Rosen, 1990; Dahl, Løken, and Mogstad, 2014). Additionally, if fathers spend more time in childcare as a result of such policies, mothers may have more time for work or leisure (Patnaik, 2016).

An important feature of many high skill occupations is that human capital accumulation and promo-

[1]The data are from the 2000 Census and the 2010 American Community Survey. Among the cohort born in 1970, women hold 54 percent of all Master's, professional, and doctoral degrees obtained by age 30.

[2]Source: 2015 Economic Report of the President, available at https://www.whitehouse.gov/administration/eop/cea/economic-report-of-the-President.

tion tracks are very steep and important during the first decade of one's career. Lawyers, academics, and executives often work in "up-or-out" environments, where individuals who miss a set window of opportunity for advancement are never able to do so (Rosen, 1990; Demougin and Siow, 1994; O'Flaherty and Siow, 1995). Family leave policies that allow women to take short periods of time off do not adequately account for the fact that the productivity loss associated with starting a family persists over a much longer time horizon than a few weeks surrounding childbirth. Having children may therefore reduce the probability that women are promoted because early productivity falls despite the existence of short family leave programs. This problem is especially acute at research-intensive universities, where tenure decisions are made at a fixed point in time. For this reason, many of these institutions have adopted tenure clock stopping policies for family-related reasons (American Association of University Professors, 2001).

We study the gender-neutral tenure clock stopping policies adopted by many universities over recent decades. These policies are unusual in that they do not require workers (i.e., assistant professors) to take time off. Instead, they allow assistant professors to stop their tenure clock for an extended period, typically one year, after childbirth or adoption. In theory, no research is expected during this time. Compared to short family leave policies, this type of policy may better account for the extended period of reduced productivity associated with having a child, and therefore may be especially beneficial in settings in which early promotion has a large impact on later success. However, gender-neutral tenure clock stopping policies may not actually level the playing field in terms of tenure outcomes between men and women if the average productivity during the period of the stopped clock differs between them. If men are able to use the additional time more productively or more strategically, it is possible that these policies could actually increase the gender gaps in the profession. Yet to date, there is little empirical evidence about the effects of tenure clock stopping policies on labor market outcomes.

We have compiled a unique dataset on all assistant professors hired at the top-50 economics departments from 1985-2004 to study the differential impact of these policies on men and women. The data includes complete academic job histories and publication counts. This rich data allows us to estimate the within-university changes in tenure rates for men and women that result from the adoption of a gender-neutral tenure clock stopping policy. We find that the probability a man gets tenure in his first job rises by 19 percentage points after such a policy is adopted, while the female probability falls by 22 percentage points. Our estimates show that these policies help men, hurt women, and substantially increase the gender gap in tenure rates. The primary mechanism driving these effects is an increase in the number of top-5 journal publications by men with no such increase by women. This suggests that the implementation of a gender-neutral clock stopping policy causes the tenure bar to rise, and that as a result fewer women are granted tenure in top-50 economics departments. However, this does not mean that more women leave academia. Among those who start their career at a top-50 university, we find no evidence that gender-neutral tenure clock stopping policies reduce the fraction of women who ultimately get tenure somewhere.

2 Family Leave Policies

Family leave–and particularly maternity leave–policies are designed to allow new parents to better balance having both a family and career. These policies are viewed as an important way to reduce the "family gap" in female wages by improving job continuity among new mothers (Waldfogel, 1998; Lundberg and Rose, 2000). In fact, evidence from generous leave policies in Europe suggests that job-protected leave substantially increases female employment rates (Ruhm, 1998; Misra, Budig, and Boeckmann, 2011; Stearns, 2015). Gender-neutral policies may also benefit women, at least in theory, by encouraging new fathers to "lean in" at home and take a more active role in childcare, allowing women more time to focus on their careers.[3] However, family-friendly policies may also have unintended consequences. For example, Blau and Kahn (2013) find that these policies lead to higher rates of part-time work and employment in lower-level positions. Compared to other OECD countries with much more generous family-friendly work entitlements, U.S. women are more likely to work as professionals or managers.

Little is known about the causal effects of access to family-friendly policies for high-skill American workers because of the endogeneity issues associated with sorting into employers and occupations.[4] Yet there are strong correlations between the degree of job flexibility and the gender wage gap in high-skill occupations, which suggests that women value amenities such as the ability to take leave, work part-time, and have flexible hours (Goldin, 2014). At the same time, Goldin and Katz (2012) show that as pharmacy became a more family-friendly occupation, the share of female workers rose and the gender wage gap

[3]While the empirical evidence on the long-term effects of leave policies for fathers is limited, there is some indication that paternity leave reforms increase childcare time among fathers not only during the period of leave but also several years later (Schober, 2014). Other studies do not find any behavioral effects within the household (Ekberg, Eriksson, and Freibel, 2013).

[4]In part because higher-skilled workers are more likely to have access to paid leave through their employers, the literature on U.S. paid family leave has found that effects of widespread, government-provided paid leave benefits are concentrated among the low-educated and other disadvantaged groups (Rossin-Slater, Ruhm, and Waldfogel, 2013).

disappeared. Although the underlying reasons for the changes may be fundamentally different, the higher education sector in the U.S. has become much more family-friendly as well. In recent decades, most universities have adopted family-friendly policies that are intended to make it possible for faculty to better balance raising a family with maintaining a successful academic career. Such policies include short term family leave to care for infants, allowing part-time work, and allowing assistant professors to stop their tenure clocks. However, there is little empirical evidence to suggest how these policies affect faculty productivity or other employment outcomes.

3 Tenure Clock Stopping Policies

Assistant professors across disciplines are typically evaluated for tenure near the end of a fixed probationary period, which usually lasts about seven years.[5] This probationary period gives the assistant professor time to produce a portfolio of work that is a better signal of his or her true productivity and demonstrates potential for continued academic success. However, the fixed probationary period disadvantages individuals who experience large, temporary negative productivity shocks during this time span. One such negative shock is bearing or caring for infants. In part for this reason, tenure-track women are less likely to have children than tenure-track men, and the gender gap in tenure rates is much larger among those with kids than those without (Mason and Goulden, 2002).

To better account for these productivity shocks when making tenure decisions, and to reduce the work-family tradeoff, tenure clock stopping policies have become common at universities over the past 30 years.[6] These policies allow eligible assistant professors to stop their tenure clock for one year due to circumstances that would significantly affect their productivity.[7] Importantly, such policies are independent of leave-taking, meaning that assistant professors do not face a tradeoff between forgoing income while

[5]The American Association of University Professors (AAUP) issues guidelines that state the probationary period should not exceed seven years (AAUP, 2014). This means that assistant professors are usually evaluated for tenure during year six. In 2001, the AAUP issued a statement suggesting that new parents should be entitled to stop their tenure clock for one year, extending this maximum period (AAUP, 2001).

[6]These policies are adopted at the university level, and are plausibly uncorrelated with other factors that affect departmental hiring decisions. Similarly, it is unlikely that applicants make decisions about whether or not to accept a job based on these policies. We show that policy adoption is uncorrelated with the number of female assistant professors hired in Section 8.

[7]Tenure clock stopping policies are equivalently called tenure clock extension policies or tenure clock rollback policies at some universities. We use the term "tenure clock stopping policy" to refer to all policies that change the maximum number of years an assistant professor can wait before going up for tenure for reasons related to having children.

on unpaid leave and gaining the extra time on their tenure clock.[8] Tenure clock stopping policies typically cover childbirth and becoming a new parent in addition to serious illness or personal issues and caring for sick or elderly relatives. While tenure clocks may be stopped subject to dean approval for non-birth related reasons, the time exclusions for new parents are automatically approved at many universities. Even if the tenure clock is automatically stopped for new parents, faculty members can choose to go up for tenure at the original time (or earlier), or to opt out of the policy. If the clock is stopped and the individual goes up for tenure later than she otherwise would have, departments and outside letter-writers are supposed to be told to disregard the additional time spent as an assistant professor. However, it is not clear how these individuals are actually evaluated.[9]

These clock stopping policies can be classified into two main types: policies that only apply to mothers, and policies that are gender-neutral. Gender-neutral policies extend equal benefits to new mothers and fathers, whereas female-only policies only directly affect women.[10] Both types of policies typically stop the tenure clock for one year for each new child, up to a maximum of two. Table 1 shows the year in which female-only and gender-neutral clock-stopping policies were implemented in each of the universities in our sample.[11] Early tenure clock stopping policies were more likely to be female-only, and were intended to "level the playing field," as women shoulder more of the burden of bearing and caring for children, and therefore face a higher cost of having children early in their careers. However, gender-neutral tenure clock stopping policies are now more common, and many universities that originally adopted a female-only policy have since converted to a gender-neutral version.

Tenure clock stopping policies may affect tenure outcomes in several ways. First, for those on the margin of receiving tenure, the extra time may allow them to publish additional papers that increase their

[8]Tenure clock extensions are also often granted during paid or unpaid leaves. However, none of the policies used in this analysis are explicitly tied to leave-taking. Universities that only grant tenure clock extensions to individuals who go on short- or long-term leave are not considered to have a tenure clock stopping policy in our analysis.

[9]Using data from a small survey of economics faculty, Thornton (2008) finds that 37 percent of tenure review committee members do not know what instructions are given regarding how to account for clock stopping when making tenure evaluations.

[10]What we call female-only policies are sometimes instead called primary caregiver policies, and cover parents of either gender who provide more than 51 percent of caregiving activities. Gender-neutral policies sometimes require parents to have "significant" childcare responsibilities, but can be used simultaneously by both parents. While in theory primary caregiver policies could be used by men, reports indicate that male take-up is extremely rare (Mason et al., 2005). Female take-up under female-only policies is also relatively low, and one of the common reasons women cite for not utilizing clock stopping policies is that they thought it would have a negative impact on their tenure case.

[11]The earliest gender-neutral policy was adopted by Northwestern University in 1981. While several universities had female-only policies in the 1970s and 1980s, no other gender neutral policy were adopted until 1990, with 1997 being the median year of gender-neutral tenure clock stopping policy adoption in our sample. The sample is defined in Section 5.

chances of success. Even if the faculty member does not use this time to publish more papers, the extra time may cause them to publish in higher ranked outlets by reducing the time risk associated with sending papers to elite journals. As time to the tenure decision increases, there is less risk associated with submitting papers to top journals with low acceptance rates because there is more time to try again (at potentially lower ranked journals with higher acceptance rates) if unsuccessful. If either the number of papers published increases or the quality of papers increases, then tenure clock stopping policies may in turn increase the tenure standard. Gender-neutral tenure clock stopping policies may then have a negative effect on women relative to men if new mothers are less productive than new fathers during the extra year.

We focus on the effect of gender-neutral tenure clock stopping policies on the probability that assistant professors at the top-50 economics departments in the United States are granted tenure (and other measures of academic performance) for two reasons. First, gender-neutral policies have become the norm at research universities. As it is theoretically possible (perhaps even likely) that gender-neutral tenure clock stopping policies may fail to improve career outcomes for women in research-oriented positions, an empirical investigation is required. The second reason stems from data limitations. Precisely because gender-neutral tenure clock stopping policies have become the norm, there are simply not enough institutions with female-only policies for long enough to allow for precisely estimated effects of these policies. That being said, all specifications control for female-only policies and the point estimates for these variables are reported in Appendix Table 1.

4 Conceptual Framework

Tenure at top-50 economics departments is heavily dependent on publications in highly ranked economics journals. As such, it is natural to think that gender-neutral tenure clock stopping policies affect tenure through publication records. In theory, tenure decisions are based on research output fully discounting tenure clock stopping years, but this practice is imperfectly followed (Thornton, 2008). But even if the "stopped" time is fully ignored, there can be important distributional consequences. Consider the extreme case where faculty voting on tenure care only about total output, with no time adjustments of any kind. For simplicity, assume candidates with equal ability. Candidate A "stopped" her clock for one year at the birth of her child and did no research during that time. In contrast, candidate B also stopped his clock when his child was born but his productivity remained constant. Even with clock stopping, the male candidate will look more productive compared to the female candidate. He will also look more productive than equal ability men and women who did not stop their clock. While this is only one of many possible scenarios, it highlights the potential distributional consequences associated with gender-neutral clock stopping policies. To formalize these ideas and explore the mechanisms through which clock stopping policies might affect publishing and tenure, we provide a simple model that focuses on the key issues.

4.1 A Simple Model

We consider a simple environment where newly-hired risk-neutral assistant professors must decide where to submit papers. They face a trade-off between the quality of the journal they choose and the probability of successfully publishing the paper. We begin with a simple one period model with no tenure clock stopping option. At the end of this single period, individuals are up for tenure, and the probability of tenure is an increasing function of their publishing success. We then allow for gender-neutral tenure clock stopping policies that allow individuals who have a child to delay their tenure decision by one period, giving them more time to submit, and hopefully publish, their research.

To focus attention on the most important issues, we abstract from production and assume that individuals arrive at their first job endowed with a single research paper. Their only choice is whether to send their paper to a "top-5" (top) journal (T_1) or a "regular" journal (R_1), where the subscript denotes the time period. We assume that the probability of publishing at a top journal is θ, the probability of publishing at regular journal is ϕ, and that $0 < \theta < \phi < 1$. In other words, the probability of publishing at a top journal is strictly less than the probability of publishing at a regular journal. We define $\theta = \delta\phi$ with $0 < \delta < 1$, so δ is the odds of publishing in a top journal relative to a regular journal. We further assume that the payoff to successfully publishing in a top journal, T, is higher than the payoff to publishing in a regular journal, R, where $R = \gamma T$ with $0 < \gamma < 1$. Therefore, γ is the relative payoff to a regular publication compared to a top publication. The payoff to not publishing is 0. The decision tree and corresponding payoffs are illustrated in Figure 2(a).[12]

To model the relationship between publications and tenure, we define X as realized publications: T,

[12] Although individual parameters are drawn from continuous distributions, individual subscripts are omitted for notational ease. This heterogeneity allows for differences in individual productivity and institutional differences in tenure requirements.

R, or 0. The probability of earning tenure is modeled as an increasing function of X and random noise ϵ, with $Z = X + \epsilon$ and $P(tenure) = f(Z)$. More formally, the probability of tenure is strictly increasing in Z. Because X is the only part of Z that individuals have any control over, it is easiest to talk about submission decisions rather than tenure probabilities. That being said, we discuss both in Section 4.5.[13]

4.2 No Children

Deciding where to send a paper is straightforward for childless individuals. A risk-neutral individual submits his or her paper to the journal that maximizes the expected value, where:

$$EV(T_1) = \theta T = \delta\phi T$$

$$EV(R_1) = \phi R = \gamma\phi T$$

As such, an individual will send his or her paper to a top journal if $\delta > \gamma$.[14]

To facilitate comparisons between individuals with and without a child and with and without access to tenure clock stopping, it is helpful to draw the optimal strategy choices along the γ line, shown in Figure 3. The top line in Figure 3 shows that childless individuals will submit their paper to a top journal when $\delta > \gamma$ and to a regular journal otherwise; when the risk of doing so is small compared to the reward.

4.3 A Child but no Clock Stopping Policy

We model the "professional cost" of childbearing as a reduction in the probability of publishing in a top journal. For simplicity, we assume that childbearing has no impact on the probability of publishing in a regular journal.[15] This could easily be amended. What is important is that the "cost" is higher for top journals. We therefore model the temporary loss of time experienced by individuals who have just had a child as a lower probability of publishing in a top journal; $\delta^k = \alpha\delta$, with $0 \leq \alpha \leq 1$ for individuals in a childbearing period. The k denotes a period in which a child is born.

[13]Because this model is highly stylized, we abstract away from the possibility of moving and getting tenure at other universities. However, one can alternatively think about this as tenure candidates being granted tenure at a top-50 university, at a lower-ranked university, or nowhere, with the probability of this ordered outcome being a function of Z.

[14]The individual is indifferent when $\delta = \gamma$.

[15]One can think about this as a higher cost associated with revisions before submitting to top-5 journals, or it being more time-consuming/costly to respond to referee comments from top journals.

For individuals who have a child but who are at an institution that does not stop the tenure clock at the birth of a child, the expected value of sending a paper to a top journal becomes $EV(T_1^k) = \alpha\delta\phi T$ and the expected value of sending it to a regular journal is the same as above. An individual will send his or her paper to a top journal if $\alpha\delta > \gamma$. As long as $\alpha < 1$, the submission rate to top journals is lower with a child than without.[16] This can be seen on the second line of Figure 3. Additionally, the gap in the share of individuals who submit to top journals is rising as α falls. The tenure rate is then also lower for those with a child, and this gap is growing as the productivity/time loss associated with childbearing rises (as α falls). As it is plausible to think that the average man has a higher α than the average woman, this means that the tenure gap between individuals with and without a child is larger for women.

4.4 A Child with a Clock Stopping Policy

In its simplest form, clock stopping adds a second period for individuals to try to publish their paper just prior to the tenure review. As they are endowed with only one paper, they can only send it out again if it is not published in period 1. We begin by assuming that the tenure decision is based on publications with no adjustment for time to the decision, that the probability of publishing in a top journal returns to the no child level during the second period, and that fertility is exogenous. We will return to these issues in Section 4.5. Finally, we assume that once an individual sends their paper to a regular journal they cannot switch back to a top journal in the following period; if rejected in period 1 it can only be sent to a regular journal in period 2. However, if a paper is rejected from a top journal in period 1, it can be sent to either type of journal in the second period. Figure 2(b) depicts the decision tree for individuals with a child.

The expected values for the three available submission patterns are now somewhat more complicated.

$$EV(T_1^k T_2) = \alpha\delta\phi T + (1 - \alpha\delta\phi)\delta\phi T$$

$$EV(T_1^k R_2) = \alpha\delta\phi T + (1 - \alpha\delta\phi)\gamma\phi T$$

$$EV(R_1^k R_2) = \gamma\phi T + (1 - \phi)\gamma\phi T$$

In an environment with clock stopping, it is easiest to think about submission decisions for two cases.

1. If $\delta > \gamma$: Individuals will choose the $T_1^k T_2$ strategy when $\gamma < \frac{\delta(1+\alpha(1-\delta\phi))}{2-\phi}$ and the $R_1^k R_2$ strategy

[16]This assumes parameter distributions such that we observe both publication strategies in the absence of children.

otherwise. Individuals will never choose $T_1^k R_2$ because it is strictly dominated by $T_1^k T_2$.

2. If $\delta < \gamma$: Individuals will choose the $T_1^k R_2$ strategy when $\gamma < \frac{\alpha\delta}{1-\phi(1-\alpha\delta)}$ and the $R_1^k R_2$ strategy otherwise. Individuals will never choose $T_1^k T_2$ because it is strictly dominated by $T_1^k R_2$.

The optimal submission decisions for these cases are shown on lines 3 and 4 of Figure 3.[17] Intuitively, the existence of the second period reduces the risk of submitting to a top journal in period 1 and thus increases the share of individuals who do so. Clock stopping policies therefore increase the range of parameter values for which individuals submit to top journals. Not only do these policies increase the probability of ever submitting to a top journal, but they also increase the number of attempts. When the relative payoff of submitting to a top journal is large compared to the risk ($\delta > \gamma$), people who send their paper to a top journal in the first period also do so in the second period. When the opposite is true ($\delta < \gamma$), the clock stopping period increases the share of individuals with a child who submit to a top journal in the first period because they can submit to a regular journal in the next period if they are unsuccessful.[18]

4.5 Distributional Consequences of Gender-Neutral Tenure Clock Stopping Policies

We are particularly interested in the change in top publications and tenure rates associated with gender-neutral tenure clock stopping policies and the distribution of benefits across individuals with different childbearing costs. To begin, consider the effect of clock stopping on expected top publications for individuals who have a child. This can be seen by comparing line 2 to lines 3 and 4 in Figure 3. When $\delta > \gamma$, more people submit to a top journal and they get two chances to do so instead of one because the $T_1^k T_2$ strategy dominates the $T_1^k R_2$ strategy. When $\gamma > \delta$, all individuals submit to a regular journal in the absence of clock stopping, but some people switch to the $T_1^k R_2$ strategy when they have two periods. In both cases, the share of individuals submitting to a top journal is higher with clock stopping than without. Everyone is also more likely to earn tenure because the existence of the additional period raises the expected value of publications for all individuals, regardless of their submission decisions.

One might also be interested in how top publication rates differ for individuals with and without a

[17]If $\delta = \gamma$: Individuals are always indifferent between the $T_1^k T_2$ and $T_1^k R_2$ strategies, and prefer $R_1^k R_2$ when $\alpha < \frac{1-\phi}{1-\delta\phi}$.

[18]The tenure clock stopping case is drawn on two lines because it is easier to think about the implications of the model separately for these two cases. In particular, the ordering of the cutoff points along the γ line holds for the relevant portion of each line: $0 \leq \alpha\delta < \frac{\delta(1+\alpha(1-\delta\phi))}{2-\phi} \leq \delta$ for $\delta > \gamma$ and $\delta \leq \frac{\alpha\delta}{1-\phi(1-\alpha\delta)} < 1$ for $\delta < \gamma$. If α is large enough in the $\delta > \gamma$ case, or small enough in the $\delta < \gamma$ case, compared to the other parameters, the clock stopping specific cutoffs are bounded at δ.

child. Referring again to Figure 3, when $\delta > \gamma$, individuals with a child are always more likely to submit to a regular journal than childless individuals, regardless of whether or not clock stopping is available. However, it is important to note that those who submit to a top journal under clock stopping get two chances to submit, so the change in the probability of top publications compared to the no child case is ambiguous. The change in the expected value of publications, and hence the change in the tenure rate, is also ambiguous because it depends on the proportion of people in the $T_1^k T_2$ and the $R_1^k R_2$ regions. When $\delta < \gamma$, individuals with and without a child behave identically in the absence of a clock stopping policy; they submit to regular journals. However, the policy increases the probability that individuals with a child publish in a top journal, relative to those without children. As such, the expected value of publications rises for everyone as does the tenure rate.

Finally, we are particularly interested in differences in the impact of clock stopping for those with different childbearing costs (values of α). When $\delta < \gamma$, individuals who have a child always send their paper to regular journals in the absence of clock stopping, and this decision does not depend on α. Under clock stopping, the $R_1^k R_2$ region shrinks as α increases. This means that individuals with lower childbearing costs benefit at least as much, or more, from access to clock stopping compared to otherwise similar individuals with higher costs. The story is more complicated when $\delta > \gamma$. In this case, clock stopping can increase the probability of top publications more for men or women, depending on the distribution of the other parameters. Generally speaking, when male αs are much larger than female αs (where "much larger" depends on the other parameter distributions), it is possible that the policy increases the probability of top publications more for men than for women. For small values of α, there is no change in expected top publications with clock stopping because individuals continue to send their papers to regular journals even when they have a second period. Once α is large enough, people switch from the R_1 strategy to the $T_1^k T_2$ strategy with clock stopping. Within this group, the change in the probability of top publications is rising with α because the childbearing cost in period 1 is falling. Once α becomes sufficiently large that individuals send to a top journal even in the absence of clock stopping (T_1^k), the gain in the probability of a top publication becomes smaller because they only gain one chance instead of two. To make this more concrete, Figure 4 plots the change in the probability of top publications and the change in the expected value of publications between clock stopping and no clock stopping for all values of α, assuming that $\gamma = 0.20$, $\delta = 0.25$, $\phi = 0.40$, and $T = 1$ for all individuals (we assume single values for these parameters for simplicity). In this example, consider the case where the female α is 0.3 and the male α is 0.7. For these values, men benefit more from clock stopping than women because they shift from the R_1 strategy to the $T_1^k T_2$ strategy. The female α is too low for the extra period to induce them to switch to submitting to top publications, so women choose the $R_1^k R_2$ strategy.

To summarize, this simple model yields several specific (all else equal) predictions about the effects of gender-neutral tenure clock stopping policies on publication and tenure outcomes.

1. For all values of α, individuals with a child and access to clock stopping are more likely to publish in top journals and get tenure than those with a child but no access to a clock stopping policy.

2. Whether the average woman benefits more from clock stopping than the average man depends on the distribution of parameters; for many reasonable parameter values, the increase in top publications and tenure is larger for men.

3. Whether or not clock stopping policies completely mitigate the "professional cost" of having a child depends on parameter values; individuals with a child and access to clock stopping may have better or worse publication and tenure outcomes on average than childless individuals.

The purpose of this model is to provide some intuition about the potential effects of gender-neutral tenure clock stopping policies in a stylized setting. Even in this simple setting, the relative sizes of the average effects for men and women are ambiguous, and therefore whether or not these policies can level the playing field is an empirical question. Further, there are several additional factors not included in the model that might affect the results. First, while tenure clock stopping policies typically instruct tenure evaluators to disregard the period in which the clock is stopped, in practice it is likely that the time to the tenure decision is taken into consideration. We can account for this in our model by allowing the probability of tenure to be a decreasing function of time as an assistant professor. In this case, clock stopping is only beneficial if the increased expected value of publications is big enough to offset the penalty of having a second period. Second, while we have assumed a constant tenure standard, the imposition of this policy could cause the tenure standard to change. If the tenure standard rises, groups with low or zero productivity gains (childless individuals and those with low αs) could be absolutely worse off under the policy. Third, with endogenous fertility, the decision to have a child before tenure will depend on the parameters discussed above, the availability of clock stopping, and the benefits of having a child. Stated somewhat differently, the individual will still maximize his or her expected value as described above, and will choose to have a child only if the benefits outweigh the professional costs. As we do not observe fertility in our data, we cannot test predictions of a model with endogenous fertility. Instead, we will identify intent to treat effects of tenure clock stopping policies on publication and tenure rates. However, we would expect that individuals with higher αs (men) would be more likely to increase fertility in response to a tenure clock stopping policy than those with lower αs (women).[19]

5 Data

We compiled two unique data sets. The first is a complete list of tenure clock stopping policy adoption dates for 49 of the top-50 Economics departments.[20] These data were collected directly from each institution.[21] All universities in our sample and the year their tenure clock stopping policies were adopted are listed in Table 1. The second dataset contains academic employment histories and publication records for faculty members hired as an assistant professor between 1985 and 2004 at any of the top-50 Economics Departments in our sample. Combining these two sources allows us to match each assistant professor to the appropriate tenure clock stopping policy at these universities. This information was collected between September 2014 and December 2015.

Faculty members were identified from archived course catalogs, which were obtained from each university. These catalogs list all department faculty and their rank. Information about each person's academic job history, publication record, and PhD was taken from their most recent curriculum vitae (CV), or found via internet search.[22] We also collected information on the person's gender, year of PhD, and the year and

[19] In an environment with risk aversion, greater female risk aversion (as is generally found in the experimental literature (Eckel and Grossman, 2008; Croson and Gneezy, 2009; Charness and Gneezy, 2012)) would further push towards lower top submission rates for women relative to men and a differentially smaller response to clock stopping.

[20] These are the top 50 Economics Departments with graduate programs as ranked by the 2010 U.S. News and World Report. The California Institute of Technology is excluded from our sample because they do not have a stand-alone Economics Department; rather they offer a PhD in Social Sciences. We were unable to obtain complete faculty information from Brown University and the University of Pittsburgh. There was a three-way tie for the 50th ranked department, so our final sample includes 49 universities.

[21] The exact source of the policy details and adoption dates varies by institution. Often records were obtained from archived copies of university bylaws or statutes, human resource departments, or faculty affairs documents.

[22] We located CVs that report academic job histories and publications for more than 93 percent of the assistant professors in our sample. For the remainder, we found the relevant job history information via internet search and publication information using the Web of Science. We also used the Web of Science to fill in recent years when CVs were out of date. As we are primarily interested in whether or not an assistant professor eventually gets tenure, we did not track specific job changes once

institution at which they first received tenure.

The sample includes all 1299 assistant professors hired at the previously defined 49 institutions between 1985 and 2004.[23] In order to ensure that we are assigning access to gender-neutral tenure clock stopping policies correctly, the primary estimating sample is restricted to individuals whose first job is at a top-50 economics department. This excludes 126 people who started their career at a university outside our sample. The sample is also limited to people who started their first job within two years of receiving their PhD. This excludes an additional 23 individuals. This restriction means that we are identifying the effects of gender-neutral tenure clock stopping policies for 1150 newly minted economists. In our main specification, we drop individuals who do not publish at least two journal articles within eight years after receiving their PhD. Removing these 102 people serves to reduce noise in the data, as those with zero or one publication would not be serious candidates for tenure at these top universities. Those without at least two publications typically leave academia quickly, and essentially never get tenure at their first job. Our main analysis therefore includes 1048 individuals. We relax this restriction in Section 7.

As noted in the previous section, our primary objective is to estimate the effect of gender-neutral tenure clock stopping policies on the probability that assistant professors at top-50 economics departments are granted tenure. We construct an indicator for whether a gender-neutral clock stopping policy was in place in the first year of the individual's first assistant professor appointment at a top-50 university. For example, MIT adopts a gender-neutral tenure clock stopping policy in 2001. Assistant professors hired in 2001 and later receive a value of 1 for this variable, while those hired in 2000 and earlier are assumed to be unaffected by the policy. We address partial treatment and lags in program take up in Section 6. The university at which a faculty member is tied to a clock stopping policy is hereafter referred to as the policy university. In order to ensure that we properly account for gender-neutral tenure clock stopping policies for universities that switched from a female-only tenure clock stopping policy to a gender-neutral version, we create an analogous indicator variable for female-only clock stopping policies.

The main outcome of interest, tenure at the policy university, is an indicator variable equal to 1 if the

the individual left academia. Non-academic jobs include working for government organizations, private sector companies, or non-governmental organizations. Non-tenure track positions within universities or non-postsecondary institutions are classified as non-academic jobs for our purposes (this is a trivial number of people in our sample). However, we do track re-entry into tenured or tenure-track academic jobs.

[23]There is a single exception. We exclude one assistant professor who passed away before their tenure decision. The sample therefore includes 1299 of the total 1300 assistant professors hired during the specified period.

assistant professor was granted tenure at the policy university and zero otherwise. Additional outcomes include whether the individual was granted tenure in the profession, academic productivity as measured by publications, pre-tenure years at the policy university, time to tenure (at all universities), and number of jobs held before earning tenure. More specifically, tenure in the profession is an indicator variable equal to 1 if the assistant professor eventually earns tenure at any university and zero otherwise. We measure academic productivity by the number of non-top 5 peer-reviewed journal articles published within four, five, six, seven, eight, and nine years of receiving a PhD, as well as the number of articles published in top-5 economics journals within these windows. Top-5 publications include regular and short peer-reviewed articles in the *American Economic Review*, *Econometrica*, *Journal of Political Economy*, *Quarterly Journal of Economics*, and the *Review of Economic Studies*.[24] Pre-tenure years at the policy university and the number of jobs held before becoming a tenured professor are measured exactly as stated. Time to tenure is the number of years it took to first receive tenure at any institution.

The main regression specification described in the next section includes an indicator for whether or not the assistant professor earned his or her PhD at a top-10 institution.[25] It also includes time-varying university level controls which were collected from the Integrated Post-Secondary Education Data System (IPEDS) and merged into our data by the policy university. Specifically, we control for the number of undergraduate students, the number of graduate students, faculty size, average salary of full professors, average salary of assistant professors, annual revenue, the fraction of the faculty who are female, and the fraction of the faculty who are full professors.

There are several limitations to note about this data. First, we do not observe actual tenure decisions, only outcomes. Some people who were granted tenure may have left anyway, while others may have left before they were up for tenure. We observe only actual promotions to tenured positions, which usually occur when individuals are promoted from assistant to associate professor.[26] This means that we are identifying effects on actual tenure promotions, rather than on tenure decisions. Second, we do not observe

[24] We exclude publications in the *American Economic Review Papers and Proceedings* issue, as well as comments, replies, and book reviews in all issues of these five journals. *AER Papers and Proceedings* articles are counted in the regular publications counts. Replies and comments are not counted as publications.

[25] A department is designated as top-10 based on job placements in the top-50 schools within our sample. The list includes: Harvard, MIT, University of Chicago, Princeton, Yale, University of Rochester, Northwestern University, Stanford University, University of California Berkeley, and University of Pennsylvania.

[26] Several departments in our sample typically promote from assistant to associate without tenure. We distinguish between associate with and without tenure.

births or the number of years taken to reach the tenure decision. Because we do not know who is eligible for a tenure clock extension or who utilizes the policy, the effects shown below should therefore be interpreted as intent-to-treat (ITT) effects. Finally, there are relatively few women hired at each university during the sample period. On average, only four female assistant professors were hired at each university between 1985 and 2004, compared to 17 male assistant professors. Having few women makes it difficult to allow for gender-specific differences across universities. We discuss this issue in the next section.

6 Estimation and Identification

Our primary objective is to estimate the effect of gender-neutral tenure clock stopping policies on the probability that assistant professors at top-50 economics departments are granted tenure. We specifically want to allow for the possibility that the effect of gender-neutral tenure clock stopping policies may be different for men and women. Our baseline specification is therefore as follows:

$$Y_{ugit} = \beta_1 GN_{ut} + \beta_2 GN_{ut} \times F_{ugit} + \zeta X_{ugit} + \eta Z_{ut} + \rho_{gt} + \psi_{ug} + \varepsilon_{ugit} \tag{1}$$

where Y is the outcome of interest, and u, g, i, and t indicate university (policy university), gender, individual, and the year the policy job started, respectively. In most cases, Y is an indicator for whether or not the individual receives tenure at the policy university. The variable F is an indicator for female, and GN is an indicator equal to 1 if individual i starts their career at an institution with a gender-neutral tenure clock stopping policy in place and zero otherwise. The vector X includes indicators for being female (F) and graduating from a top-ten PhD program, as well as gender-specific indicators for starting one's career at a university with a female-only clock stopping policy in place. It also includes interactions between an indicator for jobs starting within two years of the adoption of a gender-neutral or female-only clock stopping policy and the respective policy by gender.[27] The vector Z includes time-varying university level controls as defined in Section 5. Finally, ρ is a vector of gender-specific year fixed effects for the year

[27] We include gender-specific controls for female-only clock stopping policies to ensure that we isolate the effect of gender-neutral policies. Ideally, we would also like to say something about the effect of female-only policies. Unfortunately, the sample of universities that only adopted female-only policies is very small and the time span between female-only and gender-neutral policies is often fairly short for changers. Allowing individuals who start jobs close to policy changes to be neither 'treated' nor 'untreated' is also important because we have no way to know how quickly or slowly policies are actually used. Assistant professors who come just before the policy is implemented may be partially treated or those who come just after the policy may not be treated if it takes time for faculty to learn about and actually start using clock stopping policies.

the policy job started, ψ is a vector of gender-specific university fixed effects, and ε is an error term. The standard errors are clustered at the policy university level.

The coefficient β_1 represents the effect of gender-neutral tenure clock stopping policies for men, and β_2 is the additional effect for women. A plausible causal interpretation of β_1 and/or β_2 rests heavily on two related issues. First, we must adequately control for underlying gender-specific trends in the outcome. As a contemporaneous control group does not exist in our context, a difference-in-difference-in-differences estimation strategy (same time different groups differenced across time) is not an option. However, we discuss a variety of alternative trend options in Section 7, including university-gender-specific linear trends, and show that our results are robust to such strategies. Second, conditional on the available control variables, the timing of policy adoption must be as good as random. As tenure clock stopping policies are adopted at the university level, it is reasonable to assume that they are not driven by hiring and tenure trends in a single department. That being said, we explore this issue in Section 8.

7 Results

While we are primarily interested in the effects of gender-neutral tenure clock stopping policies, our unique dataset also allows us to descriptively examine how women fare in top-50 economics departments. Figure 5 shows how the gender composition of assistant professors changed between 1985 and 2005, and how men and women compare in terms of publications and tenure at the policy university. On average there are relatively few female assistant professors over this time period relative to male assistant professors. While there was a slight rise in the average number of female assistant professors hired over the entire sample period and there was a decline in the average number of male assistant professors hired during the recession, female assistant professors continue to be a minority. Moreover, the second panel clearly shows that female assistant professors are less likely to get tenure relative to their male counterparts. Interestingly, there was some improvement in the female tenure rate during the early 1990s. However, the gender gap widens again after 1995. This timing is consistent with the timing of the introduction of gender-neutral tenure clock stopping policies. Finally, the last two panels of Figure 5 plot the top-5 and non-top-5 publication gender gaps. Again, they begin wide, are eliminated in the middle of the sample period, and then re-emerge at the end of the sample period.

Before turning to the estimates from equation (1), we first show simple descriptive averages of our main outcome variables for universities that never adopt a gender-neutral tenure clock stopping policy and for universities that ever adopt such a policy. The first two columns of Table 2 report the average tenure rates and publication counts for men whose first job was at a university that never adopts a gender-neutral policy. Column 1 includes male assistant professors hired between 1985 and 1994, and column 2 includes male assistant professors hired between 1995 and 2004. The primary take-away from the first two columns is that the male tenure rate at these universities falls from 30 percent to 22 percent across the two periods. Columns 3 and 4 replicate this exercise for universities that ever adopt a gender-neutral tenure clock stopping policy. As this table is just meant to be descriptive and give some context, we have simply broken the data into two time periods with no regard for when the policy is actually adopted. At these institutions, the male tenure rate rose from 29 to 36 percent across the two time periods. Columns 5-8 repeat this exercise for female assistant professors. The tenure rate for women at universities that are never-adopters rose from 12 to 25 percent across the two time periods, while the tenure rate for women at universities that ever adopt a policy fell from 26 to 17 percent.[28] While these are not within-university changes, the patterns foreshadow the fixed effects estimates to come.

Column 1 of Table 3 presents our main results for equation (1). Male assistant professors whose first job was at a top-50 university with a gender-neutral tenure clock stopping policy in place have a 19.4 percentage point tenure rate advantage over men at the same university prior to the implementation of the policy (β_1). In contrast, the adoption of a gender-neutral tenure clock stopping policy negatively affects women in our sample. The gender gap in tenure attainment at the typical policy university increased by 41.9 percentage points after implementation of the policy (β_2). Not only are women less likely to get tenure compared to men after the adoption of a gender-neutral tenure clock stopping policy, but they are also 22.4 percentage points less likely to get tenure relative to women at the same university before the policy was implemented ($\beta_1 + \beta_2$). Both the male-female difference-in-difference and the absolute male and female differences are statistically significant at conventional levels.[29]

[28] The level differences across universities highlights the importance of including gender-specific university fixed effects.

[29] Equation (1) also includes analogous female-only clock stopping measures and controls for early productivity. The estimates for these variables are reported in Appendix Table 1. Unlike gender-neutral tenure clock stopping policies, female-only clock tenure stopping policies appear to have small positive effects, but in all cases the estimates are very imprecise. Further, given the small number of schools that only adopt a female-only clock stopping policy and the short periods that female-only policies were in place at universities that first adopt a female-only and then switch to gender-neutral policies, these results should be interpreted with caution. Probit estimates are similar in all cases.

In order to determine whether tenure clock stopping policies also affect the probability of receiving tenure in the profession, we re-estimate equation (1) replacing the dependent variable with an indicator variable equal to 1 if the assistant professor eventually earns tenure at any university and zero otherwise. In contrast to the results for tenure at the policy university, column 2 of Table 3 clearly shows that gender-neutral tenure clock stopping policies have little impact on the probability of earning tenure in the profession for either men or women. Although the point estimate of the effect of the gender-neutral policies is negative for women relative to men, it is substantially smaller than the result in column 1 and is not statistically different from zero.[30]

Taken together, the results presented in Table 3 suggest that the adoption of a gender-neutral tenure clock stopping policy reduces tenure at the policy university for women and that these women are therefore likely moving to lower ranked universities. While our data clearly shows reduced tenure rates at the policy university, it is difficult to show that women are more concentrated at lower ranked schools after gender-neutral policies are adopted. Faced with a small sample of women starting in top-50 economics departments, and the fact that moving down from a top-5 department leaves a person at a different rank than moving down from the 45th ranked department, we simply do not have the data to pin this down in a precise manner. This problem is compounded by the fact that department rankings are inherently noisy, and the noise (and/or fluctuations across time) is progressively worse for lower ranked departments.

Table 4 replicates Table 3 using a variety of samples and specifications. Panel A shows effects on the probability of earning tenure at the policy university, and Panel B shows effects on the probability of earning tenure anywhere. To facilitate comparisons, column 1 replicates the primary results reported in Table 3. First, we show the point estimates are very similar when the time-varying university-level characteristics are omitted (column 2). Next we show that the results are also qualitatively similar when excluding the indicator for graduating from a top-10 economics department and expanding the sample to include individuals with one or more publications, or even no publications, shown in columns 3-5 respectively. Finally, column 6 adds policy university gender-specific linear time trends.[31] Irrespective of how we specify the model or the sample, the results are qualitatively similar.

[30]The sample size in column 2 is smaller because some assistant professors continue to be employed as untenured assistant professors in a second or third job through the end of the sample period. Although we know they did not get tenure at the policy university, we do not yet know if they will eventually get tenure somewhere else. However, these results are not driven by selection; all results are similar if we assign all missing observations either tenure or no tenure.

[31]It is important to note that this model is highly parameterized, and as such one should interpret these results with caution.

As tenure at top-50 economics departments is highly dependent on publication records, it is natural to think about impacts on publishing as the pathway through which gender-neutral tenure clock stopping policies operate. We therefore re-estimate equation (1) replacing our dependent variable with the number of top-5 publications and the number of non-top-5 total peer-reviewed papers published by each year from year four through year nine. These results are reported in panels A and B in Table 5, respectively. We report the cumulative publication results at each point in time because there is not an obvious single year at which to evaluate publications when thinking about publications as a mechanism for changing tenure rates. By year four, the average male assistant professor whose first job was at a top-50 university with a gender-neutral tenure clock stopping policy in place has 0.41 more top-5 publications than men at the same university prior to the implementation of the policy. This grows to approximately 0.88 by year seven. In contrast, in no year can we reject the null hypothesis of no difference in the number of top-5 publications for women after policy adoption relative to women at the same university before the policy was implemented. While the estimates for the gender differential are only significant through year six, they are nonetheless always large and negative.[32] Panel B of Table 5 shows analogous estimates for non-top-5 publications. While the point estimates suggest that women also publish fewer non-top-5 papers after a gender-neutral tenure clock stopping policy is implemented, these estimates are very imprecise.

These results suggest that lower female tenure rates may emerge because male top-5 publishing rates rise, which in turn raises the departmental tenure standard that more women then fail to meet. This could occur if men who have kids at institutions with tenure clock stopping policies spend more time pursuing top-5 publications. If these gambles pay off some fraction of the time, we would expect to see more top-publications and hence higher tenure rates for men. Consistent with women having higher fertility costs, the results in Table 5 suggest that women are less able to use the additional time strategically or effectively.

Table 6 examines the impact of tenure clock stopping polices on the number of years spent at the policy university as an assistant professor, the overall number of years to tenure (conditional on getting tenure somewhere), and the number of jobs held before earning tenure. On the surface, it is tempting to think that allowing assistant professors to stop their tenure clock will lengthen the average time for the first two measures. However, the landscape is much more complicated. The introduction of such a policy might

[32]Results using count models are qualitatively similar. To add additional context for these estimates, Figure 6 shows the distribution of top-5 publications for men and women by year seven.

change the probability that men and women change universities prior to the tenure decision. It might also lengthen the time spent at the policy university, but then shorten the length of a new clock if they move to a new university after being denied tenure (or in anticipation of a tenure denial). The policy might even change the probability that some individuals are granted early tenure. Column 1 shows that there is no significant effect of this policy on the number of years spent as an assistant professor at the policy university. The point estimates are negative, but very imprecise. Column 2 shows that the policy decreases average time to tenure in the profession by one year for male assistant professors. This is not surprising since the tenure rate for men rises. In contrast, the female-male difference-in-difference is positive two years and the difference for women is over one extra year to tenure. While these estimates are somewhat noisy, they clearly suggest a lengthening of time to tenure for women. Finally, column 3 reports the effect on the number of jobs held before becoming a tenured professor. The total female effect as well as the gender differential are both positive, although again the point estimates are somewhat noisy. Taken as a whole, these results are consistent with more women being denied tenure and trying again at a new, likely lower ranked, institution.

8 Threats to Identification

Interpreting the results above as causal effects of gender-neutral tenure clock stopping policies requires the assumption that policy implementation was exogenous and that the policies did not change departmental hiring decisions. Although we cannot perfectly test these assumptions, Tables 7 and 8 provide evidence that they are reasonable.

We begin by examining whether there were changes in the gender hiring mix after the adoption of gender-neutral tenure clock stopping policies. The data are collapsed into a pre-adoption period (measured as years 3 through 7 before the policy) and a post-adoption period (measured as years 3 through 7 after the policy). The sample is restricted to the 31 universities that adopted a gender-neutral tenure clock stopping policy between 1985 and 2004 and made at least one hire in each period. We use this sample to estimate the change in the fraction of female hires using a two-period university fixed effects model in which the only explanatory variable is a post-treatment indicator. The result reported in Table 7 is consistent with the conjecture that there was no change in the gender-mix of assistant professor hires after the adoption of gender-neutral tenure clock stopping policies across top-50 economics departments.

Table 8 comes at endogeneity from the other direction by asking whether it is possible to predict the adoption of gender-neutral tenure clock stopping policies using institutional characteristics, either in levels or changes. Each cell in Table 8 is from a separate regression. Each cell in column 1 reports the point estimate from a cross-sectional OLS regression with an indicator for adopting a gender-neutral tenure clock stopping policy by 2004 on a single institutional characteristic (measured as the average level of that characteristic from 1980-1989).[33] For example, the first cell in column 1 reports that a 1000 student increase in the undergraduate population is associated with a 0.2 percentage point increase in the probability that an institution ever adopts a gender-neutral tenure clock stopping policy, but the point estimate falls far below conventional levels of statistical significance. The remaining cells in column 1 report similar evidence for the number of graduate students, faculty size, the average salary for professors, the average salary for assistant professors, annual revenue, the fraction of faculty who are female, and the fraction of faculty who are full professors. None of these characteristics are statistically significantly correlated with policy adoption.

Column 2 of Table 8 changes the question slightly, to examine whether changes (trends) in university characteristics predict policy adoption in the future. More specifically, we show that the changes in university characteristics from the early 1980s to the late 1980s do not predict policy adoption.[34] We compare trends in the 1980s to later policy adoption because there are no policy adoptions in the 1980s. We find that changes in institutional characteristics do not predict policy adoption (see column 2 of Table 8). Taken as a whole, Table 8 provides no evidence that levels or trends in institutional characteristics predict gender-neutral tenure clock stopping policy adoption.

9 Discussion

By combining two original datasets – one on assistant professors hired at the top-50 economics departments from 1985-2004 and the other on tenure clock stopping policies at these universities – we study

[33]This period pre-dates gender-neutral tenure clock stopping policy adoption for all but one university (Northwestern), which is excluded from the analysis. The University of California campuses are collapsed into a single average because this was a system choice. The sample therefore includes 43 institutions.

[34]To mitigate non-reporting issues (data for some institutional measures are missing in some years), the early 1980s is defined as the average from 1980-1984 and the late 1980s is defined as the the average from 1985-1989.

the impact of gender-neutral tenure clock stopping policies on tenure rates for men and women. While the objective of these policies might be to increase family-friendliness and level the playing field for women, our results show that, at least for economics, they accomplished the opposite. After the implementation of a gender-neutral clock stopping policy, the probability that a female assistant professor gets tenure at that university decreases by 22 percentage points while male tenure rates rise by 19 percentage points. We further show that the primary mechanism driving the tenure results appears to be that men publish more in top-5 journals after the policies are implemented, but women do not. This suggests that these policies cause within-university tenure standards to rise. Because women do not similarly increase their productivity, fewer are granted tenure in top-50 departments. However, we find no evidence that the policies reduce the fraction of women who eventually earn tenure somewhere.

These results imply that gender-neutral tenure clock stopping policies do not adequately reflect the true gender-specific productivity losses associated with having children. Men are more likely to be productive while their tenure clock is stopped and women are much less able to do so, yet they are treated equally under these policies. As a result, the policies actually increase the family gap in economics at research intensive universities. Since tenure at a highly-ranked school is a measure of professional success, this finding is important even if women are not more likely to leave the profession altogether.

Economics professors are not the only high skill professionals that face rigid and important promotion decisions early in their careers. Other academics, lawyers, financial professionals, and some types of doctors are also likely to be promoted based on early measures of success. There is evidence of family gaps in each of these professions, especially among top-earners, which suggests a need for more family-friendly policies. In theory, gender-neutral policies that attempt to level the playing field by adjusting measures of productivity to account for early childrearing sound promising. However, at least in economics, such policies have unintended consequences that actually hurt women. It therefore seems likely that these types of policies may have unintended consequences in other high skill occupations as well.

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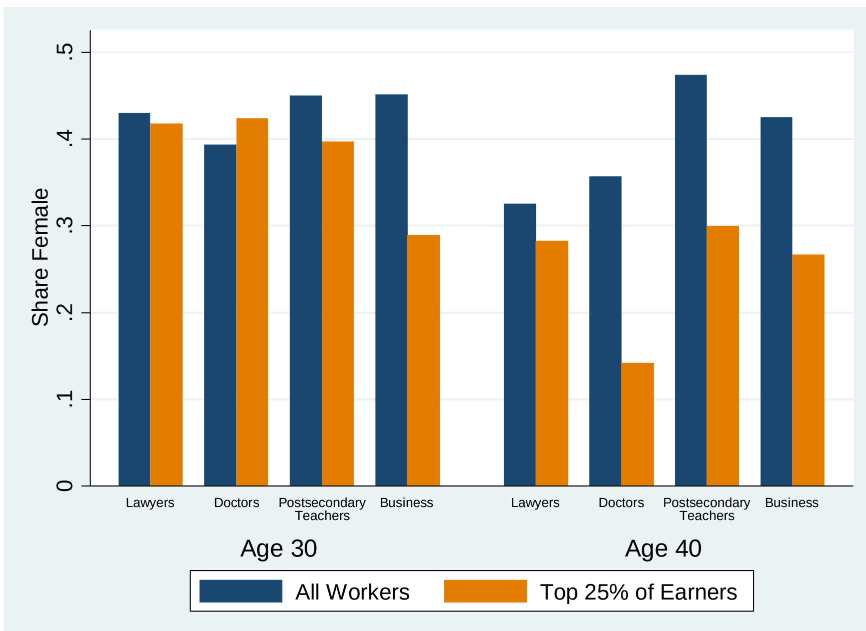
Figure 1: Share Female among Fulltime Workers with Advanced Degrees in Selected High Skill Occupations



Note: Figure shows individuals born in 1970 at age 30 and age 40. Data at age 30 come from the 2000 Census and data at age 40 come from the 2010 American Community Survey. Sample is conditional on having a Master's, professional, or doctoral degree. Sample is restricted to workers who report usually working 30 hours per week or more. Top earners are defined as those in the top quartile of the occupation-specific wage income distribution among workers with advanced degrees.

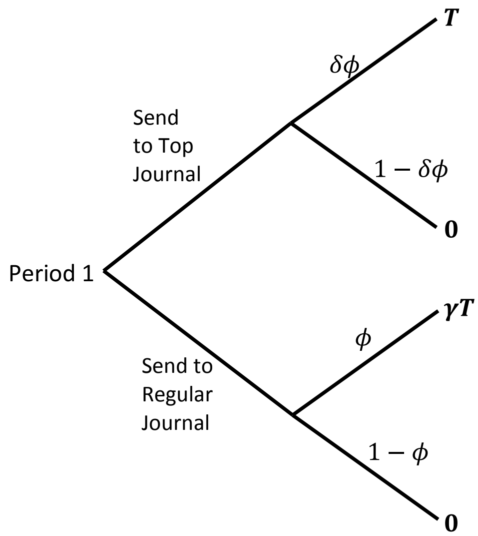


Figure 2(a): Decision Tree for Individuals without Children

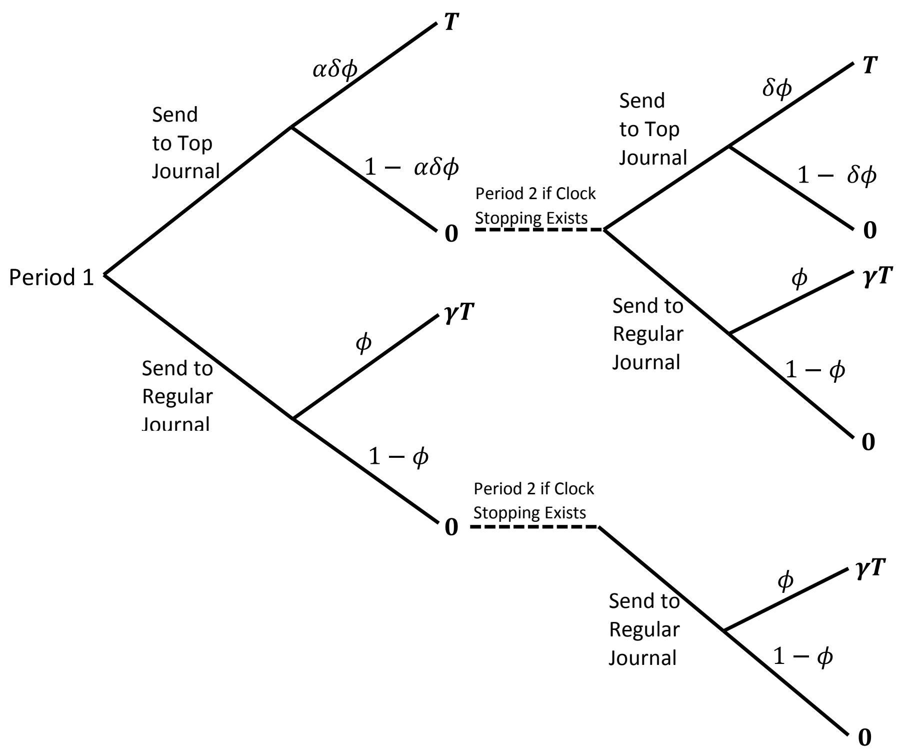
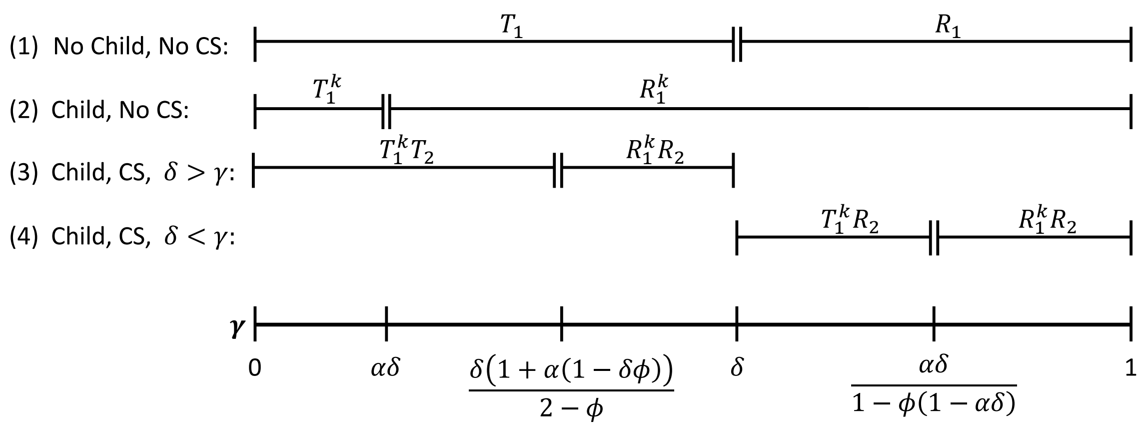


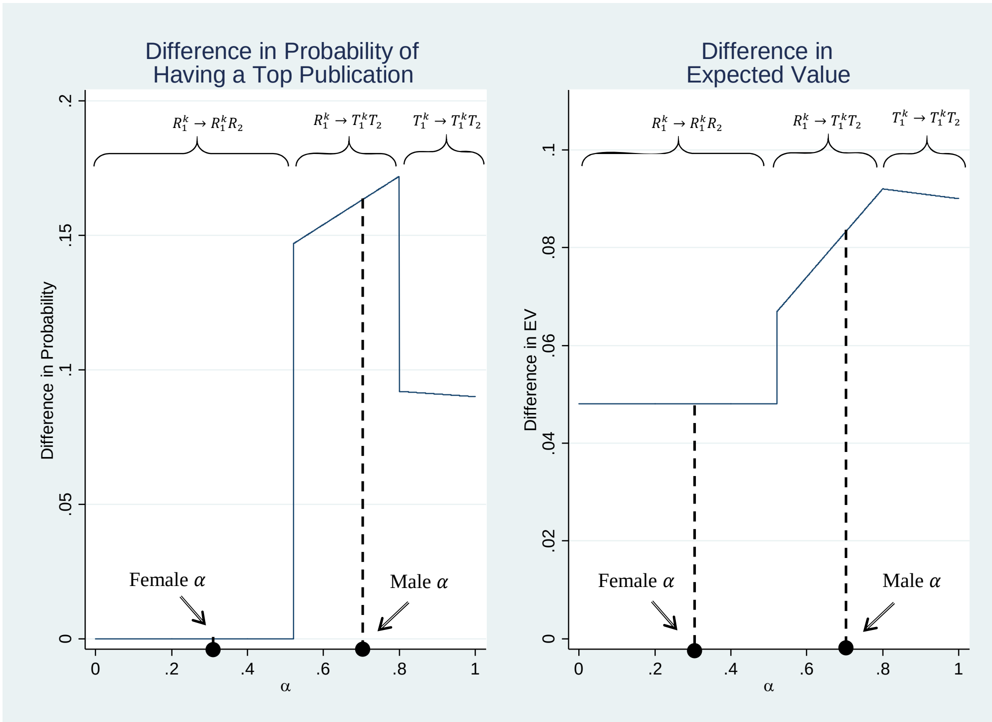
Figure 2(b): Decision Tree for Individuals with Children, with and without Gender-Neutral Tenure Clock Stopping Policies

Figure 3: Optimal Submission Decisions as the Relative Returns to Publishing in a Top Journal (γ) Vary



Note: CS stands for gender-neutral tenure clock stopping policy. This figure shows the optimal submission decisions for individuals in each of the four cases for all possible combinations of the parameters in the model. The γ line at the bottom applies to all four cases above it.

Figure 4: Gains from Access to Clock Stopping for Individuals with a Child ($\delta > \gamma$)

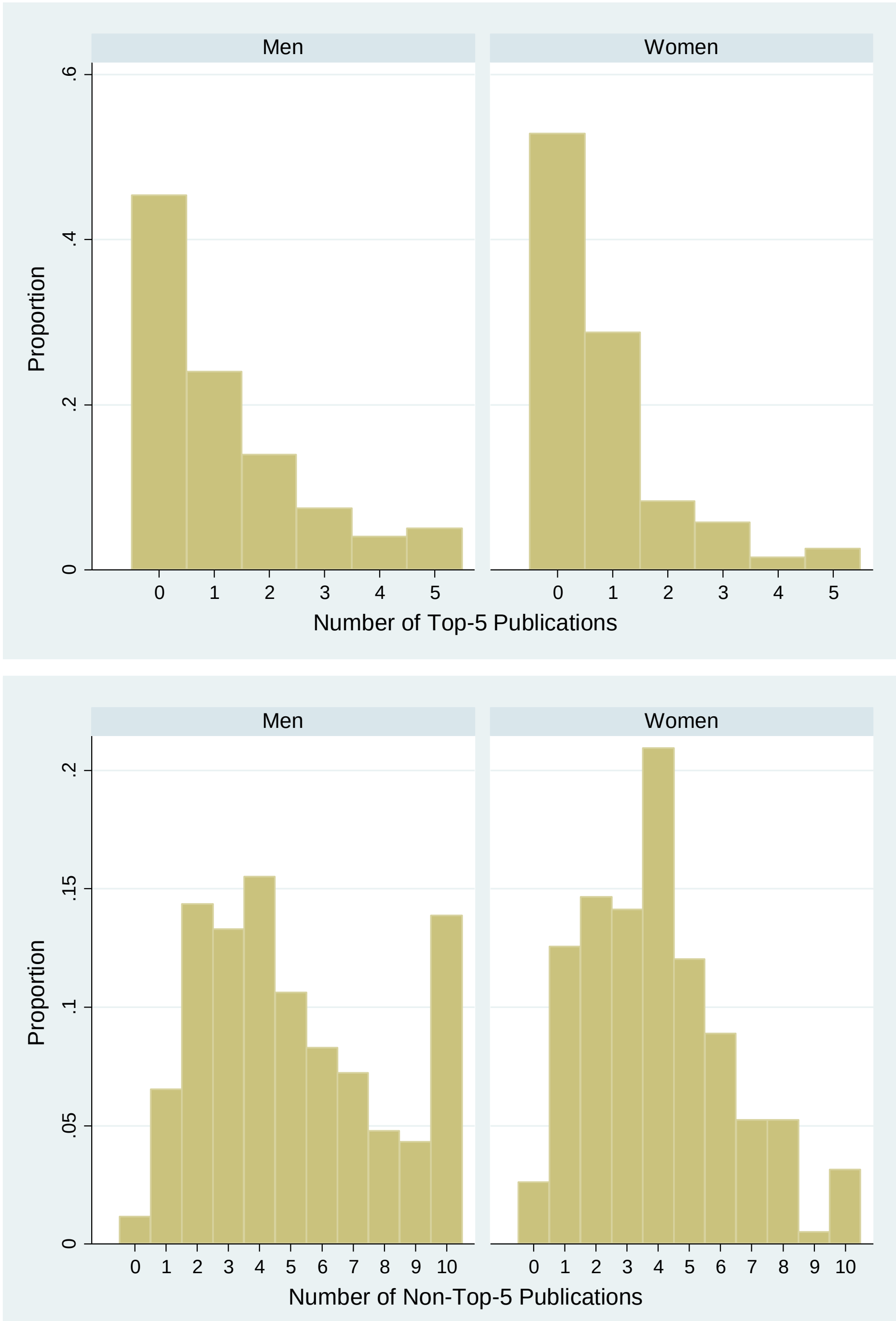


These figures provide an example of the benefit of having access to a tenure clock stopping policy on the outcome of interest (the probability of having a top publication or the expected value of the publication strategy) as α increases. These figures fix the model parameters at: $\gamma = 0.2, \phi = 0.4, T = 1$, and $\delta = 0.25$. The differences in the probability of having a top publication and in the expected value are calculated by taking the difference in the optimal outcome for an individual with a child between the access and no access to clock stopping cases. Fertility is assumed to be exogenous. Changing the values of these parameters shifts these figures vertically and/or horizontally, but the general patterns remain the same. The indicated female and male values of α refer to the example in section 4.5. The optimal change in submission decisions as α changes (holding the other parameters constant at the levels indicated) are labeled at the top of each panel.

Figure 5: Trends in Top-50 Economics Departments

Sample includes individuals whose first job was an assistant professor at a top-50 university within two years of receiving a PhD and who publish at least two papers within eight years of graduation. Figures show 7 year moving averages for smoothness. Publications are counted through the 7th year after receiving a PhD.

Figure 6: Distribution of Top-5 and Non-Top-5 Publications within 7 Years



Sample includes individuals whose first job was an assistant professor at a top-50 university within two years of receiving a PhD and who publish at least two papers within eight years of graduation. Publications are counted through the 7^{th} year after receiving a PhD. Top-5 publications are top coded at 5 and non-top-5 publications are top coded at 10.

Table 1: Tenure Clock Stopping Policies at Top-50 Universities

	Female-Only	Gender-Neutral		Female-Only	Gender-Neutral
Arizona State	2003		University of California–Berkeley	1988	1997
Boston College		1993	University of California–Davis	1988	1997
Boston University			University of California–Irvine	1988	1997
Carnegie Mellon University	1992		University of California–Los Angeles	1988	1997
Columbia University	1995		University of California–San Diego	1988	1997
Cornell University			University of California–Santa Barbara	1988	1997
Duke University		2003	University of Chicago	1996	
Georgetown University		1999	University of Florida		2004
Harvard University		2001	University of Illinois–Urbana-Champaign		1999
Indiana University–Bloomington			University of Iowa		1993
Johns Hopkins University		2000	University of Maryland–College Park		1996
Massachusetts Institute of Technology		2001	University of Michigan-Ann Arbor		1990
Michigan State University			University of Minnesota–Twin Cities		1992
New York University	1999		University of North Carolina–Chapel Hill		2004
North Carolina State University - Raleigh		2002	University of Pennsylvania		1997
Northwestern University		1981	University of Rochester		
Ohio State University		1996	University of Southern California		1993
Pennsylvania State University	1990		University of Texas–Austin	1997	
Princeton University	1970	1991	University of Virginia	1987	2000
Purdue University		1991	University of Washington		
Rice University		1993	University of Wisconsin–Madison		1994
Rutgers University		1992	Vanderbilt University		2003
Stanford University	1971	2002	Washington University in St. Louis		
Texas A&M University–College Station		2003	Yale University		
University of Arizona		1990			

Source: Collected directly from universities from university bylaws, statutes, policy documents, faculty handbooks, Human Resource departments, or direct communication with staff. Table shows policies adopted by 2004. Policies adopted after 2004 or that only stop the tenure clock if parental leave is taken are not shown. These are the top 50 Economics Departments with graduate programs as ranked by the 2010 U.S. News and World Report. The California Institute of Technology is excluded from our sample because they do not have a stand-alone Economics Department; rather they offer a PhD in Social Sciences. We were unable to obtain complete faculty information from Brown University and the University of Pittsburgh. There was a three-way tie for the 50th ranked department, so our final sample includes 49 universities.

Table 2. Summary Statistics

	Men				Women			
	Never Adopt Gender-Neutral Policy		Ever Adopt Gender-Neutral Policy		Never Adopt Gender-Neutral Policy		Ever Adopt Gender-Neutral Policy	
	1985-1994	1995-2004	1985-1994	1995-2004	1985-1994	1995-2004	1985-1994	1995-2004
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Tenure at policy university	0.30	0.22	0.29	0.36	0.12	0.25	0.26	0.17
	(0.46)	(0.42)	(0.45)	(0.48)	(0.33)	(0.44)	(0.44)	(0.38)
Tenure at any university	0.86	0.90	0.80	0.86	0.65	0.80	0.75	0.73
	(0.35)	(0.29)	(0.40)	(0.35)	(0.49)	(0.41)	(0.43)	(0.45)
Top-5 publications in first 7 years	1.37	0.85	1.28	1.28	0.73	0.83	0.89	0.84
	(1.97)	(1.00)	(1.78)	(1.70)	(0.96)	(0.85)	(1.19)	(1.63)
Non-top-5 publications in first 7 years	6.20	4.86	5.86	5.19	3.50	3.67	4.09	4.34
	(4.42)	(3.51)	(4.39)	(3.93)	(2.00)	(2.67)	(2.15)	(2.85)
Sample size	133	109	332	283	26	36	65	64

The sample includes 1048 individuals at 49 universities. Tenure at policy university and tenure at any university are binary variables. Non-top-5 and top-5 publications in first 7 years measure the number of papers published within 7 years of receiving a PhD. Standard deviations in parentheses. Never and ever adopters are defined for the entire period (1985-2004); they are not specific to the column period. For example, a university that adopts a gender-neutral tenure clock stopping policy in 2002 is classified as an ever adopter in both 1985-1994 and 1995-2004 columns.

Table 3. Gender-Neutral Clock Stopping Policies and Tenure Outcomes

	Tenure at Policy University (1)	Eventually Get Tenure Somewhere (2)
Gender-neutral clock stopping (GNCS)	0.194**	0.079
	(0.086)	(0.051)
Gender-neutral clock stopping × female	-0.419**	-0.122
	(0.137)	(0.205)
<u>Total GNCS effect for women</u>		
GNCS + GNCS × female	-0.224**	-0.043
	(0.103)	(0.191)
<u>Summary meaures for GNCS adopters</u>		
Female pre-treatment mean	0.26	0.71
Male pre-treatment mean	0.27	0.80
Sample size	1048	1038

The sample includes 49 universities. Standard errors are clustered at the policy university-level. All models also include gender-specific indicators for the year the policy job started, gender-specific university indicators, a female indicator, an indicator for graduating from a top-10 PhD program, time-varying university characteristics (number of undergraduates, number of graduate students, faculty size, average salary of full professors, average salary of assistant professors, annual revenue, fraction of faculty who are female, fraction of faculty who are full professors), gender-specific indicators for having a female-only policy, and gender-specific indicators for starting a job within two years of a policy change interacted with each of the policy indicators. Pre-treatment means are for universities that adopt a gender-neutral tenure clock stopping policy by 2004 and are provided for context.* (**) Statistically significant at the 10 (5) percent level or better.

Table 4. Gender-Neutral Clock Stopping Policies and Tenure at the Policy University: Alternative Samples and Specifications

			Productivity/Ability Controls and Sample Restrictions			Trends
	Baseline from Column (1) in Table 3 (1)	Excludes Time-Varying Controls (2)	Excludes Indicator for PhD from a Top-10 Economics Department (3)	Includes Individuals with 1+ Publications by Year 8 (4)	Includes Individuals with 0+ Publications by Year 8 (5)	Includes Linear School-Gender Time Trends (6)
Panel A: Tenure at Policy University						
Gender-neutral clock stopping (GNCS)	0.194**	0.209**	0.207**	0.190**	0.187**	0.180
	(0.086)	(0.083)	(0.087)	(0.086)	(0.089)	(0.137)
Gender-neutral clock stopping × female	-0.419**	-0.419**	-0.401**	-0.385**	-0.334**	-0.742**
	(0.137)	(0.142)	(0.140)	(0.141)	(0.137)	(0.329)
Total GNCS effect for women						
GNCS + GNCS × female	-0.224**	-0.210*	-0.194*	-0.185*	-0.147	-0.562*
	(0.103)	(0.111)	(0.106)	(0.103)	(0.105)	(0.293)
Summary meaures for GNCS adopters						
Female pre-treatment mean	0.26	0.26	0.26	0.24	0.22	0.26
Male pre-treatment mean	0.27	0.27	0.27	0.26	0.25	0.27
Sample size	1048	1048	1048	1105	1150	1048
Panel B: Eventually Get Tenure Somewhere						
Gender-neutral clock stopping (GNCS)	0.079	0.089*	0.095*	0.098*	0.088	0.098
	(0.051)	(0.049)	(0.056)	(0.055)	(0.059)	(0.096)
Gender-neutral clock stopping × female	-0.122	-0.153	-0.137	-0.111	-0.011	-0.948**
	(0.205)	(0.203)	(0.193)	(0.193)	(0.199)	(0.418)
Total GNCS effect for women						
GNCS + GNCS × female	-0.043	-0.063	-0.041	-0.013	0.077	-0.849*
	(0.191)	(0.189)	(0.179)	(0.180)	(0.190)	(0.424)
Summary meaures for GNCS adopters						
Female pre-treatment mean	0.71	0.71	0.71	0.66	0.62	0.71
Male pre-treatment mean	0.80	0.80	0.80	0.78	0.78	0.80
Sample size	1038	1038	1038	1095	1139	1038

The sample includes 49 universities. Standard errors are clustered at the policy university-level. All models also include the following, unless otherwise stated in the column heading: gender-specific indicators for the year the policy job started, gender-specific university indicators, a female indicator, an indicator for graduating from a top-10 PhD program, time-varying university characteristics (number of undergraduates, number of graduate students, faculty size, average salary of full professors, average salary of assistant professors, annual revenue, fraction of faculty who are female, fraction of faculty who are full professors), gender-specific indicators for having a female-only policy, and gender-specific indicators for starting a job within two years of a policy change interacted with each of the policy indicators. Pre-treatment means are for universities that adopt a gender-neutral tenure clock stopping policy by 2004 and are provided for context.* (**) Statistically significant at the 10 (5) percent level or better.

Table 5. Gender-Neutral Clock Stopping Policies and Publication Outcomes

	By Year 4 (1)	By Year 5 (2)	By Year 6 (3)	By Year 7 (4)	By Year 8 (5)	By Year 9 (6)
Panel A: Top-5 Publications						
Gender-neutral clock stopping (GNCS)	0.414**	0.620**	0.724**	0.879**	0.867**	0.719**
	(0.175)	(0.225)	(0.280)	(0.306)	(0.325)	(0.321)
Gender-neutral clock stopping × female	-0.487*	-0.618*	-0.848*	-0.826	-0.808	-0.865
	(0.258)	(0.339)	(0.468)	(0.496)	(0.543)	(0.590)
Total GNCS effect for women						
GNCS + GNCS × female	-0.073	0.001	-0.124	0.043	0.059	-0.147
	(0.219)	(0.310)	(0.426)	(0.441)	(0.466)	(0.515)
Summary meaures for GNCS adopters						
Female pre-treatment mean	0.4	0.6	0.7	0.9	1.1	1.3
Male pre-treatment mean	0.5	0.7	0.9	1.2	1.4	1.6
Panel B: Non-Top-5 Publications						
Gender-neutral clock stopping (GNCS)	0.084	0.323	0.364	0.060	0.197	0.232
	(0.491)	(0.569)	(0.685)	(0.887)	(1.019)	(1.229)
Gender-neutral clock stopping × female	-0.926	-1.465*	-1.247	-1.087	-1.309	-1.437
	(0.680)	(0.813)	(0.984)	(1.241)	(1.497)	(1.765)
Total GNCS effect for women						
GNCS + GNCS × female	-0.842	-1.142*	-0.882	-1.028	-1.111	-1.205
	(0.617)	(0.665)	(0.815)	(1.036)	(1.228)	(1.442)
Summary meaures for GNCS adopters						
Female pre-treatment mean	1.6	2.3	3.3	4.1	5.0	5.8
Male pre-treatment mean	2.5	3.5	4.6	5.9	7.0	8.0
Sample size	1048	1048	1048	1048	1048	1048

The sample includes 49 universities. Standard errors are clustered at the policy university-level. All models also include gender-specific indicators for the year the policy job started, gender-specific university indicators, a female indicator, an indicator for graduating from a top-10 PhD program, time-varying university characteristics (number of undergraduates, number of graduate students, faculty size, average salary of full professors, average salary of assistant professors, annual revenue, fraction of faculty who are female, fraction of faculty who are full professors), gender-specific indicators for having a female-only policy, and gender-specific indicators for starting a job within two years of a policy change interacted with each of the policy indicators. Pre-treatment means are for universities that adopt a gender-neutral tenure clock stopping policy by 2004 and are provided for context.* (**) Statistically significant at the 10 (5) percent level or better.

Table 6. Gender-Neutral Clock Stopping Policies, Time to Tenure, and Job Churning

	Pre-Tenure Years at Policy University (1)	Years to Tenure (2)	Number of Jobs to Associate (3)
Gender-neutral clock stopping (GNCS)	-0.080	-1.001*	-0.234
	(0.307)	(0.517)	(0.179)
Gender-neutral clock stopping × female	0.054	2.204*	0.746
	(1.020)	(1.178)	(0.447)
<u>Total GNCS effect for women</u>			
GNCS + GNCS × female	-0.026	1.203	0.512
	(0.864)	(1.117)	(0.355)
<u>Summary meaures for GNCS adopters</u>			
Female pre-treatment mean	5.7	7.0	1.8
Male pre-treatment mean	5.5	6.8	1.8
Sample size	1048	808	864

The sample includes 49 universities. Standard errors are clustered at the policy university-level. All models also include gender-specific indicators for the year the policy job started, gender-specific university indicators, a female indicator, an indicator for graduating from a top-10 PhD program, time-varying university characteristics (number of undergraduates, number of graduate students, faculty size, average salary of full professors, average salary of assistant professors, annual revenue, fraction of faculty who are female, fraction of faculty who are full professors), gender-specific indicators for having a female-only policy, and gender-specific indicators for starting a job within two years of a policy change interacted with each of the policy indicators. Pre-treatment means are for universities that adopt a gender-neutral tenure clock stopping policy by 2004 and are provided for context.* (**) Statistically significant at the 10 (5) percent level or better.

Table 7. Changes in Hiring Gender Mix After Gender-Neutral Clock Stopping Policy Adoption

	Fraction Female Hires
Post-adoption indicator	0.027
	(0.046)
Mean pre-treatment percentage female hires	0.175
Sample size	62

Pre-adoption period is years 3-7 before the gender-neutral tenure clock stopping policy is adopted and the post-adoption period is similarly defined as years 3-7 after policy adoption. The sample is restricted to the 31 universities that adopted a gender-neutral tenure clock stopping policy between 1985 and 2004 and made at least one hire in each period. The model is weighted by the number of hires at each univeristy in each period. * (**) Statistically significant at the 10 (5) percent level or better.

Table 8. Predicting Gender-Neutral Clock Stopping Policy Adoption

	Does level from 1980-89 Predict Adoption by 2004 (1)	Do Changes from 1980-84 to 1985-89 Predict Policy Adoption by 2004 (2)
Number of Undergraduate Students (in 1,000s)	0.002	0.055
	(0.006)	(0.069)
Number of Graduate Students (in 1,000s)	-0.012	0.097
	(0.024)	(0.091)
Faculty Size (in 100s)	0.004	-0.028
	(0.016)	(0.097)
Average Salary for Professors (in 1,000s)	0.003	-0.009
	(0.010)	(0.015)
Average Salary for Assistant Professors (in 1,000s)	0.009	-0.018
	(0.021)	(0.027)
Annual Revenue (in 10,000,000s)	0.041	0.025
	(0.035)	(0.076)
Fraction of Faculty Female	-1.060	0.157
	(1.752)	(4.145)
Fraction of Faculty Full Professors	-0.683	-0.117
	(0.761)	(1.249)
Private University	-0.156	--
	(0.147)	
Sample size	43	86

The sample includes universities that do not have a gender-neutral clock stopping policy at the beginning of the sample period, and the University of California campuses are collapsed into a single average because the policy was a system decision. The sample therefore includes 43 institutions. Each cell is a separate regression. Column 1 is a cross-section with an indicator for ever adopting the policy regressed on the average value for the specified explantory variable as well as a constant. Column 2 is a two period panel that includes the listed variable, a period indicator to capture trends, and institution fixed effects.

Appendix Table 1. Gender-Neutral Clock Stopping Policies and Tenure Outcomes

	Tenure at Policy University (1)	Eventually Get Tenure Somewhere (2)
Gender-neutral clock stopping (GNCS)	0.194**	0.079
	(0.086)	(0.051)
Gender-neutral clock stopping × female	-0.419**	-0.122
	(0.137)	(0.205)
Female-only clock stopping (FOCS)	0.044	0.045
	(0.076)	(0.083)
Female-only clock stopping × female	0.060	0.081
	(0.139)	(0.159)
Graduated from a top-10 PhD program	-0.081**	-0.016
	(0.037)	(0.033)
Time-Varying University Measures		
Number of Undergraduate Students (in 1,000s)	-0.008	-0.008
	(0.018)	(0.008)
Number of Graduate Students (in 1,000s)	-0.024	-0.006
	(0.025)	(0.026)
Faculty Size (in 1,000s)	-0.004	0.005
	(0.006)	(0.004)
Average Salary for Professors (in 1,000s)	0.008*	-0.003
	(0.005)	(0.004)
Average Salary for Assistant Professors (in 1,000s)	-0.008	0.004
	(0.010)	(0.007)
Annual Revenue (in 100,000,000s)	-0.001	0.000
	(0.003)	(0.003)
Fraction of Faculty Female	0.741	0.304
	(1.063)	(0.648)
Fraction of Faculty Full Professors	-0.076	-0.025
	(0.409)	(0.234)
Total GNCS effect for women		
GNCS + GNCS × female	-0.224**	-0.043
	(0.103)	(0.191)
Total FOCS effect for females		
FOCS + FOCS × female	0.104	0.126
	(0.101)	(0.137)
Sample size	1048	1038

The sample includes 49 universities. Standard errors are clustered at the policy university-level. All models also include a female indicator, gender-specific indicators for the year the policy job started, gender-specific university indicators, and gender-specific indicators for the job starting within two years of a policy change interacted with each of the policy indicators. * (**) Statistically significant at the 10 (5) percent level or better.