Assessing the Family and Medical Leave Act in a Real Options Framework

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I. Introduction & Literature Review

1. Overview

In 1993, the Family and Medical Leave Act (FMLA, or "the legislation") was passed, a national legislation which guarantees eligible employees a 12-week job-protected unpaid leave from work to address family issues, such as childbearing, taking care of a new infant, or caring for a sick family member or self. Previous to the legislation, only 12 states and the District of Columbia had any mandated leave policies (Table 1[1]). While the legislation also covers male employees, thereby establishing paternity leave rights nationally (and male workers are found to indeed have significatly increased their leave-taking incidences after the legislation (Baum 2003)), it is widely understood that the legislation was aimed at improving the working conditions for females of childbearing age in particular ("While the FMLA is framed in sex-neutral language, conventional wisdom has been that it was enacted to protect women" (Gely & Chandler 2004)).

Table 1: Characteristics of State and Federal Family Leave Legislation

State	Weeks of Leave	Employer Size	Tenure Required	Date of Enforcement	Work Requirement
California[a]	17	No Minimum	1 year	1/92	No Minimum
Connecticut[b]	12	75 employees	1 year	7/90	1000 hrs in prior yr.
District of Col.	16	50 employees	1 year	4/91	1000 hrs in prior yr.
Federal FMLA	12	50 employees	1 year	7/93	1250 hrs in prior yr.
Maine	8	25 employees	1 year	4/88	No minimum
Minnesota	6	21 employees	1 year	7/87	20 hrs per week
Massachusetts	8	6 employees	3 months	10/72	Full-time
New Jersey	12	75 employees	1 year	4/90	1000 hrs in prior yr.
Oregon	12	25 employees	90 days	1/88	No minimum
Rhode Island	13	50 employees	1 year	7/87	Full-time
Tennessee	16	100 employees	1 year	1/88	Full-time
Vermont	12	10 employees	1 year	7/92	30 hrs per week
Washington[c]	12	100 employees	1 year	9/89	35 hours per week
Wisconsin	6	50 employees	1 year	4/88	1000 hrs in prior yr.

Source: Klerman, J. A. and A. Leibowitz (1997), the Women's Legal Defense Fund (1994), Bond (1991), and the Bureau of National Affairs (1987). California passed legislation mandating leave for disability in 1980. [b] Connecticut passed legislation mandating leave for disability in 1973. [c] Washington passed legislation mandating leave for disability in 1973.

Source: Baum (2003)

Why the government would be inclined to do so is clear from both the equity and efficiency perspective. The inequity in wages between the genders ("the gender gap") that still persists in the 21st century is thought to largely arise from the lack of human capital accumulation by the female population due to frequent employment discontinuity throughout their lives (Goldin 1993; Blau 1997). Hence improving the employment continuity of the female population is expected to help close the inequity in wages between the genders. Having more women stay employed will reduce the amount of human capital unexploited, also, and today more women receive higher education than men, which makes women as qualified, if not more, human capital resources as men. So the current state of women's disproportionally frequent job discontinuity and wage differential is argued by some to reflect a market failure with negative externalities. An effective maternity leave policy would be especially helpful in improving both equity and efficiency, since it would help reduce what is called the "family gap" that composes a significant amount of the gender gap for women, up to 35% of it (Waldfogel 1998). The family gap is the wage differential between women with and without children, which has been growing in the recent years, even as the gender wage gap itself has been narrowing. Since maternity leave policies directly support would-be-mothers by allowing for the job-continuity, it is suggested that providing coverage to women could close roughly 40% of the family gap (Waldfogel 1998). So, the FMLA is then the first federal effort to increase the employment and retention rate for women in the labor market, and more generally to improve the labor market conditions.

2. Theoretical Background & Empirical Evidence

However, economic theory suggests that certain counteracting economic forces might also come into existence with the introduction of FMLA, rendering the legislation ultimately nugatory in many key areas. Especially regarding the female employment rates, a downward pressure on wage attributable to decreased demand for the female labor by the firms (i.e. the downward shift of the labor demand curve for women; "group-specific disemployment" (Gruber 1992)) as well shifting of the costs of the leave—mainly the costs of the health insurance coverage during the leave and from

absenteeism—by the firm to women (also in the form of decreased wage) could come into effect. Analogous instances of decreased wage due to mandated benefits have been widely studied and published, like Gruber (1994) on employer-provided health insurance coverage and Anderson and Meyer (1997) on unemployment insurance. In fact Gruber specifically looked at the natural experiments on the labor market effects of mandated maternity benefits as imposed by the Pregnancy Discrimination Act of 1978, finding that shifting of the costs to the benefited group of married young women was 100%. Such shifting of the costs obscures how many women were positively influenced to supply labor by the legislation, and leaves the true, total impact of the legislation on women's work incentives ambiguous. Although, in fact such "canceling-out" would be an indication of efficiency: Summers(1989) explains that mandated benefits act as benefit taxes, the increased labor supply of the benefited group (their lowered reservation wages reflecting the value of the benefit received), reducing any deadweight loss of financing for the benefits imposed. That would bring about little to no change in the employment rate overall, while having improved welfare.

Indeed, the empirical findings show the legislation to have had an insignificant effect on the female employment rate (Klerman and Leibowitz (1997), Waldfogel (1999), and Baum (2003)). This is a less than ideal situation for policy makers and analysts. While the static outcome might imply efficiency, if the policy was designed under the belief that there *is* a need for increased female labor supply in the absolute level (perhaps now mostly for its role as an instrument in reducing the gender inequity, since theoretical doubts have been cast on the efficiency point[2]), the legislation would need to be improved. But exactly which aspect of the current legislation should be engineered to deliver that change is obscured by the seeming status quo of the labor market outcomes and theoretical ambiguity.

[2] Gruber (1994) is articulate on this point about the possible tension between equity and efficiency: "If the goal of a mandate is not to correct a market failure, but rather to provide benefits to some deprived group in society, then full shifting to wages may not be viewed as a desirable outcome. Thus…it is important to understand the goal of government mandate policy: is it to correct a market failure, or to redirect resources across groups?" Especially regarding the gender gap or family gap in pay, based on the economic theory of labor demand and supply, the full transfer of benefits cost to women's wages as Gruber and Summers show is probably efficient, which would mean that a certain wage gap might be desirable. But that is the opposite goal of many policies and advocates for equity.

In the end, many arguments are made for focusing on increasing the employment and the job-continuity of women as the ultimate goal of the legislation and the direction that the policy analysis should take place, especially if we are to focus on correcting the inequity concerns. Also the employment variable is connected to other variables like the time allocation between work/leave and wage in a meaningful, logical way, corroborating the claim that the employment rate would be a reliable indicator of the success of the legislation. For example, an increase in the incidents of the leave taken by women would suggest an increase in the employment rate, since it would imply that more women who would otherwise have quit her job to stay home beyond what was originally allowed (if any), are now staying employed by taking the job-guaranteed leave.

But admittedly it would be too difficult and analytically unsound to infer the total impact of the legislation on employment based on other variables only, especially since they often point to different directions. For example, Jane Waldfogel found a significant increase in the number of leave-taking incidents and length of leaves taken among eligible employees of medium-sized firms post-1993 (Waldfogel 1999), which would seem to increase employment rate for the reasons discussed above (i.e. women who would've quit are now staying employed and taking leaves). But Baum who specifically looked at the employment rate found no significant changes in employment and wage of young female population during those years (Baum 2003). Similarly, Klerman and Leibowitz (1997) found no significant effects on employment, work, and leave-taking in their difference-in-difference-in-difference specifications, although leave-taking did seem to have been increased in their less rigorous difference-in-differences specification. So both employment and wage is found to be more or less static throughout the existing literature on the FMLA, perhaps confirming the market efficiency by the invisible hand of the supply-and-demand framework discussed earlier—but the hand is truly invisible, and it is difficult to see whether the equilibrium has been moved at all (whether it's a new equilibrium), or whether this is just a demonstration of the legislation's shortcoming as many advocates for the FMLA expansions argue.

3. Possible Explanations for the Lack of Influence

3.1. Coverage

One explanation for the apparent ineffectiveness of the legislation in changing the employment rate is the fact that even previous to the passage of the FMLA, most employers might have had family leave policies already (either voluntarily, or due to the Pregnancy Discrimination Act of 1979 which requires employers with temporary disability leave policies to extend such policies to cover pregnancies also). This is evidenced by facts such as National Longitudinal Survey of Youth (NLSY) reporting 57% of working women had employer-provided maternity leave benefits in 1987, which is only slightly below the 2000 coverage rate of 58.5%. So Waldfogel (1999) argued that the law—which covers only medium-to-large sized employers and their full-time[3] employees—most likely affected women who were already covered by private, voluntary arrangements for leave, which would explain the lack of measurable changes attributable to the FMLA (although private arrangements most likely offered shorter and limited leave policies than the FMLA, which explains the increase in length and incidents of leave Waldfogel also found, as mentioned(1999)). However Baum (2004) found that the legislation did cause significant changes in employers' family leave policies offered across the nation, showing that the FMLA *did* impinge on the coverage rate of the population in a significant manner. So we can deduce that the insignificant influence of the legislation seem to arise from 1) certain particular characteristics of the leave itself, or 2) characteristics of the population (other than its connection with being covered by private arrangement for leave before 1993) instead.

3.2. Length

Some literature, particularly ones that compare the impact of the FMLA with similar maternity leave policies in Europe (Ruhm 1998) or Canada (Baker and Milligan 2005), suggests that the problem might be the length of the leave allowed by the FMLA. Baker and Milligan in particular

3 Full-time and eligible for the FMLA purposes is: " (1) [they] have been employed by a "covered" employer for at least 12 months, which need not be consecutive; (2) had at least 1,250 hours of service during the 12-month period immediately before the leave started; and (3) are employed at a worksite where the employer employs 50 or more employees within 75 miles." (29 C.F.R. § 825.110)

examined the effect of the maternity leave expansion legislation across Canada at different times to identify a trend that modest mandates of 17-18 weeks do not increase the length of the leave taken by females, while expansions ranging from 29-70 weeks do. This Canadian observation might apply equally to the FMLA, suggesting that the length of the leave granted is too short to alter women's behaviors—and studies done in the States suggest likewise (Cantor et al., 2001, Waldfogel 2001). However, Ross (1998), using data from the 1990 to 1995 panels of the Survey of Income and Program Participation (SIPP) reports that women who gained coverage under the FMLA took approximately six weeks more unpaid leave post-birth, and Waldfogel (2003) who used the SIPP data from a longer time period (1990 to 1998) in fact did find that women who gained coverage under the FMLA took about three weeks more unpaid leave post birth (Han, Berger, and Waldfogel 2004). So the population in the U.S. seems to have been affected by the FMLA with regard to the average length of the leave taken, despite the relatively short leave allowance coverage. And in the end, whether there is any change in the length of the leave *taken*[4] alone would not really affect the employment rate, as it only affects the trade-off between work and time-off for those already employed, still it could suggest that the threshold for effectiveness of the legislation to help women stay employed instead of quitting (which would relate to women who prefer much longer leaves) is not quite reached with the FMLA's modest length, which would contribute to explaining the FMLA's lack of accomplishment in impacting the employment—it seems that "the FMLA has had a less impact on leave usage than leave coverage" (Berger et al 2005).

3.3. Financial Difficulty

Other than the length of the leave offered by the FMLA, the fact that the leave is unpaid is often pointed out to be the cause of the ineffectiveness. The financial cost of being unpaid can be

[4] The length of the leave *taken* and the length of the leave *allowed* are of course different things, suggesting different effects on employment; an increase in the length of the leave *allowed* by the legislation means the time constraint for women have been expanded, which would mean more women who could've quit work will now stay employed. An increase in the average length of the leave taken could be correlated with an increase in employment, but it is more of a symptom, rather than a cause, of the legislation or the population's certain unique characteristics that make the leave allowance not fully utilized. Hence, it is not a useful tool for deducing change in the employment rate by itself.

significant, therefore not relieving the dilemma that working women have. Europe is often looked upon in this regard, as their maternity leave policies are not only longer (some lasting up to 3 years in Germany) but also paid. Initiatives like California's Paid Family Leave Law passed in 2004 which provides workers with a maximum of six weeks of partial pay each year in the form of insurance, or the recent Family Leave Insurance Law (2007) in Washington state which instructed a task force to form a Leave Insurance program to begin October 1, 2009, indicate the awareness of legislators that the FMLA's unpaid, short-term leave allowance alone might not really improve the lives and working conditions of women.

3.4 Population Characteristics

Approaching the problem from yet another angle, it might be the case that it is today's female population with their unique characteristics and preferences that is making the legislation "ineffective." Although we have mentioned the possibility that women will start taking longer leaves only after a certain threshold point—perhaps their utility from time at home stays constant until a certain point, after which it increases (exhibiting an unusual pattern of increasing marginal returns)—it might be also true that American women are more career-oriented than others, thus preferring to take the shortest leave. About a third of all U.S. mothers return to work within three months of giving birth, and half return within four to six months (Klerman and Leibowitz 1990, 1994, 1999; Smith and Bachu 1999). In contrast, half of all mothers in Sweden, Germany, and Great Britain take maternity leaves for longer than 15, 24, and 36 months, respectively, and only about five percent of mothers in any of these countries return to work within three months of giving birth (Gustafsson et al. 1996)[5]. And all other things equal, the more career-oriented the population, the less change in the population's labor supply behavior, that is less change in the employment rate. If there are two groups of women—the first being women who prefer work over staying home (in order not to

[5] Of course, this behavioral discrepancy is also the *result* of not having Europe's long, paid leave policies in the states—but as I will come back to in the conclusion, this "endogeneity" concern in the end seems irrelevant in terms of worrying for, and trying to improve, the pure welfare of any given woman in the female population.

jeopardize her career), and the second group being women who prefer taking a leave at any cost. The first group is clearly more career-oriented. If a job-guaranteed maternity leave legislation is enacted, and if there were more women of the first kind whose preference was to stay employed by not having a baby or by coming back to work very shortly after giving birth, this group of career-driven women will now take job-protected leaves, but their employment status is unchanged (employed in both instances). On the other hand, the employment status does change for the other proportion of women ("non-career-driven"), since they would've quit before, but are now staying employed and taking leaves (if the length allowed is acceptable and enough for at least some of them). But if the U.S. population is more career-oriented than others, there would be more women of the first kind in the U.S. whose behavior do not change (i.e. less women whose employment status would be affected by the legislation), depressing the legislation's *measured* effect.

4. Summary & Objective

Overall, many possible explanations have been suggested to explain the empirical findings that the FMLA lacked influence. In addition, many unverified theories of what we should do to improve the situation have been proposed. In this paper, I want to suggest a different framework as a tool with which to analyze the FMLA's impact, a framework that allow us to look more closely at the subtle and varied differences in the way the legislation can affect different women differently. I argue that looking at the FMLA's job-protected leave allowance in a real options sense is effective in understanding exactly why the legislation's influence on employment might be null at the mircro-level, even without introducing the macroeconomics of the labor supply and demand shifts caused by wages and transfer of costs. I focus on the "population characteristics" approach of the possible explanations suggested earlier, and in particular argue that the "non-effect" of the legislation might be because there are different women for whom the legislation is in fact inducing counteracting trends, such as a decrease in employment as opposed to an increase, or a decrease in fertility, even. This approach of sub-categorizing women to better identify the legislation's effect was done in a several

existing studies in the form of looking at only eligible and covered employees (i.e. full-time employees as opposed to part-timers) or controlling for education and job-specific training factors (related to the human capital levels) or narrowing down the sample ages to the childbearing ages only (20~27 year old), as well as doing a time-series analysis that compares four generations of women (Goldin 1993). However not much was done to systematically categorize women into different groups by their inherent characteristics that relate to their utility and preferences, and compare the legislation's effect on them in the same time. The options framework forces us to recognize the fact that there are women who expect and observe different outcomes from their career track, or from staying at home, naturally categorizing women into different groups according to their characteristics. I show that looking at different women for whom the legislation might have different effects show us why it is that we are not observing any change in the labor supply trends as measured by the employment rate specifically. In the end, I suggest that the employment rate is not the best gauge of the success of the legislation, and that we should focus on other ways of measuring, and improving, the FMLA's efficacy in improving the working conditions for women as well as in extending any positive externalities that might be associated.

Before making the argument, however, an explanation and illustration of what a real option is, and how a real options analysis is different from other analytic methods, would be appropriate. In Section II that follows, I explain the basics of the real options analysis method and demonstrate how it is applicable to the FMLA with a simple illustration. In Section III, I explain the model in more depth, and show yet another numerical illustration of the model, which gives us a few interesting insights about the nature of women's decision-making process. Then in Section IV, using the latest version of the model with more fine-tuned assumptions, I look at three different types of women whose behaviors are altered by the FMLA in different ways, and look at the implications that follow, and conclude with some informed speculation as to the reason behind the current "ineffectiveness" of the legislation and what we should do about it.

II. Real Options

1. Real Options Basics

Real options analysis is a technique derived from option pricing theories in financial economics. It is a method of evaluating an investment project, to decide whether to invest in it today. It is different and often more accurate than the traditional way of analyzing investment decisions, which is to compare the net present discounted value of the project and the cost of the investment today, or to compare the net present values of alternative projects and taking the highest one. The real options method also employs the net present values (NPV) as a tool, but it also identifies and recognizes the "hidden" value of the project in its flexibility. Flexibility is valuable because it allows for additional discoveries and clarities that come with time to be taken into account, which helps assessing the true realizable value of the investment project.

For example, in a multi-phased development project it is likely that one can abandon the project at a later time if the state of affairs relating to the expected final value of the project turns out to be unfavorable, either during the design phase, or the first phase of the investment, etc. However the sunk cost of the initial investment incurred if one were to abandon the yet-unfinished project might be less than the upside potential that was undertaken by making the initial investment, which would justify having made that choice before. However, a NPV analysis would have compared the investment cost today with the *expected* value of the *finished* project, and without recognizing the possibility of an installment investment over time and the possibility that in adverse circumstances one could abandon the project in the interim, minimizing the losses. So the NPV of the project might be projected to be lower than it truly is, making one forgo the possibly valuable investment.

Without going further into other examples about how the real options perspective can provide insights that are different from the NPV perspective without flexibility, here I will discuss why the FMLA is a real option for women, and provide a basic example of how such options perspective can provide a different recommendation than the NPV perspective does.

2. The Family and Medical Leave Act as a Real Option

The FMLA, as introduced in the earlier section, is a federal mandate that requires employers with 50 employees or above to provide a 12-week job-protected leave to its employees who have worked at the firm for at least 12 months, with 1,250 hours or beyond.

This leave can be used to address either self or family's health issues, and is widely used by women shortly before or after giving a birth. Since the legislation guarantees that she could return to her previous post after a leave of up to 12 weeks, assuming that a woman was not covered before, now she has a new set of decisions to make—whether to take the job-protected leave or not, and also if she does leave, whether to come back within the legislation's time constraint or not.

But if those choices are real options, what is the investment project that women are appraising with it? An option does not have any value, or does not exist, without an underlying asset. The investment projects in this case would be her job (more generally her career) and the alternative project would be the project of having a baby ("fertility project"). Understanding career as an investment project, or children as assets to invest in, is in fact a standard economic perspective that became popular by Becker in particular, in his works such as "Human Capital, Effort, and the Sexual Division of Labor" (1985) or "On the Interaction between the Quantity and Quality of Children" and "The Allocation of Time and Goods Over the Life Cycle" in his book *A Treatise on the Family* (1991). Becker argues that an individual's decision to spend time working can be viewed as an investment in the human capital for work (as well as the position-specific human capital) that she expects to benefit from as she continues to work (due to the economies of scale and comparative advantage from specialization). Although his most seminal theory on fertility was that children are consumption goods, from which parents derive utility not only based on quantity but also quality, he also discusses fertility decisions as a function of costs of raising children and expected insurance benefits in the old age, arguing that the earnings foregone and human capital for work disinvested due to having and raising a child is the opportunity cost of the child. This supports my viewing a woman's

career and child as alternative investment projects as a valid perspective.

If a woman's career is indeed an investment project, then looking at women's decisions regarding her labor supply patterns (e.g. to supply labor at all, to continue working or to take a leave, and to return to the workplace or not to return) as options that she has along the trajectory of that investment project seems reasonable, perhaps even prudent. We could view a woman's choice to take a leave as exercising a put option on career/a call on the alternative project (of fertility), and her decisions whether to return to workplace as another call (this time a call on work). The FMLA, with its job-protected 12-week leave allowance, has created an unambiguous 12-week American[6] real option for eligible working women across the country. However the situation is a little more complicated than simply having those two call options as mentioned above, since the call option on return created by the FMLA does not come into existence unless she has exercised the first option on taking the leave at all. When an option depends on another option, it is a compound option. So we can say that the FMLA created a compound option of returning to work which expires after 12 weeks after having exercised the first option (on leave).

Understanding the FMLA as creating an option on *return* as opposed to on the leave itself is crucial in modeling women's investment decisions as precise as possible. The maternity "leave" in and of itself is less significant than the fact that by taking the leave, although she is not working, she is *staying employed*, as opposed to quitting. The importance of staying employed, of course, is the fact that she will return to work, to continue to work, after a while. A leave wouldn't be different from quitting if the importance was in the fact that she does not work (for the moment).

However taking a leave is a much more meaningful and interesting action than simply extending one's employment, since one then has a right, but not an obligation, to return to work. It is true that the employee might be required to reimburse any health insurance costs incurred during the leave to the employer if she elects not to return, but that still does not bind the leave taker to

[6] American options are options that can be exercised any time before the expiration date, as opposed to European options which can be exercised only on a given date.

returning. Therefore, understanding leave-taking and returning as two separate options is more appropriate, especially if during the leave period any additional information is acquired or any uncertainties are resolved that could change her decisions. And since a woman's choice to leave per se is not different from her freedom to quit, what the FMLA really creates is not the option to leave, but a call option on returning to her previous post that becomes alive when she takes the leave.

I will now illustrate how the options framework of the FMLA would work and potentially offer a different investment recommendation than the NPV method with a very simple model. This will corroborate my proposal that the real options framework is proper for analyzing the FMLA's impact on women, and also show the reasoning behind some of my later modeling choices.

3. An Introductory Exercise on Modeling the FMLA as a Real Option

3.1. Overview

In this introductory model and beyond, the following acronyms will be used to describe a woman's career path (the underlying investment project) and options regarding the project. When I say "with flexibility", it implies that the options' existence and values are recognized.

Also below is the basic decision tree that I use to value the flexibility in W_0 with its options in the simplest way possible:

W_0 = the value of the career investment project with flexibility ("Work" project)
V_0 = the value of the career investment project
Vu= the value of the career investment project with an up-realization
Vd= the value of the career investment project with a down-realization
B_0 = the value of the fertility investment project; the value of having a baby
Bu = the value of the baby with an up-realization
Bd = the value of the baby with a down-realization
B_{Vu} = the value of the fertility investment project with flexibility at Node Vu
B_{Vd} = the value of the fertility investment project with flexibility at Node Vd

[Figure 1] Basic Structure Chart

		● Max [Vu, Bu]
	● Max [Vu, B_{Vu}]	● Max [Vu, Bd]
● Max [W_0, B_0]		● Max [Vd, Bu]
	● Max [Vd, B_{Vd}]	● Max [Vd, Bd]
T_0	T_1	T_2

There are two time periods, and three decision-making points. At T_0, the woman compares the NPV of going to work ("W_0") and of having a child ("B_0"). If she takes W_0 at T_1, she realizes an up- or down-realization of her career, and faces a decision at that point as to whether to continue working (take Vu) or to take a leave ("B_{Vu}", or "B_{Vd}" depending on the realization of the V). An important assumption here is that I view the fertility investment project as the only mutually exclusive alternative of the career investment project. That is to say, the alternative of labor is not leisure, but rather bearing and rearing a child at home—and it is mutually exclusive of supplying labor. In the options language, the call on leave(or more accurately: the call on baby) is the same as the call on the fertility project. Part-time or flex-time work options that might be available to women are not considered here. This binary assumption is simplifying, but is in fact used widely to model the female labor supply patterns, as in Klerman and Leibowitz (1998). In the Klerman and Leibowitz model, the amount of time that a woman spends at home after a birth is a function of the length and type of leave coverage provided by the employer and of her preferences about when to return to work. The assumption is that the alternative of working at the spot wage assigned to her in the model is staying at home to take care of her infant baby. Although Klerman and Leibowitz consider the alternative to work only in terms of utility maximizing behavior along indifference curves, here I explicitly compare the two investment projects separately, and instead of using a spot wage system also take into account any changes in wages by allowing for Vu/Vd realizations.

So at T_0, women have a choice between W_0 and B_0 –whether to start working, or to have a

baby then. If she expects W_0 to be higher than B_0, she will supply labor.

At T1, women have worked for one period, and she has observed her own performance at work and gathered more information about the career she is undertaking. She now has a better sense of the true value of the career investment project—it has either proved more valuable than her expectation (Vu), or it has proved to be less valuable (Vd). At that point again, she has a decision to make between staying at work, or leaving work for the alternative investment project (of having a child) with the expected value of B_0.

But I differentiate between taking B_0 at T_1 at the node Vu and at the node Vd as B_{Vu} or B_{Vd} as can be seen in Figure 1. This is because while they are both calls on the fertility project, the value of the project at these two nodes are different because of the option values embedded in these options are different, since the wages she would be coming back to are different depending on whether she reached Vu or Vd at T_1. Then between T_1-T_2 she observes and reassesses the value of the fertility project (while she is on leave), and at T_2, where we have four final states of nature, she will take the higher (see Fig.1).

Now I will perform one simple numerical exercise 1) to show how a real options model such as this can produce interesting insights that might not have been obtainable in another framework, 2) and also to support my later modeling choices in the next chapter, in which I perform more exercises with a more meticulous model.

3.2. Exercise #1: "No Option Value"

In this exercise, we have an agent whose fertility project's present value is higher than her career project's (B_0=100>V_0=95), a likely scenario. This is because the up realization of each projects gives the same value of 120, while the career project's down realization is lower (Vd=80) than the fertility project's (Bd=90). This means also that the career project has a higher volatility (also a likely scenario); the spread between the up- and down-realization is larger for the career project (110-

80=30>110-90=20). Figure 2 shows the basic payoff schedules for V and B. Probabilities of the reaalizations in this model is 0.5 each as noted.

[Figure 2] V_0 and B_0 for Exercise #1

		110			110
	pu=.5	**Vu**		pu=.5	**Bu**
V_0			**B_0**		
95			100		
	pd=.5	80		pd=.5	90
		Vd			**Bd**

At T_0, although the NPV of the fertility project is higher, which according to the NPV method of investment analysis would induce the woman to adopt the fertility project over the career project, we see that when accounting for the flexibility of being able to quit and then return to work, W_0—the career project's value *with flexibility*—is in fact higher than the fertility project's NPV (see Fig.3). This value is obtained by the woman's value maximizing behavior from T_2 backwards. This shows the basic insight that recognizing flexibility in an investment project can raise its value enough for us to invest in it, although the NPV analysis method might have rejected it. But what is most notable bout this simple exercise is that here we see that the exercise of the second option (option to return) at T_2 depends solely on the outcome of the career path that she *had already observed at T_1*. In Figure 3, we see that if she had reached Vd at T_1, she exercises the option to leave, and never comes back to work at T_2. And if she reached Vu instead, she is indifferent between leaving at all and staying at T_1, so the options are quite meaningless there (in fact, if there is any cost to switching back and forth, she will not leave at all[7]). Then, the second options at T_2 are never exercised.

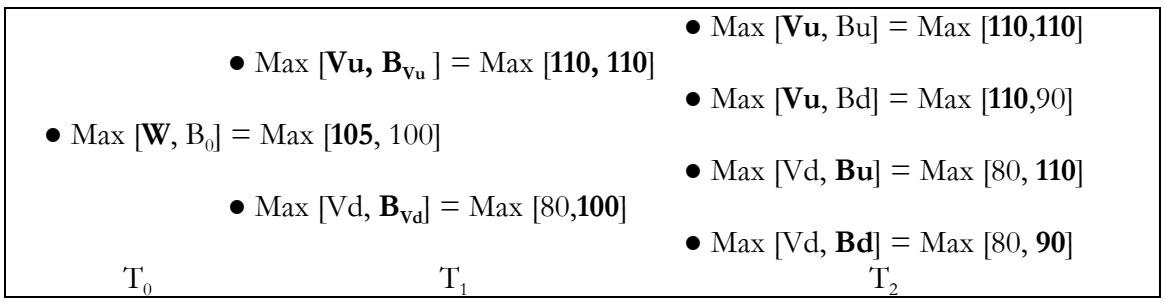
What this means is that an option to return after a period of leave—the option that the FMLA pertains to—does not add any value to someone whose investment in career is more uncertain with volatile enough payoffs so that after a period of trial, the comparative superiority/inferiority of

[7] In this simple model I don't yet have charges on exercising the options; this will change in the next chapter.

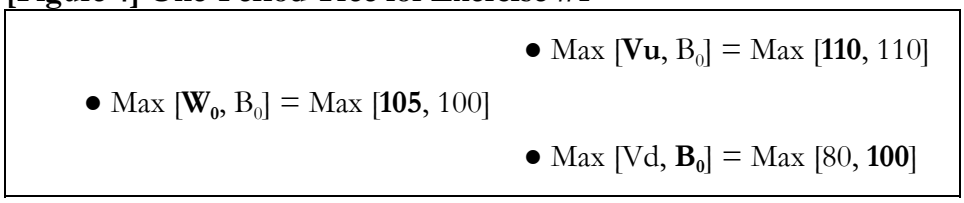
the career project becomes clear to her[8]. There *is* an option value in this scenario ($W_0>V_0$), so the real options framework is still insightful, but this option value comes from the option to leave, the right that exists naturally (one's freedom to quit is what makes work different from slavery). The fact that the legislation doesn't create new option value can be seen directly by comparing the NPV schedule of a one-period tree that ends at T_1 (Figure 4) with the two-periods tree we are using (Fig.3). Indeed, W_0 of the one-period tree, *without* the second option, is the same as that of the two-periods tree, meaning that the second option at T_2 has no extra value.

This exercise, then, has an interesting implication for our investigation. The option to return to work that the FMLA is shown to be of *no* value to some for whom the better investment decision is already clear based on her characteristics and preferences *together with* newly acquired information from work alone. In this situation she will start out by trying out career, and by T_1 she will have realized which is a clearly better investment (career v. child), the knowledge that render the option to return pointless.

[Figure 3] Two-Periods Tree for Exercise #1[9]



[Figure 4] One-Period Tree for Exercise #1



8 Here, perhaps this seems obvious because the upside payoffs are the same with both projects while the downside payoff is lower for career. But the same situation holds if instead of $V_u=B_u$, $V_u>B_u$, while still $V_d<B_d$ and $V_0<B_0$ or $V_0=B_0$.

9 In all the figures, within the maximization functions where two or more different values are compared, what is actually selected (the higher value) is in **bold.**

4. Lessons

In this section of the paper I demonstrated how the real option framework can give a different insight than the NPV framework would (a woman choosing to work at T_0 while the PDV of work is lower than that of having a child), yet how having *an* option is not necessarily value-adding always—we saw that if there was no new information to be gained or uncertainty to be resolved going forward, having an option is of no value, as was with the second option here. Then, with regard to the FMLA, if we are going to inquire whether it created any value for women, we must think about what kind of uncertainties can now be clarified by the virtue of the legislation that weren't resolvable before. It seems that the legislation, then, would add value for women for whom it is not clear whether being a mother at home will be a more worthwhile project for her than having a career.

There were some major simplifications here, which is partly why such an extreme conclusion was reached (a conclusion that the option to return has *zero* value to women with the same upsides for career and fertility, but a lower downside for career). The most obvious simplification is that career and fertility projects are considered to be mutually exclusive. This is not the case in the real world (it is not as if a woman decides to return to work after having a child, her child is taken away); actually that is the whole point about a woman's dilemma to return to work or not, the fact that she has to juggle her career *and* child. But for simplicity, I am assuming that the value of work with a child at home is the same as the value or work without a child. This essentially implies that the added difficulties of managing a child and career are equal to the utility of having a child. I could introduce a separate value for returning to work with a child at home, but it is not clear whether that should be above or below the value of work without a child. In addition, I don't believe that the major conclusions of the analysis would be affected: the FMLA increases the value of work because it provides flexibility and the opportunity to observe how satisfying a career may be before making a commitment. Indeed we saw with the demonstration of Exercise 1 that this value of "discovering information" is the source of value of the return option.

Another modeling concern is that I gave the options framework of this model an "edge" to yield a higher value than the NPV framework because there is no cost to switching in this model. Everything good comes with a price, and ability to delay making a commitment, that is having flexibility, is one of them. The decision compromises "fairness" of the comparison that I made between the real options framework vs. NPV framework. Also, I have modeled the career project as flexible, but not the fertility project—the possibility that women can start working later was not included here, which makes the decision-making at T_0 to be also asymmetrical. I address these concerns in the main model that now follows.

III. The Model

1. Overview

Unlike in the simple model of the last chapter, in the model that I will use going forward has three outcomes at every time periods instead of two—there is also a possibility that the agent gains no new information about the probable outcome (the final value) of the project she is currently undertaking, and the value of the project will remain at V_0 if she were working, and B_0 if she were home—i.e. she receives a confirmation of the earlier estimation of the project's value as accurate, rather than gaining any new information that prompts her to adjust her original estimation. So at T_1 has 3 nodes, and at T_2, nine.

What is also a key improvement in this framework is that in order to correct the symmetry issue that I raised, now there will be two projects *both with flexibility*—so the agent in the model is not comparing apples and oranges, so to speak. So at T_0, she compares the NPV of the investment projects *each estimated with flexibility,* to invest in the higher one.

Since the fertility project is now considered also with flexibility, a new symbol for the fertility project with flexibility is needed to distinguish it from B_0. I will use H_0 to denote the fact that she is at home (H for "Home") with the fertility investment project, as opposed to at work (W for "Work").

The new decision tree for this version of the model is also shown below in Figure 4. If she undertakes the fertility project (from hereafter, "Home" project, "H"), just like with her career she will reach one of the three different realizations that help her estimate the value of the project at either Bu, B_0, or Bd. Then at that point, she has an option (again just like with the work project) to pick up the alternative project at that point. That is, she will join the labor market at T_1, having stayed at home for one period. If she exercises the option at T_1, then she also has another option at T_2 to "return" to home.

The model is also further developed by now introducing charges on exercising the options. The possible complication, or oversimplification, from omitting dividends can be mitigated by having those charges as well (for a more careful discussion on this point, see Appendix), and assuming that

[Figure 5] The New Decision Trees[10]

		Node 4			
		Max(Bu,Vu-Cex)			Max(Vu,Bu-Cex)
		Node 5			
	Node 1	Max(B_0,Vu-Cex)		Max(Bu,V_{Bu}-Cex)	Max(V_0,Bu-Cex)
	Max(Vu,B_{vu}-Cex)	*Node 6*			
		Max(Bd,Vu-Cex)			Max(Vd,Bu-Cex)
W0		*Node 7*	**H0**		
	Node 2	Max(Bu,V_0-Cex)			Max(Vu,B_0-Cex)
	Max(V_0,B_{V0}-Cex)	Node 8		Max(B_0,V_{B0}-Cex)	
		Max(B_0,V_0-Cex)			Max(V_0,B_0-Cex)
		Node 9			
		Max(Bd,V_0-Cex)			Max(Vd,B_0-Cex)
		Node 10			
		Max(Bu,Vd-Cex)			Max(Vu,Bd-Cex)
	Node 3	*Node 11*			
	Max(Vd,B_{Vd}-Cex)	Max(B_0,Vd-Cex)		Max(Bd,V_{Bd}-Cex)	Max(V_0,Bd-Cex)
		Node 12			
		Max(B_d,Vd-Cex)			Max(Vd,Bd-Cex)

[10] As is clear from the chart, I still model the two projects as mutually exclusive, and further, the options don't exist for the project that she has switched into—that is, the first switching option is alive only during T_0-T_1, and the second option, only during T_1-T_2.

there is a cost to being able to freely switch from one project to another is only realistic (this also addresses the fairness issue mentioned earlier). So, at T_1, if she exercises the option to switch to the alternative project, she has to pay an exercise charge (denoted by C_{ex}) in order to do so. And she also has to pay a charge if she decides to switch back to her original project at T_2.

Now I will perform a numerical exercise similar to the one done earlier to show how this improved version of the model provides a different insight now, and one that is actually quite surprising in a different way.

2. Exercise #2 (Exercise #1 Revisited)

The numerical values assigned to the basic variables in this exercise are the same as in #1 (Figure 2). The only difference is that the probabilities for the up- and downsides are now different, since there is also the possibility that the value of the project will remain the same. So the probability is 33.33% for each possibility, adding up to 1.

As was in Exercise #1, the expected PDV of career is still lower than that of having a child (V_0=95, B_0=100). So it is interesting to observe that in the real options framework we observe the lower-NPV career project (W) turns out to be *more valuable* than the fertility project at home (H), when exercise prices of the options are sufficiently low. This is not a mere repetition of the point made earlier, since here this result of "value reversal" is happening even when the fertility project is also evaluated with its own flexibility's value. Also, in this exercise as we will see, having a return option at T_2 does add new value to the project, while in the earlier example it did not.

Below I discuss two different interesting phenomena that happen as I experiment with the charges.[11] In this exercise, the exercise charges are the same for both options in both projects—that is, switching from career to home, or from home to career, as well as once having left, returning to work from home, or returning home from work, all cost the same (=Cex).

11 In this simple exercise, the exercise charges are the same for both options in both projects—that is, switching from career to home, or from home to career, as well as once having left, returning to work from home, or returning home from work, all cost the same (=Cex).

2.1. Cex=0

At Cex=0, we see that the value of both paths are *the same* at 103.89(Figure 6). This is because if there is no cost to switching from one project to another, the woman will always switch to the best available, higher value opportunity at each node, and in the end it wouldn't matter which investment she started out with: at the final node of T_2, whichever realization it is, it has the same probability of being reached in both trees and same values to be chosen from at each state of nature. Therefore, she will end up with the same decision in the same state of nature, regardless of whether she reached it by starting out with H or W, which makes the two project's values identical, although H's underlying (B) was worth more than W's (B_0 =100, V_0=95).

It is only natural that if one is free to switch from one project to another at no cost, it does not matter where she starts. This also means that she is *indifferent* between either of the projects at T0, regardless of how much more valuable one project is over the other.

2.2. 0<Cex<5

But when the charges rise above 0, the values of the two projects are no longer the same. However, the result is even more interesting: the less valuable project (the career project; W) becomes in fact *more* valuable than the (initially) more valuable project, H.

How does this happen? Two factors contribute to making W (the less valuable PDV project) more valuable than H. Firstly, the options value added to W by recognizing its flexibility was much higher than the options value given to H (this could've been inferred from the fact that the two project values were raised to equal one another when Cex=0, when their PDVs without options (the starting points onto which options values are added) were different—compare the option values shown in Figure 6). Secondly, starting from the equal project values at Cex=0, the option value decreases more slowly for W than for H.

This phenomenon can be understood more easily when explained backwards. So, we know that at Cex=0, H equaled W for the reasons discussed above. We know that then as the charges are

raised from 0, it matters how W and H each reached the same PDV—and by "how", I mean how many times the options had to be exercised to reach that same PDV. The more exercise, the more drop in the PDV from when there were no charges. Since the options are more frequently exercised with H than with W (as shown Figure 7) when the exercise cost is sufficiently low—say, 2(=2% of B_0)—the option value decreases more quickly with H, driving its net project value below W's.

Why are options more frequently exercised with H? This is related to why there are option values added to the higher-value project at all by giving it the flexibility to switch to the lesser-value project. There is still value added with that flexibility because there *are* states of nature where a realization of V is higher than that of B. For example, Vu is higher than both B_0 and Bd (obviously, since Vu=Bu here). So if she reaches either B_0 or Bd at T1 instead of Bu, with a low enough exercise cost, it is worthwhile to switch to V and "have a shot at" obtaining the highest payoff once again. But this means that other than possibly achieving Vu, since either V_0 or Vd are less valuable than its counterparts B_0 or Bd of the original project, if she does not achieve Vu (which is of only 1/3 probability), she will *switch back* to the original project (two out of three times if she were at B_0, and one out of three times if she were at Bd at T_1).[12] That is, she is more likely to exercise the second switching option with the higher value project H than with the lesser value project W, *if* she has ever exercised the first switching option at T_1. Alternatively, with W, and once she has exercised the first switching option at T_1, she is less likely to switch back to the "less valuable project" that she began with. Hence with W, the second option is rarely exercised[13].

This, then, is why the total project value of the originally higher value Cex=0, H=W), making the total value with flexibility higher for the lower PDV project. It is also as if we're comparing the value of a simple call option on each project—and of course, the call on the more valuable asset is more valuable than the call on the less valuable. And by choosing Work at T_0, we're choosing the call

[12] Below Cex=3; 3<Cex<10 she only switches at Bd(1/3 times at T1), and also only switches *back* only at (Bd,Vd).
[13] And of course, this is what "actually" happens, since W is chosen over H at T0 for precisely these reasons. Nothing happens with H in fact, since H is never chosen ("never activated") to begin with.

[Figure 6] Exercise #2 Decision Trees; Cex=0

		Vu	110		
V_0	95			Spread	30
		Vd	80		
			110		
B_0	100			Spread	20
		Bd	90		

Cex	0

Same
W = H

			(V→B) ?		(B→V) ?
			0		0
				110 Max(Bu,Vu-Cex)	Back to W
				110 Max(B0,Vu-Cex)	Back to W
		110.0 Max(Vu,B_0-Cex)	110.0 *INDIFFERENT*	110 Max(Bd,Vu-Cex)	Back to W
W_0	103.89			110 Max(Bu,V0-Cex)	.
Option Value	*8.89*	101.7 Max(V_0,B_0-Cex)	101.7 *SWITCH.*	100 Max(B0,V0-Cex)	.
				95 Max(Bd,V0-Cex)	Back to W
				110 Max(Bu,Vd-Cex)	.
		100 Max(Vd,B_0-Cex)	100 *SWITCH.*	100 Max(B0,Vd-Cex)	.
				90 Max(Bd,Vd-Cex)	.

			(B→V) ?		(V→B) ?
			0		0
				110 Max(Vu,Bu-Cex)	Back to H
				110 Max(V_0,Bu-Cex)	Back to H
		110.0 Max(Bu,V_0-Cex)	110.0 *INDIFFERENT*	110 Max(Vd,Bu-Cex)	Back to H
H_0	103.89			110 Max(Vu,B_0.Cex)	.
Option Value	*3.89*	103.3 Max(B_0,V_0-Cex)	103.3 *SWITCH.*	100 Max(V_0,B_0-Cex)	Back to H
				100 Max(Vd,B_0-Cex)	Back to H
				110 Max(Vu,Bd-Cex)	.
		98.3 Max(Bd,V_0-Cex)	98.3 *SWITCH.*	95 Max(V_0,Bd-Cex)	.
				90 Max(Vd,Bd-Cex)	Back to H

[Figure 7] Exercise #2 Decision Trees; Cex=2

		Vu	110		
V_0	95		1.20	Spread	30
		Vd	80		
			0.80		
			110		
B_0	100		1.14	Spread	20
		Bd	90		
			0.86		

Cex	2

Different
W > H

			(V→B) ?		(B→V) ?
			2		2
				110 Max(Bu,Vu-Cex)	.
				108 Max(B0,Vu-Cex)	.
		110 Max(Vu,B_0-Cex)	106.7 *STAY*	108 Max(Bd,Vu-Cex)	.
W_0	102.33			110 Max(Bu,V0-Cex)	.
Option Value	*7.33*	99 Max(V_0,B_0-Cex)	99 *SWITCH.*	100 Max(B0,V0-Cex)	.
				93 Max(Bd,V0-Cex)	Back to W
				110 Max(Bu,Vd-Cex)	.
		98 Max(Vd,B_0-Cex)	98 *SWITCH.*	100 Max(B0,Vd-Cex)	.
				90 Max(Bd,Vd-Cex)	.

			(B→V) ?		(V→B) ?
			2		2
				110 Max(Vu,Bu-Cex)	.
				108 Max(V_0,Bu-Cex)	.
		110 Max(Bu,V_0-Cex)	106.7 *STAY*	108 Max(Vd,Bu-Cex)	.
H_0	101.89			110 Max(Vu,B_0.Cex)	.
Option Value	*1.89*	100 Max(B_0,V_0-Cex)	100 *SWITCH.*	98 Max(V_0,B_0-Cex)	Back to H
				98 Max(Vd,B_0-Cex)	Back to H
				110 Max(Vu,Bd-Cex)	.
		95.7 Max(Bd,V_0-Cex)	95.7 *SWITCH.*	95 Max(V_0,Bd-Cex)	.
				88 Max(Vd,Bd-Cex)	Back to H

on B over the call on V—that is, delaying having a child over delaying work, since a child is a more valuable asset.

But certainly this interesting situation caanot happen at all times: indeed, as the charges are raised, there will be less and less incidences of exercises, and after a while the expected total option value will fall below the expected total charges incurred—i.e. there will be no profitable switching opportunities available . So eventually H's value (B's value + optiosn value) stops decreasing at its original PDV of B_0=100 (option value=0), while W's value continues to decrease until ts original value (95). So it is only with low enough charges that switching options are more frequently exercised with both trees, and more frequent with the higher value project, with which accumulating charge costs help the sum total value of the less valuable project end up being higher. With a charge above 3, she stops switching at T_1 if she achieved B_0, which makes the total number of switching incidences less than with W. The effect of this drop in the rate at which the option value decreases for H catches up with the total value when Cex=5, where H and W are the same again. Further, with a charge above 10, she never switches from H—hence H(the fertility project value with options) equals B(the project value without options) by then.

3. Lessons and Implications

What are some of the relevant inferences that can be drawn from this exercise? Firstly, it was interesting to note that recognizing women's flexibility in switching from home to work, or vice versa, makes her perfectly indifferent between what she actually does to begin with, if there were no costs associated with switching. Of course, it is unrealistic to assume that there is no cost to making such life transitions. What *is* applicable is that we can infer that even if having a child seemed more worthwhile than having a career to some women, those women might still decide to work if the costs of women's transitions into work from home (or vice versa) were low enough—and we did observe that when the charges were low enough, W was made more valuable than H. And surely this is the goal the FMLA—to make easy women's decision and transitions to work.

However, one has to be precise about what the FMLA actually does. The FMLA does not lower the cost of options other than the one at T_2 of the W tree, the option to switch back (return) to work after having taken a leave. Then to model the effect of the FMLA, it is reasonable to observe how the result of analysis changes as the cost of exercising that specific option on return-to-work is decreased, while the charges on the other options are held constant. Next section is a series of exercises on lowering the charge of the return-to-work option in different environments, to observe how the FMLA would affect different women differently according to her environment.

IV. Experiments

1. Modeling Conditions

The last experiment showed that, ironically, the lesser value project can be *more* valuable if exercise charges are sufficiently low, for the value of delaying commitment to the more valuable project is greater. This was an interesting demonstration of the basic options result with a twist. The fact that what was previously unprofitable (vis-à-vis the alternative of staying at home) becomes profitable when its flexibility is recognized, is not surprising in and of itself as a result of an options analysis; but this particular discovery was still noteworthy because we saw that this was the case even if both paths were recognized with the flexibility of switching. So far, it was clearly demonstrated that 1) the value of the option to return arises only when there is uncertainty to be resolved/new information to be gained (Experiment #1), and 2) the more volatile the project, the more likely it will be chosen first, even though less profitable on average (Experiment #2).

The objective of this section is to continue to develop interesting insights as such, but now with a specific regard to the impact of the passage of the FMLA. The FMLA would express itself in this model by lowering the exercise charge on the return-to-work option at T_2 for W. So I now specify the Cex of the switch from B to V (Home to Work) at T_2 of the Work tree, and call it

C_{BV_W}("$_{BV}$" because B→V, on the W tree). In fact I will now differentiate the charges for the other options as well: W's option at T_1 to leave work is C_{VB_W}("$_{VB}$" because V→B), and In H, the option to start working at T1 is C_{BV_H}, and the option at T_2 to return to home is $C_{VB\_H.}$

There are many variables here and therefore many assumptions to be made. Mainly, there are the payoff schedule for V and B to be chosen (of which magnitude and relative volatility both matter), and now how the four different kinds of charge vary would affect the result of the analyses as well. While I don't deny the fact these are ultimately arbitrary numbers, having a certain *modus operandi* as to how I go about choosing them, especially vis-à-vis one another, is important. I spell out some main assumptions here, and give more detailed reasons for them in the Appendix.

1.1. The Base Case

I use the environment used in the earlier exercises as my base case, and modify relevant variables as needed to observe any change in behavior. The base case can be seen again in Figure 2. I let V_0—which is the median of Vu & Vd—deviate from the base case as necessary, while keeping consistent Bu=110 & Bd=90 (therefore B_0=100[14]) for consistency.

1.2. Charges

I set the charges for transitioning from Work to Home (C_{VB_W} & C_{VB_H}) at either tree to equal one another at 0.5% of B_0—which is 0.5. This is a very small figure, but I consider it more reasonable than assigning, say, 5% of $B_{0,}$ for reasons given in the Appendix.

The charges for transitioning from Home to Work at both trees (C_{BV_H} & C_{BV_W}) also initially equal one another before the legislation, at 3% of $V_{0,}$ which is about 3[15]. C_{BV_H} & C_{BV_W} are set to be considerably higher than C_{VB_W} & $C_{VB\_H,}$ (6 times), because I assume that there is more difficulty in searching for, acquiring, and beginning a career than there is for simply quitting.

[14] B's spread chosen here to be 20 (or a standard deviation of ~14.4), is also arbitrary, but in the end it is the relative volatility that matters in choosing one project over another, so I do maintain this throughout the paper as well.
[15] This is of course not true always since V varies. When the value of V falls significantly, say to 77.5 (Figure 10), it becomes very low. But it is always possible to find a case where the same result holds with the charge of 3 if I were to fix this charge at that cost, and the nature of the findings do not change.

Post-FMLA, however, the charge for C_{BV_W} –returning to work after having taken a leave, as opposed to starting on a new job—is reduced to .5% of V_0. It is still non-zero, and cost about the same as the difficulty of transitioning from work to home—a minor friction cost.

1.3. Adjusting for Time Lengths

The C_{BV_W} of 0.5% post-FMLA might seem too low compared to the earlier cost of 3% (reduced by ~85%). I assume this because there is a disparity between the lengths of T_0-T_1 and T_1-T_2. While I assume to T_0-T_1 to be one year(since the FMLA eligibility is having worked for the employer for at least 1 year, assuming a period of a year seems not only straightforward but also appropriate), T_1-T_2 is only 12 weeks, reflecting the length of the leave allowed by the FMLA—only a quarter of the earlier period[16]. I assume that cost of returning/switching is lower as the time taken off is shorter.

Having a short time period in a real options model can be problematic for a reason other than inconsistency; it implies that there would be less resolution of uncertainties since the time during which any new information might be gained is shorter. And we already saw that the benefit of an option depends on the fact that one can gain more information in order to make a more valuable investment decision based on more new information. So, to make the model more "rigorous" or "close to reality", I adjust the probabilities of achieving a certain *up*- or *down*-realizations between T_1-T_2 to be less than between T_0-T_1 as well. The fact that I set up three modes of realizations after each time period—not only Vu/Bu or Vd/Bd but also V_0/B_0—is convenient for this purpose. Unlike between T_0-T_1 where I set the probabilities of the three realizations to be equal to one another at 100/3=33.33%, between T_1-T_2 I assume 10% realization probabilities for the *up*- and *down*-states (approximately a quarter of 33.3%), and 80% realization probability for the status quo (V_0/B_0) realizations.

[16] This means that, although C_{VB_W} & C_{VB_H} are the "same", C_{VB_H} should in fact be a quarter of C_{VB_W}, since the return option with the charge of C_{VB_H} is also modeled to be exercised only after 12 weeks (the return-to-home option is the second option in the H tree). So I use 1.25 (1/4)*5 for C_{VB_H}.

Now, based on those assumptions, I will perform a series of numerical exercises in which I compare the behavior of women before- and after-the FMLA and discuss the results and implications from them.

2. *Exercise #3: "Immune to the FMLA"?*

First, I test with the base case (Figure2; although, probabilities are different than noted in the figure between T_1-T_2, and are instead pu=.1, pd=.1, and p0=.8) to see whether the FMLA's lowering C_{BV_W} has any effect on the investment behavior of a representative woman of the base case.

It must be noted that the adjustment of probabilities alone makes the base case result different from the last exercise, even before any adjustment for charges. Notably, at C_{ex}[17]=0, W does not equal H as it did in Exercise #2 anymore. In fact, the effect of W becoming higher than H is already present at C_{ex}=0. This is because one no longer arrives at the final states of nature—one of the nine different nodes at T_2—with the same probabilities (1/9). The up-realization's probability went down by a lot (less chance of achieving Vu=Bu), and remember that the possibility of the up-realization between T_1-T_2 was the motivation for one to switch to W at T_1, if one had started with H. Now the up-realization at T_2 is reached only with 1/3*1/10=1/30 probability, which is significantly lower than before. Hence, the value added to H by having options to switch becomes much less. In other words, the reduced volatility caused by the reduced time during which any uncertainties can be resolved—the life of the second option—reduces the possibility that someone with the higher PDV project (H) could benefit by switching to W, exhibiting the standard options characteristic. So even at C_{ex}=0, W is already higher than H although the value of the underlying is lower (V<B).

Then, it is not surprising that once the "real" charges as assumed are introduced (which, in general, also reduces the value of H more, since it has a higher charge "up front" for the first switching option, since C_{BV}>C_{VB},) and the FMLA's effect is applied (which does nothing to the value of H while increasing the value of W if the return options are ever "in the money"), nothing changes

[17] From here on, when I say "Cex", I imply that I equated the four charges at that same value.

at T_0 in terms of her behavior—she works in both cases. In fact, in all three time periods, there is no change[18]. But shouldn't the practical elimination of any charge on the return option make it more likely that women would return? Not necessarily; what matters is her underlying expectations about how much utility she would have by working vis-à-vis staying home with a child, of which realization at the final point (T_2) are only marginally reduced by the FMLA, and also only *some*times (since she might not even reach that node at all, e.g. if she decides to stay at T_1). It turns out that, in fact, when C_{BV_W} is completely eliminated, there is no behavioral change with this base case. So, it almost seems as if this particular woman is "immune" from the FMLA.

Granted this exercise is an eventless, uninteresting one, it reinforces the point that I will come back to, which is that the lack of behavioral change might not be something we should be worried about. It is important to emphasize how the FMLA still adds value for women, since as in this exercise, although she does not change her behavior at any of the decision-making points, she does expect to benefit from the elimination of the return-to-work search cost by the FMLA when and if she chooses to return—which happens one out of nine times (Node 9) for certain. So there is no doubt that the FMLA in general creates welfare (this woman in the base case is in fact not "immune" from the benefits of the legislation).

But, to find out whether we should expect at least some positive behavioral changes as a result of the legislation with some other women—which might be the goal of the FMLA as well as simply increasing welfare[19]—it appears that what we should be interested in, in order to observe any change in the labor supply or fertility patterns, is the marginal cases, where women's utility expectations are so that she *does* change her behavior in one way or another because of the legislation. And with three decision making points—T_0, T_1, & T_2—the FMLA's impact could be seen in at least three different kinds of ways:

[18] Which means that the decision trees results are identical to Fig. 7, so I do not show the decision trees.
19 Such a goal always sounds suspect to economists, since it could be more of a distortion and deviation away from the equilibrium. However, as discussed in the literature review section, we assume that certain market failures exist from women's difficulty in the labor market, as well as that a positive externality follows from increasing the employment rate as well as leave-taking. I return to these concerns in the concluding remarks.

Firstly, we might observe a change of behavior at T_0 (H>W pre-FMLA, but W>H post-FMLA), which would be a discovery that the FMLA has a positive employment effect by inducing more women to begin working (T_0) *who otherwise would not have at all*. Call these women Type 1.

Secondly, the legislation could induce more women who are already working to take a leave (T_1)—and there would be a "change of behavior" if her characteristics are so that she would not have taken any leave before, but now she does with the protection of the FMLA. Women with such characteristics are Type 2.

Lastly, but most directly, at T_2, we could expect to see more returns to work than before, since the cost of doing so is directly lowered/eliminated by the legislation. If some women, who would not have returned to work without the legislation after their leave, now do, these women have changed their behavior due to the FMLA. This is Type 3.

We will see that the difference between these three different types of women can be broadly characterized as functions of the expected value of career and its volatility. For example, we will see that in general Type-1 women will have the lowest value of career (V/W) compared to other women (accounted for its volatility (or discounted for the lack of thereof)), while Type-2 women generally have the most valuable careers in general, with a potential for a sizable upside with a greater volatility. However, Type-3 women are expected to be a very variable population, for whom generalization is difficult. The comparative analyses of these three types of women will provide some interesting implications that are more subtle and varied than briefly mentioned here, and provide a room for a richer understanding of the legislation.

3. Exercise #4—"Type 1"

Since our initial base case proved itself essentially immune to the FMLA, I have to alter the base case enough to identify characteristics a Type 1 might have. And the characteristics that are shown in Figure 8 produce the behavioral pattern of Type 1. Unlike the base case, here the career's

[Figure 8] V_0 and B_0 for Exercise #4[20]

	105.5 V_u		**110** B_u
98.25 V_0		**100** B_0	
	91 V_d		**90** B_d
Spread :	14.5		20

volatility is lower than the fertility project's. The change of behavior before- and after-the legislation for these women is shown in the comparison decision trees in Fig.9.

In Figure 9, we see that before the effect of the FMLA is taken into account H is larger than W, which means that this representative woman of Type 1 would not have gone to work at all. But after the legislation, she would choose W over H (shown in the red box). Then this representative woman and other Type 1's, will create an upward pressure on the employment rate, which we assumed to be a positive change.

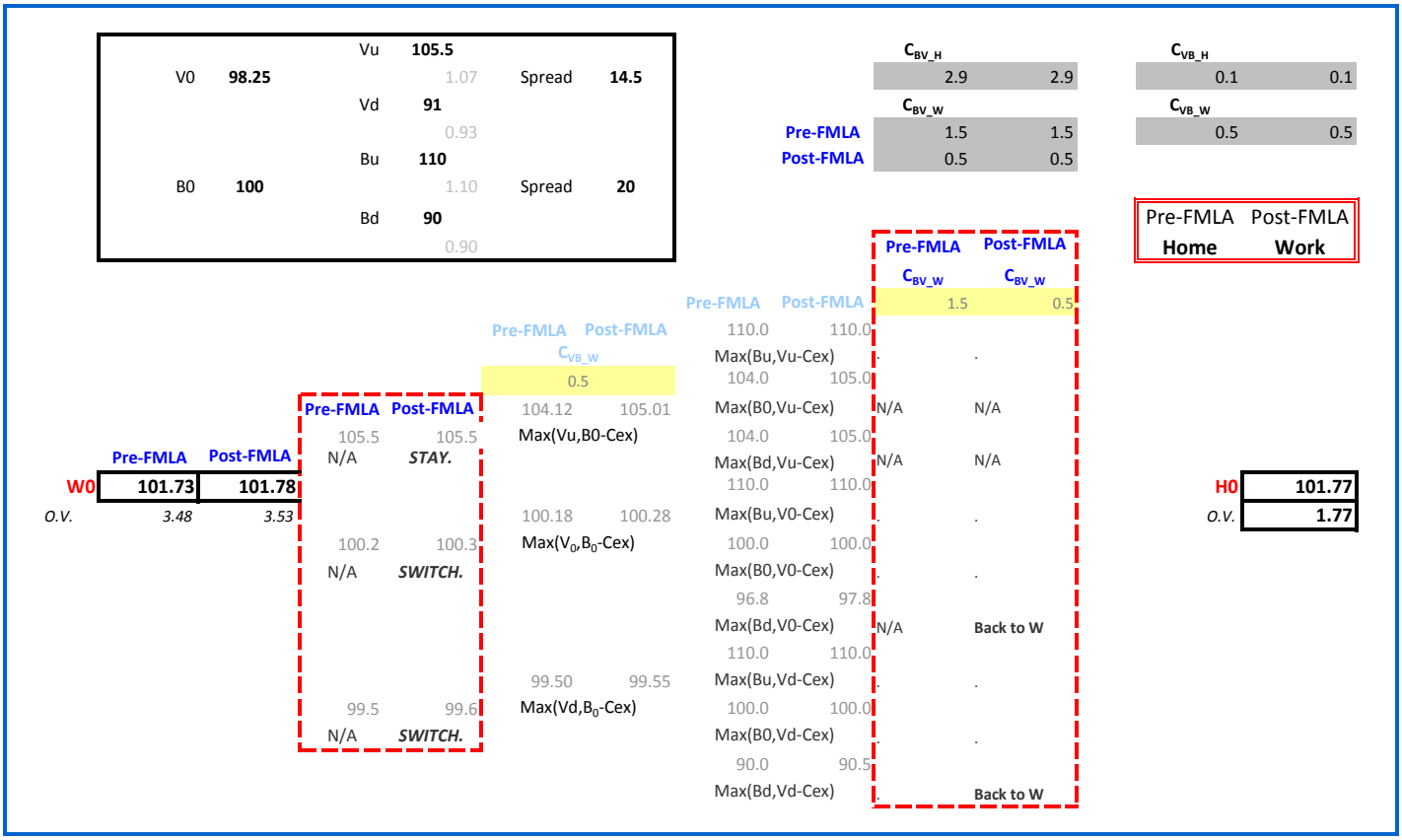
But interestingly, the other way to interpret is that the fertility rate would decrease: women who would have stayed home and have a child (H) are now going to work (W) instead. Taken as a whole, yes, that is the case—but how large the decrease will be depends on whether these women who now chose W over H after the legislation at T_0, would then choose to take a leave at T_1 or not. If she does take a leave, she does not create any change in the fertility rate, since she is having a child just a period later. But if she does not—if she picks "Stay" at T_1—the legislation has definitely moved women away from childbearing to work (this is what happens at Node 1 of Figure 9; refer to Figure 5 for node numbers). This is an ironic result, since we would not expect a maternity leave protection would *lower* the number of women having children. But it is demonstrated that such is a definite possibility—an interesting insight not addressed in the previous literature.

To inquire how much decrease in fertility we might actually expect from Type 1, it is important to remember that these are indeed marginal representatives of women. Holding B constant,

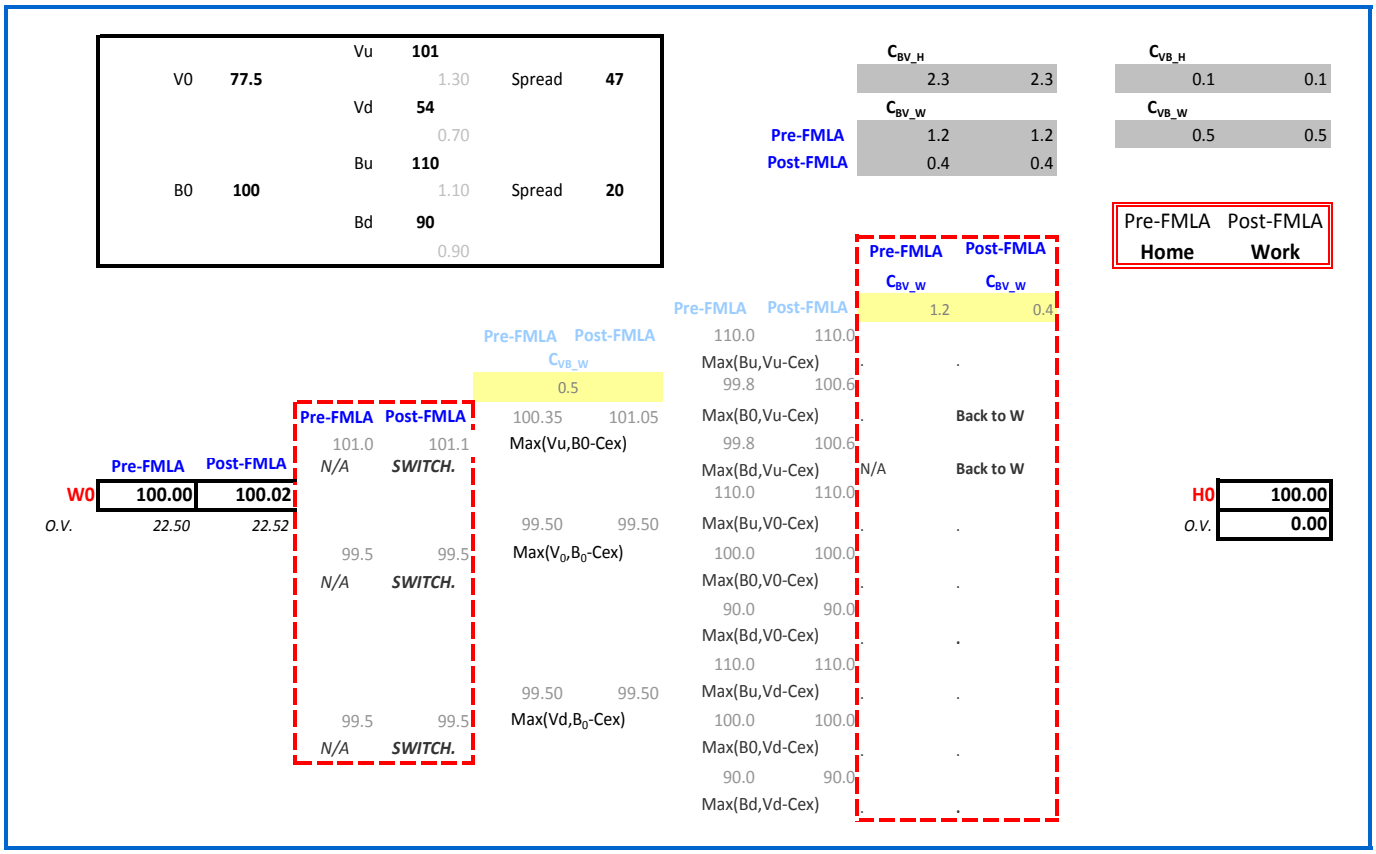
20 I don't bother to show probabilities in my figures anymore ; they are always .33 for all three realizations between T0-T1, and .1 for up- and down-realizations and .8 for no change between T1-T2.

Type 1 women must have career payoffs that are either 1) decent (close to B's, or even a bit higher), but predictable (not volatile) and not high enough to compensate for the lack of volatility (we know that ceteris paribus, the more volatility the more option value added), or 2) volatile, but definitely lower payoffs on average (e.g. the payoffs as in Fig. 10) with which women now change behavior, purely because there is a great upside potential (relatively speaking, since B's payoffs are much larger than V's) added to W by the options, while H is gaining *no* option value (Fig. 10) because the alternative asset is too inferior. So we see "Switch" at Nodes 1~3 in Figure 10 post-FMLA, meaning a woman here who now took W over H (unlike before) is always still going to make a fertility decision.

[Figure 9] Decision Trees for Exercise #4-1: a Type 1



[Figure 10] Decision Trees for Exercise #4: a Type 1 who does not change the fertility



What follows from this sub-categorization is that more women of the latter (more volatile, though relatively lower payoffs from career) would in fact be "better" for the purposes of preserving the fertility rate. Assuming we identify the right compensation for all levels of reduced work volatility for these Type-1 marginal women, then it is obvious that once a low-volatile career woman is moved to switch to W, she is now less likely to leave work *the less volatile it is*, since it would mean she were more highly compensated for the loss in volatility (since it was not the option value but more of the increase in the absolute value of the project that moved her to take W). That is, she is less likely to be induced to switch *again* to H(=B).

So within Type 1, more women with volatile careers would mean more women who try out both projects—by taking W at T_0, then switching to H at T_1, not affecting the fertility rate negatively. Meanwhile, the increase of the employment rate at T_0 is always true with Type-1 women.

4. Exercise #5—"Type 2"

[Figure 11] V_0 and B_0 for a Type 2

	150.5 V_u		**110** B_u
100.4 V_0		**100** B_0	
	50.3 V_d		**90** B_d
Spread:	100.2		20

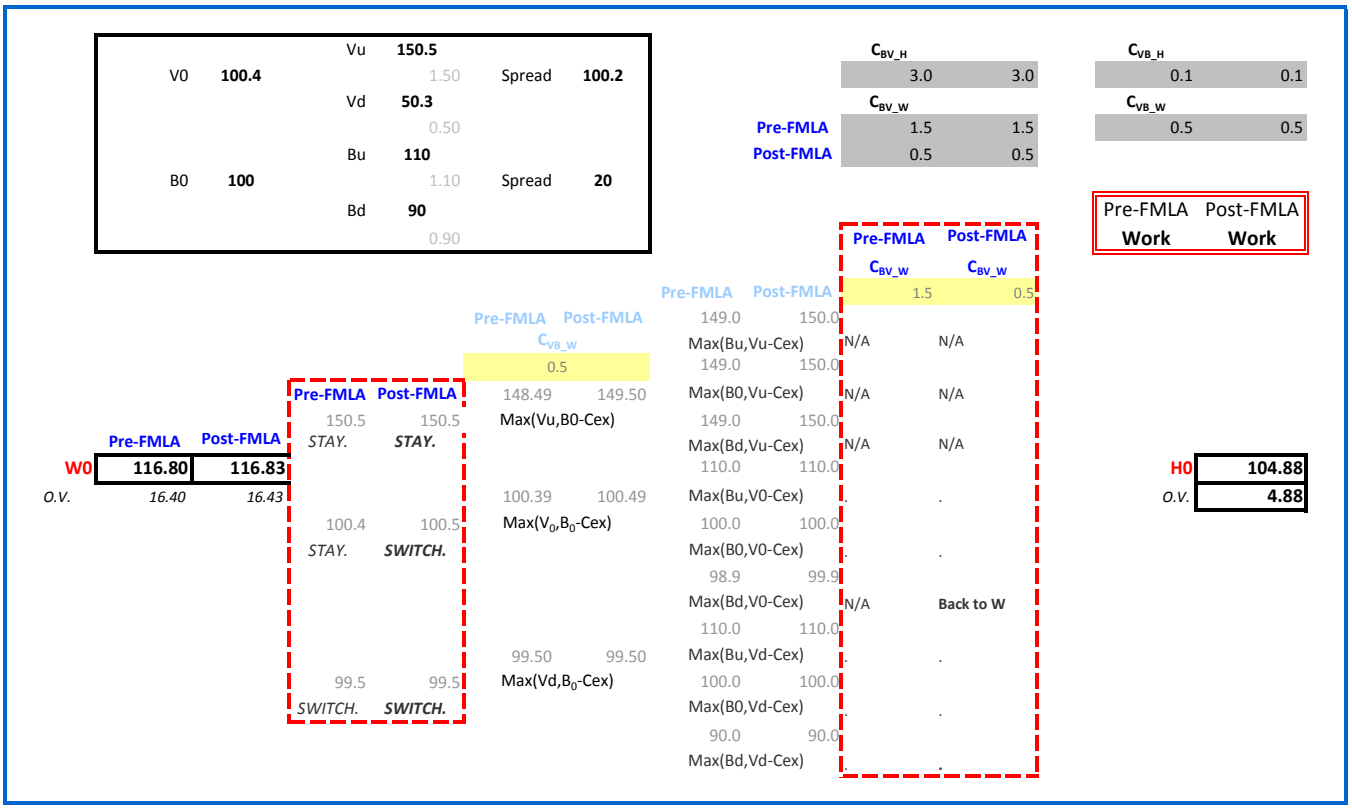
Type 2 is a group of women whose *leave-taking behavior* changes due to the legislation. We see that women of Figure 11's characteristics will not have taken a leave at Node 2 before the legislation. But after the legislation, women will now take a leave, and this behavioral change is shown in Figure 12's Node 2.

What does this mean for the employment rate or the fertility rate effect from Type 2? Firstly, this is a clear, direct increase of the fertility rate. It follows that there will be a "dropping-out" phenomenon in general, that is, the number of women currently at work at any given point in time will be lower since some of them will be now on leave. But however, we cannot say anything conclusive about the change in the employment rate, since those women who are on leave are technically still employed—the decision that will actually have a bearing on the employment rate is not made at T_1, but is merely delayed until the end of the leave.

One might think that this "delay" of a true effect on employment rate should be applied to the analysis just done at T_0 with Type 1 women, too, that we should retract our earlier conclusion that the FMLA clearly increases employment rate for a group of women (Type 1) until we've looked at what those women end up doing at T_2. However, this is not right; the employment rate still goes up at T_0 because at any given point in time, Type 1 women are the new entries to the market, supplying labor when they would not have before.

But to reiterate, with regard to the Type-2 women, although they *are* changing their behavior, they do not affect the employment rate, not yet anyway. Then it seems that in order for us to deduce any effect on the employment rate by these women, we must further subcategorize them to see which

[Figure 12] Decision Trees for Exercise #5 (Type 2)



which of them would contribute to any pressure on the employment rate. And it is clear that if any, the change will be a reduction, since if women who were not going to leave are now leaving, and as long as *some* of them are not coming back, we have an attrition of the labor force due to the FMLA.

But we saw that with Type-1 women, if there were enough volatility, we might observe an increase in one (employment in this case) without necessarily seeing a decrease of the other (fertility). So, is it possible that we can have an increase in fertility rate (which is a certainty for Type 2 as a whole) without any decrease in the employment from at least some of them? It can be already easily inferred that Type-2's careers should in general be more valuable than Type-1's, since before the legislation with the same B_0's Type-1's would not have chosen to work at all, while Type-2 would've chosen to work *and* stay there. But post-FMLA, with some Type-1's whose careers are volatile

enough, they might still have a child a period later (that is, choose the original project she would have chosen earlier without the FMLA) with 100% certainty (Figure 10). So, can we have a similar situation with Type-2 women, that we can have at least some of Type-2's to return to work with 100% certainty after having been induced to leave at T_1 post-legislation?

Here that is not possible. We're expecting to see a node at T_1 with a decision to Switch (to home) followed at T_2 by decisions to Switch (back to work) again at all three nodes that follow—that would be an increase of fertility without any decrease in the employment rate. But here in the options framework it does not make sense, since it means that no new information was ever expected to be gained by taking the risk of switching in the first place; she must have known that work is always more valuable than the alternative, and will see little sense or point it taking the leave knowing W (V) is better.

This result hinges on the modeling design where the tree ends at T_2, as well as the assumption of mutual exclusivity; if it were the case that the value of career with a child at home is larger than the value of career without one (i.e. that the child asset has some value/pays dividends although the woman is not at home, and more than any loss in utility by having to "juggle"), many women will be induced to take leaves with 100% knowledge that she will come back in the end (and this is a highly likely scenario in reality). However in this model it would simply be a waste of switching costs. At any rate, even if the model were improved to do away with the mutual exclusivity assumption, the fact is that Type-2 population as a whole must contribute to a decreasing employment pressure, since at least some of these women are going to find out that staying home is a more advantageous project for her (Node 7 of Fig.12). That is, even if the model were altered to accommodate for the possibility that there could Type-2's who now take a leave with a certainty that working is after all a more valuable project for her (and therefore will return with a 100% certainty), the alteration is irrelevant in terms of how the legislation *changes* the employment rate since those who return are not changing behavior before and after (employed both before-and after. Remember that these are women who

were not going to leave at all before the legislation). So, there will be some decrease in the employment with this population by an amount less than the total number of Type-2 population[21].

5. Exercise #6

5.1. "Type 3"

Now we look at Type 3, which is a group of women who change their behavior at T_2. These are women who would've worked at T_0, then left at T_1, both before and after the legislation came into effect. And before the legislation she would not have returned to work, but now she does.

For these women, the employment result is of course tautological: they increase the employment rate by continuing to participate in the market when otherwise they would not have. There is no effect on the fertility rate, as these are women who all have made a fertility decision already (both before, and after the FMLA) at an earlier period (T_1) than the one we're looking at (T_2).

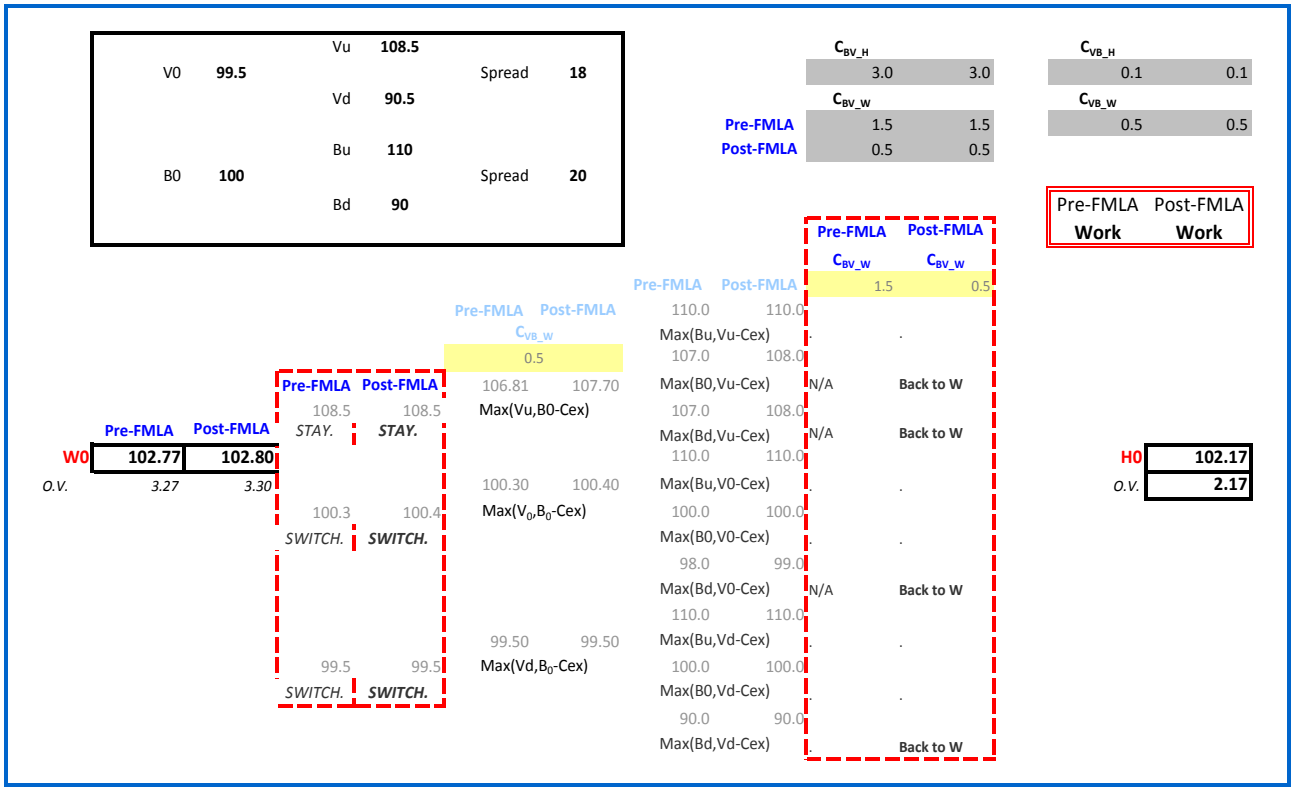
[Figure 12 V_0 and B_0 for a Type 3

	108.5 V_u		**110** B_u
99.5 V_0		**100** B_0	
	90.5 V_d		**90** B_d
Spread:	18		20

Figure 13 shows her behavioral change at Node 12, for example. However, of course, the behavioral change of this type has the highest probability of occurrence, at any of the other T_2 nodes among Nodes 4~12, and what's more, Type-3 women are also benefiting the most from the legislation, since any reduction in the cost by the legislation affect the T_2 nodes one-to-one.

21 The same can be said of the fertility rate analysis of Type 1, that in general there would be some decrease in the fertility created by the legislation since at least some of the Type 1's would have low-volatility careers that make her unlikely to try H(B) at later periods once moved to choose W instead.

[Figure 13] Decision Trees for Exercise #6: a Type 3



5.2. The Compound Aspect of the Model Discussed

The fact that we can expect Type-3 changes to be the most prevalent brings to our attention an attribute of the model that was not discussed in depth before, namely the compound aspect of the options. The second option to switch is of course dependent upon the first option at T_1 to leave (hence why all Type 3 women are leave-takers). The implication is that when valuing the options, as was done here throughout the paper, the second option is in fact the first option—Copeland and Antikarov, in their book *Real Options: A Practitioner's Guide*, introduces the compound options with an example of a multi-phase investment project, and says that "[T]he first option chronologically is the right to buy the second option... it follows that the first chronological option is the second option from an economics point of view because it will be exercised contingent on the value of [the next]

phase. Thus, with sequential compound options the order of economic priority is the opposite of the time sequence (pp178-179)."

The situation in this model is a little more complicated, since there is also a switching aspect to the options. But the switching aspect can be simplified, when understood in terms of the multi-phase investment: the first option in the sense of Copeland & Antikarov's "the right to buy the second option" is in fact the flip side of choosing one project over another at T_0. That is, if a woman chose W over H at T_0, she is in effect keeping the option of buying H open until the next period (T_1), when it expires. And the option to switch to H at T_1 is analogous to exercising that first option to now buy H. But this act of switching to H is in fact also a purchase of another option (hence a compound option)—the option on the "put" on H, which comes with H in this case. That is, the purchase of H comes with the protective put (an asset with an insurance against a certain level of loss). If she were to switch back to W at T_2, it would be the exercise of that put option on H.

This sheds light on the nature of the importance of volatility and its direction. Unfortunately in the exercises done here, I had to set the B's values constant for simplicity and consistency across the exercises for comparison purposes. However, what this compound perspective of the decision-making shows us is that in fact it would be the volatility of the asset *not chosen* (but only upside of it, since the downside is covered) that ultimately determines whether the second option will be exercised—and, as Copeland emphasizes, the second options are at the crux of the investment decisions that are being made, since they are the first options economically.

But this new perspective of understanding our model still relates to our limited findings in a meaningful way, and gives a series of insights worth the final discussion. Firstly, the understanding that the second chronological option is in fact the first economic option supports the claim that there would be more Type 3 women than Type 2 or Type 1 women. In the end, most of Type 1's and Type 2's are just more "extreme" versions of Type 3's. This can be observed by returning to the decision tree charts of the different Types. In Figure 9, where the focus was on the fact that the representative

woman here was moved from H to W at T_0, in fact we can see that there was an unobserved "hypothetical" behavioral change at T_2 of W pre- v. post-FMLA. That is, where the nodes are shown with "N/A" at T_2 are the nodes where she would have exercised the option to return, *if she had to take W before the legislation*[22]. We can observe that there is no indication of any action (no "N/A") at Node 12 of W in Figure 9, meaning that if she were to take W and reached Node 12 pre-FMLA, she would have stayed at home and not return to work. But post-FMLA, we see that she would. So, it is after all a Type-3-like behavioral change implicit in women's expectations that makes her a Type-1 (choose W over H). The same can be observed in Figure 10's Node 6.[23]

So, what we can safely speculate is that in general, there would be more Type-3 women (or to be precise: more of Type 3 behavioral changes) than Type-2 or Type-1's. This, then, also means that we do not ever have to worry about a one-to-one decrease in the fertility due to the FMLA vis-à-vis any increase in the employment. I'm repeatedly making the point that ultimately these women are making those behavioral changes because they expect to return to work at least in *some* states of nature in the future, benefiting from the FMLA, of which frequency would only be increased, not decreased, due to the legislation overall.

[22] Of course, she did not actually, since H was higher than W in that case. W was never activated to begin with.

[23] But this does not always have to be the case. As I've said numerous times, the FMLA can still benefit women without changing her behavior; the accumulated benefit from merely saving charges without changing her investment decisions can still sway her to change behavior at an earlier time without actually having made any difference in the T2 behaviors.

V. Concluding Remarks

In this paper I argued that there are mainly three types of women who would change their behavior under the influence of the FMLA, who, as a group, bear a certain effect on the employment/fertility rate. We saw that with Type 1, there will be a clear increase in the employment while it was a possibility that a decrease in the fertility might not be necessary. With Type 2, there will be an unambiguous increase in fertility and a decrease in the employment rate by a smaller amount. This is because there will be attrition of women who find out that she will actually enjoy more utility by staying out of the labor force. And lastly, with Type 3, there will be an increase in employment rate with no effect on the fertility rate.

It seems, then, whether the FMLA as a whole would/should create an increase, or decrease, in the employment/fertility would depend on the composition of the general female population of child-bearing age by these types. If we were to naively assume that there are more or less the same numbers of each type of women, both the fertility and employment should increase, since the decrease in the fertility with Type 1 or the decrease in the employment with Type 2 are both less than one-to-one with the increase in employment/fertility that also happens with these women, as explained. And what's more, if it were true that Type 3 are the women who most benefit from the FMLA (one-to-one cost-savings), and there are most likely more of them than the other two types, we would hope, and expect, to see a clear increase in the employment rate—since Type 3 increase the employment rate for certain.

Then this brings us back to the very first question posed in the literature review section, the question the policy analysts and policymakers ask themselves: so can we, and should we, employ the employment rate as an analytical, measurement tool on the effectiveness of the FMLA in creating value and welfare for the female population?

However, we already know that there was no significant change in the employment rate attributable to the FMLA from the existing literature on the topic. Then, the present investigation offers two suggestions as to why this might be the case, both of which converging on the same insight as to what might be the most sensible way of assessing the value and efficacy of the legislation.

Firstly, we might conjecture that the lack of change in the employment rate might be due to the fact that there are a significant amount of Type-2 women out there who might be canceling out the increase in the employment by both Type-1's and Type-3's. And we already know that Type-2 women are the ones with the more valuable career payoffs than Type-1's, *ceteris paribus*.[24] This brings us back to the possibility discussed in the literature review section about how American women tend to be more career-oriented; more career-orientation translates into more utility placed in the career project, à la Type-2.

Alternatively, we might recall our very first finding from the introductory exercise after all. Exercise #1 had shown, with its simple model, how if there were no uncertainty to be resolved, the creation of (or the reduction in the cost of) the return option is of no additional value to women than the mere fact that she could leave work anytime she wanted to in the first place. Similarly in Experiment #3, we saw that the FMLA can be valuable to women by simply reducing the expected cost of return *without actually changing* what she will do in any specific state of nature. Both exercises were done on the base case scenario, which assumed that women expect similarly favorable upsides from either projects, but a worse downside from career. If it is possible that the base case is indeed the most conservative, yet realistic, assumption of the average utility expectations for women, it is of no surprise that the FMLA caused very little behavioral change among women—if a woman's work experiences are so that it is clear to her (even without actually experiencing childbearing/motherhood) which investment project would be more valuable to her in the end, her choice to leave at all in the first place probably reflected what her preference and final decision might be. For these kind of

[24] By ceteris paribus, I mean that keeping the B payoff schedule the same, as well as the Vd the same for e.g. at 93.4, to have a Type-1 effect we would need a Vu of 107, while to have a Type-2 effect we would need a Vu of 107.5.

"prescient" women, even when she does come back to work, it was a planned behavior just saying that if the worst possible scenario expected from staying home is realized, even without the FMLA benefits she would return to work (i.e. regardless of the cost of leaving that situation).

Altogether, the present analysis does seem to suggest that the career is probably considered to be a marginally more rewarding investment (hence many women deciding not to jeopardize it pre-FMLA) or at least a significantly more volatile one (revealing the comparative superiority/inferiority of career vis-à-vis having a child with clarity by the time she is deliberating whether to have one), if we are to understand the lack of change in the employment in this framework's perspective.

And if it is true that, as the analysis here suggests, career might be often quite valuable as well as more volatile for many of the childbearing female population making these kinds of decisions, we can make a further conjecture on a very positive note: the general female population might be already enjoying a significant option value, *regardless of the FMLA*. If we remember the very first exercise done with the simple model, where we saw how with a more volatile career that can give clear indications as to whether having a career will be clearly superior or not by the time she has to decide whether to leave, we saw that most of the option value comes from the mere fact that she could leave—not necessarily the fact that she could return. And this option to leave is a natural right that naturally exists[25], regardless of the maternity leave coverage.

Then, we have a new perspective in which to understand the current situation of a lower-than-ideal retention rate, job continuity, and even a lower employment rate overall, which the FMLA is purportedly trying to correct. These are indications that there is a great fluidity in the female labor market, from which women might be benefiting greatly. It might be a double-edged sword, since as the literature suggests, those factors are the drivers of the "family gap" and the gender gap in wages. But, it might be that women are simply enjoying a different kind of utility, the utility from flexibility (i.e. fluidity) in making the life-long investment decision that suits her best.

[25] I avoid a discussion of financial difficulties that might prevent some women from exercising this option, but it is a valid concern.

Even if the theory here as to why there is no change in the employment rate remains a mere speculation, the most basic take-away from the real options analysis of the present paper is that at least we should not rely on measuring the positive value added to women's lives by the legislation by trying to observe any change in their labor-supply patterns, since the legislation's impact on women can vary in the oppositional direction, while still being of value to women in their respective manners. First we saw that unless we are looking at women at the margins, most women would benefit from having the reduced cost of return—because she expects that at least in *some* state of nature in the future to benefit from it—*without* changing her ultimate behaviors (Exercise #3). Secondly, we saw that in general there would be more explorations of the alternative project caused by the reduced cost of switching on return, because it provides insurance value on exploration—and the fact that she might end up with the same project that she would've chosen if she did not explore was shown to be a positive thing, not any lack of value added (Exercise #4, Exercise #5). Lastly, with Exercise #6 where we see more *returns* happening (Type 3), the increase in welfare was the most direct and clear—of which effect is what the most existing literature on the FMLA focuses on. But when recast in light of the compound aspect of the options, we saw that in fact the Type-3-like change can be embedded in the other types of behavior, which simply reinforces the fact that the benefits of the FMLA is distributed over time, having more subtle, complex, and varied influence on the labor and fertility decisions of women than simply increasing their returns. Hence, seeking for a significant change in the total behavioral patterns, especially as measured by the employment rate, among the female population as a whole would be a misguided attempt, missing the point of what the FMLA can truly do for women to increase their welfare.

What I have found in this investigation of the Family and Medical Leave Act's efficacy under the real options framework seems self-evident and intuitive in retrospect, both in the common sense and in the economic sense. The fact that giving women flexibility and time to make a better

investment decision is value-adding to them—even when they seem to be making "counterintuitive", "reverse" decisions such as now choosing *not* to have a baby, or now having taken a leave that otherwise she would not have, or choosing *not* to return to work after all—makes perfect economic sense: people respond to incentives, and if we see people responding and changing their behavior when they were *not forced to,* there must have been positive incentives for them to do so, even if the actions seem counterintuitive to us. Then, the advocates of the maternity policies and benefits—the advocates who, ever since 1993, have been pushing for the expansion of the FMLA partially based on the fact that we need to see an increase the retention rate and employment level—might have to reassess their true priority in that perhaps the low job-continuity caused by more women taking leaves and deciding not to come back could be reflecting the different kind of utility and welfare that each individual is choosing to benefit from, especially if the other investment project (the fertility/home project) suits her better. What's more, we might be exaggerating whatever "counterintuitive" effect that could potentially happen with the population by giving them more time (by expanding the leave allowance, etc) with which they will gain more information and possibly change their decisions in unexpected way. But again, such unexpected, unpredictable changes that any given woman makes might be the most ideal influence we might expect from the legislation—allowing women to try "having it all" by now exploring what she would not have considered before, or at least, choose what suits her better after at least having tried them.

Appendix

[An Account of the Charge Assumptions—Charges as Dividends]

In real life, we know that one reason why women might work for a period of time although she knows she clearly values the fertility project over career is the money she will be making in the meanwhile. This, in terms of the model, would be the fact that if she selects W over H, she will be receiving salary dividends during the time she has that asset.

It is convenient that here our options each last for only one period; the flip-side of this is that the cost of switching into that project *now* by exercising the option (for keeps) is having missed the earlier period's dividend that if she initially started out with that project.

And the cost of switching into that project, by definition, is the "charge" on exercising that option. So I assume that a charge on switching *into* a project should be comparable to a period's worth of dividend from that project, probably somewhat greater, taking into account the friction cost, search cost, etc.

So C_{BV} should be an amount similar to having missed a period's wage, but since there would also be a search cost to seeking employment now after having missed her earlier chance, C_{BV} should be somewhat greater than what can be expected to be one period's wage.

A similar reasoning is applied to determining C_{VB}. And I assume that in the end, the final value of the project (H_0 or B_0) is the sum total of the utility she derives from having owned the project (or the asset) till the end. I assume that a woman making decisions here would work for 30 years if she decides to work, and would live for 50 more years (during which the child remains alive). And I assume the project value to be the sum total of her salary received for 30 years—but since her salary would have grown over time, the initial salary should be less than 100/30=3.33. So I assume 2 for the missed salary of her first period of work, which is 2% 0f V0. This means that C_{BV}—the charge for joining the labor force a period later—should be larger than 2, since there is additional *search cost* to be accounted for as well. So I assume C_{BV} of 3 (hence assuming the search cost of 1%V_0).

What about C_{VB}? It would be lower than C_{BV}, since the dividends from a child are received for a much longer period of time. Also it should be less than 105/50=2.1, if there is any growth in dividends over time as the project value increases—especially with the child asset we would expect a more concentrated payoff in a distant future than during its infancy[26]. So I assume C_{VB} of .5 (0.47% of B0[27]).

Since the FMLA grants an unpaid job-protected leave, it eliminates the search cost in C_{BV}, although C_{BV} is still not 0, since the leave is unpaid (one is still missing a dividend). So I assume that the FMLA makes the C_{BV} of W at T2 to be 0.5(or .5% of V0), a quarter of 2% of V0 after the time adjustment (since the time duration is 12 weeks and not a year).

[26] At least, that is how economics of fertility are often discussed; child as an insurance against one's old age. I considered having a *negative dividend*, or a tax on the asset, to reflect the fact that marital happiness is reported to drop dramatically for many households after a birth of a child in the family. But I just assume a dividend of a very small amount.

[27] But I do also experiment with assigning even lower percentages here.

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