

Proposed Reforms of Marital Institutions*

Scott Drewianka
The University of Chicago

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1 Introduction

One of the most striking aspects of social change over the past few decades has been the trend away from traditional family structures, a transition marked in nations around the globe by decreased rates of marriage and fertility and increasing rates of divorce, nonmarital cohabitation, and extramarital fertility. While there remains disagreement about the sources, costs, and benefits of these shifts, few would argue that they have important consequences for the health and happiness of both individuals and societies at large.

For this reason, persons with many different opinions on the transformation of the family have pondered the relationship between the family and the state. For those favoring the observed trends, the primary concern is how legal regulations governing family structure might be changed to better support the needs of individuals and couples. On the other side, those opposed to the trend away from the traditional family have several concerns of their own, ranging from the fear that the state has caused the trends—either by creating incentives to move away from the traditional family or simply by usurping its functions—to the hope that the public policy may be able to mitigate them.

As a consequence of these contemplations, officials in several nations (and, within the United States, in several states) have recently debated proposed legal reforms for the family. In the United States, most of the reforms and proposals have attempted to stop the shift away from the traditional family. One such proposal is the introduction of a new marital institution, “covenant marriage,” that imposes greater requirements for couples seeking divorce. Arizona and Louisiana currently offer the covenant option, and proposals have been considered in roughly 20 other states. A number of states also require a waiting period between the time a marriage license is issued and the time the wedding may occur in order to give couples time to ponder the commitment they are about to undertake, perhaps filtering out those with the greatest probability of eventual divorce. Another popular measure is the promotion of premarital counseling, with the idea being to equip couples better for dealing with marital conflict. Some states (e.g., Florida, with a number of others considering the idea) do this by offering discounts on marriage licenses to couples who complete “marriage training” classes, others subsidize the provision of such courses (e.g., Oklahoma), others (e.g., Wisconsin) encourage the clergy and others who perform marriages to refuse to marry anyone who has not completed a training

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course, and two (Utah and Florida) even include marriage training as a standard part of the high school curriculum (Belluck, 2000).

Meanwhile, the strategy of much of the rest of the world has been to adapt existing institutions in ways thought to best reflect the needs and desires of couples. In Ireland and Chile, this has taken the form of a debate over the legalization of divorce. The nation of France (along with various municipalities and corporations in the United States) has acted in another direction by recognizing “civil unions,” a new type of relationship involving more benefits and responsibilities than informal cohabitation but fewer benefits and responsibilities than legal marriage. Though designed primarily for homosexual couples, some 40 percent of couples enrolling in the new French institution have been heterosexual (Daley, 2000). Still another approach is that of Sweden and Denmark, which have chosen, in essence, to formalize the cohabitation institution by imposing a number of legal rights and responsibilities for cohabitators (Popenoe and Whitehead, 1999).

All of this legislative activity indicates a good deal of interest in altering the trends in the family, or at least accommodating them. At the same time, the diversity of the plans offered is indicative of either uncertainty about the effects of legislation or variation in their goals.

The purpose of this paper is to clarify the issues under debate. At times this will mean predicting the effects of policies, at other times explaining why the direction of those effects is unclear, and at other times clarifying the different goals that would lead one to favor or oppose those policies. It is hoped that such a discussion will lead to better debate on the goals of public policy toward the family and to legislation that better achieves whichever goals are chosen.

In light of the fact that the effects of many policies will be unclear, the ideal evaluation of those policies would be primarily empirical in nature. Unfortunately, there are a number of strong reasons why an empirical approach is untenable here. The largest problem of all is the fact that there is simply no data to examine—many of the proposed policies are still just mere proposals, not actualized anywhere in the world, and many of those that have actually taken effect did so only recently. Further, many of the key variables here are quite difficult to measure, things like the cost of divorce to individual couples, the marginal benefits derived from additional investments in relationships, and such presumably important covariates like religiosity, compatibility with one’s partner, and social benefits and stigmas associated with certain types of family arrangements. Even if we could measure everything we wanted to measure, we would still face a tremendous endogeneity problem, since individuals’ decisions about their relationships are at least in part a function of both the quality of those relationships and the quality of other potential relationships. Finally, those endogeneity problems would be compounded by the fact that, as Broel-Plateris (1961) shows, parameters that are determined at least in part socially (e.g., the ease of getting divorced) depend upon the number of people who have an interest in those parameters (e.g., the number of couples who want to divorce).

Accordingly, this paper will take a theoretical approach to the problem. One problem with such an approach is that models’ predictions can vary with the axioms upon which they are built. To avoid this pitfall as best as possible, the model presented here will be made as general as possible. Even with this very general framework, the model will predict behavior very similar to that we observe among couples at any point in time, and we will be able to say quite a lot about the effects of proposed policies.

The remainder of the paper is thus organized as follows. The next section of the paper introduces the theoretical model upon which our analyses will be built. Following some discussion about the general features of this model and what they mean for couples and for policymakers, we examine the effects the model predicts for

several of the different proposed reforms to the family institution: changes in the difficulty of ending relationships, changes in the cost of entering relationships, changes in the marginal benefits associated with making greater commitments, training that makes individuals and/or couples “better” at relationships, the introduction of a sub-marital level of commitment (e.g., “civil unions”), regulation of cohabitation (as in Scandinavia), and the introduction of a super-marital level of commitment (“covenant marriage”). In several cases we will find counterintuitive effects, factors which mitigate the success of the policies, and conflicts between different goals that reasonable people might have. We conclude with a summary of the findings and a discussion of the importance of having a clear ranking of goals before making family policy.

2 A General Model of Family Structure Decisions

The model developed here will consider the decisions faced by couples as they form or dissolve relationships. Single persons search for partners, observe the payoff they would receive from forming a partnership with that person, then decide whether or not to form that partnership. If they elect not to form partnerships, the individuals go their separate ways and search for new potential partners the next period.

On the other hand, those couples forming partnerships may choose among several possible levels of commitment and may make any of several different types of adjustments to their lives that would promote the future of the relationship. We shall refer to such adjustments as “relationship-specific investments,” though it should be understood that the term refers to a broad class of behaviors ranging anywhere from having children to buying jointly-owned property to learning about one another’s families and other distinguishing characteristics to altering one’s career path to better accommodate the relationship. Making commitments and investments may require an up-front cost, or costs may accrue if and when the commitment or investment ends (or both). Commitments and investments also provide benefits as long as the relationship remains intact. This could be because the investments are directly productive, because society promotes stable relationships by subsidizing or otherwise supporting relationship-specific investments, or because added commitment induces couples to be more cooperative because it is more likely that their bargaining process will be repeated in the future.

Once a couple forms, the next period the partners’ degree of compatibility changes randomly. This may mean that the fundamentals of the relationship (which could be either psychological factors like passion or economic factors like the “gains from trade” associated with the relationship) change over time, or alternatively that the couple’s compatibility each period is a noisy observation on the “true” level of compatibility to which it reverts. After observing its new degree of compatibility, the couple may decide to dissolve (possibly at some cost that may depend on the couple’s past level of commitments), with the individual partners searching for mates again the following period, or they may elect to remain together. Staying together allows the partners the option of altering their level of commitment to the relationship or their levels of investment in the relationship. The set of feasible commitments from which they choose may or may not depend on their past levels of commitment and/or investment. For instance, a couple can have a second child only after having a first child (ignoring the possibility of twins, of course). The couple then would repeat the decision-making process in the following period.

The assumptions we make about these various factors are rather unremarkable. We hold that more compatible couples receive a higher payoff, all else equal, and that they are more likely than a less compatible couple to be more compatible in the future. Making (or increasing) an investment or a commitment can cause pain

in the future if the relationship sours, but also generates some benefits under the right circumstances. (Of course, why else would anyone voluntarily agree to do something with the potential to cause pain?) We also assume that making some sort of investment or commitment does not cause a couple to lose previously-held options to increase investments or commitments in the future, though they may lose the option to decrease those investments. Finally, and perhaps most controversially, we will assume that different types of compatibility, investments, and commitments do not interfere with one another's marginal effectiveness, but they may increase it.

All of these assumptions seem to describe the situation faced by couples considering family formation. They may also seem almost too barren, perhaps too abstract to imply much at all about behavior. Perhaps surprisingly, we shall see that such pessimism is unfounded. On the contrary, even these few simple principles are sufficient to draw some fairly powerful conclusions about the family formation process.

2.1 Formalization and Notation

More formally, let $\pi \in \Pi \subseteq R^P$ index a given couple's degree of compatibility, and let $I \in Y \subseteq R_+^J \cup \{0\}$ be a J -dimensional vector of the levels of different types of commitment and investment chosen by the couple, with $I = 0$ reserved for the case that the couple does not stay together. Note that this notation does not allow for the possibility that other types of investments may be irreversible, but none of the qualitative results that follow would change at all if we did allow for that possibility; we maintain the reversibility assumption purely for notational economy.¹ Since commitment and investments will behave equivalently in this model, we will hereafter use the two terms interchangeably.

A couple that stays together with compatibility π and degree of commitment I and that chooses alter its degree of commitment to I' receives a single-period payoff given by the function $R(\pi, I, I')$, which is assumed to be bounded over $\Pi \times Y \times Y$. For $I' \neq 0$, we will assume that R is strictly increasing in its first argument and one of the other two, and at least weakly increasing in the other; that the terms are all at least weakly complementary (e.g., the marginal payoff of making an additional investment is at least as great when the couple is more compatible), meaning that R is supermodular in I, I' and has increasing differences;² and at least weakly convex in π . (Linear in π will be perfectly fine.) The cost of the switch from I to I' is given by $c(I, I')$, where we take c to be bounded on $Y \times Y$ and submodular.³ Note that this merely means that the marginal cost of making investment I' is decreasing in the previous level of investment I . For instance, the cost function would satisfy this condition if

$$\text{Example: } c(I, I') \equiv \begin{cases} c(I), \text{ with } c' > 0 & \text{if } I' < I \\ 0 & \text{if } I' \geq I \end{cases}$$

although many other cost functions would work as well.

Couples with past investments I draw their new level of investments I' from some set $\Gamma(I)$. We will assume that both Γ and $\Gamma \setminus \{0\}$ are lattices and Γ is ascending

¹In assuming that couples make decisions, rather than individuals, we are abstracting from intrahousehold bargaining. In essence, we are assuming that couples have sufficient flexibility in their bargaining to ensure that after bargaining both partners agree on the action to be taken.

²A function $f(x, y, z)$ is supermodular in x, y if for all x_1, x_2, y_1, y_2 such that $x_1 \leq x_2$ and $y_1 \leq y_2$, $f(x_1, y_1, z) + f(x_2, y_2, z) \geq f(x_1, y_2, z) + f(x_2, y_1, z)$. It has increasing differences in z if $f(x_2, y_2, z) - f(x_1, y_1, z)$ is increasing in z . If f were a differentiable function, it would have both properties if all cross-partial derivatives were non-negative.

³A function f is submodular if $-f$ is supermodular.

in I .⁴ In essence, this merely says that couples do not lose higher investment opportunities by making some incremental investment. Note that one possibility here is simply that $\Gamma(I) = Y$ for all I , but we adopt the more general notation to emphasize that this is a very flexible framework in which to work.

The cumulative distribution function for next period's compatibility π' for a couple currently having compatibility π and choosing commitment I' is given by $H(\pi', \pi, I')$, where $H(\pi', \pi, I') = F(\pi, \pi')$ if $I' \neq 0$, and $H(\pi', \pi, 0) = 1$ for all π (i.e., the relationship is over if the couple splits). We also assume that $F(\pi, \pi')$ stochastically dominates $F(\pi, \pi'')$ for $\pi' \geq \pi''$.

Singles draw new potential partners from the cumulative distribution function $G(\pi')$. We also allow for a taste for being single (or, if negative, a cost of search), denoted by ζ .

Finally, we will assume that individuals are infinitely-lived (for convenience only, since this does not affect the qualitative conclusions) and discount the future at constant rate $\beta \in (0, 1)$. Define $V(\pi, I)$ to be the discounted expected value of payoffs to a couple with current compatibility π and level of commitment I . For convenience, also define W to be the discounted expected value of payoffs for a currently single person

$$W \equiv \zeta + \beta \int_{\pi \in \Pi} V(\pi, 0) dG(\pi)$$

and to let $R(\pi, I, 0) \equiv W$ (for all I). Then, letting t denote the time at which an observation occurs,

$$V(\pi_t, I_t) \equiv E \left[\sum_{\tau=0}^{\infty} \beta^{\tau} (R_{\tau} - c_{\tau}) \mid \pi_{\tau}, I_{\tau} \right].$$

It is also useful to define the value of choosing a particular new level of investment $I' \neq 0$ as a function

$$J(\pi, I, I') = R(\pi, I, I') - c(I, I') + \beta \int_{\pi' \in \Pi} V(\pi', I') dF(\pi', \pi)$$

In that case,

$$v(\pi, I) = \max \left\{ W - c(I, 0), \sup_{I' \in \Gamma(I), I' \neq 0} J(\pi, I, I') \right\}$$

We are now ready to establish several important results. Proofs are found in the Appendix.

Proposition 1 *The value function $V(\pi, I)$ is increasing and convex in π , strictly increasing over the range where the optimal choice involves the couple staying together, and has increasing differences. Moreover, the value $J(\pi, I, I')$ of choosing option I' is strictly increasing and convex in π , supermodular in I, I' , and has increasing differences.*

These properties are interesting for a couple of reasons. First, the fact that V is increasing means that more compatible couples are better off than less compatible couples. In one sense, this is not at all surprising. However, the result is due only in

⁴A set S is a lattice if for every two elements $x, y \in S$, $x \vee y$ and $x \wedge y \in S$, where $x \vee y$ ($x \wedge y$) denotes the least upper bound (greatest lower bound) of x and y . A correspondence $\Gamma(x)$ is ascending if $x_2 \geq x_1$ and $y_i \in \Gamma(x_i)$ ($i = 1, 2$), then $y_1 \vee y_2 \in \Gamma(x_2)$ and $y_1 \wedge y_2 \in \Gamma(x_1)$.

part to the fact that they are more compatible. More interesting is the mechanism by which compatibility is compounded through the ability to make investments and commitments. Being more compatible now means that a couple is more likely to be compatible in the future. As such, the partners are more likely to want to remain together in the future, so they are more likely to make commitments to and investments in that relationship today. These commitments and investments then further reassure the couple of remaining together by increasing the benefits of the relationship and by increasing the costs of leaving the relationship. Such effects extend the initial advantage of better compatibility, which is why the marginal value of compatibility is increasing in the existing level of compatibility.

That mechanism is what generates the convexity of the value function. Convexity is an interesting property in its own right, since the expected value of a convex function of a random variable is raised by a mean-preserving spread of the distribution of that random variable. In this application, since the value function is convex, everyone will be happier if there is greater variability in compatibility, holding constant the mean of the distribution, whether we are talking about the variability in compatibility with potential partners or about uncertainty about the future compatibility of existing relationships. In short, the increased likelihood of winding up with a high level of compatibility outweighs the increased likelihood of winding up with a low level of compatibility because divorce (or the ability to remain single) limits the losses of unlucky couples. Ironically, this implies that individuals would privately prefer a system in which there is more divorce, provided that the increase arises because of greater unpredictability of individual relationships and not because relationships are of lower average quality. Weighing against this effect, of course, are any the social costs (but not private costs) associated with divorce, but it is nevertheless perhaps surprising that there are any ways at all in which individual welfare could be linked to high divorce rates.

In many ways, the demonstrated properties of the J function are even more interesting, since they lead almost immediately to the following extremely important corollary.

Corollary 2 *The set of optimal choices of investments*

$$\gamma(\pi, I) \equiv \left\{ \begin{array}{l} I' \in \Gamma(I) : V(\pi, I) = J(\pi, I, I') \text{ and } I' \neq 0, \\ \text{or } V(\pi, I) = W - c(I, 0) \text{ and } I' = 0 \end{array} \right\}$$

is an ascending sublattice of $\Gamma(I)$, and both $I^(\pi, I) \equiv \min \gamma(\pi, I)$ and $I^{**}(\pi, I) \equiv \max \gamma(\pi, I)$ are well-defined and increasing in both arguments.*

This result has substantial content. Among other things, it indicates that even when multiple investment/commitment choices are optimal, the maximum and minimum of those choices will also be optimal. Thus, if we make a behavioral assumption that either the maximum or the minimum of the set of optimal choices is always chosen, we will be describing a well-defined function that actually does describe an optimal strategy. Here we will make the assumption that couples choose the minimum of any equally attractive investment decisions, recognizing that our qualitative results would not change at all if we assumed they chose the maximum instead. The main advantage of being so concrete is that it simply allows us to discuss the new level of investment as a specific number, without having to maintain more cumbersome language that better reflects the possibility of indifference.

Corollary 2 thus indicates that the optimal investment choice will be an increasing function of both compatibility and past investments. It thus implies the following:

- Pairings of single persons that form unions are of better quality than those which do not.

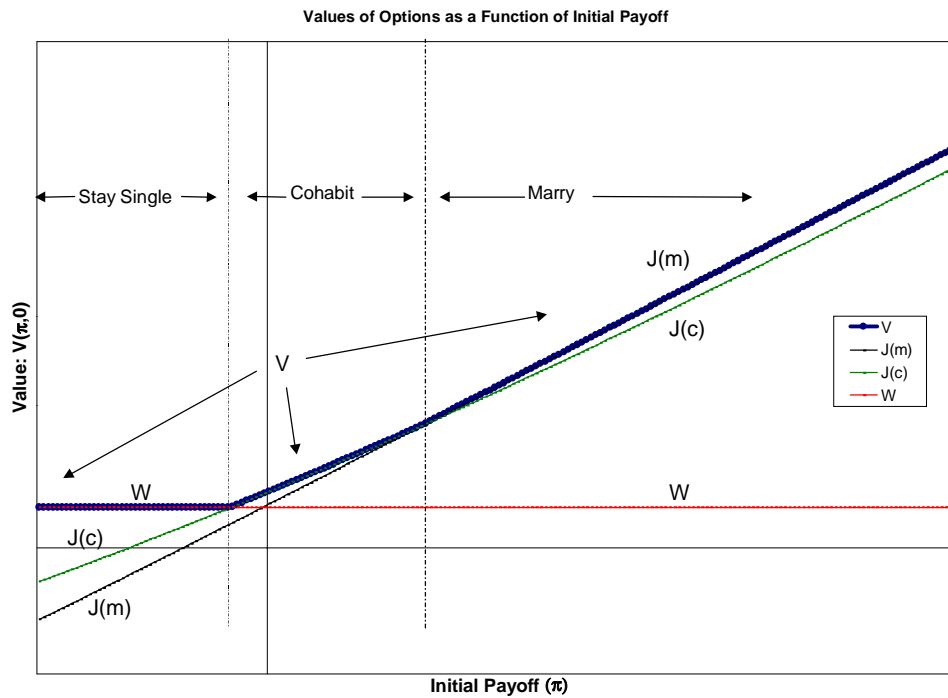


Figure 1: More compatible couples choose greater levels of commitment. This is one (but not the only) source of the value function's convexity.

- Among all new couples, those of better quality are more likely to begin the relationship with more legal commitment—for example, as a marriage rather than a cohabitation. See Figure 1 for a diagram. Such couples would also make other investments (e.g., reproduce, purchase property jointly, and so forth) more rapidly.
- Conditional on relationship status and past fertility, a better quality couple is more likely in a given time period to make additional commitments (e.g., convert a cohabitation into a marriage) and to have additional children, and it is less likely to divorce. By the same token, lower quality couples are more likely to reduce their reversible commitments.⁵
- Conditional on relationship quality, couples with more children or other existing commitments are more likely to formalize an informal union and less likely to separate.
- Similarly, conditional on relationship quality, married couples are more likely to have additional children than non-married couples.
- Accordingly, relationship quality, commitment, and investments (e.g., fertility) all increase the expected duration of a marriage, particularly in combination with one another.

⁵Johnson and Skinner (1986) discuss women's labor supply as a function of relationship quality. Arguing that specializing in household production is an investment in a relationship (because it promotes the relationship at the expense of an individual's career), they predict that less specialization will occur when marriages turn sour. They find empirically that women increase their labor supply in advance of divorce.

Given the generality of the model that yielded these predictions, it is perhaps not very surprising that all of them are consistent with the available empirical evidence. In the past, many people attributed these differences in behavior to differences in tastes, arguing, for example, that persons in relationships of poor quality choose cohabitation are often social misfits of one variety or another, and they are more likely to cohabit because they have a relatively strong taste for cohabitation. We are saying here that if social misfits are more apt to choose cohabitation, it is because their relationships yield lower benefits than the relationships of others, which makes sense in light of the argument that individuals who do not match up well with their peers would seem less likely to match up well with a potential partner either. More generally, what this analysis shows is that we need not rely upon hypothesized psychological differences to explain the pattern of behavior we see, since those patterns emerge directly from the technology of commitment itself.

2.2 An Aside about Excessive Optimism or Pessimism

It is also tempting to claim that these predictions also accord with our intuition. The statement is probably true for some in the audience reading the paper, but that is less clear for the population at large, much of which appears to view many of these decisions as the result of “mistakes” on behalf of couples. Much of the rhetoric about divorce takes this form: some argue that divorce (and, similarly, cohabitation) is evidence that individuals and couples fail to recognize the benefits provided by formal marriage, while others cite divorce as evidence that couples overestimated the benefits of marriage in the first place. Yet here we have said nothing about under- or overestimating benefits, costs, or probabilities, and yet we still see the potential for divorce and a wide range of other behaviors.

That said, the model has something in common with both theories. As those on the right argue, marriage in this model does provide more benefits than cohabitation or casual dating, marriages are less apt to dissolve than cohabitations, and ending them is costly. However, these features do not necessarily mean that divorce is always suboptimal. Though marriage itself does provide benefits, divorce can occur when a couple is no longer sufficiently compatible to sustain the relationship. In such a case, the fact that the relationship ended, per se, does make the couple worse off—but they are still on the net better off because they were so incompatible with their partner. In a sense, this is akin the message of those on the left, who claim that divorces occur because they is preferable to continuing a miserable relationship. Yet it is not the institution of marriage itself that wrecks the relationship and makes people miserable, but rather the poor quality of the relationship itself, which may not have been the case in the past.

Similarly, cohabitants here do realize that marriage would give them better benefits now and would give them incentives to make additional investments that would give the couple a better chance of surviving. Nevertheless, their currently low level of compatibility makes them fear that the relationship will eventually dissolve, in which case they would be worse off for having made additional commitments now.

That said, there is no reason whatsoever that we could not reinterpret the model here to include misinformation—for instance, a pre-investment over- or underestimate of the marginal payoff or costs associated with making additional investments, followed by a true cost or benefit that emerges after the investment decisions are made. The outcome of such a model would be quantitatively different from the interpretation stressed above, but not qualitatively. For instance, there would be two kinds of people who marry, those who are quite compatible and those who overestimate the marginal benefit of the marriage commitment. Those who overestimated these benefits would then be more apt to make initial investments in the

relationship, but compared to other couples making the same level of investment, they would be more apt to divorce. Similarly, those underestimating the benefits of marriage would be less likely to marry in the first place, perhaps choosing instead to cohabit. With a lower degree of commitment and a more pessimistic view of the future of the relationship, such a couple would invest less in the relationship, making it less likely to survive than it would be had its initial impression been correct. Nevertheless, insofar as commitments are made, they are likely to yield benefits exceeding what had been expected, so pessimistic couples would be more apt to be surprised at how well their relationships worked out—even though those relationships could have worked out even better had the couple’s initial impression been more accurate.

None of this is meant to suggest that stories based on “mistakes” should be viewed as especially attractive. As the paragraphs above suggest, the implications of the model do not require us to believe in incorrect beliefs about benefits and costs. It is also a little hard to swallow the idea that the same mistakes are made repeatedly—it is not as if marriage, divorce, and cohabitation are uncommon amongst the relatives and peers of most people in society. Nor is there much hope of empirically distinguishing a model based on mistakes from one based on decisions under good information, particularly given that many factors affecting couples’ compatibility with one another are well beyond the statistician’s reach. Finally, most of the public policies in question do not seek to educate people about the benefits and costs of different types of relationships so much as they attempt to change those benefits and costs.

Nevertheless, those readers intent on viewing these issues in terms of mistaken beliefs can take heart in the fact that their ideas fit reasonably well into this framework and yield qualitatively similar predictions. Even the policy analyses that follow will not depend on the correctness of couples’ beliefs, except insofar as the couples correctly recognize the direction (but not necessarily the magnitude) of the change in the attractiveness of different levels of commitment generated by particular policies.

2.3 A Reasonable Specification of Costs

Now that we have established that investments and commitment move in tandem, we will focus just on commitments, bearing in mind that investments will respond similarly. This focus is justified primarily by the fact that commitments are the most natural aspects of relationships to observe, as well as the easiest. Furthermore, the proposed family policies we will examine in the next section are primarily designed to alter either the types of commitments that individuals are allowed to make or the relative attractiveness of those different types of commitments.

This focus will also enable us to modify our model to reflect an odd stylized fact about commitment that is not always applicable to other forms of investment: couples almost never reduce their level of commitment unless they actually end the relationship. It is extremely unusual, for instance, for a married couple to divorce for the purpose of cohabiting, save for a few odd cases in which (contrary to our assumptions above) formalizing the relationship actually lowers its payoff to the couple. This might happen, for instance, if one partner is financially irresponsible, in which case marriage would jeopardize the income of the other partner as well.⁶

As it turns out, by imposing a few more restrictions on the cost function c , we can

⁶Another possibility is exemplified by a famous case involving pop music icon Prince and his wife, who divorced but continued living together in an apparently cooperative fashion. In their case, the motive for the change in status was said to be a sudden extreme philosophical opposition to long term commitments that arose from an ongoing dispute with a record company with which the artist had signed a long term contract.

predict that commitment does not decrease until the relationship ends. Specifically, suppose that it is defined as follows:

$$c(I, I') = \begin{cases} k(I) & I' < I \\ 0 & I' = I \\ q(I, I') & I' > I \end{cases} \quad (1)$$

where k is strictly increasing, q is submodular and increasing (possibly weakly) in its second argument, and $k(I) \geq q(0, I)$ for all I .

Strange as this function may appear, it is actually a fairly reasonable specification for the costs of switching from one type of relationship to another. Those who do not switch pay no costs. Those switching to less committed form of relationship pay a fixed cost for breaking the commitment. Meanwhile, those increasing their level of commitment continue to pay a cost for making the new commitments which is at least weakly increasing in the new level of commitment, albeit possibly less steeply for those with higher initial levels of commitment. The condition that $k(I) \geq q(0, I)$ simply means that it is more costly to terminate a commitment than it is to enter it in the first place.

It is straightforward to verify that the specification of c in Equation 1 continues to be submodular. The following result is also fairly easy to establish (see the Appendix for proof):

Proposition 3 *If the cost of switching from one type of commitment I to another I' is given by Equation 1, then couples never find it optimal to lower their level of commitment without ending the relationship.*

This result is somewhat interesting in that it demonstrates that the observed pattern of non-decreasing commitments (except when relationships end entirely) is the natural outcome of a model that remains quite general. Of course, we could have obtained the same predictions simply by putting restrictions on Γ —specifically, denying couples the right to lower their level of commitment without separating entirely—but this would seem a natural description of the costs and options couples actually face.

Either way, regardless of how we rule out the empirically irrelevant transitions from more- to less-committed relationships, doing so will be quite helpful for the policy analyses that follow in the next section.

2.4 The Effect of Altering the Attractiveness of Marital Institutions

We now turn to the task of analyzing policies that alter the relative attractiveness of different levels of commitment. The first order of business here will be to outline some general principles about the effects of such policies. Then, in the next section of this paper, we will apply general lessons learned here to several realized or proposed reforms to the legal status of the family, including those to raise or lower the costs of divorce or entry into marriage, those to raise the marginal benefit of commitments, and those that create new types of commitment.

The strategy used here will be to propose a policy change that affects the marginal benefit or cost of only one particular level of commitment, then explore the ways in which that change affects the relative attractiveness of other levels of commitment. There are three main ways in which a particular type of relationship can be made more attractive: we could raise the marginal benefit associated with that level of commitment, lower the marginal cost of entering that type of relationship, or lower the cost of ending that type of relationship.

Examples of each of these methods exist among the mentions by those seeking to make marriage relatively more attractive than cohabitation. Proposals to create a tax code more favorable to married couples would increase the marginal benefit of being married, while plans to reduce the cost of a marriage license or streamline the procedure for marriage would lower the cost of marrying. No fault divorce laws can make marriage more attractive by reducing the cost of divorce, thereby lowering the risk involved in marriage. Still other proposals work by making nonmarital cohabitation less attractive, either by lowering the benefits of cohabitation (for instance, the old laws prohibiting unmarried persons from acquiring contraceptives) or by increasing the cost of ending such a relationship—for instance, by making such couples register the dissolution of their relationship with civil authorities.

We will not initially concern ourselves with the distinctions between these various methods of altering the appeal of one type of relationship. Even so, the method used does make a difference in the effect of the policy. Ignoring only for the moment their effects on the relative merits of different types of relationships, these methods operate at different times and on different couples. Raising the marginal benefits of a particular type of relationship simply makes that type of relationship more attractive all around. Presumably this would recruit into that type of relationship both couples who would otherwise have made fewer commitments and couples who would otherwise have made greater commitments, and once couples enter that type of relationship they would appear less apt both to dissolve the relationship and to make additional commitments. On the other hand, reducing the cost of entering a relationship lowers the barrier for entry, so the primary effect is likely to induce some lower quality couples into that type of relationship, with little effect on any couple that has already entered the relationship. Reducing the cost of terminating the relationship also attracts some less compatible couples into that type of relationship, but it does so by making them (as well as any other couples already in that type of relationship) less committed than before. On the other hand, reducing the marginal cost of additional commitments in the future attracts couples interested in making additional commitments, quite possibly increasing the population in that type of relationship primarily by drawing away couples which would have made those additional commitments had the policy remained constant.

Yet in addition to these primary mechanisms, altering the attractiveness of one type of relationship also affects the relative attractiveness of other types of relationships because making more or fewer commitments now affects the relative likelihood that the couple would be able in the future to partake of the increased benefits of the altered type. Consider, for example, a world with three kinds of relationships, call them dating, cohabitation, and marriage, and the option to be single. Suppose now that dating became relatively more attractive than before, for whatever reason (e.g., a decrease in supervision of dating couples). The immediate effect is obviously to raise the attractiveness of dating relative to the other three options. However, in addition, singleness is also more attractive than before (though not as much as dating is) because potential relationships may involve dating, which will be more attractive. Married and cohabiting couples are also happier, but only because their opportunity cost has risen—that is, because they will have better alternative options in the event that their relationships end. Thus, the relative attractiveness of singleness grows by more than the relative attractiveness of either marriage or cohabitation, meaning that both types of relationship are now more likely to end. Additionally, since cohabitations are more likely than marriages to end (Proposition 2), so the change raises the attractiveness of cohabitation relative to marriage, even as both are falling relative to dating and singleness.

To see such effects formally, it will be useful to place additional restrictions on our assumptions. In essence, we will employ a continuum of relationship types, with payoffs and costs differentiable in all of their arguments, and we will introduce a new

parameter indexing the policy we wish to change. This modification is a departure from reality, where discrete types of relationships would seem more appropriate, but we do so in order to use the standard tools of calculus to analyze the effects of the policy shift, which are more useful here because the parameter in question will often affect the decision rule in a non-monotonic fashion.

Formally, assume that for all I , $\Gamma(I) \setminus \{0\}$ is a compact subset of R_+^J , that R , k , and q are differentiable in all arguments (for $I' \neq 0$ in the case of R), and that the policy change raises some parameter x that makes levels of commitment marked by $I \in I_c \leq I < I^c$ more attractive than before by a constant amount, either by increasing the payoff or lowering the cost of entering that relationship. For concreteness, suppose that if the policy works by increasing the benefits of relationships with commitment on that range, then we define

$$R(\pi, I, I', x) = R(\pi, I, I') + h(I, x), \text{ where } h(I, x) \equiv \begin{cases} x & I_c \leq I < I^c \\ 0 & \text{else} \end{cases}.$$

We can make obvious similar definitions for $q(I, I', x)$ and $k(I, x)$ to study the effects of policies affecting the costs of entering and exiting certain types of relationships. For technical reasons, we also add the following assumptions: $\lim_{\pi \downarrow \pi^*(0)} I^*(\pi, 0) = \varepsilon < I_c$ (i.e., the minimum level of investment available to new couples is less than I_c), $I \in \Gamma(I)$ for $I \geq \varepsilon$, $-\int F_2 d\pi' \leq 1$, and $G(\pi')$ stochastically dominates $\lim_{\pi \downarrow \pi^*(0)} F(\pi', \pi)$.⁷

Using this formulation, we can show the following:

Proposition 4 *Suppose a policy change raises the attractiveness of levels of commitment I such that $I_c \leq I < I^c$. Then all of the following are true:*

1. *Everyone is privately better off than before the policy change.*
2. *The welfare of couples already having investments $I \geq I^c$ does not rise as quickly as that of single persons. Accordingly, such couples become less likely to make additional investments and more likely to end their relationship.*
3. *Couples having investments $I < I^c$ and considering raising those investments to $I' \geq I^c$ will now have less incentive than in the past.*

The intuition for result (1) is straightforward. (Full proofs of all parts appear in the Appendix.) Everyone still has the same options as before, only now there is at least some small possibility of receiving a higher payoff than before. Of course, this only means that everyone is better off *privately*, since many of the concerns about changes in the stability of families focus on the *social* costs associated with instability. The intuition for results (2) and (3) are essentially the same as for the example discussed earlier.

Less clear is the effect of the policy change upon couples with $I < I_c$. There are two different ways in which such couples might obtain the new marginal benefits associated with the change in policy. On one hand, the couple could receive the new benefits by making greater commitments now, or at least eventually in the future. Alternatively, the couple could break up and look for new partners, with

⁷The last of these assumptions is perhaps not as strong as it might appear, and in fact a much weaker condition would suffice. Under the plausible specification that $R(\pi^*(0), 0, \varepsilon) > c(0, \varepsilon)$

+ $\beta \int [v(\pi', 0) - v(\pi', \varepsilon)] dF(\pi', \pi^*(0))$ (which as $\varepsilon \rightarrow 0$ merely indicates that the initial flow of benefits is positive for couples marginally willing to be couples), it is necessarily true that $\int v(\pi', 0) dF(\pi', \pi^*(0)) < \int v(\pi', 0) dG(\pi')$. Stochastic dominance adds to this the stronger condition that the same would be true if any increasing function were substituted for v . Yet if this is objectionable, note that proofs to follow will require only that the integration condition hold for the specific increasing function $\frac{\partial}{\partial x}(v - h)$.

whom they might be sufficiently compatible to make the newly-more-attractive level of commitment optimal. For instance, if policies increased the benefits of legal marriage, a dating man and woman might choose to make greater commitments today in order to increase the likelihood that they would eventually marry, or they might decide that they are unlikely ever to marry, in which case it may be relatively more attractive than before to end the relationship and search for new partners with whom they are more compatible.

In spite of these conflicting incentives, adding a few more assumptions to our model will allow us to say something substantive about which couples find it more attractive to invest more than before and which couples find divorce a more attractive alternative.

Proposition 5 *Assume that either (A) $R(\pi, I, I', x) \equiv R(\pi, I, I') + h^1(I, x)$, (B) $k(I, x) = k(I) - h^1(I, x)$, or (C) $q(I, I', x) \equiv q(I, I') - h^2(I, I', x)$, where*

$$h^1(I, x) \equiv \begin{cases} x & I \in [I_c, I^c] \\ 0 & \text{otherwise} \end{cases}$$

and

$$h^2(I, I', x) \equiv \begin{cases} x & I \notin [I_c, I^c], I' \in [I_c, I^c] \\ 0 & \text{otherwise} \end{cases}.$$

Then

1. For each case above, for couples with unaffected levels of I ($I \notin [I_c, I^c]$), the standards for maintaining the relationship for another period are raised (making divorce more likely).
2. For cases (B) and (C) above, Part 1 is true for all couples, whether or not their current level of commitment is directly affected by the policy change.
3. The optimal new level of investment I^* either decreases or rises to some $I \in [I_c, I^c]$; if the latter occurs at (π_1, I_1) , then it does for all $(\pi_2, I_2) \geq (\pi_1, I_1)$ such that $I^*(\pi_2, I_2) \leq I_c$.

The intuition for Proposition 5 is as follows. Case (A) corresponds to increasing the flow of benefits associated with some level of commitment, case (B) to decreasing the cost of ending a relationship having some particular level of past commitment, and case (C) to decreasing the cost of entering a particular type of relationship. Now consider a couple on the margin between staying together and splitting with $I < I_c$. Such a couple will not wish to increase its level of investment, so there is no chance that the policy change would increase the couple's payoff either this period or next. In addition, the members of the couple are more likely to find partners with whom they would optimally choose the improved level of commitment by splitting up and searching for new partners than by staying together.⁸ Accordingly, the policy shift raises the value of the option to separate more than that of the option to stay together. This would even be true for couples already having $I \in [I_c, I^c]$ under cases (B) and (C); in (B), the policy explicitly lowers the cost of splitting up, while in (C) a couple already having $I \in [I_c, I^c]$ has already paid the entry cost affected by the change in policy. (Conversely, in case (A), such a couple will not have an additional benefit for staying together.) In addition, the higher risk of separation lowers the incentive to invest in existing relationships. Weighing against the increased risks are the new benefits (or lower costs) associated with the new

⁸This is due to the stochastic dominance of G over $F(\cdot, \pi^*(0))$, which in turn implies that G stochastically dominates $F(\cdot, \pi^*(I))$ for all I .

policy. The risks are most relevant for couples currently considering separation most seriously, while the benefits are most relevant for couples who would have considered most seriously a level of commitment similar to those affected by the change in policy.

Propositions 4 and 5 tell us quite a bit about the effects of policies that change the relative attractiveness of different types of relationships. Many proposed reforms, however, involve adding new types of relationships—for instance, the “covenant marriages” established in Louisiana and Arizona and the “civil solidarity pacts” available in France. Fortunately for us, creating new types of relationships can be alternatively described as raising the relative attractiveness of those types from an initial level so low that no one chose them. Thus, Proposition 4 is relevant in these cases as well.

Before moving on to more concrete policy applications, we stop to point out one more general principle that should guide policymakers: those couples altering their behavior in response to a change in the legal regime will be couples only marginally attached to a given type of relationship. In one sense, this is almost tautological—of course those people on the margin will be those most apt to change their behavior. Nevertheless, in spite of how obvious this point may seem, it often points to limits on the effectiveness of policies. For instance, a policy that recruits cohabitants into marriage succeeds only in adding couples who are marginally willing to be married. Such couples are presumably more likely to split than other married couples (though more likely to remain together than when they were cohabiting, as per Proposition 2), so some fans of marriage may see this as something of a pyrrhic victory—more couples are marrying, and the aggregate rate of separation among all couples would be lower, but these gains would come at the expense of increasing the rate of legal divorce. Whether one views this favorably or not, it should be clear that the marginal nature of couples changing their behavior will often put competing goals at odds with one another. Consequently, one of the most important lessons to take from policy analyses to follow is the importance of having clearly defined preferences over the many conceivable goals we might have.

3 Policy Comparisons

3.1 Altering the Cost of Divorce

Perhaps the most widely discussed policy proposal regarding the family is the reform of divorce laws. Many in the U.S. advocate stricter divorce laws, in some cases because they believe the growth divorce between 1965-1980 was caused by the institution of no-fault divorce laws. (Early empirical work by Broel-Plateris (1961), however, found that the trend toward more lenient divorce laws was caused by an increased demand for divorce, rather than the more commonly assumed converse.) Proposed changes include mandating counseling for divorcing couples, increasing the legal requirements of couples seeking a divorce, and imposing restrictions on the migration of divorced parents.

Since the majority of costs associated with divorce are presumably social and psychological in nature, and thus not easily measured, it is not clear whether any of these measures would mark a major increase in the cost of divorce. That said, people proposing these reforms seem to think that they would have a meaningful effect on behavior, so let us proceed under that assumption to investigate the qualitative effects of such a reform.

For couples already legally married, the increased cost of divorce would obviously serve to decrease the incidence of divorce, and the decrease in the divorce rate would be further exacerbated by some increases in relationship-specific in-

vestments. However, for couples not already married, the increased cost makes marriage a riskier proposition, so they would be less likely to commit to marriage in the first place. The effect of the policy upon the distribution of sub-marital levels of commitment is not entirely clear, though there will likely be at least some flight to relationships involving less commitment (e.g., some couples may decide not to move in together in the first place). All of the couples choosing less commitment than they otherwise might would then make fewer relationship specific investments, and those relationships would be increasingly likely to end in separation. Thus, even though the divorce rate among married couples would fall, the overall separation rate among couples could conceivably rise. Those married couples that do divorce may have more children than they otherwise might. On the other hand, the reduction in commitment among non-married couples lowers the number of children per pre-marital separation. It is not clear whether the number (or the percentage) of children affected by instable relationships would rise or fall.

In other countries, the debate is opposite to that of the United States. Specifically, nations that have previously prohibited divorce are now starting to allow divorce. Ireland, for example, has recently elected to allow divorce, and Chile is considering a similar move. Of course, even where divorce has not been allowed, some relationships have always ended prior to death, so in one sense *de facto* divorce is not entirely new to these countries. Still, formalizing divorce has several advantages for couples. For one thing, legal divorce frees individuals to form new legal relationships with other people. Another important feature of formalized divorce laws is that they provide an orderly framework for the dissolution of the relationship, procedures to determine the division of property and the custody of children. In the absence of such a framework, these sorts of disputes are often particularly difficult to settle because, unlike negotiations in ongoing relationships, cooperation is not supported by the ability to punish violators in future interactions—and perhaps more importantly, divorcing individuals often evoke strong negative reactions in one another. Accordingly, even though informal divorce has always existed, formalizing the divorce process likely goes a long way toward lowering the effective cost of ending a relationship.

What are the effects of creating divorce law? Based on the analysis above, it seems straightforward to say that the qualitative effects are the opposite of those predicted for the thought-experiment in which the cost of divorce were increased. That is, writing a divorce law not only increases the measured divorce rate (it literally could not be otherwise), but also increases the actual rate at which marital relationships end. This will be especially so early on, as couples who had been staying together only because of the difficulty of divorce are suddenly able to end their bad marriages.

In addition, the ability to divorce puts a limit on the extent to which individuals can be “stuck in a bad marriage,” making marriage a relatively more attractive institution to unmarried persons. This effect will induce more people to marry. These new entrants will be more apt to end their relationships in the future than their predecessors were, but less likely than they themselves would have been had they not married. Further, at least some of the better-quality non-married couples will make additional investments that will make their relationships more stable. However, those same investments increase the losses in the event that the relationship does end.

In short, we cannot say much for certain in this case, except for the obvious prediction that the divorce rate will initially rise above the previously-existing informal divorce rate. After a while, the divorce rate would then fall, though not necessarily below the initial level of informal divorce. Other than that, it is unclear whether the overall dissolution rate among relationships rises or falls, whether more or fewer children are involved in such breakups, or whether the steady-state fraction of the

population which is married increases or decreases.

3.2 Altering the Cost of Getting Married

A second popular proposal involves altering the cost of getting married. Most of the time such a recommendation involves raising that cost, for instance by mandating that couples complete some sort of premarital counseling prior to the wedding, or perhaps simply by requiring them to wait for a specified period of time between obtaining a marriage license and the wedding itself. Many religions, for example, insist on counseling sessions before a wedding may be performed by the clergy, and even some governments have begun to adopt this approach.

The thinking behind this policy is at least partially correct; such a move would indeed cause some couples to contemplate the commitment they are making, with the least compatible couples deciding not to wed. In addition, this proposal would make marriage somewhat less attractive to unmarried persons—particularly to those who would resent an interloper passing judgement on their relationship—so all of the effects above would apply, with the most important effect probably being that some couples now elect to cohabit rather than bear these new costs. Both of these effects reduce the legal divorce rate later on, since some of the least promising couples are screened out in advance. However, they also raise the rate at which marginal relationships end because such couples now do not make as much commitment as before.

3.3 Premarital Education and Counseling

Aware of the difficulties listed above, some states have chosen to promote premarital education and counseling without actually making it a requirement for marriage. These policies take two main forms. Several states and many major religions simply subsidize premarital education, often reducing marriage license fees for couples who agree to take a course. Two states (Florida and Utah) have recently adopted a different approach, instituting a slightly different plan in which all high school students are taught skills designed to raise their ability to conduct relationships generally.

In the places where such training is subsidized, but not required, couples only need to take the training if they want to. Thus, subsidizing this sort of education actually lowers the cost of marrying for couples willing to take this training, and does not change the cost for couples unwilling to take it. It is rather unlikely that the reduction in costs would have a large direct effect on behavior, however, since these changes in the direct costs of marrying would seem to constitute only a minor change in the cost of marrying—especially considering the many thousands of dollars couples often spend on the wedding and surrounding events (engagement rings, receptions, honeymoons, and so forth).

Of course, that is not the main reason that anyone wants to subsidize premarital counseling. Rather, the main goal is to promote the future of the relationship. The analysis of this effect will depend a little on how we describe such an effect in terms of the model, but best way is probably to consider the training a subsidized (or mandated) relationship-specific investment. As with any such investment, it would increase the benefit from remaining in that relationship, thus encouraging other investments and lowering the probability of eventual divorce.

What is less clear is the extent of this effect. The subsidies given by states are small—typically around \$50—so we might reasonably conclude that couples who would take the counseling only when it is subsidized do not view the counseling as very valuable relative to what it requires them to sacrifice in terms of time and privacy. Insofar as such couples are correct, these subsidies would not yield much

benefit, though they could still be efficient if the social cost of divorce were high enough. That said, a more likely explanation for the popularity of these subsidies is that states feel couples systematically underestimate the value of this sort of training.

Nevertheless, it is at least clear that these subsidies should reduce divorce rates at least a little. The effects of teaching these skills in high school are less clear. The best way to describe the effect of this policy is as an increase in the payoff to all types of relationships in which both members of the couple were educated within the state. In more technical terms, the policy induces a new distribution of compatibilities (G) which stochastically dominates the old one. Clearly, this means that more couples will exceed the old standards for making commitment greater than any given level. However, the policy also raises the opportunity cost of being in any given relationship because other potential relationships will also be better than before. This second effect works to reduce commitment within relationships, both raising the standards for making relationship specific investments above any given level and increasing the probability that a relationship of a given quality would end. It is unclear which effect would dominate, i.e., whether the increase in compatibility of a given match exceeds the increase in the minimum level of compatibility couples require to make greater commitments. In other words, we can only say that such a policy increases the private welfare of citizens, as we can make no predictions whatsoever about changes in the rates of marriage, divorce, investments, or fertility.

In addition, it should be noted that this policy is probably more expensive than the subsidies for couple-specific marital training since it will be given to some people who never marry and since individuals cannot choose to opt out of the training if they feel the costs of this training exceeds their valuation of its benefits.

3.4 Raising the Marginal Benefits of Marriage

Another policy promoted by proponents of marriage involves raising the benefits of married couples. The current debate over making the U.S. federal income tax friendlier to married couples is one example of this line of reasoning, as are debates over policies that give some of the legal rights of married couples to cohabitators (see below).

The effects of raising the benefits of marriage should be largely opposite those of raising the costs of entering or exiting marriage. Since marriage would be more beneficial than before, married couples would be more reluctant to leave the institution. Some new couples would elect to marry too, and being married would lower the likelihood that they would separate. That said, these newlyweds would still be more likely to divorce than couples who would have married under the old regime, so it is unclear whether the aggregate divorce rate would rise or fall or whether the number of children involved in divorce would rise or fall. Also unclear is the fate of couples who are still unwilling to marry. Some of them would likely increase their current levels of commitment and investment in the anticipation of future marriage, but others would either make fewer commitments and investments or end their relationships outright. One's normative assessment of these changes, as with the policies discussed earlier, thus depends crucially on one's feelings about the merits of marriage and about the desirability of unmarried couples.

Before moving on, it seems appropriate to comment briefly on the efficacy of plans to make the tax code friendlier to married couples. Several bills to do this have recently circulated in Congress, and public sentiment appears to be strongly in favor of reducing the so-called "marriage tax." In light of this, it is perhaps surprising that there is virtually no evidence whatsoever that the tax code is currently dampening the marriage rate in a meaningful way. Among those who have looked for an effect,

the debate is over whether there truly is no effect (Sjoquist and Walker, 1995) or whether the effect is just small (Alm and Whittington, 1995).⁹ Moreover, insofar as the “marriage penalty” inhibits marriage among the 42 percent of couples paying a penalty, it is likely more than counterbalanced by the effects of the “marriage bonuses” received by the 51 percent of couples who actually pay lower taxes when married—especially when one considers that bonuses are more likely to be received by lower income couples and penalties are more likely to be paid by higher income couples (Williams and Weiner, 1997).¹⁰ Much of the current rhetoric ignores these facts, falsely alleging that the tax code has led many couples away from marriage and that reforming the tax code could yield higher marriage rates and lower divorce rates. This is not to say that there such a plan is necessarily without merit, just that it is more appropriate to think of proposals to lower the marriage penalty simply as a proposed tax cut that will primarily benefit two-earner households with annual incomes in excess of \$50,000.

3.5 Civil Unions

Another policy that has received recent attention involves creating a new type of relationship with more benefits and responsibilities than informal cohabitation, but fewer benefits and responsibilities than traditional marriage. This new type of relationship grew out of the trend toward greater recognition of homosexual relationships. Although gays are currently not legally allowed anywhere to enter the legal relationship known as “marriage,” several types of authorities sought ways to treat them in the same way they treat married heterosexual couples—sometimes driven by competition for workers (as when firms instituted partnership benefits for gays), sometimes by political or ideological consideration. As these programs became more popular, their benefits were often extended to unmarried heterosexual couples as well. Thus was born a new type of heterosexual relationship, intermediate between informal cohabitation and formal marriage. In the U.S., this primarily takes the form of job benefits extended to unmarried heterosexual couples who register with their employers and the ability of unmarried couples to write marriage-like contracts with one another, but in numerous European nations it has actually been formally institutionalized. For example, last November France began enrolling unmarried couples, both homo- and heterosexual, in “PACS,” or “civil solidarity pacts.” These arrangements have many of the features of traditional marriage, though they do not make formal arrangements for inheritance, nor do they make provisions in the event of children or infidelity. On the other hand, these unions can be ended much more quickly than legal marriages (but not as quickly as informal relationships), typically without passing through the court system. So far, about 40 percent of the 14,000 couples enrolled in this program have been heterosexual (Daley, 2000).

So, what are the effects of creating this new type of union? As indicated earlier, the best way to investigate this question is to suppose that civil unions always existed, but were insufficiently attractive to enroll any couples, and the policy change has rendered these unions more popular than before. The most obvious implication is that the new couples electing civil union status would previously have chosen

⁹Alm and Whittington (1995) estimate that the elasticity of the probability of marriage with respect to the increased tax liability associated with marriage is -0.012. Although this number is statistically significant at the 1% level, it implies that eliminating the marriage tax entirely raises the marriage rate by less than 0.1 percentage points—and the high degree of statistical significance implies that it is very unlikely that the marriage rate would be raised by more than 0.2 percentage points.

¹⁰A 1997 Congressional Budget Office report (Williams and Weiner, 1997) estimates that 14-23 million couples paid marriage taxes of \$8-\$40 billion dollars in 1996, while 24-31 million couples received marriage bonuses of \$32-\$45 billion dollars.

either marriage or cohabitation. Marriage is now less attractive than before, particularly compared to being single. Some married couples who would previously have remained together will now see more options for singles, raising the opportunity cost of remaining married to the point where those couples will elect to divorce rather than continue trying to make their marriages work. This effect works to increase the divorce rate in the short run.

In addition, all couples who would have married under the old regime will now invest less than before, or at least no more. Those who enter civil unions will invest less because they have less commitment than in the past, while those who still choose to marry invest less because they realize their marriages are more likely to end. The reduction in commitment and investments for all couples who would otherwise have married then exacerbates this increase in the likelihood that these relationships end. Nevertheless, the measured divorce rate—the rate at which couples actually leave legal marriages—still might fall, since the couples who would have been most likely to divorce will now not legally marry in the first place.

Meanwhile, some couples who would have cohabited now choose civil unions instead. These couples are now more likely to invest in their relationships than in the past and less likely to end those relationships. The same might be true for some couples with even less commitment, but it is also that some such couples would be more apt to dissolve their relationships to search for new, hopefully better, partners.

In the U.S., even after the tremendous increase in nonmarital cohabitation in recent decades, many more couples are legally married than cohabiting. Thus, though we cannot say for certain, it is probable that introducing civil unions would increase the rate of dissolution among all relationships and decrease the rate of entry into all relationships. The fertility rate, and the rate of investing in relationship-specific investments generally, would also probably fall. While this effect promotes the increased tendency of couples to split, it also lowers the average cost of those splits, both to couples and to society at large. The effect on the total cost of relationships ending is thus ambiguous: the number of couples incurring the cost rises, but the average cost falls.

3.6 Formalizing Cohabitation

A variation on the idea of civil unions is the complete formalization of cohabitation. In this scheme, there is no such thing as informal cohabitation; the act of living together itself entitles couples to certain legal arrangements. This is fairly similar to the traditional legal approach to cohabitation in the U.S., where couples who lived together long enough were considered to be married under the common law. Sweden has also adopted a form of formalized cohabitation—indeed, some go so far as to liken the rights and responsibilities of cohabiting Swedish couples to those of married American couples (Popenoe and Whitehead, 1999).

Unlike the cases above, here we cannot simply describe one type of relationship as becoming more attractive. Instead, formalization raises both the benefits and potential costs of cohabitation. In light of this, the extreme hostility some conservative Americans express toward the Swedish system is somewhat perplexing, particularly if they are correct in their assertion that Swedish cohabitation is practically the same as marriage in the United States, because if they are right, the Swedes would have effectively legislated away American-style informal cohabitation by formalizing it. The major difference would simply be in labeling, and the fact that Swedes would have the option to make an even greater level of commitment. Of course, these critics may be wrong and the reality may be that the Swedish system of formalized cohabitation still involves somewhat less commitment and somewhat fewer benefits than does American marriage.

In spite of the fact that formalization acts in two ways (by increasing both the

benefits and costs of cohabitation), we can still make fairly vivid predictions about the effects of formalization. First, because formalization makes cohabitation more like traditional marriage, it leads some of the less compatible couples who would previously have chosen informal cohabitation either to remain single or to choose even less commitment and relationship-specific investments. Similarly, some of the least compatible couples who would previously have chosen to marry will now prefer formalized cohabitation.

Also unlike the cases previously considered, it is not clear what effect formalization has on the opportunity cost of being in a relationship. Some potential new relationships are now less attractive than in the past, but others are more attractive than in the past. The net effect on the value of the option to search is thus unclear. Consequently, we cannot say for certain whether formalization would increase or decrease the divorce rate.

3.7 Covenant Marriage

The final policy we will examine is the introduction of a new type of relationship involving more commitment than traditional marriage. Two states, Louisiana and Arizona, actually offer such a union, called “covenant marriage,” and at least 17 states have considered adopting such a plan. Couples committing to covenant marriage enter a relationship that is unusually difficult to exit. Divorce under such an arrangement is only to be granted after counselling and a long waiting period (measured in years), except in certain cases involving infidelity, abuse, or abandonment. So far, covenant marriage has not proven to be a very popular option, being chosen by only about 3 percent of new couples having the option (Cummins, 2000).

One possible reason for the unpopularity of this institution is that it does not appear to offer any benefits beyond those of traditional marriage, save for additional costs associated with ending the relationship. Unless these costs somehow create a benefit, covenant marriage would appear to be dominated by the traditional marriage relationship. On first glance, it is difficult to see where any such benefits might come from. True, we would expect greater commitment to reduce the probability that the couple would divorce, but the additional probability of staying together comes entirely from the probability of staying together when one would otherwise wish to leave the relationship. There is no way to justify such an effect as a benefit. Closer inspection reveals one other way that these higher exit costs could yield benefits, namely by enabling greater cooperation among partners by increasing their assurance that the relationship will continue in the future. Yet this benefit would appear to be worth the most to couples unsure that they wish to stay together, which would hardly seem to be those most willing to take on the risks associated with covenant marriage. One is left to speculate that some couples simply enjoy the idea of making the strongest commitment they are allowed to make.

Such an analysis suggests that covenant marriage is destined to remain unpopular unless there is further institutional change that increases its benefits beyond those of traditional marriage. One way to do this might be to make covenant marriage the default option—that is, to continue offering both traditional and covenant marriage, but to raise the relative attractiveness of covenant marriage by requiring couples choosing traditional marriage to opt out of the covenant system. However, while such a plan might make covenant marriage more popular, it is probably unlikely to emerge from the political process, particularly given that there is currently so little interest in covenant marriage in the first place.

That said, at least some couples clearly view covenant marriage as having greater marginal benefits than traditional marriage. It is thus not difficult to predict which couples would choose the covenant option: those with the highest compatibility (among those who would ever accept covenant marriage at all). Having the option

makes all couples better off simply because there is a small chance that they might want to exercise that option. Some couples with low compatibility may wish to end their relationship to search for a new partner with whom they are more apt to take advantage of the new arrangement, but some more compatible couples would increase their current levels of commitment and/or investments in the hopes that one day their relationship would become a covenant marriage. The net effect on the rate at which relationships end is unclear, though it is most likely that the measured divorce rate itself would fall. However, if this is the case, the average number of children involved in divorce would likely rise, since married couples' reduced likelihood of divorce would lead them invest more.

4 Conclusions

Although we have used the model developed in this paper to make predictions about actual and proposed policies toward the family, the primary purpose of developing the model was to generate a useful framework for thinking about such changes generally. That is, the main goal of this paper was not to comment extensively on any one policy, but to develop a broad methodology and to learn some general lessons from it.

Unfortunately, one of the most striking lessons is that it is very difficult to make many concrete predictions from theory alone. Ordinarily, this would be a call for empirical work, but empirical work in this arena is even more difficult. Many of the proposed reforms have never taken effect anywhere, and most of those that have been put in place are quite recent developments. Beyond that, even where there is sufficient experience with a policy to study it, many key variables are difficult or impossible to quantify, or even observe. What are we to do with cultural factors, for example? Unless we can control for the characteristics that make, say, Sweden the country that it is, how are we to translate the Swedish experience into policies designed for Americans? A further, related problem is endogeneity—if the policies in Sweden are in part due to a demand for those policies, then it is unlikely that exogenously imposing those policies in other places would yield effects of similar magnitude. It was this set of problems that led us to the theoretical approach to begin with.

At the least, we have identified here several forces that make theoretical predictions difficult. First, many proposed reforms operate on relatively high levels of commitment. One of the first things we learned was that it is impossible to make strong predictions about the response to such a change by couples currently involved in a relationship with less commitment than that. The underlying reason is that such persons in such couples could get to the newly augmented (or diminished) type of relationship in two different ways—by increasing their commitment to their current relationship or by ending that relationship and seeking a better one with a new mate—and it is not always clear which approach is preferred.

A second reason for the difficulty in making predictions is that there will typically be a change in the composition of couples involved in a given type of relationship. For instance, even if we could predict that all couples were more likely to increase their levels of commitment and relationship-specific investments, we still could not make a concrete prediction about the rate of marital divorce because the couples entering marriage from cohabitation have lower compatibility than those who would have married anyway. So, even though the additional commitment and investments would make such couples less apt to divorce than they otherwise might have been, they remain more likely to divorce than couples who would have married in any event. Adding them to the pool of married persons thus lowers the average compatibility of married couples. Hence it is unclear which effect wins out—the

decreased probability of divorce due to increased commitments and investment, or the increased incidence of married couples with relatively low levels of compatibility.

Predictions about the social cost of divorce are also difficult to make because of the dual nature of investments. On one hand, investments yield benefits that make the relationship more attractive, thus lowering the likelihood that divorce will occur. However, in the event that divorce does occur, the cost of divorce is higher when there are more investments. Consequently, if society is concerned about the total number of relationship-specific investments that are lost in divorce—for example, if one of our goals is to minimize the number of children whose parents separate—it is far from obvious whether or not we would want to promote policies that increase investment.

More generally, all of this analysis points to a strong need for a serious discussion about the relative merits of different potential goals. It is not sufficient simply to express a desire for “family values;” policymakers need to specify what they mean by that homey phrase. Numerous goals would seem to fall under this mantle: raising the marriage rate, lowering the divorce rate, increasing the number of married couples, increasing the number of couples involved in any type of relationship, lowering the number of couples in less-committed relationship forms, increasing fertility, reducing the number of children affected by divorce, maximizing the total benefits derived from all types of relationships, and many others. As we have seen in each case we examined, these goals frequently conflict with one another. Until we have some agreement about which goals are most important, it will be very difficult to make normative pronouncements about any particular policy directed at the family.

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6 Appendix

The following will make extensive use of theorems found in Stokey, Lucas, and Prescott (1989), which we shall hereafter refer to as “SLP.” One key theorem they present defines “Blackwell’s sufficient conditions for a contraction” (SLP, Theorem 3.3, p. 54), which states as follows:

“Let $X \subseteq R^l$, and let $B(X)$ be a space of bounded functions $f : X \rightarrow R$, with the sup norm. Let $T : B(X) \rightarrow B(X)$ be an operator satisfying

- a. (monotonicity) $f, g \in B(X)$ and $f(x) \leq g(x)$, for all $x \in X$, implies $(Tf)(x) \leq (Tg)(x)$, for all $x \in X$;
- b. (discounting) there exists some $\beta \in (0, 1)$ such that

$$[T(f + a)](x) \leq (Tf)(x) + \beta a, \text{ all } f \in B(X), a \geq 0, x \in X.$$

[Here, $(f + a)(x)$ is the function defined by $(f + a)(x) = f(x) + a$.] Then T is a contraction with modulus β .”

Proof of Proposition 1: We begin our proof by letting W_0 be a constant and defining operator T_1 such that

$$T_1 J_0(\pi', I', I''; W_0) \equiv R(\pi, I, I') - c(I, I') + \beta \int_{\pi \in \Pi} \max \left\{ W_0 - c(I', 0), \sup_{I'' \in \Gamma(I'), I' \neq 0} J_0(\pi', I', I''; W_0) \right\} dF(\pi', \pi)$$

for bounded functions J_0 . Then it is straightforward to verify that T_1 satisfies Blackwell’s sufficient conditions above, so there exists a unique fixed point for T_1 , call it $J_0^*(\cdot; W_0)$ (SLP, Theorem 3.2). Recall that $(R - c)$ is strictly increasing and convex in π , supermodular in (I, I') , and has increasing differences. All of these properties are preserved by maximization, integration over an increasing transition function, and summation, so T_1 maps functions J_0 having those properties into the (closed) subset of functions having such properties. Thus, J_0^* has those properties.

Now define

$$V_0(\pi, I, W_0) \equiv \max \left\{ W_0 - c(I, 0), \sup_{I' \in \Gamma(I), I' \neq 0} J_0^*(\pi, I, I') \right\}$$

By the same logic as above, V_0 has the cited properties, except that it is only weakly increasing over the range where $V_0 = W_0 - c(I, 0)$.

Finally, define a second operator T_2 by

$$T_2 W_0 \equiv \zeta + \beta \int_{\pi \in \Pi} V_0(\pi, 0, W_0) dG(\pi)$$

Again, it is trivial to use Blackwell’s sufficient conditions to show that T_2 is a contraction, and thus that it has a unique fixed point. Call it W and define $V(\pi, I) \equiv V_0(\pi, 0, W)$. Then V is the value function for couples in this model, and it has the properties of the more general function $V_0(\pi, 0, W_0)$ above. Further, $J \equiv J_0^*(\cdot; W)$, so it too has the properties demonstrated for the more general class of functions J_0^* . \square

Proof of Corollary 2: We begin by showing that the optimal new investment is 0 only for sufficiently low π (given I) and I (given π). Since $J(\pi, I, I')$ is strictly

increasing in π for all I, I' , if $J(\pi_0, I, I') \geq W - c(I, 0)$, then $J(\pi, I, I') \geq W - c(I, 0)$ for all $\pi \geq \pi_0$. Further, given π, I' , and $I_2 \geq I_1$,

$$J(\pi, I_2, I') - [W - c(I_2, 0)] \geq R(\pi, I_2, I') - R(\pi, I_1, I') + \{J(\pi, I_1, I') - [W - c(I_1, 0)]\} \geq c(I_2, 0) - c(I_1, 0) - c(I_2, I') + c(I_1, I')$$

The expression on the right-hand side of the equation is non-negative, since R is at least weakly increasing in I and c is submodular. Thus, if the optimal choice for I' is 0 at (π_0, I_0) , it will also be the optimal choice for all $(\pi, I) \leq (\pi_0, I_0)$.

For (π, I) such that $\sup_{I' \in \Gamma(I), I' \neq 0} J(\pi, I, I') \geq W - c(I, 0)$, it follows that $V(\pi, I) = \sup_{I' \in \Gamma(I), I' \neq 0} J(\pi, I, I')$ so we are seeking to maximize a supermodular function over

a lattice. Topkis (1978, Theorem 6.1) has shown that the set of solutions to this problem $(\gamma(\pi, I))$ is an ascending sublattice of $\Gamma(I)$. Furthermore, since γ is a sublattice, it has maximal and minimal elements, defined as I^* and I^{**} here, which are increasing functions of (π, I) because of the ascending nature of γ . \square

Proof of Proposition 3: Let $I_2 \geq I_1 > 0$. Then

$$\begin{aligned} J(\pi, I_2, I_2) - J(\pi, I_2, I_1) &= R(\pi, I_2, I_2) - R(\pi, I_2, I_1) + k(I_2) \\ &\quad + \beta \int_{\pi' \in \Pi} V(\pi', I_2) - V(\pi', I_1) dF(\pi', \pi) \\ &\geq k(I_2) - \beta[k(I_2) - k(I_1)] \\ &> 0. \quad \square \end{aligned}$$

Proof of Proposition 4: Recall that we are now assuming that levels of commitment marked by $I \in I_c \leq I \leq I^c$ more attractive than before because some policy parameter denoted by x rose. Now consider $I_0 > I^c$ and $I' \geq I_0$, and let $\pi^*(I)$ be defined as the maximum π such that $J(\pi, I, I) = W - c(I, 0)$. Then

$$\begin{aligned} \frac{\partial}{\partial x} J(\pi, I_0, I') &= \frac{\partial}{\partial x} R(\pi, I_0, I') - \frac{\partial}{\partial x} q(I_0, I') \\ &\quad + \beta \left[\frac{\partial W}{\partial x} - \frac{\partial}{\partial x} c(I', 0) \right] F(\pi^*(I'), \pi) \\ &\quad + \beta \int_{\pi' \geq \pi^*(I')} \frac{\partial}{\partial x} V(\pi, I') dF \\ &\leq \frac{\partial}{\partial x} [R - q + \beta(W - c) F(\pi^*, \pi)] \\ &\quad + \beta [1 - F(\pi^*, \pi)] J_{x, \max} \end{aligned}$$

where $J_{x, \max} = \sup_{\pi' \geq \pi^*(I')} \sup_{I'' \geq I'} \frac{\partial J}{\partial x}(\pi', I', I'')$. (This will exist because we have assumed that $\frac{\partial R}{\partial x}$ and $\frac{\partial c}{\partial x}$ are bounded.) Since $I_0 > I^c$,

$$\frac{\partial}{\partial x} [R - q - \beta c F(\pi^*, \pi)] \equiv 0.$$

Further, the fact that $I' \geq I_0$ implies that

$$\begin{aligned} J_{x, \max} &\leq \beta F(\pi^*(I''), \pi') \frac{\partial}{\partial x} W \\ &\quad + \beta [1 - F(\pi^*(I''), \pi')] J_{x, \max} \\ &\leq \frac{\beta F(\pi^*, \pi')}{1 - \beta + \beta F(\pi^*, \pi')} \frac{\partial W}{\partial x}. \end{aligned}$$

Thus, $|J_{x,\max}| < \left| \frac{\partial W}{\partial x} \right|$.

Similarly, if we define $J_{x,\min} \equiv \inf_{\pi' \geq \pi^*(I')} \sup_{I'' \geq I'} \frac{\partial J}{\partial x}(\pi', I', I'')$, we find that

$$J_{x,\min} \geq \frac{\beta F(\pi^*, \pi')}{1 - \beta + \beta F(\pi^*, \pi')} \frac{\partial W}{\partial x}.$$

In general, the π' and I'' for $J_{x,\min}$ will differ from that for $J_{x,\max}$, so the fraction $\frac{\beta F}{1 - \beta + \beta F}$

will differ for the two expressions. However, $\frac{\beta F}{1 - \beta + \beta F} \in (0, 1)$ everywhere, so we can say that $\alpha_1 \frac{\partial W}{\partial x} \leq \frac{\partial J}{\partial x} \leq \alpha_2 \frac{\partial W}{\partial x}$ where $\alpha_1, \alpha_2 \in (0, 1)$. We thus establish that $\frac{\partial J}{\partial x}$ has the same sign as $\frac{\partial W}{\partial x}$.

Now suppose that $\frac{\partial W}{\partial x} \leq 0$. Then for $I' \geq I^c$, $\frac{\partial J}{\partial x}$ is everywhere a smaller negative number than $\frac{\partial W}{\partial x}$, as above (or both are zero). For $0 \leq I' \leq I^c$, let π^{**} be defined as the minimum π such that the optimal new investment is greater than I^c . It follows that for $I' > 0$,

$$\begin{aligned} \frac{\partial J}{\partial x} &= \frac{\partial}{\partial x} [R - q - \beta F(\pi^*, \pi)k] \\ &\quad + \beta F(\pi^*, \pi) \frac{\partial W}{\partial x} + \beta \int_{\pi^* \leq \pi \leq \pi^{**}} \frac{\partial J}{\partial x} dF \\ &\quad + \beta \int_{\pi \geq \pi^{**}} \frac{\partial J}{\partial x} dF \end{aligned} \quad (2)$$

and by our results above

$$\begin{aligned} \frac{\partial J}{\partial x} &\geq \frac{\partial}{\partial x} [R - q - \beta F(\pi^*, \pi)k] \\ &\quad + \beta [1 - F(\pi^{**}, \pi) + F(\pi^*, \pi)] \frac{\partial W}{\partial x} \\ &\quad + \beta \int_{\pi^*(0) \leq \pi \leq \pi^{**}} \frac{\partial J}{\partial x} dF \end{aligned}$$

Letting $J_{x,\min(2)} \equiv \inf_{\pi^*(0) \leq \pi \leq \pi^{**}} \sup_{I''} \frac{\partial J}{\partial x}(\pi, I', I'')$, we can thus say that

$$\begin{aligned} J_{x,\min(2)} &\geq [1 - \beta F(\pi^{**}, \pi) + \beta F(\pi^*, \pi)]^{-1} \frac{\partial}{\partial x} [R - q - \beta F(\pi^*, \pi)k] \\ &\quad + \frac{\beta - \beta F(\pi^{**}, \pi) + \beta F(\pi^*, \pi)}{1 - \beta F(\pi^{**}, \pi) + \beta F(\pi^*, \pi)} \frac{\partial W}{\partial x} \end{aligned}$$

Since $\frac{\beta - \beta F(\pi^{**}, \pi) + \beta F(\pi^*, \pi)}{1 - \beta F(\pi^{**}, \pi) + \beta F(\pi^*, \pi)} \in (0, 1)$ and $\frac{\partial}{\partial x} [R - q - \beta F(\pi^*, \pi)k] \geq 0$ in the relevant range, if $\frac{\partial W}{\partial x} \leq 0$, then $J_{x,\min(2)} \geq \frac{\partial W}{\partial x}$. We have thus established that if $\frac{\partial W}{\partial x} \leq 0$, $\frac{\partial J}{\partial x} \geq \frac{\partial W}{\partial x}$ everywhere that $I' \neq 0$.

Accordingly,

$$\begin{aligned} \frac{\partial W}{\partial x} &= \beta G(\pi^*(0)) \frac{\partial W}{\partial x} + \beta \int_{\pi \geq \pi^*(0)} \frac{\partial J}{\partial x}(\pi, 0, I^*(\pi, 0)) dF \\ &\geq \frac{\beta [1 - G(\pi^*(0))]}{1 - \beta G(\pi^*(0))} \frac{\partial W}{\partial x}. \end{aligned}$$

However, $\frac{\beta - \beta G}{1 - \beta G} \in (0, 1)$, so this inequality is a contradiction. Hence we conclude that $\frac{\partial W}{\partial x} > 0$ and for $I' \geq I^c$, $\frac{\partial J}{\partial x} \in (0, \frac{\partial W}{\partial x})$.

Further, inspection of Equation 2 reveals that where $I' \leq I^c$,

$$\frac{\partial J}{\partial x} = z + \beta \int_{\pi^* \leq \pi \leq \pi^{**}} \frac{\partial J}{\partial x} dF$$

for some positive number z . It follows that

$$J_{x, \min(2)} \geq \frac{z}{1 - \beta [F(\pi^{**}, \pi) - F(\pi^*, \pi)]} > 0$$

Hence we have shown that $\frac{\partial J}{\partial x} > 0$ everywhere.

Now suppose that $I' > I^c$. Then

$$J_x = \beta F(\pi^*(I'), \pi) W_x + \beta \int_{\pi' \geq \pi^*(I')} J_x dF$$

and

$$\begin{aligned} J_{3x} &= \beta [W_x - J_x(\pi^*, I', I^*(\pi^*, I'))] f(\pi^*, \pi) \frac{d\pi^*}{dI} \\ &< 0 \text{ (because of our earlier result that } W_x > J_x \text{)}. \end{aligned}$$

□

Proof of Proposition 5: We first show that the Proposition holds for case (A), then show how the proof would differ for cases (B) and (C).

Case (A): Define $Z(\pi, I, I') = J(\pi, I, I') - W + k(I)$. Then the standard for maintaining the relationship increases if and only if $Z_x(\pi^*(I), I, I^*(\pi^*, I)) > 0$. We know from before that $Z_x(\pi^*(I), I, I^*(\pi^*, I)) < 0$ for $I > I^c$. Furthermore,

$$\begin{aligned} \frac{d}{dI} \frac{\partial}{\partial x} [Z(\pi^*(I), I, I^*(\pi^*, I)) - h^1(I)] &= (Z - h^1)_{1x} \frac{d\pi^*}{dI} + (Z - h^1)_{2x} \\ &= (Z - h^1)_{1x} \frac{d\pi^*}{dI} \end{aligned}$$

except at I_c, I^c , where the derivative is undefined. Thus, $(Z - h^1)_x$ rises or falls in I as $(Z - h^1)_{1x}$ is negative or positive.

To examine this more closely, define $\Psi \equiv J - h^1$ and note that

$$\begin{aligned} \Psi(\pi, I, I') &= R(\pi, I, I') - q(I, I') + \beta h^1(I') [1 - F(\pi^*(I'), \pi)] \\ &\quad + \beta [W - k(I)] + \beta \int \Psi_1[\pi', I', I^*(\pi', I')] [1 - F(\pi', \pi)] d\pi', \end{aligned}$$

so

$$\Psi_{1x} = -\beta h_x^1 F_2 - \beta \int \Psi_{1x} F_2 d\pi'.$$

Once again we can use the contraction mapping theorem. Define $T : B(X) \rightarrow B(X)$ by

$$Tv(\pi, I, I') = -\beta h_x^1 F_2(\pi^*(I), \pi) - \beta \int v[\pi', I', I^*(\pi', I')] F_2(\pi', \pi) d\pi'$$

for bounded functions v . It is easy to verify that Blackwell's conditions apply, so T is a contraction, and thus it has a unique fixed point. Further, T maps non-negative

functions to non-negative functions, so the fixed point must be a non-negative function. Since $Z_{1x} = \Psi_{1x}$, it follows immediately that $Z_{1x} \geq 0$ everywhere. We thus establish that $(Z - h^1)_x(\pi^*(I), I, I^*(\pi^*, I))$ is monotonically decreasing in I .

In addition,

$$\begin{aligned} \lim_{\pi \downarrow \pi^*(0)} (Z - h^1)_x(\pi, 0, \varepsilon) &= \beta \int (V - h^1)_x(\pi', \varepsilon) dF(\pi', \pi^*(0)) \\ &\quad - \beta \int (V - h^1)_x(\pi', 0) dG(\pi') \\ &= \beta \int (V - h^1)_x(\pi', 0) [dF(\pi', \pi^*(0)) - dG(\pi')] \\ &\leq 0. \end{aligned}$$

(The second equality follows from the fact that $(V - h^1)_{2x} = 0$, while the inequality results because $(V - h^1)_x$ is non-decreasing in π and G stochastically dominates F .)

Therefore, $(Z - h^1)_x(\pi^*(I), I, I^*(\pi^*, I))$ is negative for all $I \geq \varepsilon$, so the minimum standard for maintaining a relationship $\pi^*(I)$ decreases for all $I \notin [I_c, I^c]$.

For part (3), note that

$$J_x(\pi, I, I') = h_x^1(I) + \beta h_x^1(I') [1 - F(\pi^*(I'), \pi)] + \beta \int [V_x(\pi', I') - h_x^1(I')] dF(\pi', \pi).$$

The first term on the right-hand side does not vary with I' , and the second only alters the value of the directly-affected levels of investment. Thus, the only non-direct distortions come from the last term. Further,

$$\begin{aligned} \frac{d}{dI} \left[\beta \int [V_x(\pi', I') - h_x^1(I')] dF(\pi', \pi) \right] &= -\beta (Z_x - h_x^1) f(\pi^*(I), \pi) \frac{d\pi^*}{dI} \\ &< 0. \end{aligned}$$

Accordingly, apart from the direct effect of the policy shift, the indirect effect is to increase $J(\cdot, I')$ more for lower I' . It follows that (a) $J_3(\pi, I, I^*(\pi, I, x_1), x_2) < 0$, and (b) $\operatorname{argmax}_{I' \in \Gamma(I) \setminus [I_c, I^c]} J(\pi, I, I', x_2) < I^*(\pi, I, x_1)$.

Finally, define $I^m(\pi, I) \equiv \operatorname{argmax}_{I' \in [I_c, I^c]} J(\pi, I, I', x_2)$. Then I^* increases if and only if $x_2 - x_1 > \Psi(\pi, I, I', x_2) - \Psi(\pi, I, I^m, x_2)$ for all $I' < I_c$, where $\Psi \equiv J - h^1$. Suppose this is true at (π_1, I_1) . Since $\Psi_{13} \geq 0$ and $\Psi_{23} \geq 0$ it will thus be true that

$$x_2 - x_1 > \Psi(\pi_2, I_2, I', x_2) - \Psi(\pi_2, I_2, I^m(\pi_1, I_1), x_2) \text{ for all } I' < I_c$$

for all $(\pi_2, I_2) \geq (\pi_1, I_1)$ such that $I^*(\pi_2, I_2) \leq I_c$.

For case (B), the proof is the same as above, except that now the affected region experiences $k_x = -h_x^1 < 0$. The proof above shows that $J_x(\pi^*(I), I, I) - W_x < 0$ everywhere, and now $Z_x = J_x(\pi^*(I), I, I) - W_x + k_x < 0$ everywhere. For part (3), now

$$J_x(\pi, I, I') = -\beta k_x(I') F(\pi^*(I'), \pi) + \beta \int [V_x(\pi', I') - k_x(I')] dF(\pi', \pi)$$

and the same logic follows as in the case above.

Finally, for case (C), the situation is similar to those above, except that now the "affected" region is not directly affected after the initial investment greater than I_c is made. As above, Z_x is decreasing in I , only now there is no countervailing effect

on $[I_c, I^c]$. Accordingly, the minimum standard for continuing the relationship rises everywhere. As for the final part of the claim, now

$$J_x(\pi, I, I') = -h_x^2(I, I') + \beta \int V_x(\pi', I') dF(\pi', \pi).$$

The proof thus follows analogously to that above. \square