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SOCIAL APPROVAL, VALUES, AND AFDC:
A RE-EXAMINATION OF THE
ILLEGITIMACY DEBATE

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ABSTRACT

Empirical attempts to link teenage out-of-wedlock births to the incentive structure of Aid to Families with Dependent Children (AFDC) have met with mixed results. This has suggested to many researchers that, while the AFDC program contains incentives for poor women to have children out-of-wedlock, these incentives cannot be the primary culprit responsible for current levels of out-of-wedlock births. This paper presents a model that is consistent with the stylized facts and the empirical evidence but establishes a mechanism through which AFDC could in fact be the primary reason for observed levels of illegitimacy. The model is standard with one exception: How much utility individuals are able to obtain from having a child depends on the level of “social approval” that is associated with having out-of-wedlock children. This social approval is a function of the fraction of individuals in all previous generations who chose to have children out-of-wedlock, where the effect of each generation diminishes with time. While the model is successful in replicating the stylized facts on AFDC and illegitimacy and establishes a link between the two through a government induced change in “values,” it also demonstrates that welfare reform aimed at reducing the incentives for poor women to have out-of-wedlock births may not be as effective as policy makers who believe in a causal link between AFDC and illegitimacy might suspect.

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0. Introduction

Concern over the rise in out-of-wedlock births, especially among teenagers, and sharp increases in the number of single headed households is widespread and growing. In the three decades following 1960, illegitimate births as a percentage of total live births rose from below 5% to over 30%, and the fraction of households headed by females rose similarly from 7% to well over 20%.¹ Today, close to one third of all births nationwide, approximately two thirds of black births and as many as 80% of births in some central cities are to single mothers. At the same time, more than half of all poor families are made up of female headed households, and children are more likely to live in poverty than members of any other age group. Given the strong link between socioeconomic background during childhood and a variety of indicators of future success, these trends are understandably disturbing to policymakers who are increasingly searching for new initiatives to encourage family formation.

One set of such proposed initiatives involves either eliminating long-standing social programs which assist single mothers or altering their incentive structures dramatically. Such proposals arise from the argument that US social policy may be a significant contributing factor to increased illegitimacy and decreased family formation, a notion that is widely discussed in the literature and broadly supported by rational choice theory. Becker (1991), for example, suggests that a program like Aid to Families with Dependent Children (AFDC) “raises the fertility of eligible women, including single women, and also encourages divorce and discourages marriage;” and Murray (1984), in an influential book, argues forcefully that such programs lie at the heart of social disintegration among the poor. AFDC is particularly targeted for criticism because, in most cases, eligibility requires both the presence of a dependent child and the incapacitation or absence of one parent. Thus, single poor women may choose out-of-wedlock births as a way to qualify for government aid, a possibility that may result, as one recent paper put it, in out-of-wedlock children becoming “income producing assets” (Clarke and Strauss (1995)).²

However, there are at least three factors that raise doubt about this link between illegitimacy and AFDC suggested by rational choice theory. First, while illegitimacy and increased family

¹ See, for example, Robins (1986) and Murray (1993).

² It is interesting to note that AFDC was created with the stated aim of aiding young widows with children. Today, only 2% of all AFDC beneficiaries fall into this category, and most beneficiaries are mothers of out-of-wedlock children.

dissolution are indeed more prominent among those eligible for public assistance, these phenomena are by no means restricted to those populations. Second, despite declines in real AFDC benefit levels over the past two decades, illegitimacy has consistently been on the rise, both among the poor and, to a lesser extent, the population at large.³ These two stylized facts are at odds with a pure rational choice model's predictions and suggest that the rational choice theorist's emphasis on the financial incentives embedded in social programs is misplaced and that a more complex mechanism may be at work. Finally, the empirical literature linking AFDC to out-of-wedlock births tends to confirm this skepticism in that its results have been largely inconclusive.⁴ Even those studies that have demonstrated a positive link (Clarke and Strauss (1995), for example), have typically relied heavily on state and especially time fixed effects whose impact on out-of-wedlock births substantially outweighs any impact demonstrated for AFDC. (Studies that do not find positive links find similar fixed effects to be important.) The rational choice framework thus fails to predict important stylized trends while receiving only modest empirical support.

We attempt here to use insights from the sociology and psychology literatures to improve the predictive power of this rational choice model. In particular, we introduce into utility functions a new argument called "social approval" (or "stigma" or "values")⁵ that is exogenous for individuals but is determined endogenously as a function of all individual behavior in past generations.⁶ Thus, the

³ See, for example, Hoynes (1996) for a discussion of these trends, and Moffitt, Ribar and Wilhelm (1996) for an intriguing political economy explanation of the decline in benefits.

⁴ Moffitt (1992), Murray (1993) and Acs (1994) examine differences between studies and find that there is only mixed evidence of a significant effect of welfare on illegitimacy. While Jackson and Klerman (1995) and Clarke and Strauss (1995) have demonstrated a positive link, Hoynes (1995), Duncan and Hoffman (1990), Lundberg and Plotnick (1990) and Ellwood and Bane (1985) have found either mixed results or failed to establish a significant relationship. In a somewhat different type of study, Grogger and Bronars (1996) find little empirical evidence that AFDC affects subsequent fertility choices by already unwed mothers, but they do find support for an AFDC effect on marriage decisions.

⁵ Anecdotal evidence certainly suggests that stigma can play a major role in out-of-wedlock fertility choices. A recent *New York Times* article, for example, suggests that "having a baby without being married is still a humiliation" in Japan where, "even among teenagers who get pregnant, many do not talk about it, [and] have never heard of other similar situations." Only 1.1% of births in Japan were to unwed mothers in 1994, while close to one third of children in the US are born into single parent households (WuDunn (1996)). The intensity of stigma in Japan doubtlessly plays at least some role. At the same time, the empirical investigations of stigma and peer effects are plagued by estimation difficulties and have thus yielded no firm consensus concerning their importance. See, for example, Jencks and Mayer (1990) for a discussion of the findings in this literature.

⁶ In some sense, we follow Mueller (1986) who, dissatisfied with poor predictions from the rational egoist model economists are accustomed to, encourages researchers to take seriously a notion he labels "adaptive egoism" in which the crucial extra ingredient is conditioned behavior resulting from social learning as expressed in rules of thumb (norms). While individuals might not literally perform elaborate optimizing calculations, they learn these rules of thumb which then lead them to *act as if* they were optimizing. Evolutionary pressures, it is argued, will ensure the survival of those values and norms that lead to individual behavior which promotes the well-being of the community as a whole. Similar evolutionary arguments appear elsewhere (see, for example, Hayek (1973, 1976, 1979) and Axelrod (1981)). In the case of illegitimacy, for example, stigma against having children out-of-wedlock can be interpreted as a sanction against a

frequency of out-of-wedlock births in the past determines the level of social approval enjoyed by those choosing to become single mothers today (where actions of older generations are discounted more heavily than those of recent generations). With exogenous shocks such as the introduction of AFDC, changes in individual behavior today therefore influence the level of social approval tomorrow, which in turn may further change individual behavior and in turn further influence the level of social approval in the more distant future. We then model the impact public policy has on the evolution of “values” as represented by the level of social approval for out-of-wedlock births as well as the consequent implications for the share of children born outside of marriage.⁷

The model we develop gives predictions consistent with both of the stylized facts we have mentioned above while also illuminating the empirical literature on the link between AFDC and illegitimacy. In particular, it is demonstrated that, in the presence of a role for social approval or stigma, rising illegitimacy accompanied by declining real AFDC benefits is eminently plausible, as is a “spillover” of illegitimacy from the AFDC population into the population at large. Furthermore, the model predicts that, especially in the long run, financial incentives embedded in AFDC can become quite secondary once values (social approval) have changed to the point where out-of-wedlock births become sufficiently desirable. Therefore, time effects (as well as state effects if populations between states are sufficiently heterogeneous and spatially separated) can dominate *even if* financial factors are initially the only consideration motivating women to choose out-of-wedlock births.

While this model is certainly not the only possible explanation for these stylized trends and the empirical literature’s mixed findings, it provides the only explanation to date that builds on the economists’ rational choice framework and links illegitimacy to social policy in a way that is consistent with empirical facts.⁸ As such, it provides a self-contained model which can be used to

practice that would lead to children being brought up in inadequate circumstances which, in turn, would lead to a weakening of the group.

⁷ Since much of the public policy discussion in regard to illegitimacy and AFDC focuses on teenage behavior, we think this type of social approval parameter is of particular relevance as we generally think of teenagers and young adults as most easily influenced by peer pressures from their slightly older peers.

⁸ The main competing hypothesis in the economics literature is that there has been a significant decline in the supply of eligible males which has caused the number of “shot-gun” marriages to decline. Two competing theories regarding this decline in the supply of men have been offered: (i) the job shortage theory offered by Wilson (1987) which suggests that this declining supply is due to declining job prospects for young men in poor communities, and (ii) the technology shock theory by Akerlof, Yellen and Katz (1996) which suggests that the increased availability of abortion and contraceptive technologies caused a decline in the supply of men who are *willing* to marry. While we do not argue here against these competing explanations, we do suggest that they, too, require an underlying model of social stigma in order to become plausible alternatives. Empirical support for the job shortage theory, for example, is relatively weak (see Akerlof et. al. (1996) for a discussion), and the decline in shot-gun marriages predicted by the technology shock

analyze those current policy proposals that take a definitive link between AFDC and illegitimacy as given. Such policy analysis in this paper suggests that, even if AFDC is solely responsible for the trends observed over the past three decades, its reform or elimination may not yield the desired outcome of reducing illegitimacy substantially or even slightly from current levels. More precisely, we demonstrate plausible cases under which a sudden elimination of AFDC is accompanied by a continuing *increase* in illegitimacy to a much higher level, as well as cases in which such a policy shift is followed by only a modest decline of illegitimacy to levels far above those experienced before the program was inaugurated.⁹

We begin our discussion in Section 1 with a brief review of the economic literature on norms and values, and a discussion of the intellectual origins of our approach in both the economics and the sociology literatures. Section 2 then proceeds to lay out the model of illegitimacy used in the rest of the paper. Section 3 undertakes some comparative statics simulations, while Section 4 investigates the transition caused by the introduction of AFDC as well as various reform proposals. Section 5 briefly considers the introduction of an explicit marriage decision into the model; Section 6 discusses the addition of a spatial dimension which may give rise to “pockets” of illegitimacy in relatively poorer areas, and Section 7 concludes.

1. The Literature on Values, Norms and Conformity

Strong patterns of conformity in human behavior as well as the influential role of norms and values have given rise to a large number of papers by economists. Models that explain such uniform behavior and standards are summarized in Figure 1. In general, they can be divided into two large categories: (i) those that confine themselves to using standard neoclassical preferences (“independent” preferences) and (ii) those that define preferences more broadly to include non-standard outside social influences directly into utility functions (“interdependent” preferences). In the former category, some have explained conformity as resulting from incomplete information games in which less informed agents imitate those deemed more informed, while others have formulated

hypothesis did not occur until years after the technology shock and took decades to run its course. Thus, these explanations become plausible only if, as Akerlof et. al. suggest, “the stigma associated with out-of-wedlock motherhood has declined endogenously.”

⁹ This is not to suggest that reforming or eliminating AFDC will not reduce the level of illegitimacy *from what it would have been* had the reforms not taken place. Rather, even an elimination of AFDC is consistent with rising illegitimacy, even though the increase may be slower and stop earlier as a result of the policy shift.

sophisticated game theoretic approaches to explain the evolution of coordination (common standards) and cooperation in the presence of positive externalities that make such cooperative outcomes socially desirable. However, while these models have yielded a tremendous amount of insight, existing sociological (Jones (1984)) and psychological (Ross, Bierbrauer and Hoffman (1976)) evidence suggests that they, by themselves, have limited explanatory power in many circumstances. Both because of this evidence and because we find the approach particularly appealing for the policy problem at hand, we will focus here on the last strand of the literature illustrated in Figure 1.

In this literature on “interdependent” preferences, economists have tended to think of “status” or “reputation” as an explicit additional argument in individual utility functions. More specifically, economic models have assumed that agents wish, all else being equal, to have the reputation of abiding by or believing in some pre-existing norm, but aside from adverse reputational effects, at least some agents would prefer to deviate from that norm. Agents consider this tradeoff and, so long as the cost from deviating does not outweigh the benefit from the good reputation, will choose to conform with the norm. Thus, economists have tended to model uniform behavior under these interdependent preferences as arising from a desire of individuals to gain the reputation of conforming with some norm. Under certain circumstances, equilibria thus arise under which most or all agents choose to behave similarly (in accordance with the norm) even though underlying preferences may differ widely.¹⁰

While economists have therefore explained the evolution and persistence of conformity through a series of carefully constructed models (as illustrated in Figure 1), mathematical sociologists (see,

¹⁰ More precisely, Akerlof (1980) assumes that some agents believe in the norm while others do not and that, whenever the number of believers is greater than the number of nonbelievers in a particular generation, the number of believers rises in the next generation (and vice versa). Nonbelievers may act like believers due to reputation effects. Two equilibria typically emerge for any given norm: one in which no one follows or believes in the norm, and another in which almost everyone does both. Persistence of the norm in the latter equilibrium is made possible by social sanctions that are sufficiently strong to keep nonbelievers from unraveling the equilibrium. Bernheim (1994) builds on Akerlof’s work in that he goes beyond demonstrating the feasibility of persistent norms to explain which norms are most likely to persist. Individual types who again care about reputation (or status) are characterized by heterogeneous preferences over a continuum of alternatives. They signal their unobservable preference type through their choice of an observable form of behavior, and it is shown that a single norm can emerge endogenously as a pooling equilibrium even when underlying preferences are quite diverse. In such an equilibrium, if the weight attached to reputation is sufficiently high, most agents choose precisely the same action while a fringe chooses dramatically deviant behavior. The development of a norm occurs because even small deviations are interpreted by others as evidence of extreme underlying preferences which causes a substantial loss in reputation. Thus, agents either conform completely if their true preferences lie sufficiently close to the norm, or they choose their ideal point and endure the loss of reputation if their preferences are sufficiently extreme. Since there is a multiplicity of pooling equilibria, there also exists a role for a social coordinator or government in selecting a focal value. (Jones (1984) differs somewhat from these approaches in that he assumes utility depends on the *degree* to which an agent deviates from actions chosen by others.)

for example, Granovetter (1978), Granovetter and Soong (1983)) have been less precise regarding the channels through which social influences produce conformity in behavior. Instead, they simply observe that many binary decisions (such as whether or not to join a riot, or whether or not to have an out-of-wedlock birth) have the following characteristics (Granovetter and Soon (1983)):

- “(i) at any time t , one’s choice between the two available decisions depends, in part, on the choices of some relevant group of others in the preceding time period $t-1$;
- (ii) each unit (person) is distinct, and will react differently from any other to the immediately previous distribution of choices; [and]
- (iii) because each decision depends on the set of decisions in the previous time period, there is an evolution of the “state vector” over time.”¹¹

Thus, for each individual a particular activity becomes desirable once the number of agents engaging in the activity in the previous period reaches some threshold, but the underlying process by which these individual threshold levels are determined is left largely unspecified. It may, for example, be the case that some individuals are more adventurous than others and thus are easily motivated to participate in riots, while others are more conservative and afraid of “being caught.” As the number of individuals participating in a riot rises, the likelihood of “being caught” declines which causes more individuals to pass their “threshold” (Granovetter and Soong (1983)). In this case, coordinating a large number of individuals to participate can result in “efficiency” gains by reducing the risk of being caught (the second column in Figure 1). It could equally well be the case, however, that individual “threshold” levels are determined because the number of others participating in the riot enters *directly* into individual utility functions (the last column in Figure 1) (Schelling (1978)) or because less well informed individuals follow the lead of more informed leaders (the first column in Figure 1). In principle, any of the explicit channels for uniform behavior laid out in Figure 1 could therefore be used to construct the foundations of a threshold model.¹²

In this paper, we build on the “interdependent utility” models in Figure 1 (commonly used by economists) to create a microeconomic foundation to a threshold model (usually used by sociologists) in order to analyze the effect of social policy on out-of-wedlock births in the presence of stigma or social (dis)approval of such behavior. We begin by incorporating a social approval parameter S (which indicates the level of social approval or disapproval for giving birth out-of-

¹¹ This view of interdependent preferences is consistent with some of the empirical sociology literature (Bengston and Black (1973), Bengston (1975), Glass, Bengston and Dunham (1986)) which identifies generational links that lead to value similarity between generations. Jones (1984) also models this process in an investigation of worker effort.

¹² Similar threshold models have been used frequently in the biological sciences to study epidemics (Bailey (1975)) in which different individuals have different “thresholds” of natural resistance.

wedlock) into individual utility functions; this is consistent with the spirit of the economic reputation models in Figure 1. We then proceed by making S a function of how many agents have chosen to give birth out-of-wedlock in past generations. While the way in which S enters utility functions is exogenous to the model,¹³ the actual *level* of S is therefore determined endogenously. Furthermore, since individuals vary both in their preferences as well as their incomes, each individual's utility maximization problem yields a different "threshold" level of social approval which will make having an out-of-wedlock birth an optimal choice for her. Thus, by endogenizing the actual level of social (dis)approval that enters individual utility functions and by modelling explicitly the underlying individual optimization problems, we provide a microeconomic foundation to the threshold model of human behavior familiar to sociologists. Agents are then viewed as rational utility maximizers who face an additional constraint of societal pressures ("culture") not usually modelled by economists. With the interaction of this individual optimization behavior and societal pressures explicitly modelled, we can then undertake a careful analysis of both the short run changes in individual behavior brought about by social policy as well as the long run impact these changes have on societal outcomes.¹⁴

The empirical sociological and psychological evidence on social values and stigma (Ainlay, Becker and Coleman (1986), Glass, Bengston and Dunham (1986), Jones (1994)) offers a great deal of support for the underlying assumptions of this approach. In particular, this evidence strongly suggests that stigma and values are (i) *learned* by observation of behavior in previous generations as well as (ii) *transmitted* via prevailing attitudes toward that behavior in those prior generations.¹⁵ The way in which adults view out-of-wedlock births, for instance, is determined by the number of out-of-wedlock births they witnessed during their formative years as well as the attitudes toward such behavior expressed by their parents (which, in turn, is determined in large part by behavior

¹³ Of course we envision an underlying evolutionary model that gives rise to this "exogenous" way in which stigma enters utility. In particular, work by Axelrod (1984) and Hayek (1973) on evolutionary competition suggests that, if children born out-of-wedlock are at a competitive disadvantage, the stigma associated with out-of-wedlock births would be sufficiently high to eliminate such births for the vast majority of agents, but that it would be sufficiently "forgiving" such that, if a woman gave birth out-of-wedlock, the sanctions, while unpleasant, were not extraordinarily punitive.

¹⁴ The connection between changing economic conditions and the evolution of values has been identified as important by others. Greif (1995), for example, states that "[s]ince current behavior is determined by past values, cultural beliefs and economic costs and benefits of various actions, economic change can, over time, alter values." The interaction of between economic forces and culture are also clearly acknowledged in the sociology literature (see, for example, Schelling (1971)).

¹⁵ Sociologists often refer to the latter process as *internalization*. See Jones (1984) and references therein for a more detailed discussion.

observed during *their* formative years.) This produces an intergenerational link between observed behavior today and societal views about such behavior in all future generations; i.e. the more prevalent certain types of behavior are today, the more socially acceptable such behavior becomes tomorrow and each day after. We capture this link in our model by making S a function not only of behavior in the preceding generation, but of behavior in *all* previous generations (with the impact of older generations being discounted more heavily than that of recent ones.) This makes possible an analysis of policy under different assumptions about the speed with which current behavior changes underlying values.¹⁶

Before proceeding to the specification of the model, we want to distinguish this work from previous work on welfare stigma by Moffitt (1983), Besley and Coate (1992) and Bird (1996). The first two of these papers investigate a type of stigma that, while very interesting, is entirely unrelated to the kind of phenomenon modelled here. In particular, while Moffitt and Besley and Coate investigate stigma felt by individuals on AFDC because they are seen as accepting public welfare, we refer in this paper to the stigma of having a child out-of-wedlock; i.e. rather than modelling welfare stigma, we model the illegitimacy stigma as it relates to welfare policy.¹⁷ Bird (1996), on the other hand, investigates the changes in societal norms against out-of-wedlock births *by those on welfare*, not against illegitimacy in general. In the process, he deviates substantially from the sociological origins of our approach by modelling norms as the political solution to a coordination game in which voters seek to prevent socially costly behavior by the poor by setting up norms that are themselves costly to enforce. Thus, agents do not have the kinds of “interdependent” utility functions described in Figure 1, and norms are *chosen* rather than resulting from an intergenerational evolutionary process.¹⁸

¹⁶ The sociological literature suggests that values tend not to change very abruptly (Williams (1971)).

¹⁷ In an interesting related paper, Lindbeck, Nyberg and Weibull (1996) investigate the role of this “welfare stigma” (rather than the “illegitimacy stigma”) on the political economy of welfare states. In particular, they assume that living off one’s own work is a social norm, and that this norm is more intensively felt by individuals the greater the fraction of the population that adheres to the norm. In this sense, they view norms similarly to the view taken in this paper, but the application is quite different. They demonstrate that, in this setting, the political economy outcome falls into one of two categories: either the society chooses low taxes and has a minority of citizens receiving transfers, or the society chooses high taxes and has a majority receiving transfers. In contrast, our paper treats welfare policy as an exogenous factor and focuses on its impact on the stigma of out-of-wedlock births and the resulting changes in illegitimacy rates.

¹⁸ Bird obtains the interesting result in his model that a transferral of AFDC programs from the federal level to local governments may result in less social pressure against illegitimacy among the poor.

2. The Model

2.1. Base Model Without Welfare

We assume that agents live for one period and differ from one another in two dimensions: (i) their wage rate $\omega \in \Omega = [0,1]$, and (ii) their intensity of preferences for having children $\beta \in B = [0,1]$. Furthermore, the set of agents N is the same in each generation (time period) and is defined to be $B \times \Omega = ([0,1] \times [0,1])$, where agent $n = (\omega, \beta)$ is interpreted to be an agent of wage type ω and preference type β . Each agent $n = (\omega, \beta)$ is endowed with one unit of leisure l and chooses simultaneously both how much leisure to consume (or equivalently how much private good ($c \in R_+$) to consume) and whether to have an out-of-wedlock child ($b \in \{0,1\}$).¹⁹ Her utility function is separable and of the following form:

$$u^{n,t}(c, l; b; S_t) = u(c, l) + b f(\beta, S_t) \quad (2.1)$$

where S_t is interpreted to be a parameter that is monotonic in the social acceptance of having a child out-of-wedlock in time period t . This social acceptance parameter S_t is determined as a function of the actions of past generations. More precisely,

$$S_t = g(K_{t-1}, K_{t-2}, \dots; \delta) = \frac{\sum_{i=0}^{\infty} \delta^i K_{t-1-i}}{\sum_{i=0}^{\infty} \delta^i} = (1-\delta) \sum_{i=0}^{\infty} \delta^i K_{t-1-i} \quad (2.2)$$

where K_t is the fraction of the population N that chooses to have children out-of-wedlock in period t , and $\delta \in (0,1)$ is a discount factor. Note that $S_t = (1-\delta)K_{t-1} + \delta S_{t-1}$. Furthermore, any steady state S must lie in the interval $[0,1]$ and can be interpreted as the fraction of N who have a child out-of-wedlock in the steady state.²⁰

For now, we assume the utility function has the following properties:

1. u is strictly quasiconcave and twice differentiable;

¹⁹ At this point, we abstract away from a separate marriage decision by implicitly assuming that utility under marriage is less than or equal to utility without marriage and without children. Therefore, agents may be indifferent between having a child within marriage and not having a child at all, or they may strictly prefer not to have children. In Section 5, we comment on the implications of explicitly adding a marriage decision to the model.

²⁰ In the steady state, $K_t = K_{t-1} = K_{t-2} = \dots = K$ which implies $S = (1-\delta) \sum_{i=0}^{\infty} \delta^i K = (1-\delta)K \frac{1}{(1-\delta)} = K$.

2. $f(0,S) = 0$; i.e. women with $\beta=0$ derive no utility from having an out-of-wedlock child;
3. $\frac{\partial f(\beta, \bullet)}{\partial S_t} \geq 0$, i.e. the benefits from having a child increase as social acceptance rises, and
4. $\frac{\partial f(\bullet, S_t)}{\partial \beta} > 0$ whenever $f(\beta, S_t) > 0$; i.e. the benefit from having a child increases as preferences for having children (as represented by β) become more intense.²¹

While f thus gives the *benefit* of having children out-of-wedlock (which might be negative if social acceptance is low), we also assume that there is a fixed time *cost* k of having a child; i.e. choosing $b=1$ implies that the consumer's endowment of time falls from 1 to $(1-k)$.²² A consumer $n=(\omega, \beta)$ in period t therefore faces the following maximization problem (given S_t):

$$\max_{c, \ell, b} u^{n,t}(c, \ell, b; S_t) = u(c, \ell) + b f(\beta, S_t) \text{ subject to } c = \omega(1 - bk - \ell). \quad (2.3)$$

Since the choice of whether to have a child out-of-wedlock is binary, we can think of each consumer taking as given the social acceptance parameter S_t and comparing the indirect utility of not having a child $V(b=0; S_t)$ with the indirect utility of having a child $V(b=1; S_t)$. More precisely, each consumer $n=(\omega, \beta)$ first solves for the optimal level of leisure, holding constant the decision of whether to have a child ($\ell_{b=1}^n(S_t)$) or not ($\ell_{b=0}^n(S_t)$):

$$\ell_{b=0}^n(S_t) = \operatorname{argmax}_{\ell} \left\{ u^{n,t}(c, \ell; 0) = u(c, \ell) \text{ subject to } c = \omega(1 - \ell) \right\} \quad (2.4)$$

$$\ell_{b=1}^n(S_t) = \operatorname{argmax}_{\ell} \left\{ u^{n,t}(c, \ell; 1) = u(c, \ell) + f(\beta, S_t) \text{ subject to } c = \omega(1 - k - \ell) \right\}. \quad (2.5)$$

She then compares the two indirect utilities

$$V^n(b=0; S_t) = u^{n,t}(\omega(1 - \ell_{b=0}^n(S_t)), \ell_{b=0}^n(S_t), 0) \quad (2.6)$$

$$V^n(b=1; S_t) = u^{n,t}(\omega(1 - k - \ell_{b=1}^n(S_t)), \ell_{b=1}^n(S_t), 1) \quad (2.7)$$

and chooses whether or not to have a child based on which indirect utility level is greater. Since these

²¹ One example of a utility function that satisfies these conditions is $u^{n,t}(c, \ell) = c^\alpha \ell^{1-\alpha} + b\beta S_t$.

²² We have also included a fixed monetary cost in previous versions of this analysis, as well as the option of purchasing child care. The inclusion of a fixed monetary cost makes out-of-wedlock births less likely for the very poor (in the absence of welfare programs), while the option of purchasing child care increases the likelihood of out-of-wedlock births among high wage earners. The resulting analysis does not change significantly beyond this but does become unnecessarily cumbersome. We therefore focus here on the case where there is only a fixed *time* cost to having children and no possibility of purchasing child care.

²³ Some readers have suggested that this specification implicitly assumes myopia on the part of consumers because they do not calculate the future evolution of S . We think that this is an inaccurate interpretation. In particular, agents in the model only live one period and thus are concerned only about the stigma in that period. Furthermore, their actions have no impact on the level of social approval.

indirect utility functions are superscripted by the agent type $n=(\omega,\beta)$, we can re-write them explicitly in terms of ω and β ; i.e.

$$V(\omega,\beta;b=0,S_t) = V^{n=(\omega,\beta)}(b=0,S_t) \quad (2.8)$$

$$V(\omega,\beta;b=1,S_t) = V^{n=(\omega,\beta)}(b=1,S_t). \quad (2.9)$$

By setting them equal to each other and solving for ω , we get a function $wage(\beta;S_t)$ that separates those who choose to have children from those who do not. In particular, the fraction of agents choosing to have children is equal to the area under this function that lies within the box of types $B \times \Omega = [0,1] \times [0,1]$. More formally, we can define a new function

$$\omega(\beta;S_t) = \begin{cases} 0 & \text{if } wage(\beta;S_t) < 0 \\ wage(\beta;S_t) & \text{if } 0 \leq wage(\beta;S_t) \leq 1 \\ 1 & \text{if } wage(\beta;S_t) > 1 \end{cases}, \quad (2.10)$$

and determine the fraction of agent types having children given a social acceptance level S_t as an

integral; i.e. $K(S_t) = \int_0^1 \omega(\beta;S_t) d\beta$.

Recall that in any steady state equilibrium, i.e. whenever $S_t = S_{t-1} = S_{t-2} = \dots = S$, the social approval parameter S is simply the fraction of the population N that is having children out-of-wedlock in any given period. Thus, a steady state equilibrium occurs when

$$K(S) = S = \int_0^1 \omega(\beta;S) d\beta. \quad (2.11)$$

Both the steady state number of children and the level of social approval are therefore determined endogenously through the decisions by individuals who take S as given.

2.11. An Example

Suppose, for example, the utility function for an individual $n=(\omega,\beta)$ were given by

$$u^{n,t}(c,\ell,b;S_t) = c^\alpha \ell^{1-\alpha} + b\beta S_t.$$

Then

$$\ell_{b=0}^n(S_t) = (1-\alpha)$$

$$\begin{aligned}
b_{b=1}^n(S_t) &= (1-\alpha)(1-k) \\
V(\omega, \beta; b=0, S_t) &= (\omega\alpha)^\alpha (1-\alpha)^{(1-\alpha)} \\
V(\omega, \beta; b=1, S_t) &= (\omega\alpha(1-k))^\alpha ((1-\alpha)(1-k))^{(1-\alpha)} + \beta S_t.
\end{aligned}$$

Suppose further that $\alpha=0.5$ and $k=0.5$. Then $V(\omega, \beta; b=0, S_t) = V(\omega, \beta; b=1, S_t)$ can be solved for ω to get the function

$$wage(\beta; S_t) = 16 (\beta S_t)^2.$$

This function does not attain a negative value for any $(\beta, S_t) \in [0, 1] \times [0, 1]$, but for values of S_t greater than $\frac{1}{4}$, it becomes greater than 1 for some values of β . Since the highest wage type has a wage equal to 1, we modify the function to get

$$\omega(\beta; S_t) = \begin{cases} wage(\beta; S_t) & \text{if } 16(\beta S_t)^2 \leq 1 \\ 1 & \text{if } 16(\beta S_t)^2 > 1 \end{cases}.$$

Figure 2 illustrates this function for $S_t = \frac{1}{2}$. The shaded region represents the set of types that choose to have children out-of-wedlock when $S_t = \frac{1}{2}$, and, since the total area of the “type-box” is equal to 1, the *area* of this shaded region, $\int_0^1 \omega(\beta; S_t) d\beta$, represents the fraction of agents choosing to have out-of-wedlock children. For this example, this integral is equal to 0.673, which means that this could not be a steady state equilibrium (because $S_t = \frac{1}{2}$).

Figure 3 illustrates the entire $\omega(\beta, S_t)$ function of which Figure 2 is the horizontal slice at $S_t = \frac{1}{2}$. This more general figure shows that, as S rises and thus social approval gets higher, so the share of out-of-wedlock births goes up (as one would expect). A steady state equilibrium occurs when $S = \int_0^1 \omega(\beta; S) d\beta$; i.e. when the integral of the horizontal slice is equal to the height of that slice. For the present example, this occurs at two points: $S=0$ and $S=0.786$. In other words, with the parameters and functional forms assumed in this example, there are two steady states: one in which no children are born out-of-wedlock, and another in which close to 79 percent of women choose to have children out-of-wedlock.

Figure 4(a) provides a second and perhaps more useful illustration. The curve in this figure

illustrates $K(S)$ - the relationship between S and the number of women choosing to have children out-of-wedlock. Whenever the curve intersects the 45 degree line from above, a steady state equilibrium is attained. (When it crosses from below, the candidate equilibrium is highly unstable.) For this example, the curve crosses the 45 degree line from above twice: once at $S=0$, and then again at $S=0.786$.²⁴

2.2. Adding Public Assistance (AFDC) to the Model

We now model two important aspects of Aid to Families with Dependent Children (AFDC). First, the only women to qualify for a cash payment of $P \in R_+$ are those with children. Second, for every dollar earned in the labor market, welfare benefits are reduced by $\pi \in [0,1]$. AFDC is therefore defined as $(P, \pi) \in R_+ \times [0,1]$ where the first term indicates the amount of the cash payment to a single mother with no outside income, and the second term indicates the rate at which P is reduced as labor income rises.

Because going on public assistance means that labor income is taxed at an effective rate of π , it is not necessarily the case that a woman who chooses to have a child out-of-wedlock will receive AFDC. Rather, the introduction of $AFDC=(P, \pi)$ means that women face a new budget constraint

$$c = \max_{b \in \{0,1\}} \{ bP + (1-bp)w(1-bk-1), w(1-bk-1) \} \quad (2.12)$$

which may be kinked when $b=1$.²⁵ Thus, when making their labor/leisure choice, women who have a child implicitly choose whether or not to go on public assistance. For low wage types, the first term in the above equation always dominates for all levels of leisure (in which case the budget constraint is not kinked), while for high wage types, the first term dominates for high levels of leisure while the second dominates for low levels of leisure.

Just as we were able to think of the problem without AFDC as a two step problem, we can now think of the case with AFDC as a three step problem. Each agent takes the social acceptance

²⁴ The shape of the curve in Figure 4(a) (as well as many of the other figures that follow) is familiar to those having worked with threshold models. In section 2.3 we discuss in more detail what conditions give rise to this shape. For now, we merely note that it arises primarily from the underlying uniform distribution of types in the $\omega \times \beta$ space. This distribution results in a bell-shaped distribution of threshold points which naturally gives rise to the sigmoid shape of the relationship illustrated in Figure 4(a). Since the underlying uniform distribution of types seems natural, we continue with this assumption.

²⁵ This kink disappears when $b=0$ as the two arguments collapse into one.

parameter S_t as given and compares the indirect utility of not having a child $V(b=0;S_t)$, the indirect utility of having a child and going on public assistance $V(b=1;\text{welfare},S_t)$ and the indirect utility of having a child and not going on public assistance $V(b=1;\text{no welfare},S_t)$. This is done by first calculating the optimal levels of leisure in each case ($l_{b=0}^n(S_t)$, $l_{b=1}^n(\text{welfare};S_t)$ and $l_{b=1}^n(\text{no welfare};S_t)$), and then substituting these into the utility function. Person n 's indirect utility of having a child is then simply the higher of the indirect utility levels of having a child with and without welfare:

$$V^n(b=1;S_t) = \max \{V^n(b=1;\text{welfare},S_t), V^n(b=1;\text{no welfare},S_t)\}. \quad (2.13)$$

As before, we can therefore get indirect utility functions of not having a child ($V(\omega,\beta;b=0,S_t)$) and of having a child ($V(\omega,\beta;b=1,S_t)$) in terms of (ω,β) , set them equal to one another, solve for $\text{wage}(\beta;S_t)$, and derive $\omega(\beta;S_t)$ which separates within the type space $B \times \Omega = [0,1] \times [0,1]$ those who choose to have a child from those who choose not to. Thus, given $\omega(\beta;S_t)$, we now can determine the steady state equilibrium of S in the same way as before.

2.21. An Example (Continued)

In the example in Section 2.11, we implicitly assumed an AFDC program $(P,\pi)=(0,0)$. Suppose that instead we had assumed a program $(P,\pi)=(0.1, 0.5)$ (i.e. a program that offers cash assistance of 0.1 to mothers who receive no outside income and that reduces this amount by 50 cents for every dollar of labor income). Figure 4(b) illustrates how the relationship between the social approval S and the number of agents choosing to have a child changes when a welfare program of this type is introduced in the context of our example. For this particular specification of the utility function and the assumed parameters, the low steady state in Figure 4(a) disappears, while the high steady state equilibrium S grows to 0.859 (from $S=0.786$ without AFDC).

What is perhaps more interesting than the steady state equilibria themselves is the transition path to the new steady state. Suppose that, within the context of this example, we started with the low steady state equilibrium ($S=0$) and introduced the program $(0.1, 0.5)$ into the system in time period $t=10$. Then Figure 4(c) illustrates the transition path of S_t for $\delta=0.9$, the discount factor in equation (2.2), and Figure 4(d) shows the number of individuals who choose to have a child in each period along this transition paths (K_t).

2.3 Some Intuition on the Relationship between K and S

Many of the conclusions derived in Section 4 will arise from the existence of a high S and low S steady state in the absence of AFDC. The existence of two (and only two) such steady states is due to the shape of the relationship $K(S) = \int_0^1 \omega(\beta; S_t) d\beta$ (graphed in Figure 4(a) for the example in the previous section.) Assuming that the stigma attached to having an out-of-wedlock birth when $S=0$ is sufficiently high, $K(0)=0$ represents one steady state. Other steady states arise whenever the function K crosses the 45 degree line from above. If the function K has a concave or a sigmoid (by which we mean convex for low S and concave for high S) shape, there will be at most one other steady state. We argue in this section, that this is in fact to be expected under reasonable assumptions regarding the underlying distribution of types and the underlying utility function. We begin by underscoring the role played by the subutility function $f(\beta, S)$, and then proceed to discuss the role played by the distributional assumptions over the underlying type space.

2.31. The Role of $f(\beta, S)$

To focus on the role played by the function f , we assume that the subutility function over consumption and leisure is Cobb-Douglas with $\alpha=0.5$, and we continue to assume that each point in the type space represents one agent (i.e. a uniform distribution of types). The Cobb-Douglas form with $\alpha=0.5$ implies that, for any fixed S , the function graphed in Figure 2 is given by

$$\omega(\beta, S) = \begin{cases} 0 & \text{if } f(\beta, S) \leq 0 \\ c[f(\beta, S)]^2 & \text{if } 0 < f(\beta, S) < c^{-1/2} \\ 1 & \text{if } f(\beta, S) \geq c^{-1/2} \end{cases} \quad \text{where } c=4k^{-2}. \quad (2.14)$$

Therefore, whenever $\omega(\beta, S) \in (0, 1)$,

$$\frac{\partial \omega(\beta, S)}{\partial \beta} = 2cf(\beta, S) \frac{\partial f(\beta, S)}{\partial \beta} > 0 \quad (2.15)$$

because $\frac{\partial f(\beta, S)}{\partial \beta} > 0$ when $f(\beta, S) > 0$. The function in Figure 2 is therefore always upward sloping.²⁶ Furthermore, for $\omega(\beta, S) \in (0, 1)$,

²⁶ This is true unless the utility of having a child out-of-wedlock is negative ($f(\beta, S) \leq 0$) or the highest wage (of 1) has been reached, in which case the slope is 0.

$$\frac{\partial \omega(\beta, S)}{\partial S} = 2cf(\beta, S) \frac{\partial f(\beta, S)}{\partial S} > 0 \quad (2.16)$$

because $\frac{\partial f(\beta, S)}{\partial S} > 0$. Thus, as S increases, the function in Figure 2 rotates up (as the vertical intercept remains at the origin due to the assumption $f(0, S) = 0$.) Finally, for $\omega(\beta, S) \in (0, 1)$,

$$\frac{\partial^2 \omega(\beta, S)}{\partial S^2} = 2c \left[\left(\frac{\partial f(\beta, S)}{\partial S} \right)^2 + f(\beta, S) \frac{\partial^2 f(\beta, S)}{\partial S^2} \right] \quad (2.17)$$

which is greater than zero if and only if

$$\left(\frac{\partial f(\beta, S)}{\partial S} \right)^2 > -f(\beta, S) \frac{\partial^2 f(\beta, S)}{\partial S^2} \quad (2.18)$$

Under the assumption of a uniform distribution of types, the relationship in Figure 4(a) simply plots $K(S) = \int_0^1 \omega(\beta, S) d\beta$. This is equal to the area under the function $c[f(\beta; S)]^2$ that lies within the unit square (which represents the type space.) Given (2.16), $\frac{dK(S)}{dS} > 0$ whenever $K(S)$ lies in the interval $(0, 1)$; i.e. K is an increasing function of S .

Note that so long as $\omega(1, S) \in (0, 1)$, $\int_0^1 \omega(\beta, S) d\beta = \int_0^1 c[f(\beta; S)]^2 d\beta$. If $\omega(1, S) = 1$, however, $\int_0^1 \omega(\beta, S) d\beta \leq \int_0^1 c[f(\beta; S)]^2 d\beta$. This implies that, as long as $\omega(1, S) \in (0, 1)$, $\frac{d^2 K(S)}{dS^2} > 0$ if and only if (2.18) holds, but if $\omega(1, S) = 1$, (2.18) is no longer sufficient (but still necessary) for convexity of $K(S)$. We will therefore adopt the following terminology: if $\omega(1, S) = 1$ for some $S < 1$, we will say that “the constraint of the type space is binding” for that value of S .

Implication 1: For low values of S , condition (2.18) is a necessary and sufficient condition for $K(S)$ to be convex. For high enough S , however, condition (2.18) is merely necessary but no longer sufficient for $K(S)$ to be convex. Thus, concavity of K can result from either a violation of (2.18) or the binding constraint of the type space at high S .

We can now investigate the shape of $K(S)$ under different assumptions about f . If f is convex in S , then $\frac{\partial^2 f(\beta, S)}{\partial S^2} > 0$ which implies condition (2.18) is automatically satisfied when $\omega(1, S) \in (0, 1)$ (which is guaranteed to hold for low values of S); i.e.

Implication 2: *If f is convex in S , $K(S)$ is convex at low values of S .*

Furthermore, if $\omega(1, 1) < 1$, the type space constraint is never binding and $K(S)$ is convex throughout (but never crosses the 45 degree line thus leaving us with one steady state at $S=0$). If $\omega(1, S) = 1$ for some $S < 1$, however, the type space is binding for high values of S . Thus, if $\omega(1, S) = 1$ for S sufficiently below 1, $K(S)$ must become concave at some level of S . In addition, unless $\frac{\partial^2 f(\beta, S)}{\partial S^2}$ increases dramatically over a small interval after $K(S)$ becomes concave, there is a strong tendency for the concavity of K to be sustained (as S increases) because of the increasingly binding constraint of the type space. Under the resulting expected sigmoid shape of K , there exists at most one steady state in addition to the low- S steady state $S=0$.²⁷

Implication 3: *If f is convex in S and $\omega(1, S) = 1$ for S sufficiently below 1, $K(S)$ becomes concave at some level of S , and there is a strong tendency for K to remain concave as S increases (due to the increasingly binding constraint of the type space).*

If, on the other hand, f is concave in S , (2.18) may be violated even at low values of S . Thus, $\frac{d^2 K(S)}{dS^2}$ may become negative well before S is high enough such that $\omega(1, S) = 1$ which is then re-enforced when S is high enough for the type space constraint to be binding.

Implication 4: *If f is concave in S , then $K(S)$ may be concave or convex at low values of S . However, once it is concave, there is again a strong tendency for it to continue to be concave as S increases.*

²⁷ This second steady state will lie strictly below $S=1$ unless f is not a function of β . An example where f is not a function of β is given by the highest curve graphed in figure 5(b).

Thus, if f is either convex or concave throughout, it is reasonable to expect that, in addition to the low- S steady state, there is at most one additional steady state at $S > 0$.²⁸

We may, however, think that it is not reasonable for f to be either concave or convex throughout. Sociological evidence suggests that it is plausible, for example, that the marginal impact on social stigma of an additional out-of-wedlock birth is increasing when the total number of out-of-wedlock births is small, but that, once the total number of out-of-wedlock births is large, this marginal impact begins to decline. This translates into a functional form for f that is initially convex but eventually concave. The basic intuition for the sigmoid shape of $K(S)$ under these circumstances, however, continues to apply. Implication 2 suggests that $K(S)$ will be convex for low values of S , while Implications 3 and 4 suggest that it will be concave for higher values of S . This leads us to a general conclusion regarding the relationship of $K(S)$ with respect to the function f :

Implication 5: *If f is (i) concave throughout, (ii) convex throughout or (iii) convex for low values of S and concave for high values of S , then it is reasonable to expect there to be at most two steady states.*

The result would not hold as clearly, however, if f were initially concave and then convex. This would imply a high impact of the first out-of-wedlock birth, followed by declining marginal impact of additional out-of-wedlock births and then an increase after some number of births. There is little evidence to suggest that such a functional form is reasonable. If this were the underlying shape of f , however, a third steady state is plausible. Similarly, additional switches between convexity and concavity of f may (but usually do not) cause additional increases in the number of possible steady states. However, we should note that the binding constraint imposed by the type space limits the number of potential steady states. As soon as $\omega(1, S) = 1$, there is a strong tendency for K to be concave *regardless of what shape f takes* because of the increasingly binding constraint imposed by the type space. Thus, it is extremely unlikely for there to be more than one steady state at $S > 0.5$.²⁹

²⁸ While it is theoretically possible in these cases for $K(S)$ to cross the 45 degree line from above more than once, it requires not only abrupt changes in the shape of f (as mentioned above), but also that these abrupt changes happen at just the right levels of S to cause $K(S)$ to oscillate around the 45 degree line. A formal proof of the intuition presented here would involve regularity conditions on the third derivative of f . At this point, we simply note that it is extremely difficult to find functional forms for f that are either concave or convex throughout and that give rise to more than two steady states. In fact, we were unable to find any such functional forms in many attempted simulations.

²⁹ We were, in fact, unable to find any functional forms (other than the most extreme) which yielded more than two overall steady states.

2.32. The Role of the Underlying Distribution of Types

So far, we have assumed that the distribution of types over the type space is uniform. There exists one agent for each point in the type space. In the previous section, we have used this assumption to argue that, under most reasonable specifications of the function f , the model gives rise to at most two steady states in the absence of AFDC. The arguments presented above become stronger if we replace the uniform distribution assumption with a unimodal distribution of agents across the type space. In that case, for low values of S , $K(S)$ will increase faster than before, while it will increase more slowly for high values of S . A functional form for f that yields a linear relationship between K and S , for example, will therefore now yield a convex relationship for low values of S and a concave relationship for high values of S . Altering the assumption of an underlying uniform distribution over the type space to a unimodal distribution therefore strengthens the argument made in the previous section that any reasonable functional form for f will yield the required shape for K that gives rise to at most two steady states. Thus, the arguments in the previous section remain largely valid under all reasonable distributions, by which we mean all unimodal distributions. If the underlying distribution of types has multiple peaks, however, additional steady states become plausible.³⁰

3. Comparative Statics of the Model

In Sections 2.11 and 2.21, we provided a specific example to clarify the model used in the paper. We now introduce a somewhat more general specification of the underlying utility function and demonstrate the robustness of the initial intuitions from the example as well as the robustness of the intuitions regarding the shape of $K(S)$ developed in Section 2.3. In particular, we specify a utility function of the following form:

$$u^i(c, l, b; S_i) = c^\alpha l^{1-\alpha} + b\gamma_1\beta^{\gamma_2}(S_i^{\gamma_3} + \gamma_4). \quad (3.1)$$

Note that this collapses to the specification in the previous example when $\gamma_1 = \gamma_2 = \gamma_3 = 1$ and $\gamma_4 = 0$.

Each new parameter accomplishes a slightly different aim:

³⁰ For an illustration of the impact of other types of threshold point distributions, see Granovetter and Soong (1983) who point out that more than two steady states are possible if the underlying threshold point distribution has multiple peaks.

- γ_1 changes the importance of the second term of the utility function (children) relative to the first (consumption and leisure).
- γ_2 changes the degree to which different preferences for children matter; when set to zero, for example, all types have the same inherent preferences for children, while larger values of γ_2 increase the degree to which a high β type differs from a low β type. (Larger values of γ_2 also decrease the overall impact of children on utility for all $\beta \neq 0$ or 1.)
- γ_3 alters the shape of the impact of changes in the social approval parameter S_t ; a value of 1 implies a linear impact in the sense that a marginal change in the value of S_t has the same effect on utility for all initial values of S_t ; a value of less than 1 implies that marginal changes in S_t are more important as S_t gets smaller, while a value greater than 1 implies that that marginal changes in S_t become more important as S_t gets larger.
- γ_4 determines at what level of social approval out-of-wedlock children become “goods”; i.e. when γ_4 is negative, then out-of-wedlock children are “bads” for low values of S_t . Thus, γ_4 determines the level of “stigma” when no one has chosen out-of-wedlock births.

3.1. Comparative Statics without AFDC

We continue with the assumption of a uniform distribution of types and illustrate in Figures 5a through 5d the change in the shape of $K(S)$ in the absence of welfare (i.e. $(P, \pi) = (0, 0)$) as these four parameters vary and as we keep $\alpha = k = 0.5$. In Figure 5a, for example, starting with the highest function in the picture, we illustrate the effects of lowering γ_1 from 1.5 to 0.5 in increments of 0.1 while keeping $\gamma_2 = \gamma_3 = 1$ and $\gamma_4 = 0$. (Higher curves correspond to higher levels of γ_1 .) Unless γ_1 , the weight on the second term in the utility function, becomes small, the model continues to have two steady states; one at $S=0$ and one at $S>0$ (where the latter steady state is increasing in γ_1 .) More precisely, at $\gamma_1 \approx 0.67$, both $S=0$ and $S \approx 0.518$ are steady state equilibria, while for values of γ_1 less than 0.67, only $S=0$ remains as a steady state. Thus, as γ_1 falls, there is a discontinuous change in the number and nature of the steady state equilibria at some relatively low value of γ_1 . Figure 5b illustrates a similar discontinuity as γ_2 , the exponent on β , increases from 0 to 2 in 0.25 increments (while $\gamma_1 = \gamma_3 = 1$ and $\gamma_4 = 0$). (Higher curves correspond to lower values of γ_2 .) While at $\gamma_2 \approx 1.81$ both $S \approx 0.404$ and $S=0$ are steady states, for values of γ_2 greater than 1.81, no strictly positive steady

state exists. Here, the larger γ_2 , the smaller is the effect of β for any type (other than $\beta=0$ or 1) and the more pronounced are the differences between different types in terms of the impact of a child on utility. Therefore, as γ_2 rises, the $K(S)$ falls (fewer individuals desire a child given S) and gets shallower (because different types respond less similarly). Again, two steady states are common for most values of γ_2 , with the higher steady state rising as γ_2 falls.

While γ_1 and γ_2 place weights on various parameters of the utility function, γ_3 determines the nature of the effect of social acceptance as expressed in the actions of prior generations. In Figure 5c, we illustrate the effect of altering γ_3 . (Higher curves correspond to lower values of γ_3 .) In particular, for values of γ_3 greater than 1 (with $\gamma_1=\gamma_2=1$ and $\gamma_4=0$), the marginal impact of additional agents having children out-of-wedlock *rises* as the number of unwed mothers rises, while for values of γ_3 less than 1, this marginal impact falls. As the value of γ_3 rises (from 0.5 to 1.5 in 0.25 increments), the curve in Figure 5c becomes shallower due to the less rapid impact of other people's past actions on individual utility. As before, the result of two steady states is fairly robust to changing values of γ_3 unless γ_3 rises above 1.75 in which case only one steady state ($S=0$) exists. (For $\gamma_3 \approx 1.75$, $S \approx 0.67$ is a steady state.)

In contrast to the parameters discussed thus far, γ_4 determines at what level of social acceptance out-of-wedlock children become "goods" (rather than "bads"); i.e. it exogenously sets the degree of stigma felt by individuals when they are the only ones to have chosen an out-of-wedlock birth ($S_t=0$). Clearly, if $\gamma_4 < 0$, children are bads for values of S_t close to zero, while for $\gamma_4 > 0$, having a child, while being costly, always yields positive utility. Figure 5d, then, illustrates the effect of changing γ_4 (with $\gamma_1=\gamma_2=\gamma_3=1$). For all $\gamma_4 \leq 0$, $S=0$ is, of course, always a steady state equilibrium. As γ_4 rises above 0, however, children now become "goods" for all levels of S_t . Therefore, even when $S_t=0$, agents with wages close to zero choose to have a child which implies that $S=0$ is no longer a steady state equilibrium. For values of γ_4 close to zero, however, there still exists a steady state equilibrium *close to 0* as well as a steady state equilibrium substantially above zero; i.e. for positive γ_4 close to zero, the curve in Figure 5d would cross from above twice. (This is not pictured.) In particular, for the parameters chosen in Figure 5d, so long as $0 < \gamma_4 \leq 0.04$, a steady state equilibrium $0 < S < 0.018$ (as well as a steady state equilibrium $S > 0.785$) exist. However, for $\gamma_4 > 0.04$, only large positive steady state equilibria that are increasing in γ_4 arise. At the same time, if γ_4

< 0 and becomes large in absolute value, then $S=0$ is the only steady state equilibrium. (This occurs for values below $\gamma_4 \approx -0.18$ (where $S=0.608$ is the smallest possible high- S steady state equilibrium).

Finally, we have thus far kept α and k fixed 0.5. In Figures 6a and 6b, we vary these parameters holding $\gamma_1=\gamma_2=\gamma_3=1$ and $\gamma_4=0$. Varying α between 0.7 and 0.3 in Figure 6a (while keeping $k=0.5$) seems to have relatively little overall impact on $K(S)$, while changing k , the time cost of having a child, has a more dramatic impact (where $\alpha=0.5$). As one would expect, raising the cost of having a child decreases K_t for any level of social acceptance S_t . The result of two steady states, however, is robust to most of these changes and disappears only when k rises above 0.75 (where $S=0.503$). Thus, when the cost of having a child becomes (unreasonably) high, only $S=0$ is a steady state equilibrium.

From the simulations reported in Figures 5 and 6, we can therefore reach the following conclusion concerning the more general specification of the utility function:

- Conclusion 1:*
- *For most parameters, the model has two steady states: A low- S steady state in which few or no women choose to have an out-of-wedlock child, and a high- S steady state in which a sizable fraction (more than 40%) choose to have one.*
 - *The two steady state result may collapse and only one low- S steady state may appear as the relative utility weight on children (γ_1) falls, as the effect of the desire of having children (β) is lower and varies less among different types (though higher values of γ_2), as the marginal effect on utility of additional out-of-wedlock children in past generations rises (through higher values of γ_3), as the level of stigma of being the only person to have an out-of-wedlock birth rises (through γ_4), and as the cost of having a child (k) increases.*
 - *Also, as the utility of being the only person to have an out-of-wedlock child gets more positive (through γ_4), the two steady state result breaks down and only a high- S steady state appears.*

3.2. Comparative Statics with AFDC

In Figures 5 and 6 we considered how $K(S)$ changes as different parameters within the utility

function change or as the cost of having a child changes *in the absence of AFDC*. Next we proceed to discuss the impact of changing the nature of the welfare program (P, π) . In particular, in Figure 7a we change the size of the cash welfare program P , and in Figure 7b we vary the rate at which welfare payments are reduced as labor income rises. Throughout, we hold $\gamma_1 = \gamma_2 = \gamma_3 = 1$ and $\gamma_4 = -0.1$ (thus making an out-of-wedlock child a “bad” when $S < 0.1$), as well as $\alpha = k = 0.5$.

Not surprisingly, higher values of P in Figure 7a (with $\pi = 0$) increase K_t , the number of agents choosing to have children, for any given S_t and thus drive the positive steady state closer to 1. In fact, for $P = 0.49$, $S = 1$ is the only steady state equilibrium (as the financial incentive to be a single mother becomes very strong). Furthermore, as P rises above 0.054, the low- S steady state equilibrium vanishes leaving the model only with a high- S steady state. (For $P = 0.054$, the low- S steady state is $S = 0.132$.)³¹

While the level of the cash payment P thus seems to have a major impact on $K(S)$, the rate at which P is reduced as labor income rises (π) has much less of an impact. In Figure 7b, we illustrate this relationship for $\pi = 0$ and $\pi = 1$ (given $P = 0.1$). While raising π decreases K_t for any given S_t , the effect is relatively weak, especially for low values of S_t (where mainly low wage types are choosing to have a child). Raising π thus has a small negative impact on the value of the high- S steady state (as well as the low- S steady state when this exists.)

Conclusion 2: As AFDC aid increases, the low- S steady state vanishes and the high- S steady state is increasing in the amount of the aid and decreasing in the degree to which this aid falls when labor income rises.

4. The Transition Path when AFDC is Introduced

Since the desirability of having out-of-wedlock children is determined in considerable part by the number of others who have had children in the past, the behavioral effects of introducing a cash assistance program that only single mothers are eligible for can be expected to grow with time. Since the effect of π (the rate at which benefits are reduced when labor income rises) appears to play a minor role in the model, we assume throughout this section that $\pi = 1$ (as it is in many US states). Furthermore, we continue to assume $\alpha = k = 0.5$ and, for purposes of illustration as well as for the

³¹ When $\gamma_4 = 0$ instead of -0.1 , the highest P consistent with a low steady state is 0.01 (where $S = 0.0325$).

sake of brevity, we assume $\gamma_1=\gamma_2=\gamma_3=1$. (None of the qualitative results change if we alter these assumptions.) Since the model is seeking to develop an explanation for the rise in out-of-wedlock births from very low pre-AFDC levels, we argue that the only empirically relevant set of specifications are those that allow for the existence of a low-S pre-AFDC steady state. Therefore, γ_4 cannot be above 0.04 as this would result in the existence of only a high-S steady state (see Figure 5d). We start by assuming $\gamma_4=-0.1$ and discuss how results change as γ_4 changes.³²

Throughout, we begin in the no-welfare $((P,\pi)=(0,0))$ case and the low-S steady state equilibrium, then introduce a welfare program $(P,1)$ and investigate the transition path to the new steady state. Furthermore, we investigate proposals to eliminate AFDC once the economy has settled into the new steady state as well as proposals to eliminate or reduce AFDC at points along the transition path. In many cases, we report results for different values of δ (which determines the length of time the transition path takes to converge to the new steady state).

4.1. Introducing AFDC in a Low-S Steady State

Under the current assumptions, two steady state equilibria exist: $S=0$ and $S=0.738$. We assume that prior to the introduction of AFDC, the economy is in the low-S steady state in which no one chooses to have an out-of-wedlock child (because such children are “bads”.) Suppose that, at time $t=10$, a cash assistance program $(P,\pi)=(0.1,1)$ is introduced. Figure 8a then illustrates the fraction of individuals choosing to have an out-of-wedlock birth in each time period under different assumptions of δ . Since higher values of δ dampen the effect of each generation’s actions on the next period’s level of S , such higher values of δ lead to dramatically longer transition paths.³³ Of course, regardless of δ , the transition path eventually reaches the same new steady state (which is, in this case, $S=0.839$). Note that this steady state is only modestly higher than the high-S steady state without welfare and that this is the only steady state for a welfare program of this size (see Figure 7). Figure 8b proceeds to illustrate the level of S_t induced by the changing behavior along the transition path under the different assumptions of δ .

³² As we argued in footnote 13, we can think of this as having arisen from an evolutionary process in which the low-S societies out-performed high-S societies and thus became the dominant cultures we observe prior to large scale government intervention. Regardless of how we originally arrived at this low-S steady state, however, it remains the empirically relevant pre-AFDC steady state to consider.

³³ Since the sociology literature suggests that values change slowly, we place more credence on values of δ close to 1.

Now suppose instead that a more modest welfare program of $(P, \pi) = (0.05, 1)$ had been introduced at time $t=10$. Figures 8c and 8d are then the analogs to Figures 8a and 8b respectively. Note from Figure 7 that with $P=0.05$, two steady states exist under the welfare program, with a low-S steady state of $S \approx 0.1$. Thus, the introduction of this smaller cash payment leads to a significantly smaller number of out-of-wedlock births than the larger program discussed above because the higher steady state is never attained. The more negative the value of γ_4 , the greater the cash benefit can be and still yield a low-S steady state; i.e. the greater the initial steady state stigma, the more generous the welfare system can be and still maintain relatively low levels of illegitimacy. With the current $\gamma_4 = -0.1$, the highest P can be without resulting in illegitimacy rates significantly above 10% is approximately 0.05.³⁴ As γ_4 approaches 0.04, the level of cash assistance required to reach the high-S steady state approaches 0, while for a value of $\gamma_4 = -0.2$, it can be as high as 0.1.

Conclusion 3: Assuming the economy starts in a steady state close to $S=0$ with no AFDC, the introduction of AFDC leads over time to substantially higher levels of illegitimacy if the cash payment is above a certain amount. If it is not above this amount, then even over time, AFDC leads to only a modest rise in illegitimacy. The minimum amount of cash assistance required to attain the high-illegitimacy result is inversely related to γ_4 and tends to be small relative to the level of AFDC cash payments we observe.

Figure 8 thus illustrates that the introduction of AFDC can lead to increasing levels of illegitimacy over time even as the AFDC benefit levels remain constant. Thus, since “values” change along the transition path, out-of-wedlock children that start as “bads” prior to the introduction of AFDC become increasingly desirable “goods” as time passes.³⁵ This causes illegitimacy to increase not only among the poor but in the society as a whole, and not only among those who choose to actually go on public assistance, but also among those who continue to work without receiving welfare benefits.

³⁴ Given that the average pre-AFDC income in the model is 0.25, this level of cash support is 20% of the average income. Since most AFDC programs (when considered jointly with other benefits tied to eligibility under AFDC) have historically provided higher levels of support, we find $P=0.1$ to be a more relevant level of assistance.

³⁵ Anecdotal evidence suggests that this may well be consistent with trends in the past 30 years. While it is difficult, for example, to think of a teenager proudly bringing her out-of-wedlock child to school in the 1950's (when we would argue such children were “bads”), this happens frequently today. Similarly, it is difficult to imagine schools in the 1950's offering day care programs for small children of high school students, whereas this is increasingly the case, especially in inner cities, today. Thus, while single parents, especially teenagers, used to be hidden from the public eye due to the stigma they and their children faced, today they are far from driven into seclusion by peer pressure and social attitudes.

We next turn to the policy problem of reversing this increase in illegitimacy, assuming either that we have reached the new steady state or that we are currently somewhere on the transition path to the new steady state.

4.2. Reforming or Eliminating AFDC to Reduce Illegitimacy

Given that we restrict ourselves to parameterizations for which the economy was originally (prior to the initial introduction of AFDC) in a low-S steady state, there are now two distinct cases we must consider: (i) cases in which there is only one pre-AFDC steady state (as in the case of large negative values of γ_4 in Figure 5d), and (ii) cases in which there are multiple pre-AFDC steady states (as in the case of most parameters we have modelled thus far). The former category represents cases in which the stigma of being in the minority is very high with respect to other parameters in the model, while the latter represents cases in which there is still a substantial but less extreme amount of stigma. As we have demonstrated in Section 3, a wide range of reasonable parameters - in fact, we would argue, most reasonable sets of parameters - put the model into the latter category in which two initial (pre-AFDC) steady states exist. Up to now, however, none of the analysis of transition paths has critically relied on the distinction between these two cases. In particular, regardless of the existence of a second steady state, the conclusions with respect to the introduction of AFDC remain the same: transition paths are such that substantial increases in illegitimacy are perfectly consistent with the model long after the introduction of some fixed cash assistance program. However, now that we have arrived at the point of discussing potential reforms aimed at reducing or eliminating the problem of illegitimacy, there appears a clear distinction between the cases in which there initially existed a second steady state and cases in which there did not.

If AFDC is eliminated at any time, either along the transition path or once the new steady state has been reached, illegitimacy will always decline to zero in cases of type (i) where the stigma of being in the minority (γ_4) is sufficiently high to result in only one pre-AFDC steady state and where that steady state occurs at $S=0$. There may be a long transition to the $S=0$ steady state from such an elimination of AFDC when values of δ are high, but there is nothing to keep S from eventually returning back to 0; i.e. illegitimacy induced by AFDC is completely reversible in the long run. High values of γ_4 thus represent cases in which stigma plays such a large role that AFDC cannot

permanently alter social values through financial incentives unless these financial incentives remain in place indefinitely (or unless it is exogenously assumed that it is more difficult to return to the initial steady state than it was to deviate from it at the inception of AFDC).

Conclusion 4a: If the stigma of being in the minority is sufficiently high, i.e. if γ_4 is negative and sufficiently large in absolute value, the elimination of AFDC results in a transition path to a new steady state of $S=0$. This is true regardless of whether AFDC is eliminated along the initial transition path to the new steady state, or once the new steady state has been attained.

For several reasons, however, economies in which this stigma is not of the required magnitude and which therefore have multiple initial (pre-AFDC) steady states, are of more interest. First, we have demonstrated in Section 3 that under most reasonable specifications, the model in fact has two such steady states. Second, a conventional economic model of AFDC (without stigma or peer effects) suggests that, to the extent that increases in illegitimacy are due to AFDC, the elimination of AFDC will result in the elimination of the illegitimacy problem. This conventional conclusion remains largely intact if stigma is extreme enough to place our model in the first category, but it fails to hold in the large number of cases in which stigma is not sufficiently extreme. We therefore proceed to concentrate on cases in which two initial steady states exist.

4.21. Eliminating AFDC at the New Steady State Equilibrium

Suppose that the parameters are such that the economy does not fall into the case described in Conclusion 4a; i.e. suppose that two initial (pre-AFDC) steady states exist, of which one is characterized by a low S . This occurs for cases in which γ_4 is either slightly positive (in which case a low- S steady state above 0 exists), or γ_4 is negative (implying $S=0$ is the low- S steady state equilibrium) but not large enough in absolute value to eliminate the second high- S steady state. For purposes of illustration and for consistency, we continue with the parameterization used to derive results in Figure 8 ($\alpha=k=0.5$, $\gamma_1=\gamma_2=\gamma_3=1$ and $\gamma_4=-0.1$). As in Figure 8, we again consider two welfare programs: $(P,\pi)=(0.1,1)$ and $(P,\pi)=(0.05,1)$.

First suppose that $(P,\pi)=(0.1,1)$. From Figure 8a, we know that this cash payment of 0.1 is

sufficiently high to eliminate a low- S steady state and thus propels the economy along a transition path leading to $S=0.839$. In Figure 9a, we assume $\delta=0.75$ and illustrate the fraction of agents choosing to have an out-of-wedlock birth in each period starting with time $t=0$ before AFDC, going through the introduction of AFDC at time $t=10$ (and the following transition path to the new steady state), and ending with the elimination of AFDC in period $t=60$ (and the following transition path to the final steady state.) Figure 9b shows a similar transition for S_t . Given that the introduction of the AFDC program led to a steady state substantially above $S=0$ (and also above the second positive steady state without welfare ($S=0.738$)), eliminating the program at the new steady state (of $S=0.839$) does relatively little to reduce the problem of illegitimacy. A sufficient number of agents are having children out-of-wedlock in the $S=0.839$ steady state to ensure that such children are far removed from being the “bads” they were at $t=0$. The change in behavior along the transition path thus increased the desirability of out-of-wedlock children to a point where most agents are no longer choosing this behavior because of the financial incentives in AFDC; in fact, a large number of agents choose not to participate in AFDC despite being qualified if they did not work. With this change in the nature of how out-of-wedlock children are viewed, the elimination of AFDC, while reducing the illegitimacy rate somewhat, stops well short of eliminating out-of-wedlock births.

Figures 9c and 9d illustrate the analogous transition paths for the case of small cash benefit programs. These figures continue Figures 8c and 8d in which we modelled a welfare program $(P,\pi)=(0.05,1)$ that was sufficiently small to allow for the existence of a low- S steady state. From Figure 7a, it is clear that $K(S)$ shifts up as P rises, and that therefore any $K(S)$ with a positive P lies above $K(S)$ with $P=0$ and does not cross it. Thus, if the welfare program is sufficiently small to allow for a low- S steady state with the program, that steady state occurs at a point to the left of the unstable equilibrium without AFDC that appears when the curve (with $P=0$) crosses the 45 degree line from below. Thus, the AFDC steady state with low values of P lies in the region in which the elimination of the program will induce the number of agents who choose to have children out-of-wedlock to decline to 0. This is dramatically illustrated in Figure 9c in which the number of agents choosing to have an out-of-wedlock birth falls to zero as soon as the AFDC program is eliminated at $t=60$. Note that, for this example, the steady state equilibrium under AFDC still occurs in a region in which out-of-wedlock children are “bads” (S lies slightly below 0.1), which means that removing

the financial incentives to have out-of-wedlock births removes all benefits to such behavior. With other parameterizations, it may occur that a low-S steady state arises under low values of P for which S is nevertheless high enough to cause out-of-wedlock children to become “goods”. However, so long as the AFDC steady state lies below the unstable equilibrium without AFDC, the elimination of AFDC still leads back to the initial, pre-AFDC, low-S steady state (although perhaps not quite as quickly). Qualitatively, then, the case of relatively low levels of cash assistance is similar to the case in which there is no high-S steady state to begin with: the elimination of AFDC leads back to the original low-S steady state.

Conclusion 4b: In cases where two steady states exist under no AFDC, if the cash assistance level P is sufficiently high, the elimination of AFDC at the new steady state leads to only a marginal reduction in illegitimacy to levels far short of the original (pre-AFDC) level. If the cash assistance amount is sufficiently low, however, the elimination of AFDC leads back to the original (pre-AFDC) steady state. Thus, as AFDC levels rise, the levels of illegitimacy they induce may become irreversible.

Finally, we proceed to investigate reforming AFDC along the transition path.

4.22. Reducing or Eliminating AFDC Payments to Single Mothers Along the Transition Path

The elimination of cash assistance for single mothers will, as previously suggested, lead back to the original steady state whenever either (i) there does not exist a high-S steady state in the absence of AFDC or (ii) the payment P was relatively small. This is true whether the program is eliminated at the new AFDC steady state or along the transition path to that steady state. We therefore consider here only the case in which the model is parameterized in such a way as to yield two steady states without welfare and in which the AFDC payment is sufficiently high to yield a high-S steady state. For illustration, we continue with the same parameters as before and assume $P=0.1$ and $\delta=0.75$.

One of the most often cited statistics concerning the AFDC program and its impact on illegitimacy is that over the past two decades, real benefits have persistently declined while illegitimacy has continued to rise. This is not, however, inconsistent with an economic model of AFDC such as ours. Suppose, as before, that $(P,\pi)=(0.1,1)$ is introduced at time $t=10$, but that the cash assistance is reduced by some percentage x each period after $t=10$. Figure 10a compares the

effects of a 0%, a 2%, a 4% and a 10% per-period decline in real benefits on the number of out-of-wedlock births over time, and Figure 10b translates these into corresponding effects on S_t . As is evident from the illustrations, a consistent decline in real benefits can still result in increasing out-of-wedlock births so long as this decline is not too large. (This is true independent of how many initial steady states there are in the model, although the path would eventually lead back to the original steady state (as real benefits approach zero) for economies in which there is only one such steady state equilibrium in the absence of AFDC.)

Conclusion 4c: Regardless of how many initial steady states there are in the economy, a persistent decline in real AFDC benefits after the introduction of the program can be consistent with an initial increase in illegitimacy. For the class of economies that have two pre-AFDC steady states, illegitimacy rates may continue to rise substantially even as AFDC benefits gradually approach zero.

Furthermore, even abrupt eliminations (rather than gradual declines) of real cash benefits to single mothers need not lead to long-run decreases in out-of-wedlock births. Such cuts do lead to permanent declines in illegitimacy in economies in which there exists only one initial steady state as well as economies in which there are multiple steady states but in which the AFDC program is of modest enough size to lead to a low-S steady state equilibrium with AFDC. But they may be consistent with long run increases in illegitimacy rates for the large class of economies with two initial steady states when welfare programs are sufficiently generous to begin with. We illustrate several instructive examples in Figure 11.

Suppose again that $\alpha=k=0.5$, $\gamma_1=\gamma_2=\gamma_3=1$, $\gamma_4=-0.1$ and $\delta=0.75$, and suppose that the government introduces an AFDC program $(P,\pi)=(0.1,1)$ in time period $t=10$. Furthermore, suppose the program is terminated T periods after its inception. Figure 11 illustrates the evolution of K_t as well as S_t for $T=12$ and $T=13$. If the program is terminated after a certain point, S_t will have evolved to a level that does not permit a return to the original low-S steady state. This critical point occurs once S_t has grown past the unstable no-AFDC equilibrium in Figure 5d, and it occurs later the higher the value of δ and the lower (more negative) γ_4 . Furthermore, note that regardless of when the program is terminated, there is an initial decline in the number of out-of-wedlock births, but,

assuming T is high enough, that decline is reversed once the economy has adjusted to the shock of the elimination of the program.³⁶

Conclusion 4d: For the class of economies with two pre-AFDC steady states, the sudden elimination of AFDC payments to single mothers along the transition path, while always resulting in a short term decrease in illegitimacy, is accompanied by an increase in illegitimacy if the program has been in existence sufficiently long. In that case, illegitimacy levels converge to the higher-S steady state despite the removal of financial incentives for out-of-wedlock births.

5. Adding a Marriage Decision to the Model

So far we have abstracted away from explicitly modelling the marriage decision and have viewed each agent as choosing between two very different states of the world: in one state, the agent chooses to become a single parent; in the other, she chooses to not have any children. A natural question that arises, then, is how a third alternative - having a child within marriage - would affect the results presented thus far. If the third alternative yields utility equivalent to (or less than) the second (not having children), an assumption we have made implicitly throughout, then the model is a trivial extension giving precisely the same results as found thus far. There are, however, additional ways in which we might think of modelling marriage that can aid in determining whether the results presented thus far are robust to adding a non-trivial marriage option to the model. While exploring all of these ways of incorporating marriage into the model is beyond the scope of this paper, we argue here that the basic intuitions developed will persist in the presence of a non-trivial marriage choice.

Suppose, for example, that marriage is viewed as a way of removing the stigma of having children out-of-wedlock but that it is, at the same time, a costly activity. More precisely, suppose that the utility from having a child within marriage is only a function of β and not a function of S_t , and that there is a leisure cost of μ to marriage (i.e. marriage entails a reduction in the leisure endowment from 1 to $(1-\mu)$). Figure 12a then illustrates the change in $K(S)$ for different values of μ when the utility from having a child within marriage is exogenously given as 0.5β . For $\mu=0$, i.e. for costless

³⁶ One could state this more informally in the following way: Once the change in stigma induced by AFDC causes changes in behavior in the "middle class", even AFDC's elimination cannot reverse the trend of rising illegitimacy rates.

marriage, this produces a sharp discontinuity at $S_t=0.5$ at which point having a child out-of-wedlock is sufficiently acceptable to yield precisely the same utility level as having a child within marriage. Figure 12b demonstrates that at that level of S_t , the fraction of agents choosing marriage falls from 0.6 to 0, and all children are born outside marriage for higher values of S_t . For $\mu>0$, the number of marriages declines less rapidly as S_t rises. If the exogenously given utility from having a child within marriage is not too large, however, there is always some value for S_t above which the relationship between K_t and S_t is the same as if marriage were not an option, and two steady states exist as before. Adding a simple marriage model of this type, therefore, does not alter the qualitative results described in this paper.³⁷ Furthermore, by introducing heterogeneity in the utility of marriage or the cost of marriage, more subtle changes in relationships occur, but, again, the qualitative results discussed thus far remain unchanged. The introduction of AFDC can thus dramatically alter the number of out-of-wedlock births as well as the number of marriages, and this change becomes permanent for a large class of parameterizations once the program has been in existence for some time, even if the program is eventually reformed or eliminated.³⁸

7. Adding a Spatial Dimension to the Model

While we have thus far treated changes in values as a society-wide phenomenon, there is considerable sociological evidence that the strength of such influences as stigma and social acceptance is often quite *local* in nature (Ainlay, Becker and Coleman (1986), Jencks and Mayer (1990), Wilson (1987), Wilson (1991), Crane (1991)). Within the context of the current paper, the impact of one agent's decision to have an out-of-wedlock birth on the utility of a second agent who is faced with a similar choice may therefore depend not only on *time* (i.e. the number of "generations" in between the two agents, as in the current model) but also on *space* (the distance that separates the two agents).³⁹ The social acceptability of an out-of-wedlock birth in New York, for example, is

³⁷ We have conducted a similar analysis of including marriage in the model when the cost of marriage is a fixed monetary cost rather than a time cost. Similar results obtain, although the fixed cost nature changes the set of agents that choose to get married. (Low wage types can no longer afford to get married in this case.) With this kind of marriage cost, however, it is easier to obtain high-S steady states in which some marriages still occur.

³⁸ There are, of course, more sophisticated ways to incorporate a marriage choice. Our focus here, however, is on the interaction of peer and social acceptance parameters with public policy, and a more complex modelling of marriage tends to obscure the intuitions developed above while not changing the basic conclusions we have reached.

³⁹ Granovetter and Soong (1983) suggest this spatial dimension in the context of sociological threshold models ("... the direct influence of others on each individual varies with the distance of others from him") and infer that this might explain "empirically observed equilibria" with "sharp discontinuities".

likely to be relatively less affected by a rise in the US illegitimacy rate if this rise is driven by additional out-of-wedlock births in Los Angeles than if it is driven by changes in local illegitimacy rates in New York. Similarly, the number of out-of-wedlock births in a wealthy Long Island community may have little impact on the social acceptance of such behavior in Harlem, and vice versa. “Distance” can therefore be interpreted not merely as geographic distance, but also as an index indicating the degree of social interaction between neighboring communities.⁴⁰

Depending on the strength of such spatial or intercommunity spillovers, the model is likely to give somewhat different predictions (which are mapped out in Figure 13). Thus far, we have implicitly assumed complete (100%) spillovers; i.e. we have assumed that the actions of any one individual have the same impact on the level of social acceptance S irrespective of the location of different agents. Separating agents into communities under this assumption would therefore make no difference whatsoever: if the introduction of AFDC causes changes in behavior in *any* community, it will change the level of S in *all* communities equally.

The other extreme (0% spillovers) views communities as completely isolated from one another, each functioning as a separate “society”. In that case, the current model is easily extended to include many communities with many different underlying distributions of preferences and incomes. While all communities may initially start in the low- S steady state, the introduction of AFDC will cause dramatic increases in illegitimacy rates in some communities (especially those with a large fraction of low income agents who are initially most affected by the financial incentives of AFDC) while having little or no impact in others. The stigma of out-of-wedlock births, even if it was originally the same in all communities, may thus be significantly different in a poor central city high school than in a wealthy suburban prep school after some adjustment period. Furthermore, the elimination of AFDC would have differential impacts in different communities.

In between these extreme perspectives lies the view that intercommunity spillovers are likely to exist but weaken with distance. Thus, the preferences for out-of-wedlock children in each community can be represented by a graph similar to Figure 4(a), but the *position* of the curve will depend on the illegitimacy rates in other neighboring communities. Initially, all communities may find themselves in their low- S steady state, where this represents a global steady state across

⁴⁰ This is also consistent with Murray’s (1993) interpretation of the empirical evidence which suggests a role for “proximate cultures” in determining local illegitimacy rates.

communities. When AFDC is introduced, it may initially affect behavior predominantly in the poorest communities, but the change in behavior in those communities may “spillover” into other communities by shifting the function in Figure 4(a) up in those communities. If these effects are strong enough, i.e. if different communities are in sufficient contact for spillovers to play an important role, then illegitimacy rates may rise even in rich communities in which no one ever takes advantage of AFDC. Immunity from the effects of AFDC would require both (i) the absence of relatively poor community members and (ii) the presence of sufficient geographic or other isolation to prevent intercommunity spillovers from playing a significant role. Extending the current model to allow for such partial spatial spillovers therefore allows for not only strong *local* social influences but also important social changes *across* communities. For some communities, this will entail a shift to a higher steady state, while for others it will not be sufficient to eliminate the low steady state. The addition of a spatial dimension to the model therefore has the potential to explain not only the stylized trends in aggregate out-of-wedlock statistics over time but also in shedding light on strong regional concentrations of high illegitimacy rates.

7. Conclusion

This paper investigates the effects of public policy (AFDC) aimed at helping individuals (single mothers) who are engaging in behavior (giving birth out-of-wedlock) that has not traditionally been “socially accepted.” If “social acceptance” of behavior is a function of the prevalence of that behavior in the past, then reducing the costs of “socially unaccepted” behavior through government subsidies can lead to long run cultural changes that make previously unaccepted behavior not only accepted but even desirable. Furthermore, the model developed in this paper suggests that in many instances it may not be possible to reverse unintended changes in individual behavior by eliminating the program that brought about these changes.⁴¹

More specifically, the model presented in this paper suggests that the introduction of financial incentives for out-of-wedlock births through AFDC can result in gradual changes in how illegitimacy is perceived. This in turn can lead to gradually increasing levels of illegitimacy and single motherhood among both AFDC populations as well as those not choosing to accept AFDC.

⁴¹ Similar irreversibilities in other contexts can be found in Greif (1994) and Arthur (1994).

Furthermore, after a certain time, cultural changes (in terms of how illegitimacy is viewed) may progress to a point past which elimination of AFDC does little in the way of reducing the problem of illegitimacy. These cultural changes may be local in nature and relatively confined to socially and geographically isolated groups, or they may spill over into other groups and communities. While this reaffirms the argument long made by conservatives that government social policy in the area of AFDC may have led to unintended and undesirable cultural changes, it also suggests that those to the left of the political spectrum may be correct in their assessment that a mere alteration or elimination of AFDC cannot solve the problems conservative reformers are most concerned about. If correct, this implies that the solution to rising illegitimacy may lie in other, more subtle policies *even if* AFDC is solely responsible for the rise in illegitimacy over the past quarter century.

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FIGURE 1

Economic Models of Uniform Behavior and Standards

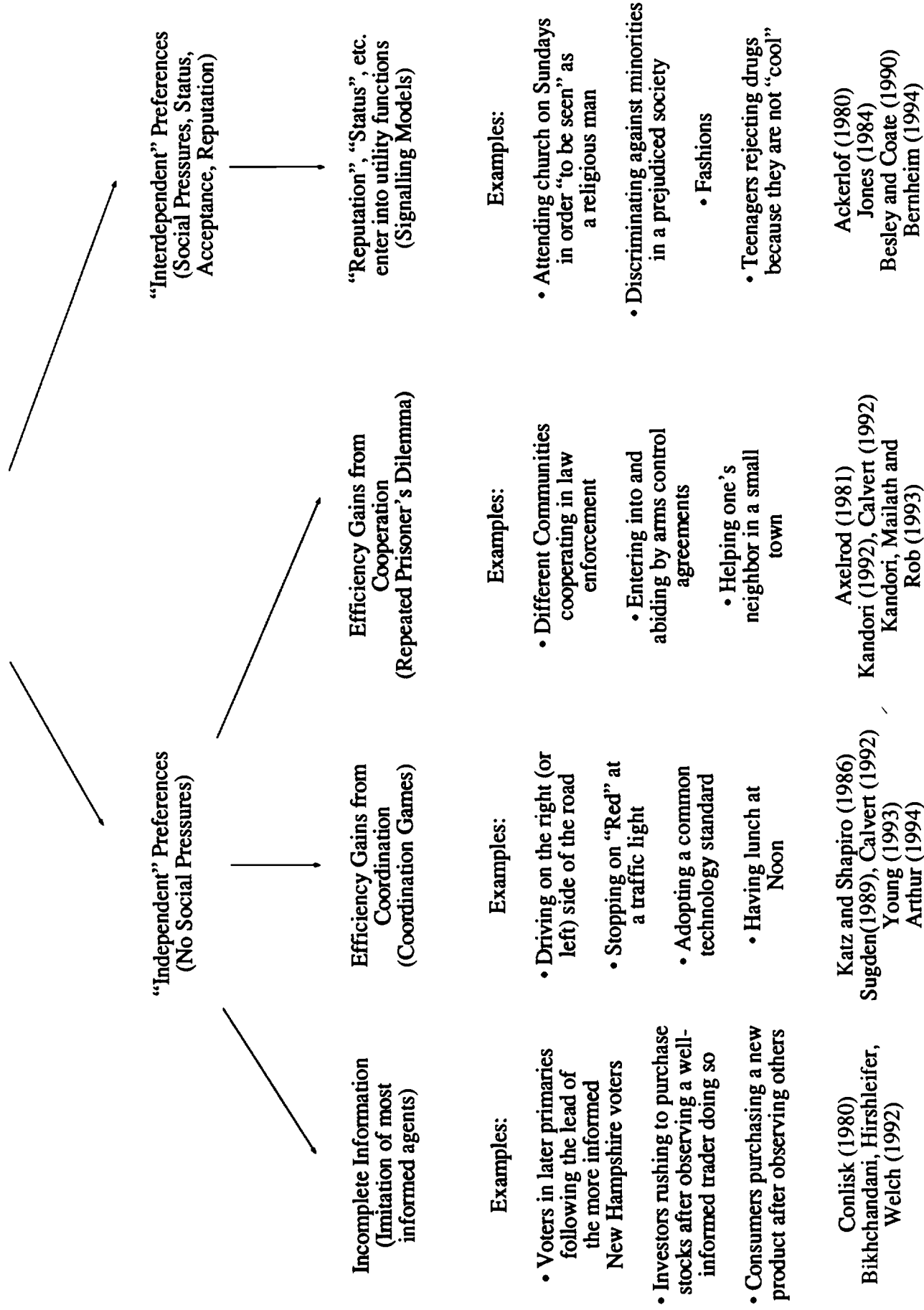


FIGURE 2

The Set of Agents Choosing Out-of-Wedlock Births when $S=1/2$
 $\omega(\beta; 1/2) = 4\beta^2$

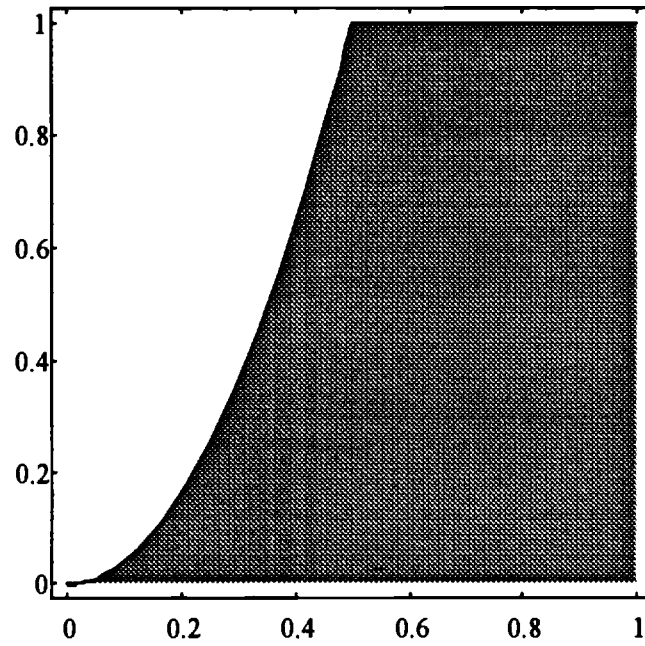


FIGURE 3

The Set of Agents Choosing Out-of-Wedlock Births as a Function of S

$$\omega(\beta, S) = 16(\beta S)^2$$

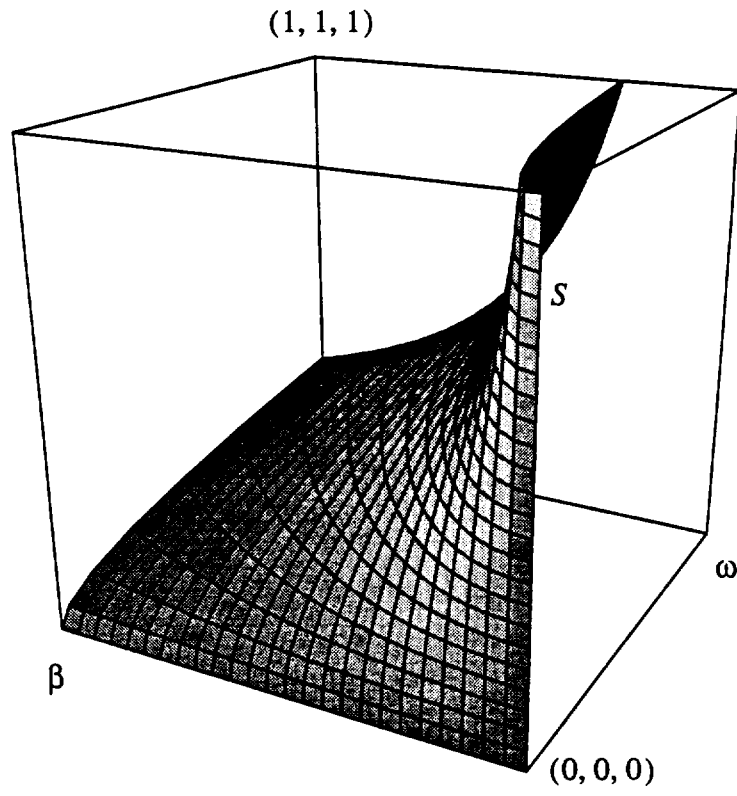


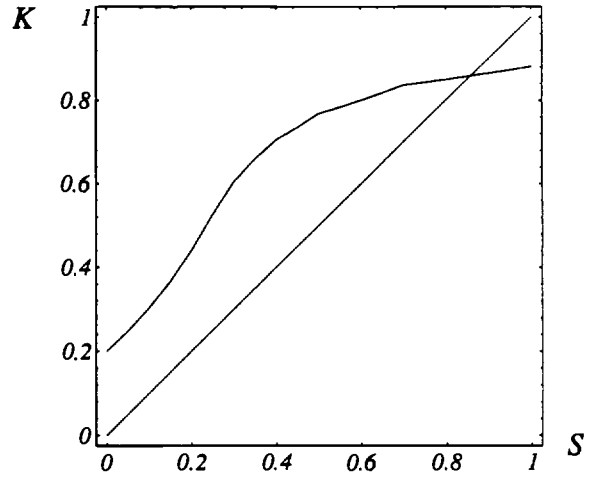
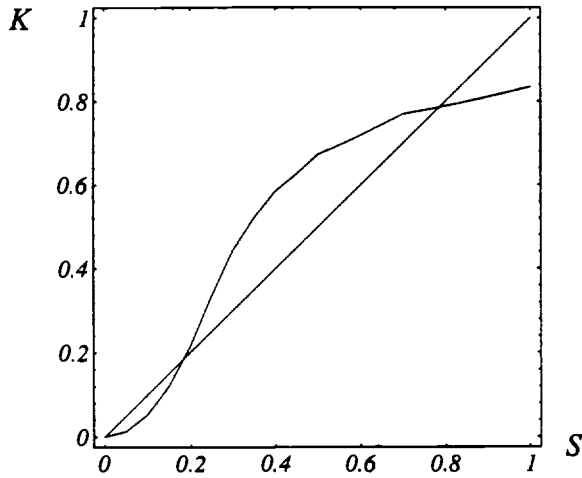
FIGURE 4

The Number of Children Out-of-Wedlock As a Function of S

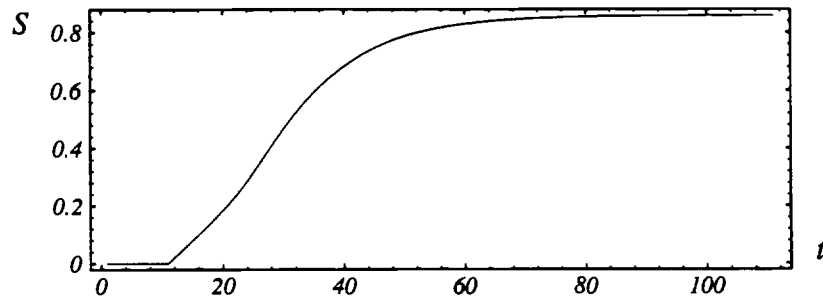
$$(\alpha = k = 0.5, \gamma_1 = \gamma_2 = \gamma_3 = 1, \gamma_4 = 0)$$

(a) $(P, \pi) = (0, 0)$ (No AFDC)

(b) $(P, \pi) = (0.1, 0.5)$



(c) Transition Path of S from an Introduction of $(P, \pi) = (0.1, 0.5)$ in Period $t=10$



(d) Transition Path of K from an Introduction of $(P, \pi) = (0.1, 0.5)$ in Period $t=10$

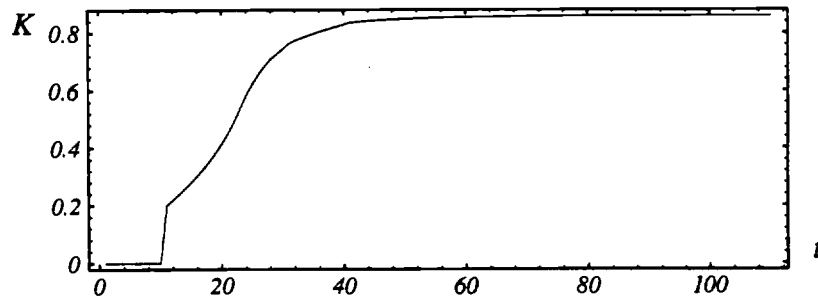
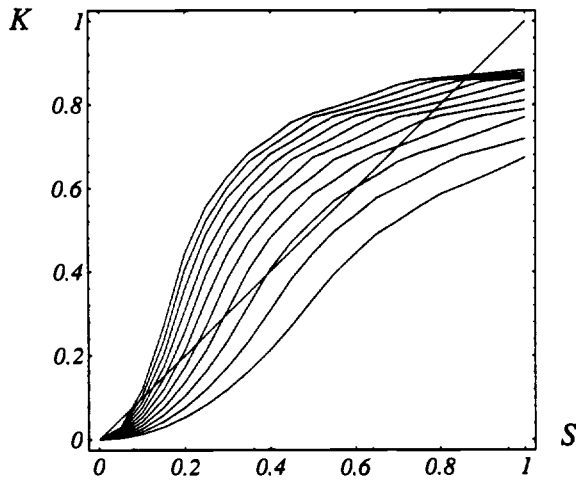


FIGURE 5

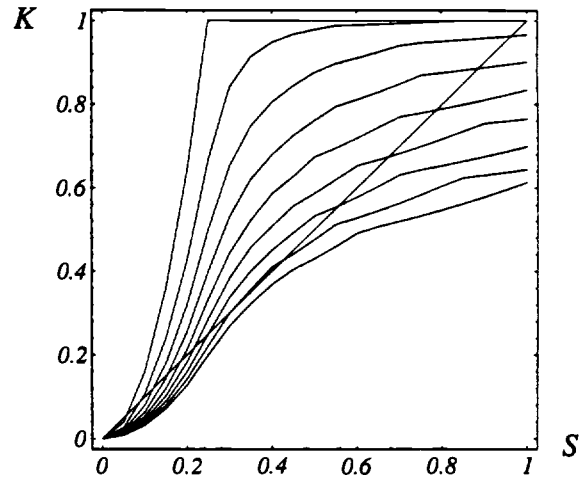
The Number of Children Out-of-Wedlock As a Function of S

$(\alpha = k = 0.5, (P, \pi) = (0, 0))$

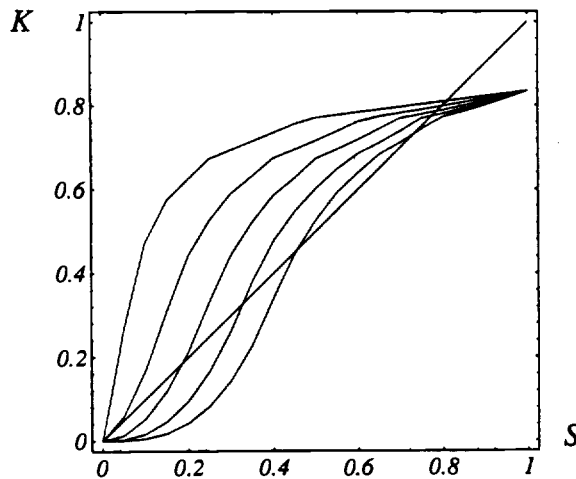
(a) γ_1 varies from 0.5 to 1.5 in 0.1 increments ($\gamma_2 = \gamma_3 = 1, \gamma_4 = 0$)
(Higher $\gamma_1 \Rightarrow$ higher curves)



(b) γ_2 varies from 2 to 0 in 0.25 increments ($\gamma_1 = \gamma_3 = 1, \gamma_4 = 0$)
(Higher $\gamma_2 \Rightarrow$ lower curves)



(c) γ_3 varies from 1.5 to 0.5 in 0.25 increments ($\gamma_1 = \gamma_2 = 1, \gamma_4 = 0$)
(Higher $\gamma_3 \Rightarrow$ lower curves)



(d) γ_4 varies from -0.3 to 0.1 in 0.1 increments ($\gamma_1 = \gamma_2 = \gamma_3 = 1$)
(Higher $\gamma_4 \Rightarrow$ higher curves)

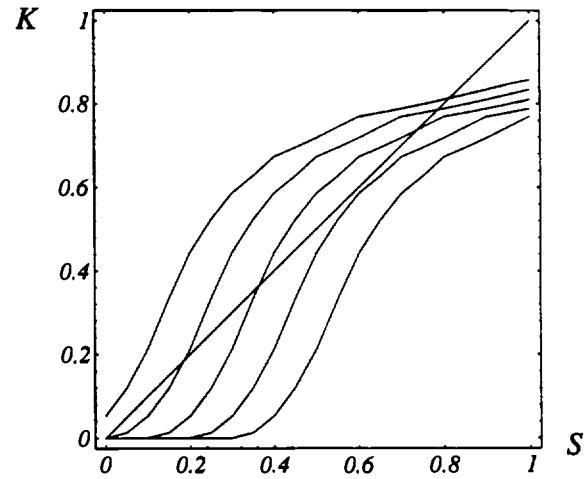
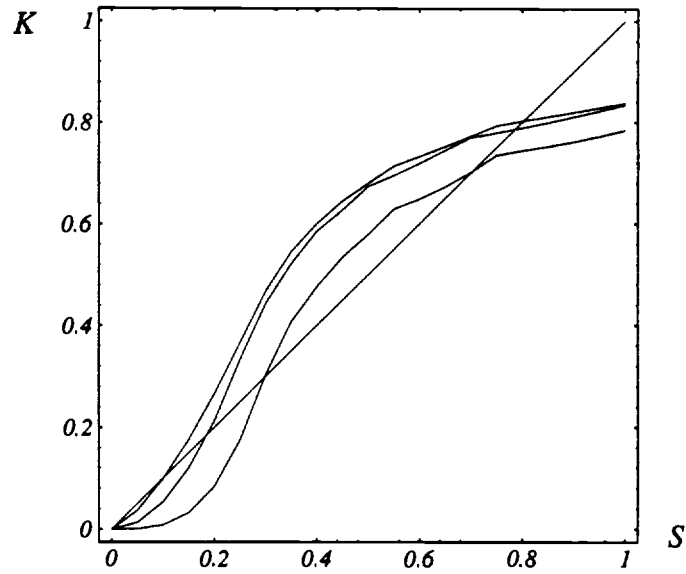


FIGURE 6

The Number of Children Out-of-Wedlock As a Function of S

$$(\gamma_1 = \gamma_2 = \gamma_3 = 1, \gamma_4 = 0, (P, \pi) = (0, 0))$$

(a) α varies from 0.3 to 0.7 in 0.2 increments ($k = 0.5$) (Higher $\alpha \Rightarrow$ higher curves)



(b) k varies from 0.9 to 0.1 in 0.2 increments ($\alpha = 0.5$) (Higher $k \Rightarrow$ lower curves)

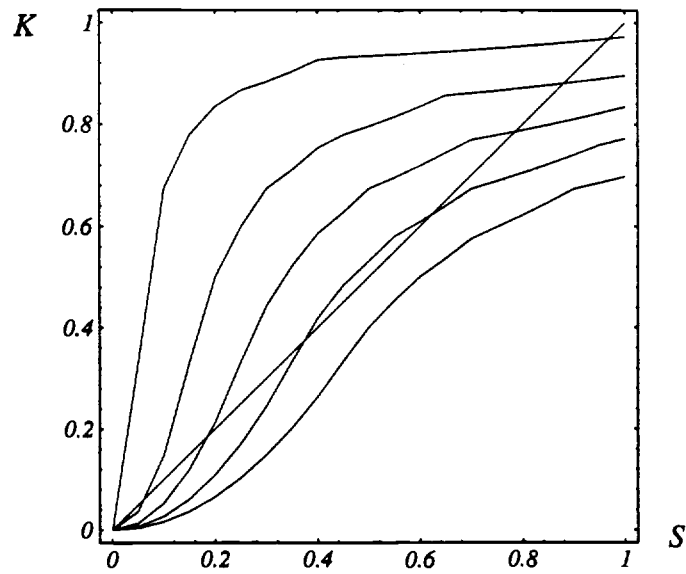
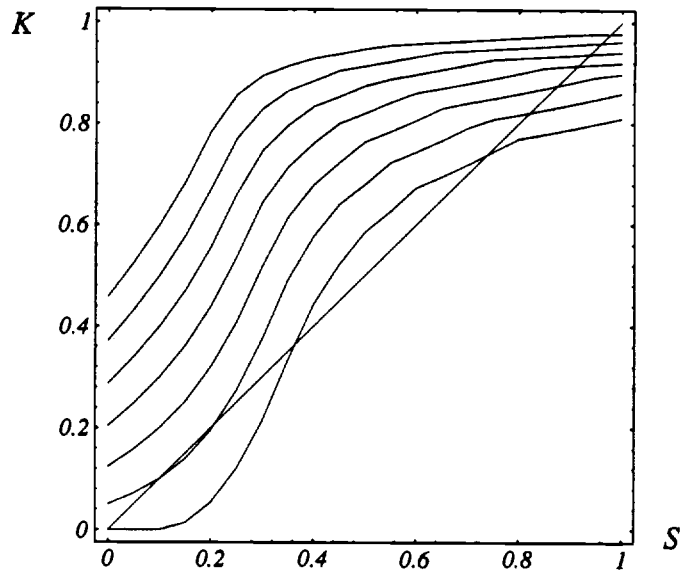


FIGURE 7

The Number of Children Out-of-Wedlock As a Function of S

$$(\alpha = k = 0.5, \gamma_1 = \gamma_2 = \gamma_3 = 1, \gamma_4 = -0.1)$$

(a) P varies from 0 to 0.3 in 0.05 increments ($\pi = 0$) (Higher $P \Rightarrow$ higher curves)



(b) π varies from 0 to 1 ($P = 0.1$) (Higher $\pi \Rightarrow$ lower curves)

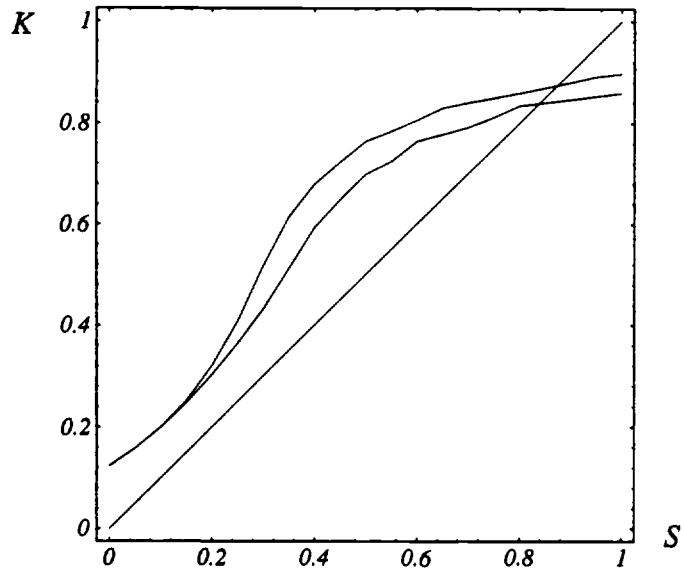
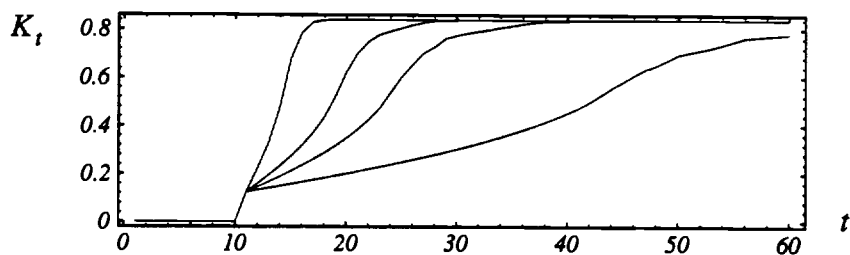


FIGURE 8

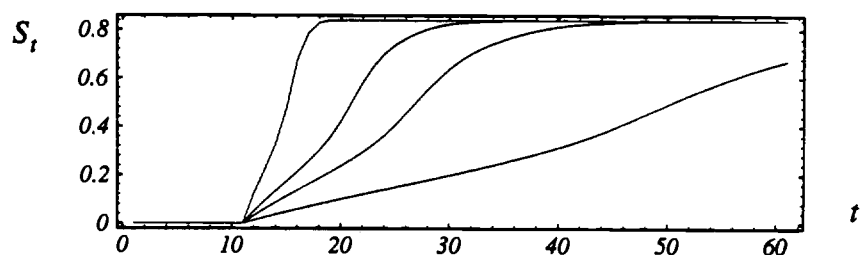
Transition Paths When AFDC is Introduced in $t=10$

$$(\alpha = k = 0.5, \gamma_1 = \gamma_2 = \gamma_3 = 1, \gamma_4 = -0.1)$$

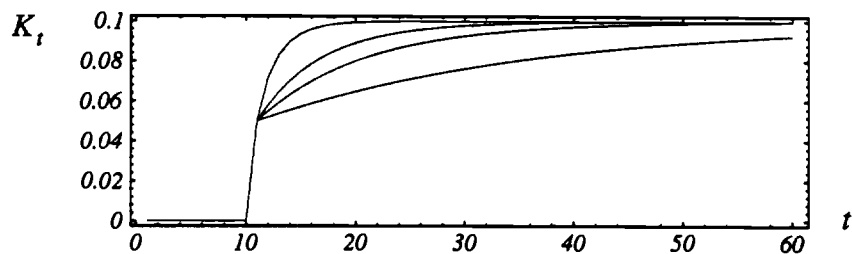
(a) Evolution of K_t , with $(P, \pi) = (0.1, 1)$ for $\delta = 0.0, 0.6, 0.75,$ and 0.9



(b) Evolution of S_t , with $(P, \pi) = (0.1, 1)$ for $\delta = 0.0, 0.6, 0.75,$ and 0.9



(c) Evolution of K_t , with $(P, \pi) = (0.05, 1)$ for $\delta = 0.0, 0.6, 0.75,$ and 0.9



(d) Evolution of S_t , with $(P, \pi) = (0.05, 1)$ for $\delta = 0.0, 0.6, 0.75,$ and 0.9

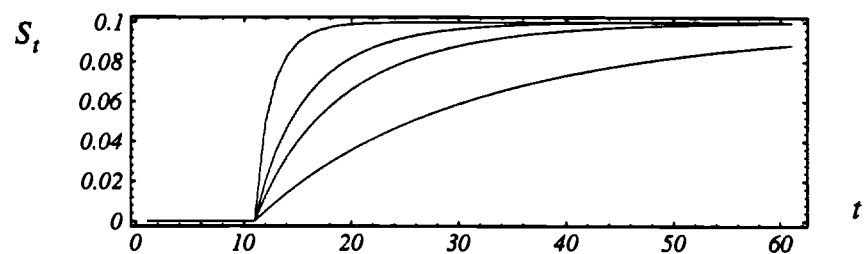
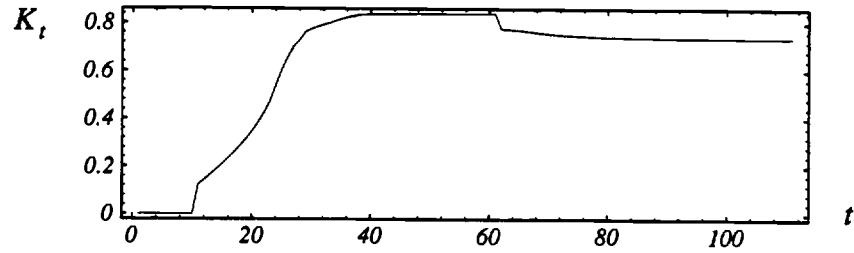


FIGURE 9

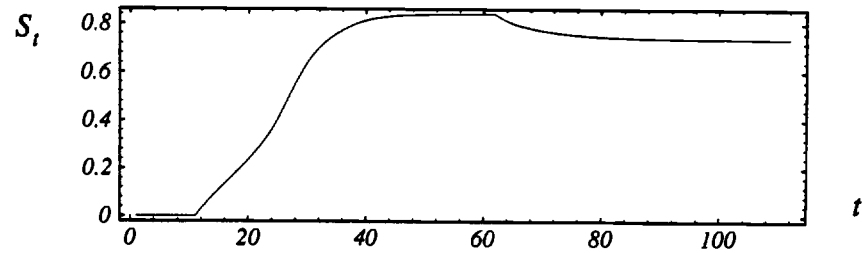
Transition Paths When AFDC is Introduced in $t=10$ and Eliminated in $t=60$

$$(\alpha = k = 0.5, \gamma_1 = \gamma_2 = \gamma_3 = 1, \gamma_4 = -0.1)$$

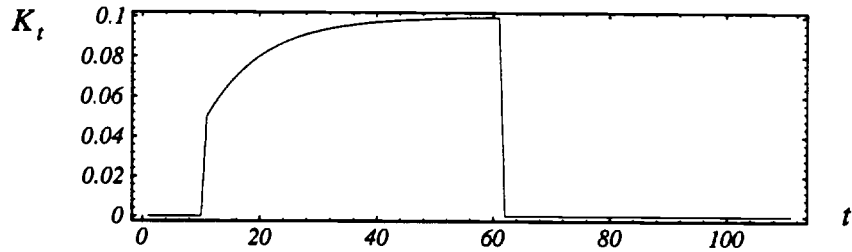
(a) Evolution of K_t with $(P, \pi) = (0.1, 1)$ for $\delta = 0.75$



(b) Evolution of S_t with $(P, \pi) = (0.1, 1)$ for $\delta = 0.75$



(c) Evolution of K_t with $(P, \pi) = (0.05, 1)$ for $\delta = 0.75$



(d) Evolution of S_t with $(P, \pi) = (0.05, 1)$ for $\delta = 0.75$

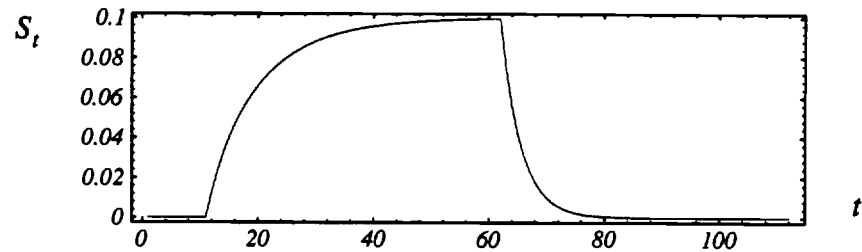
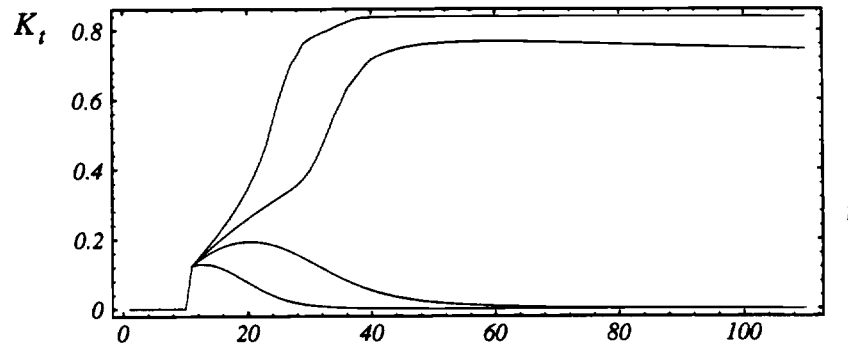


FIGURE 10

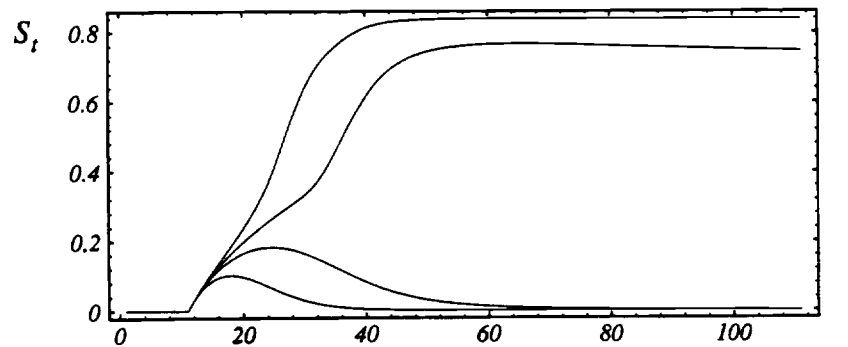
Transition Paths when $(P, \pi) = (0.1, 1)$ is Introduced in $t=10$ and P Declines in Each Following Period by $X\%$

$$(\alpha = k = 0.5, \gamma_1 = \gamma_2 = \gamma_3 = 1, \gamma_4 = -0.1, \delta = 0.75)$$

(a) Evolution of K_t for $X = 0\%, 2\%, 4\%$, and $10\%*$



(b) Evolution of S_t for $X = 0\%, 2\%, 4\%$, and $10\%*$



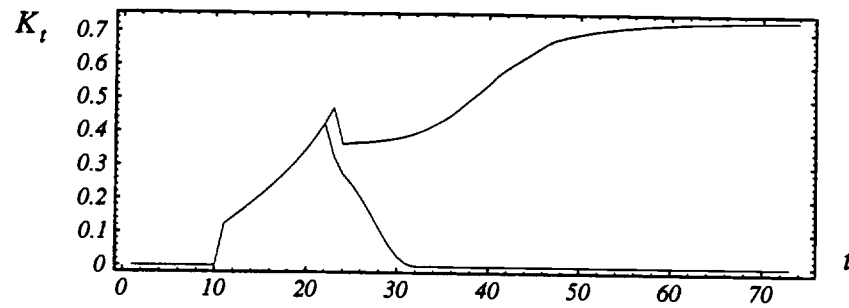
* Note: In the graphs, the transition paths for $X = 2\%$ do not extend all the way toward the new steady state. This new steady state occurs at $S = 0.73$ as benefits asymptotically approach zero.

FIGURE 11

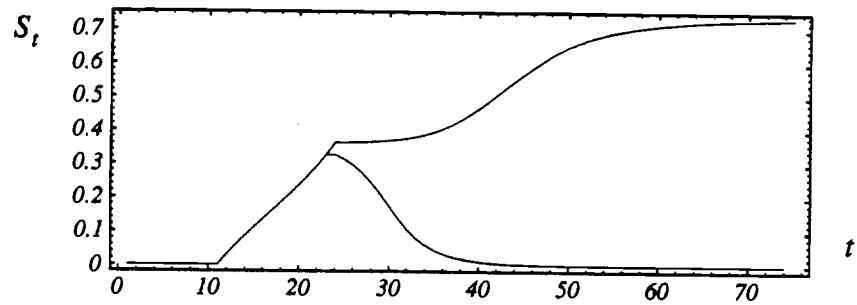
Transition Paths when $(P, \pi) = (0.1, 1)$ is Introduced in $t=10$ and Terminated T periods Thereafter

$$(\alpha = k = 0.5, \gamma_1 = \gamma_2 = \gamma_3 = 1, \gamma_4 = -0.1, \delta = 0.75)$$

(a) Evolution of K_t for T=12 and T=13



(b) Evolution of S_t for T=12 and T=13



(a) Evolution of K_t for T=13, 16 and 20

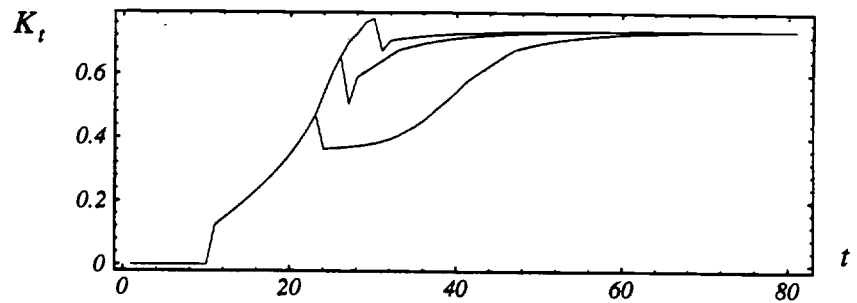


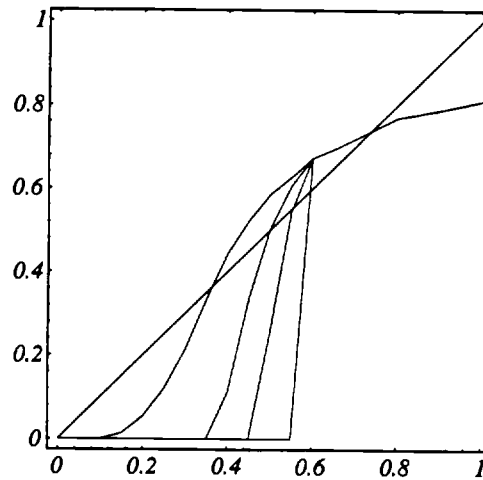
FIGURE 12

Adding a Marriage Choice to the Model

$$(\alpha = k = 0.5, \gamma_1 = \gamma_2 = \gamma_3 = 1, \gamma_4 = -0.1)$$

Relationship between S and Fraction of Kids out-of-wedlock for different values of μ ranging from 0 to 0.6 when the utility of marriage is 0.5β .

- (a) The relationship between out-of-wedlock births and S as $\mu = 0.0, 0.2, 0.4$ and 0.6 and the utility of marriage is 0.5β .
(lower curves correspond to lower values of μ)



- (b) The relationship between marriages (within-marriagebirths) and S as $\mu = 0.0, 0.2, 0.4$ and 0.6 and the utility of marriage is 0.5β .
(higher curves correspond to lower values of μ)

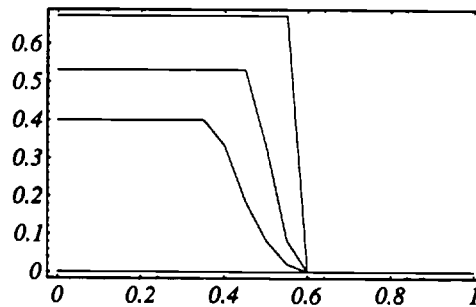


FIGURE 13

Extending the Model to Include Spatial Spillovers

Degree of Spatial Spillover		
0%		100%
No Spillovers	Partial (Spatial) Spillovers	Complete Spillovers
Communities are entirely isolated and function as separate "societies"; changes in one community have no impact on others ⇒ AFDC has an impact on social acceptance and on local illegitimacy rates only if at least some members of the community are poor. This impact is entirely contained within the community itself. If no one in the community is poor, no change in either social approval or behavior takes place in that community.	Communities are linked to neighboring communities, but the effect of changes in one community on others diminishes with distance ⇒ While no one in a particular (wealthy) community may initially change her behavior as a result of AFDC, changes in illegitimacy rates in neighboring communities alter the level of local social acceptance. Since this effect is a function of distance, behavior may be affected (depending on the degree to which the community is geographically or otherwise isolated.)	Communities are entirely connected as one unified "society", and changes occur uniformly across communities ⇒ AFDC's impact on behavior changes social acceptance equally in all communities; If AFDC changes behavior in any community, it changes social acceptance equally across all communities. Changes in illegitimacy rates are therefore likely in all communities.