

DESERTING OFFSPRING

Parental Investment as a Game of Chicken

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Abstract. We model mates' interdependent parental investment decisions as a game of Chicken. An individual is better off (in terms of reproductive success) deserting one's offspring to start a new union if one's mate stays to raise the offspring, but better off *not* deserting if one's mate would in turn desert the offspring. Modelling the parental investment decisions as a game of Chicken leads to four hypotheses: An individual is more likely to desert if (1) the mate is more committed to the offspring, (2) the mate has more resources to invest in children, (3) the former mate is currently unmarried, and (4) the children are older (in sharp contrast to the prediction by both Trivers [1972] and Dawkins and Carlisle [1976]). Data from the 1992 U.S. Current Population Survey provide at least partial support for all hypotheses except Hypothesis 2. In particular, the data analysis strongly supports our prediction that individuals are more likely to desert older children than younger children *even when time since separation is controlled for*, and rejects the earlier prediction by Trivers (1972) and Dawkins and Carlisle (1976).

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DESERTION OF CHILDREN by their noncustodial parents (especially fathers) is an enormous social problem in the contemporary United States. The first national survey of the receipt of child support, conducted in 1978, revealed that less than half (49%) of women awarded child support actually received the full amount due them, and more than a quarter (28%) of them received nothing (Liss, 1987:781). The percentages have remained more or less constant since. In 1991, 52% of custodial parents awarded child support received the full amount; 25% of them received nothing (U.S. Bureau of the Census, 1995:7, Table B).

The prevalence of "deadbeat dads" and their nonpayment of child support are especially alarming in light of the growing evidence that child support payment has a strong positive effect on the welfare of the children after divorce. King (1994) demonstrates that the amount of child support has a significantly positive effect on the child's academic performance. Amato and Gilbreth's (1999) comprehensive meta-analysis shows that the noncustodial father's child support increases the child's academic success and decreases externalizing problems.

Evolutionary psychology (Barkow, Cosmides, and Tooby, 1992; Buss, 1995, 1999) provides a new perspective on parental investment and mate desertion among humans, and there have been numerous studies of these phenomena from this perspective (Anderson, Kaplan and Lancaster, 1999; Anderson et al., 1999; Betzig, Borgerhoff Mulder, and Turke, 1988; Daly and Wilson, 1988a; Draper and Harpending, 1982). Other models of parental investment and mate desertion, however, have explicitly or implicitly referred to nonhuman species (Beissinger, 1986; Grafen and Sibly, 1978; Knowlton, 1979; Maynard Smith, 1977; Trivers, 1972:146-50). These models have also assumed that the male and the female make *independent* decisions whether to desert or stay. Lazarus (1990) is the first to recognize that the desertion decisions are *interdependent*, and argues that the optimal decision of an individual whether to

desert largely depends on if his or her partner decides to desert the young in turn or to raise them alone. After exhaustively exploring all possible combinations of male and female strategies and their fitness consequences in time-dependent analyses, Lazarus (1990) concludes that one of the scenarios bears close resemblance to the Prisoner's Dilemma game. "As in the version of that game in which individuals meet only once, the ESS here is to desert preemptively (i.e., defect) rather than stay (cooperate), even though both parents do better if they both stay" (Lazarus, 1990:680).

We define parental investment as "any investment by the parent in an individual offspring that increases the offspring's chance of surviving (and hence reproductive success) at the cost of the parent's ability to invest in other offspring" (Trivers, 1972:139), and we define desertion of offspring as the absence of parental investment.¹ Parental investment, and therefore desertion, vary continuously; parents can desert their offspring to a greater or lesser degree. In our theory and empirical analysis, we conceptualize and operationalize parental investment and desertion as a continuous variable.

In this article, we present an evolutionary psychological explanation of parental investment and desertion among humans. We specifically model the game between the man and the woman when both have alternative mating opportunities as a game of Chicken (rather than Prisoner's Dilemma), and argue that an individual is better off deserting (in terms of reproductive success) if the mate stays with the children but better off staying if the mate also deserts (or otherwise fails to make sufficient parental investment to assure the reproductive success of their offspring). We will derive four hypotheses from our model of parental investment and test them with data from the 1992 U.S. Current Population Survey.

Parental Investment Decisions as Chicken

Natural and sexual selections have equipped humans with two domain-specific psychological mechanisms that often come into conflict with each other. The first mechanism, or epigenetic rule (Lumsden and Wilson, 1981), dictates that humans invest resources in their sons and daughters so that they will be successful in the mate selection market and more likely to mate and reproduce (Trivers, 1972). From the point of view of inclusive fitness, however, it does not matter which parent invests in the offspring; in fact, it does not even have to be a biological parent (even though no one is more likely to do so than the biological parents themselves). What is necessary is that *someone* invest sufficient resources into the young so that they will grow to sexual maturity.

In contemporary industrial and postindustrial societies, with highly developed market economies, where both men and women are able to earn the highly fungible resource of money, it often does not matter which parent invests in the

children. Because both the man and the woman can earn money, and money can buy much of what children need, the market economy obviates the need for sexual division of labor in parental investment.² Of course, it sometimes requires two parents to earn enough money to invest sufficiently in their children; however, what matters is the amount of resources, not the presence of the mother and the father (although the presence of both biological parents in the household does confer additional benefits to children [Daly and Wilson, 1985, 1988a; Flinn, 1988]).

This symmetry holds for other forms of parental investment, such as time and caring. In contemporary societies, both the father and the mother are capable of spending time alone with their offspring to care for them. It appears that there are few things only fathers can do or only mothers can do. Once again, the important thing is that *someone* invest enough time into the children to care for them well. While children will be better off with more time and care invested in them, these resources can come from either the father or the mother.

The second psychological mechanism, or epigenetic rule, dictates that humans constantly attempt to "do better" in their mating (Buss, 1994:171-73; Dawkins, 1989:140-65). When the opportunity arises to mate with a better partner, humans under some conditions might be tempted to leave the current partner and begin a new union with the better partner. For men this generally means younger and more fecund women. For women it means more resourceful and higher-status men (because of high male parental investment among humans) (Buss, 1994:19-72). Humans possess this psychological mechanism because it was adaptive in the ancestral environment. The dissolution of marriage and subsequent cessation of parental investment by one or the other mate were always distinct possibilities in the ancestral environment (Betzig, 1989; Buss, 1994; Fisher, 1992). Smith (1984) argues that this is why women today have extramarital affairs, one of the reasons for which is to maintain a "backup" husband in case the current one leaves.

While this psychological mechanism to search for better mates exists in both males and females of most species, it is much stronger among men than women. Qualities that men seek in women (youth and fecundity) *decrease* with the woman's age, while those that women seek in men (resources and status) generally *increase* with the man's age. Thus, *ceteris paribus*, as time goes on, men become more motivated to leave their current partners, while women

When the opportunity arises to mate with a better partner, humans under some conditions might be tempted to leave the current partner and begin a new union with the better partner

become less motivated to do so. Further, *ceteris paribus*, women should be far less motivated to desert their children than men for several reasons (Buss, 1999:192-95). Maternity is always certain, while fathers always face some degree of paternity uncertainty; the internal gestation of the fertilized eggs inside the mother's body makes it easier for the father to desert during the pregnancy, while it is impossible for the mother to do so (Gross and Shine, 1981); men face greater mating opportunity costs by staying in a given union than women do (Gross and Sargent, 1985; Pedersen, 1991); and each child is more costly to reproduce for women than for men (Dawkins and Carlisle, 1976; Trivers, 1972). However, our model of parental investment purports to be general and is applicable to both men and women.

Since children from earlier unions are not conducive to a successful new union,³ the temptation exists to desert one's children from the current union for a new mate. However, this temptation, created by the second psychological mechanism, comes in direct conflict with the dictate to invest in one's children to maximize inclusive fitness, created by the first psychological mechanism. Herein lies the dilemma that all humans face when they have the opportunity to mate with an alternative partner: Should they stay in the current union and continue to invest in the offspring? Or should they desert the current mate and offspring, start a new union, and raise new offspring in the hope that their reproductive success will be greater than if they had stayed in the current union?

This dilemma, however, does not take the form of the famous Prisoner's Dilemma game. Instead, it is more usefully represented as a game of Chicken. Figure 1 presents the stylized payoff matrices for Prisoner's Dilemma and Chicken games.

In Prisoner's Dilemma (Figure 1a), there is a pure dominant strategy for each player. For each player, defection (D) will bring a higher payoff than cooperation (C) no matter which choice the other player makes. For instance, if Player B cooperates (left column), Player A is better off defecting (with a payoff of 4) than cooperating (with a payoff of 3). If Player B defects (right column), Player A is still better off defecting (with a payoff of 2) than cooperating (with a payoff of 1). Since the payoffs are symmetrical, Player B's situation is identical to that of Player A. The optimal choice for the player therefore does not depend on what the other player does; defection is always optimal.

This is not the case with the game of Chicken (Figure 1b); the optimal choice for the player depends on the choice the other player makes. For instance, Player A is better off defecting if Player B cooperates (4 vs. 3) but better off cooperating if Player B defects (2 vs. 1). Once again, the symmetry of payoffs produces the identical situation for Player B.⁴ There is no dominant strategy in the game of Chicken; the optimal choice depends on what the other player chooses.

Taylor and Ward give the following characterization of Chicken:

There is a minimum amount of work which must be done; either individual alone can do it all, but each prefers the other to do all the work. The consequences of nobody doing the work are so disastrous that either of them would do the work if the other did not. (1982:352)

These characterizations perfectly describe the game that a man and a woman with offspring and alternative mating opportunities face. The "minimum amount of work which must be done" refers to sufficient parental investment in their offspring to guarantee that the offspring will grow to sexual maturity. It is equally important for the inclusive fitness of both the man and the woman that this work be done. Because of industrialization and market economy, "either individual alone can do it all," provided that he or she has sufficient resources. However, "each prefers the other to do all the work," because, as long as the mate makes sufficient parental investment in the offspring from the current union, either the man or the woman can maximize reproductive success by deserting the current offspring and forming a new union. "The consequences of nobody doing the work," the death or complete reproductive failure of the offspring from the current union, would be a significant reduction in one's inclusive fitness and are therefore "so disastrous that either of them would do the work if the other did not."

Parental investment as a game of Chicken therefore postulates that an individual is better off defecting if the current mate stays with the offspring and makes parental investment subsequent to the desertion, but better off staying if the current mate defects as well (or otherwise fails to make sufficient parental investment subsequent to the defection), leaving the offspring to die or suffer from complete reproductive failure.

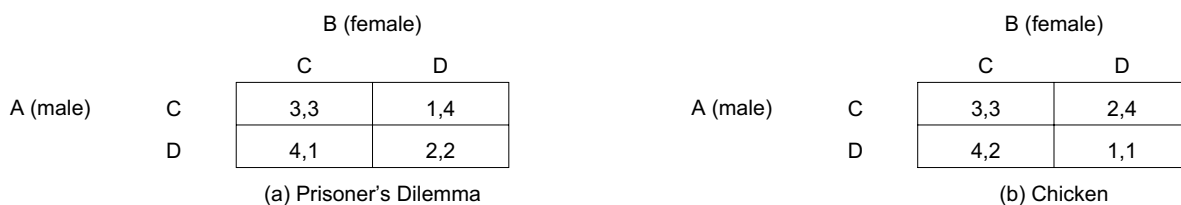


Figure 1. Prisoner's Dilemma and Chicken Games

Hypotheses

Assume that a couple (a man and a woman) have children, and that either or both of them are contemplating desertion (ceasing their parental investment into the children) because they both have alternative mating opportunities. Conceptualizing their interdependent parental investment decisions as a game of Chicken will provide the following hypotheses.

Hypothesis 1. An individual is more likely to desert offspring if the mate is more committed and devoted to the children than if the mate is less so committed or devoted.

This hypothesis derives straightforwardly from our argument. More committed and devoted parents are more likely to “cooperate” (invest in the offspring) subsequent to the desertion of their mates than less committed and devoted parents, who are more likely to defect subsequent to their desertion. Left alone, more committed and devoted parents are more likely to “do the work alone.” Individuals with alternative opportunities are therefore more likely to desert their offspring if their mate is more committed and devoted to their children than if the mate is less so committed and devoted.⁵

It would be extremely difficult to operationalize, let alone measure, the extent to which parents are committed and devoted to their offspring. Further, there may not be sufficient variation on this dimension since most biological parents are committed and devoted to their children. However, we can make one broad generalization with regard to the extent to which parents are committed to their offspring.

Women (just like females of many other species) have a far lower limit to the number of lifetime offspring than men do. Due both to the internal gestation (during which further reproduction is impossible) and a shorter reproductive life, women can produce only a limited number of children in their lifetimes, whereas men can potentially produce an unlimited number of children. This gross sexual asymmetry in the number of potential lifetime offspring, combined with the dual principles of maternity certainty and paternity uncertainty, makes women more committed than men to each child, and this sexual asymmetry grows with age (Daly and Wilson, 1988b:521-23). A basic principle of evolutionary biology is that one’s reproductive potential is negatively correlated with one’s reproductive effort toward any given offspring (Barash, 1980; Montgomerie and Weatherhead, 1988:172-74). Women have far lower reproductive potential than men do, and each child therefore represents a greater share of lifetime reproductive potential for women than for men. While *reproductive success* is equally important for men and women, *each child* is far more reproductively valuable to women than it is to men.

This sexual asymmetry of lifetime reproductive potential no doubt accounts for the fact that the female is the only one that makes any parental investment in the offspring among many other species. In these species, mothers alone raise the

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young, and the fathers do not stick around after copulation. Men do make greater parental investment in their children than males of most other species, but their parental investment is still far less than women’s. It therefore follows that women are more committed to each offspring than men are, and our Hypothesis 1 can be rephrased as follows:

Hypothesis 1.1. Men are more likely to desert their offspring than women are.

Hypothesis 2. An individual is more likely to desert offspring if the mate is more resourceful than if the mate is less resourceful.

Once again, this hypothesis derives straightforwardly from our argument above. *Ceteris paribus*, resourceful partners are better able to continue sufficient parental investment on their own (subsequent to the desertion of their mates) than less resourceful ones. Such resourceful partners are thus more able to “do the work alone” subsequent to desertion of their mates.

This hypothesis holds truer for men than women. Given alternative mating opportunities, men are more likely to leave more resourceful women (with more education or income) than less resourceful women (with less education or income). There is no additional dilemma here, because resources and status are by themselves not what men pursue in women in general (Buss, 1989; 1994:49-72).

There is an additional complication for women, however. Because resources and status *are* what women pursue in men (Buss, 1989; 1994:19-48), women have to weigh the resources of their current mates against those of their potential new mates. The more resourceful their current mates are, *ceteris paribus*, the less likely it is that their potential new mates are more resourceful (and thus less likely to be more attractive) than their current mates. The resourcefulness of the current mates thus simultaneously has both positive and negative effects on women’s likelihood of desertion.

There is another type of sexual asymmetry involved with Hypothesis 2, with respect to the sex of the offspring (Trivers and Willard, 1973). Sons’ reproductive success importantly hinges on the resources and statuses that parents can confer upon them; the more resources and the higher the statuses the sons attain, the more reproductively successful

they will be. Daughters' reproductive success, in contrast, depends less on the resources that parents can invest in them (beyond the minimum threshold for survival and health). The daughters' reproductive success largely depends on their youth and physical attractiveness, which parental investment can do little to affect. We therefore expect Hypothesis 2 to hold more strongly when the couple have sons than when they have only daughters.⁶

Hypothesis 3. Subsequent to separation, an individual is less likely to desert offspring from the earlier union if the former mate has additional children in a new union than if the former mate has no such additional children.

An individual can make parental investment decisions long after the separation from the former mate. Parental investment decisions are independent of separation decisions and are also reversible. Hypothesis 3 predicts that individuals become less likely to desert their offspring if their former mates have additional children in their new unions. This is because the presence of such additional children presents the possibility that their former mates may divert some of their resources from investing in their joint children to investing in those from the new unions. Even if the former mates expend their resources on all children equally (without any effort to divert resources away from the joint children with noncustodial parents), the presence of additional children automatically means that those from the earlier unions receive proportionately less resources than before (holding constant the total household resources). Flinn (1988:360-62) documents that stepchildren are reproductively less successful than genetic children in the same household in a rural Trinidadian village. We therefore predict that even parents who have deserted their children might cease to do so and resume their parental investment once their former mates have additional children with new partners.

Since former mates are more likely to have additional children if they are married than if they remain unmarried, we can derive a subordinate hypothesis from Hypothesis 3. While Hypothesis 3 strictly predicts the effect of additional children on desertion decisions, we use the former mate's remarriage as an indicator of the *risk* of such additional children. Even when the former mates do not yet have additional children they are, generally speaking, at greater risk of having them when they are married than when they remain unmarried, and individuals might respond to this greater risk as well as to the actual presence of additional children in the new union.

Hypothesis 3.1. Subsequent to separation, an individual is less likely to desert offspring from the earlier union if the former mate is married than if he or she remains unmarried.

Hypothesis 4. An individual is more likely to desert older children than younger children.

If the age of a child is an indicator of cumulative parental investment (the older the child, the more parental investment that has been made), then this hypothesis goes directly against both Trivers (1972:146-50) and Dawkins and Carlisle (1976; Dawkins, 1989:140-65). Trivers argued that parents should be *less* likely to desert older children than younger children because they have already made more parental investment in older children and will therefore be deterred by the prospect of wasting all of it by deserting them. Then Dawkins and Carlisle pointed out the "Concorde fallacy"⁷ (Grafen and Sibly, 1978:645) in Trivers's argument: Parental investment decisions should not be influenced by how much resources parents have already invested in their children (what economists call "sunk costs"), but by how much *more* resources they will have to invest to bring the children to sexual maturity. Trivers (1985:268-69) has subsequently conceded Dawkins and Carlisle's critique, and altered his argument accordingly.

Dawkins and Carlisle note: "Either parent's reluctance to desert at any moment should be related to the quantity of investment still needed to bring the offspring to maturity. This quantity will be negatively related to the amount that has already been invested: it does not matter who did that investing" (1976:132). In other words, while their reasoning is different from that of Trivers, Dawkins and Carlisle also maintain that parents should be *less* likely to desert older children because the parents have to make less additional investment to bring them to maturity. The parents might as well stick around older children (instead of deserting them) and complete the job because it will take relatively little more to do so.

We concur with Dawkins and Carlisle that it does not matter for the desertion decisions who did the investing in the children. However, we point out that *it also does not matter who will do the investing in the future to complete the job*. True, the older the child, the less investment it will take to bring the child to maturity. But that also means that it will be easier for the deserted mate to complete the job alone, whereas it is comparatively more difficult for that mate to bring younger children to maturity alone. A parent with an alternative mating opportunity, contemplating desertion, can be relatively more certain that the mate can and will bring their 14-year-old to maturity alone than their two-year-old. Thus, our model of parental investment decisions as a game of Chicken leads us to predict (contrary to both Trivers [1972, 1985] and Dawkins and Carlisle [1976]) that the age of the child has a positive (not negative) effect on the parent's likelihood of desertion.

Empirical Analysis

Data

We use the 1992 March/April Current Population Survey data to test our hypotheses. These are the most recent Census

Bureau data available, with a nationally representative sample of noninstitutional civilian adults, which include questions about alimony and child support payments. Our sample includes all adults (men and women) who have at least one child under 21 in their household whose other parent lives elsewhere.⁸ Our sample contains 3,097 such individuals. Our cases are therefore *custodial parents*.

Dependent Variables

We use two separate measures of parental investment: time and money. For the time equations, the dependent variable is the number of days (0 - 365) in 1991 that the noncustodial parent spent with the children. The fewer days the noncustodial parents spend with their children, the more they desert the children. For the money equation, the dependent variable is the proportion (0 - 1.0) of child support payment that the noncustodial parents were supposed to pay that they actually paid in 1991. The less child support the noncustodial parents pay the custodial parents and the children, the more they desert the children. Note that both dependent variables measure desertion inversely: The greater their levels, the less desertion. (See the appendix for the descriptive statistics for all the variables used in the statistical analyses.)

Independent Variables

Sex. In order to test Hypothesis 1.1, we include the sex of the noncustodial parent (0 = male, 1 = female) in the equations. Hypothesis 1.1 predicts that female noncustodial parents are less likely to desert than male noncustodial parents, and therefore a positive effect of sex of the noncustodial parents on the dependent measures.

Resources. We use two separate measures of time as a parental resource: The number of free hours in a typical week, and the number of free weeks in 1991. We compute the number of free hours by subtracting the number of hours that the custodial parents worked in a typical week from 112 (16 x 7 waking hours per week). We compute the number of free weeks by subtracting the number of weeks that the custodial parents worked in 1991 from 52. For the money equation, we use the custodial parent's total earnings from all sources as a measure of financial resources. Hypothesis 2 predicts a positive effect of the custodial parent's resources on the likelihood of the noncustodial parent's desertion, and therefore predicts a negative effect of the resource variables on the dependent measures.

Marriage. In order to test Hypothesis 3.1, we include the marital status of the custodial parent (0 if currently not married, 1 if currently married) in the equations. Hypothesis 3.1 predicts a negative effect of the custodial parent's marriage on the noncustodial parent's likelihood of desertion, and therefore a positive effect of the marriage variable on the dependent measures.

Age of the Youngest Child. Finally, in order to test our crucial hypothesis about the effect of children's age on the likelihood of desertion, we include the age of the youngest child (measured in years) in the equations. Our Hypothesis 4 predicts that the age of the children has a positive effect on the noncustodial parent's likelihood of desertion, and therefore a negative effect of this variable on the dependent measures. In contrast, Trivers (1972) and Dawkins and Carlisle (1976) would predict a positive effect of this variable on the dependent measures.

Control Variables

In addition to the four independent variables to test our four hypotheses, each equation contains a set of control variables.

Time Since Separation/Divorce. For various reasons, one might expect the parental investment by noncustodial parents to decrease over time. One reason for this might be that the more time that elapses since separation/divorce, the more likely the noncustodial parents are to remarry and have a new set of offspring, thereby diverting their resources to children in the new union (following the logic behind our Hypothesis 3.1). Time since separation/divorce (measured in years) is also confounded with the age of the youngest child; for any given case, the two variables are perfectly collinear. Since our Hypothesis 4 predicts the effect of the age of children on desertion, and not that of time since separation/divorce, we control for this important confound with the age of children.

Race. We include a variable to control for the race of the custodial parent (1 if black, 0 if otherwise), which also obliquely controls for the race of the noncustodial parent (which is not available in the data).

Age. We control for the age of the custodial parent (measured in years).

Visitation Rights and Joint Custody. We include two dummy variables to control for whether the noncustodial parent has visitation rights (1 = yes) or the parents have joint custody of the children (1 = yes). We obviously expect these variables to have significant positive effects on the number of days that the noncustodial parents spend with the children; this should be true by definition. There is also some prior evidence to suggest that visitation and joint custody are positively correlated with the amount and frequency of child support paid by the noncustodial parents, although the relationship appears not to be causal (Seltzer, Schaeffer and Charng, 1989; Veum, 1993). We therefore include these two variables to reduce the noise in both dependent measures.

In addition, the time equation contains a control variable to measure if the noncustodial parent lives in the same state as the children (1 = yes). We naturally expect the geographical distance between the noncustodial parent and the children to affect the frequency of their contact, but not the

amount of child support payment. The money equation contains a control variable to measure if the child support payment was ordered by court (1 = yes). We expect the court order of child support payment to increase the amount and frequency of child support, but not the frequency of contact between the noncustodial parent and the children.

Results

Hypothesis 1.1. Table 1 presents the coefficients for the two time equations (one with free hours and the other with free weeks as predictors), and Table 2 presents those for the money equation. Sex of the noncustodial parent has the predicted positive effect in the time equations; noncustodial

mothers are significantly ($p < .0001$) less likely to desert their children than noncustodial fathers. Noncustodial mothers on average spend 17 more days with their children than noncustodial fathers. Our analysis, however, does not support Hypothesis 1.1 when the dependent measure is the child support payment. Contrary to our prediction, noncustodial mothers are significantly ($p < .0001$) less likely to pay child support than noncustodial fathers.

We speculate that there might be two possible reasons for the unexpected finding with regard to the child support payment. First, men have greater financial resources than women in general. While the child custody payments are usually a set percentage of their net income (such that noncustodial parents who make more money are required to pay more than those who make less), those who make more money nonetheless have more *discretionary* income,

Table 1. Number of Days That the Noncustodial Parent Spent with the Child in 1991

	Prediction	Equation (1)	Equation (2)
Predictor Variables			
Sex (female = 1)	+	16.8678****	16.8730****
	(3.6624)	(3.6236)	
Free hours	-	.0045	—
	(.0742)		
Free weeks	-	—	.0066
		(.0626)	
Married	+	-4.8100	-4.8140
	(2.7936)	(2.7937)	
Age of youngest child	-	-1.9597****	-1.9572****
	(.3315)	(.3322)	
Control Variables			
Years since divorce/separation		-.2821	-.2818
		(.2747)	(.2747)
Race (black = 1)		-7.4377*	-7.4527*
		(3.7470)	(3.7501)
Age		.3217	.3221
		(.2801)	(.2801)
Visitation		11.6159****	11.6342****
		(2.6714)	(2.6721)
Joint custody		40.0730****	40.0969****
		(3.2174)	(3.2244)
Same state		29.4116****	29.4135****
		(2.6833)	(2.6823)
Constant		57.6187	57.8247
		(12.4231)	(11.2948)
R ²		.1349	.1348
n		3097	3097

Note: Standard errors are in parentheses.
 * p < .05
 ** p < .01
 *** p < .001
 **** p < .0001

Table 2. Proportion of Child Support Payment Due That the Noncustodial Parent Actually Paid in 1991

	Prediction	
Predictor Variables		
Sex (female = 1)	+	-.3153****
		(.0221)
Total earnings	-	2.1269 ⁻⁶ ****
		(5.2291 ⁻⁷)
Married	+	.0411*
		(.0165)
Age of youngest child	-	-.0056**
		(.0019)
Control Variables		
Years since divorce/separation		-.0025
		(.0017)
Race (black = 1)		-.1009****
		(.0218)
Age		.0054***
		(.0014)
Visitation		.2303****
		(.0159)
Joint custody		.1865****
		(.0188)
Court order		.1879****
		(.0155)
Constant		-.6323
		(.0630)
R ²		.2275
n		3097

Note: Standard errors are in parentheses.
 * p < .05
 ** p < .01
 *** p < .001
 **** p < .0001

because living costs and expenses do not increase proportionately with net income. Thus, those with greater financial resources (e.g., men) are still better able to fulfill their child support obligations than those with less financial resources (e.g., women). Second, given that an overwhelming majority of custodial parents are mothers, we suspect that mothers who do not get custody of their children upon divorce are a highly select group of women who are somehow deemed unsuitable (or else do not want) to retain custody of their children. For instance, they may have psychological or substance abuse problems, or they might be in school or otherwise constrained (which makes it more difficult both to take care of their children and to hold full-time jobs). The same factors that lead these women not to retain their custody might also make them less able to fulfill their child support obligations. Our analysis supports Hypothesis 1.1 only when we measure desertion by time, not by money.

Hypothesis 2. In Table 1, neither measure of custodial parent's time resources (free hours and free weeks) is significant; the amount of free time available to custodial parents does not seem to have any effect on the amount of time noncustodial parents spend with their children. And the measure of financial resources in Table 2 has the unexpected positive effect on the dependent measure. Contrary to Hypothesis 2, the more money the custodial parent has, the more child support the noncustodial parent pays. This could be due to class homogamy: The more money the custodial parents have, the more money the noncustodial parents also have, and therefore the better they can fulfill their child support obligations. Unfortunately, our data contain no information on the noncustodial parent's income. Our analysis therefore provides no support for Hypothesis 2.

Hypothesis 3.1. In Table 1, the custodial parent's marital status has no significant effect on the amount of time noncustodial parents spend with their children; contrary to our expectation, noncustodial parents spend the same amount of time with their children whether the custodial parents are married or not. In contrast, the custodial parent's marriage has the predicted positive effect on the dependent measure in the money equation in Table 2. Consistent with Hypothesis 3.1, noncustodial parents pay more child support when the custodial parents are married (and thus have greater chances of having additional children) than when the custodial parents remain unmarried. Our analysis therefore supports Hypothesis 3.1 when we measure desertion by money, not by time.

Hypothesis 4. Finally, our analysis provides very strong and consistent support for Hypothesis 4, regardless of how we measure desertion. The age of the youngest child has a significantly ($p < .0001$) negative effect on the frequency of contact between the noncustodial parent and the children in Table 1, and it also has a significantly ($p < .01$) negative effect on the amount of child support payment. Noncustodial parents on average spend two days less for each year the children gain,

and they also pay less child support as the children get older. The age of children therefore has a positive effect on desertion, no matter how we measure it. It is important to emphasize that we control for the time since separation/divorce in our regression equations. The positive effect of the age of children on desertion (where the noncustodial parents become more likely to desert their children as they get older) is therefore *not* an artifact of the time elapsed since separation/divorce. These findings support our model of parental investment as a game of Chicken, and reject both Trivers's (1972, 1985) and Dawkins and Carlisle's (1976) predictions.

Conclusion

Humans (as well as members of other species) have two potentially conflicting evolved psychological mechanisms. One psychological mechanism compels us to invest in our offspring to increase our inclusive fitness (in parenting effort), while another psychological mechanism compels us to seek further mating opportunities (in mating effort), by possibly deserting the current mates and offspring. We contend that the conditions in industrial and postindustrial societies allow one parent, if he or she is sufficiently committed and has sufficient resources, to raise children alone, without the help of the other parent. These conditions transform the interdependent parental investment decisions between the man and the woman into a game of Chicken, rather than the Prisoner's Dilemma game. Our model of parental investment as a game of Chicken leads us to propose four hypotheses. Our analysis of the 1992 Current Population Survey data at least partially supports three of these four hypotheses. Our analysis fails to support our prediction that individuals are more likely to desert when their mates have more resources than when they have less resources. However, there is some evidence to support our prediction that individuals are more likely to desert when their mates are more committed and devoted to the offspring (and hence men are more likely to desert their offspring than women), and that individuals are less likely to desert when their former mates are married than if they are unmarried. Most importantly, our analysis strongly supports our prediction that individuals become more likely to desert as the children get older (even with the time since separation/divorce controlled for), and therefore rejects Trivers's (1972, 1985) and Dawkins and Carlisle's (1976) earlier prediction that parents become less likely to desert their children as they get older. We believe that only the game of Chicken as a model of parental investment can account for this finding, as well as others that we predict and our analysis supports.

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Appendix. Descriptive Statistics

	Mean	Standard Deviation
Dependent Variables		
Days noncustodial parent spent with children in 1991 (0 - 365)	43.93	77.28
Proportion of child support paid in 1991	.30	.44
Independent Variables		
Sex of noncustodial parent (female = 1)	.14	.34
Free hours in a week (0 - 112)	82.92	18.81
Free weeks in 1991 (0 - 52)	18.86	22.46
Total earnings (U.S. dollars)	13220.73	14780.10
Custodial parent's marital status (married = 1)	.31	.46
Age of youngest child	8.90	5.69
Control Variables		
Years since divorce/separation	14.60	7.05
Race (black = 1)	.22	.42
Age of custodial parent	34.72	8.38
Joint custody (yes = 1)	.17	.38
Noncustodial parent's visitation right (yes = 1)	.51	.50
Noncustodial parent in the same state (yes = 1)	.65	.48
Court order of child support (yes = 1)	.38	.48

Notes

- Throughout this article, we assume that the quality and quantity of parental investment is independent of coresidence; in other words, we assume that noncoresident or noncustodial parents can make investment in their children by paying the child support and spending time with them. There is evidence that such investment by noncustodial parents increases the children's welfare (Amato and Gilbreth, 1999; McLanahan, 1985; Furstenberg, Morgan, and Allison, 1987; King, 1994). This is not to deny, however, that the absence of a biological parent from the household, and the subsequent presence of a stepparent, have adverse effects on the children. Children are more likely to be abused (Daly and Wilson, 1985) and murdered (Daly and Wilson, 1988b) by, or otherwise have agonistic interactions (Flinn, 1988) with, stepparents than with biological parents.
- There are obvious exceptions to this, however. For example, while the children are nursing, only the mother can provide the crucial parental investment of breast milk. The mother and the father are thus not truly equivalent, even in contemporary industrial and postindustrial societies, for very young children. The true game of Chicken between parents may therefore not begin until after the children are older. Because only the mother can provide important parental investment during the years immediately following the birth of the children, fathers may particularly be tempted to defect and not make parental investment during these years. Hagen (1999) presents an intriguing argument that the function of the postpartum depression among mothers is to threaten to defect when the fathers' parental investment is not forthcoming, thereby forcing the fathers (and other relatives) to make or resume their investment, in a logic similar to the game of Chicken we discuss here.
- "Children from the first marriage significantly reduce the probability that women remarry during any given period of time since legal termination of their first marriage and increase the time it takes to remarry for those who do" (Becker, Landes, and Michael, 1977:1176; however, see also Koo and Suchindran, 1980). Marriage, however, has become an increasingly poor indicator of new unions because a large portion of unmarried people with children cohabit. Marriage has also become a poor indicator of potential parenthood since a large number of unmarried women now become mothers.
- While we use symmetric payoffs in this simple illustration, they need not be symmetric to constitute a game of Chicken. In fact, we later argue (in connection with Hypothesis 1) that the payoffs for men and women are asymmetric. The defining characteristic of a game of Chicken is that (C, D) and (D, C) be the only two pure-strategy Nash equilibria. In other words, regardless of the actual payoffs, a player is better off making the choice *not* made by the other player.
- Note, however, that our logic here contradicts some of Daly and Wilson's (1988a) work on discriminative parental solicitude and Hagen's (1999) recent work on postpartum depression, both of which demonstrate that parents make *more* investment in their children if their mates also make *greater* parental investment.
- We thank one anonymous reviewer for pointing out this sexual asymmetry to us. We would also point out in passing that the greater need for parental investment for the reproductive success of sons over that for daughters is probably why the presence of sons decreases the probability of divorce and why fathers are more involved in raising sons than daughters (Morgan, Lye, and Condran, 1988; Katzev, Warner, and Acock, 1994).
- "A government which has invested heavily in, for example, a supersonic airliner, is understandably reluctant to abandon it, even when sober judgment of future prospects suggests that it should do so. Similarly, a popular argument against American withdrawal from the Vietnam War was a retrospective one: 'We cannot allow those boys to have died in vain.' Intuition says that previous investment commits one to future investment" (Dawkins and Carlisle, 1976:131).

8. Unfortunately, the survey refers to both biological and adopted children (but *not* stepchildren). While we would have liked the data to contain only biological children, we believe that the inclusion of adopted children will not affect our results too much for two reasons. First, there are very few adopted children in the United States. In 1991, when our data were collected, only 0.6% of all children under 18 lived with nonrelative adoptive parents (<http://www.census.gov/population/socdemo/ms-la/tabch-1.txt>). Second, for a variety of reasons, adoptive parents behave more like biological parents than stepparents (Daly and Wilson, 1985:206).

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