

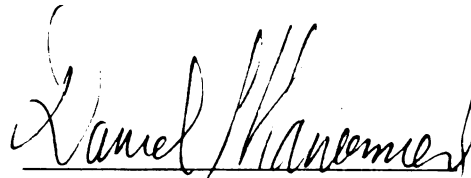


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**THE STRATEGIC USE OF CHILD SUPPORT PAYMENTS AND
VISITATION RIGHTS**

By

Donna Marie Anderson

A DISSERTATION

**Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of**

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Department of Economics

1993

ABSTRACT

THE STRATEGIC USE OF CHILD SUPPORT PAYMENTS AND VISITATION RIGHTS

By

Donna Marie Anderson

This thesis deals with the determination of child support and noncustodial parent-child visitation in the post-divorce environment. A strategic bargaining model of negotiations over child support and visitation rights is proposed that emphasizes the influence of the custodial parent's control of visitation rights and the noncustodial parent's control of child support on the process and outcome: the custodial parent uses his or her control over the time the child spends with the noncustodial parent to elicit certain behavior from the noncustodial parent, namely payment of child support, while the noncustodial parent uses his or her control of child support to obtain the agreed upon amount of visitation. The model incorporates the child's welfare into the utility function of each parent. The one-period Nash equilibrium leads to lower support payments and visitation than the efficient outcome. The optimal outcome can be supported in a repeated game, a better approximation of the post-divorce environment, with the use of trigger strategies: as long as both parties care enough about the future, the threat of noncooperation in the future makes the agreement self-enforcing.

Data from the National Survey of Children are used to

test the interdependence of the visitation and child support decisions. The analysis suggests that child support is being used strategically based on the significance of the simultaneous equation specification and the significance of various strategic factors important to the theory such as the pre-divorce negotiation costs, the post-divorce relationship between the parents, and the preferences of the child and parents. The evidence of the strategic use of visitation is less compelling. The significance of the parents' relationship indicates the importance of family dynamics in child support determination and the need for more research and better data in this area. These results suggest that legally allowing child support and visitation to be linked, and stricter enforcement of visitation awards would help alleviate the child support noncompliance problem.

To my husband,
John D. Hibshman,
for his patience, love,
and support.

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CHAPTER I. INTRODUCTION

A child support order in a divorce is a remedy to enforce the obligation of support which parents owe their children. Unfortunately, lack of compliance with court-ordered payments is pervasive. A large percentage of custodial parents living alone with children never receive support from the absent noncustodial parent. Custodial parents who do receive child support often receive this in insufficient amounts and at irregular intervals. According to the U.S. Bureau of the Census, only 51 percent of women awarded child support payments received the full amount of the child support award in 1989¹.

Otherwise law-abiding citizens with the ability to pay are exhibiting a complete disregard for the law. Satisfactory data do not exist on the noncustodial parent's reasons for inadequate payments, or nonpayments. One possible motive for noncompliance that has not been adequately developed in the economic literature is that the payments are being used strategically by the noncustodial parent in order to influence the behavior of the custodial parent. At the same time, however, the custodial parent is using his or her control over the time the child spends with the noncustodial parent to elicit certain behavior from the

¹All 1989 and 1990 descriptive statistics are from the U.S. Bureau of the Census, Current Population Reports, Series P-60, #173, Child Support and Alimony: 1989.

noncustodial parent. Thus, actions taken by each parent affect the outcome, or well-being of the other parent, suggesting a gaming situation.

This thesis develops a dynamic game-theoretic model of strategic child support payments in which the parents engage in a gaming strategy that results in an equilibrium distribution of child support payments and visitation rights. A divorced parent controlling payments (the noncustodial parent) strategically interacts with the ex-spouse who has custody of the child (the custodial parent) and control over visits. Even though each parent is altruistic towards the child, they are also affected by actions taken by the other parent.

A. Statistics on Child Support and Visitation Rights

Census data show that as of spring 1990, 58 percent of divorced or separated women age 15 and over with children under 21 years of age had a legally binding child support agreement. This is down from 1986 when the figure was 61 percent, and 1979 when the percentage was 59 percent². Among those with an award and due payment in 1989, only about one-half received full payment, about one-quarter received partial payment, while one-quarter received no payment at all. These particular statistics have not

²U.S. Bureau of the Census, Current Population Reports, Series P-23, #52 (106), Child Support and Alimony: 1985 (1978).

changed since 1979, when 23 percent of women due child support received less than they were due, 28 percent received no payment, and around one-half received full payment. Health care benefits were included in the child support awards of 40 percent of mothers, though only two-thirds of the absent fathers required to do so actually provided them, while 7 percent who were not required to do as part of a child support award provided the benefits.

Two-thirds of the women due child support payments in 1989 were awarded payments through the court system, while an additional 29 percent had voluntary agreements, which may also be approved by a court. Only 4 percent of women had some other type of agreement. Court-ordered payments usually take place when a mutually acceptable agreement cannot be worked out between the parties. Voluntary written agreements between the parties are not ordered by the courts and may or may not have been recognized by the courts as part of the divorce proceedings. Interestingly, the mean amount of child support received by women with voluntary child support awards was \$2,929 in 1989, 48 percent higher than the mean amount received by women with court-ordered agreements. Women with voluntary agreements also received a higher percentage of payments due (83 percent) than women with court-ordered payments (61 percent).

Of those women who were never awarded child support payments in 1989, 64 percent wanted an award but did not obtain it for various reasons such as the father was unable

to pay, paternity could not be established, the father could not be located, or the mothers did not pursue an award. 6 percent had a final agreement pending, meaning a child support agreement was awaiting final legal action before becoming final, or a voluntary written agreement was not yet final. 9 percent had another settlement, and the remaining 22 percent did not want a child support award.

55 percent of absent fathers had visitation privileges with their children in 1990, another 7 percent had joint custody, and 38 percent had neither. Moreover, 63 percent of absent fathers lived in the same state as their children in 1990. An additional 26 percent of absent fathers lived in another state and the remaining 11 percent of absent fathers either lived overseas or had an unknown residence. Absent fathers who lived in the same state as their children had a payment rate of 81 percent while fathers who resided in a different state had a rate of 66 percent. Those fathers with residences overseas or unknown had a payment rate of 47 percent.

A higher percentage of mothers of children whose fathers had visitation privileges were awarded child support (78 percent) as compared to those who had neither visitation privileges nor joint custody (27 percent). The award rate for mothers of children whose fathers had joint custody was 65 percent, less than the rate for fathers with visitation only. This is understandable because in such situations the father provides support functions in lieu of cash payments.

A higher percentage of fathers with joint custody pay the child support due (90 percent) than fathers who have visitation privileges (79 percent) and those without visitation or joint custody provisions (44.5 percent).

These statistics underscore three primary points explored in this thesis: the low rate of full compliance with child support awards and the fact that this rate has not changed over the past decade; the link between visitation and child support; and the importance of the relationship between the ex-spouses as evidenced by the significance of voluntary agreements in the receipt of higher amounts of child support. Delving into the latter two points hopefully will promote a better understanding of the first point and appropriate enforcement initiatives.

B. Literature on Child Support and Visitation

Many papers that concentrate on the child support compliance issue empirically, focus on the effects of noncompliance on the post-divorce economic status of custodial and noncustodial families, including Nichols-Casebolt (1986), Weitzman (1981), and Garfinkel and Oellerich (1989). These studies found, for example, that divorce has a more negative economic impact on women than it does men, resulting in financial difficulties and often poverty for the custodial parent.

A recent paper by Del Boca and Flinn (1990) focused on the effects of a divorce settlement on the post-divorce

welfare levels of the parents and the children by first theoretically modelling the preferences of each parent within the legal environment, and then empirically estimating the behavioral parameters that characterize these preferences. Similar to my thesis, each parents' utility is a function of own consumption, and child "quality" as measured by expenditures on the child and time spent with each parent. They use their estimates, derived from Wisconsin Child Support Experiments data, to determine the optimal custody arrangements and child support orders within a Nash equilibrium framework. These divorce outcomes are then compared to those observed in the data and found to be markedly different³. They conclude that more information is needed on the objectives of the judges and lawyers involved in determining settlements.

Other papers focus on the determinants of child support awards and receipt, most notably Beller and Graham (1985). Using 1979 Census data, they found that the likelihood of being awarded child support depended upon the needs of the mother and her children as measured by the number and ages of the children, education of the mother, mother's age at divorce, and upon the absent father's long-term ability to pay as measured by education, value of property settlement at divorce, and age at divorce. In contrast, the likelihood

³The primary limitation of their one-period model is that the interactions they seek to model are almost surely dynamic, not static.

of receiving child support due depended less upon the circumstances of the woman and more upon the current financial well-being of the ex-husband. His income was found to affect whether or not any child support was actually paid, but not how much was paid. Fathers with low current incomes evaded payment altogether, instead of partially cutting back on payments, a result supported in Peters et al (1992). Because of the different types of noncompliers, Beron's (1990) research emphasized the important policy implications of distinguishing between those who pay no support at all from those who pay some support.

Other reasons for noncompliance examined in the literature include remarriage by the noncustodial parent (Garasky, 1990), and lack of enforcement of awards. This latter issue is the primary focus of one of the most exhaustive studies done on the collection of child support by Chambers (1979). It was based on 13,000 case files in twenty-eight Michigan counties, as well as interviews with fathers, ex-wives, court personnel, judges and jail keepers. Chambers found that the counties with the highest rates of compliance shared two characteristics: a self-starting system of collecting child support, where child support payments are made directly to the court so that court personnel can monitor compliance, and a high incarceration rate.

More recently, Robins' (1986) empirical analysis of the

effectiveness of child support enforcement policies on the receipt of child support disclosed that the state's child support enforcement programs have a significant positive effect on receiving child support for all families who reported receiving help from the child support agency. He also found that the program had significant effects on whether an AFDC family had a support obligation, but no effect for non-AFDC families.

These results lend support to the neoclassical theory of low child support in which differences in child support payments between households are attributed to differences in relative prices (e.g., the price of noncompliance as measured by the state's enforcement efforts), demographic factors, and income. Economists therefore emphasize the effect of policy changes, such as increasing enforcement, on the receipt of child support payments.

One problem with this model, as noted by Folbre (1984), is that neoclassical theory assumes random variation in family utility functions. (A divorced couple with children is considered a family, albeit a binuclear one as opposed to a nuclear one). However, if systematic differences in unobservable family utility functions exist, the interpretation of observed relationships between changes in household behavior and changes in relative prices would be wrong. If, for example, income has an effect on the relative bargaining power of the two parents, families where one parent controls substantial wealth may make very

different decisions than those in other, similar families. Likewise, control of visitation can be a very powerful bargaining tool, and its effect on the outcome depends upon the noncustodial parent's attachment to his children and his own bargaining tools. The use of income or visitation as sources of bargaining power may therefore render the utility functions endogenous to the particular family. Ignoring the strategic effect of these factors confounds the empirical estimates of the effects of relative prices on outcomes⁴.

The estimates of the positive effect of visitation on child support receipt promotes the possibility that these two factors are being used strategically. Wallerstein and Huntington (1983) studied the link between payments and visits. They found that visitation and the post-divorce relationship with the children were among factors correlated with nonsupport. At eighteen months post-divorce, children who were fully supported were visited more frequently than other children. Frequency of contact was a less significant measure of the father's interest than the pattern of the visit and the duration of each visit. For example, weekend visits and overnight visits were highly correlated with child support. Additionally, the relationship between child support and visiting, while of little consequence at the

⁴Several economists, including Manser and Brown (1980), McElroy and Horney (1981, 1990), and McElroy (1990) examine this issue as it relates to a nuclear family. They derive Nash-bargaining models of household decision-making which allow for different family member utility functions and derive a joint utility function within a bargaining framework.

time of the separation, grew increasingly important over the years that followed.

Furstenburg et al (1983), in their study of the patterns of contact maintained by the noncustodial parent and the child, also found a positive relationship between compliance with a child support award and contact between the noncustodial parent and child. Using data from the National Study on the Well-Being of Children, they established that the fact of support rather than the amount of support seemed to be related to the maintenance of ties between father and child.

Weiss and Willis (1985) developed a model of optimal marriage contracts to explain this linkage. Their reason for nonpayment of support is the existence of a monitoring problem: the noncustodial parent suffers a loss of control over the allocative decisions of the custodial parent and cannot be sure the custodial parent is spending the award on the child. This results in a nonoptimal allocation of their joint resources. In Weiss and Willis' 1989 paper, they estimated that ex-wives spend up to three-fourths of a child support transfer on their own consumption. The authors proposed an enforcing arrangement solution in the form of a sequential bargaining process in which the noncustodial parent pays support only after receiving child visitation rights and insuring the payments are being spent on the child.

Recent work by Peters et al (1992) utilize an implicit

contracting framework to understand how child support compliance is affected by the dynamic nature of the parents' relationship and the relationship between the non-custodial parent and the children. They test their theory using longitudinal data collected by the Stanford Child Custody Project of over 1,000 California families who filed for divorce in 1984 and 1985. They found that the level of contact between the noncustodial parent and his children was a strong predictor of compliance to support awards. Significantly, they recognized that child support agreements can be voluntarily modified after divorce if the original agreement becomes inefficient in the face of changing circumstances such as remarriage of one parent, or change in employment status. Frequently, these changes are not negotiated legally into a new formal contract due to high legal costs, so that an unwritten or implicit contract is the result. In other words, the couple engages in private ordering, discussed in the next section. Consequently, one or both parties may be legally noncompliers, though they are full compliers with respect to the new informal contract. The emphasis of their empirical analysis is on the extent informal modifications of initial divorce agreements occur and compliance with the new implicit agreements.

These latter papers allude to the importance of the relationship between former spouses in the post-divorce environment. Rather than ending a family with children, divorce changes the relationships within the family. The

particular aspect of this post-divorce relationship my thesis deals with is the informal post-divorce process over the determination of child support and noncustodial visitation. This process can be handled formally through the legal system, or informally. My thesis deals with the informal process, legally termed "private ordering".

C. Private Ordering

Private ordering is defined as "'law' that parties bring into existence by agreement"⁵. Under private ordering, two parties are given considerable leeway to negotiate the outcome of their dispute within the framework of the law. The current legal system has varying degrees of private ordering at divorce. The foremost situation is when the divorcing couple negotiates custody, visitation, child support, and property division at the time of divorce. When a divorcing couple has no children, the law generally recognizes the power of the parties upon separation or divorce to make their own arrangements concerning marital property and alimony, subject to no or little subsequent court modification.

However, when minor children are involved, parents lack any formal power to make their own law. Private agreements concerning custody, child support, and property division are possible and common, but agreements cannot bind the court,

⁵Mnookin, R.H. and L. Kornhauser, "Bargaining in the Shadow of the Law", 1979, p. 951, fn1.

primarily because it is the ultimate responsibility of the state to determine what arrangement is best for the child. Further, even if the parties' initial agreement is accepted by the court, it lacks finality. A court may at any time during the child's minority reopen and modify the initial decree in light of any subsequent change in circumstances.

Nevertheless, available evidence suggests that parents actually have broad powers to make their own deals at this time. In a recent study, Mnookin et al (1990), using data from the Stanford Child Custody Study, found that in the overwhelming majority of cases, it is the parents, often with the involvement of lawyers, who resolve issues concerning custody and visitation following divorce. As noted in Mnookin and Kornhauser (1979), advantages exist to these private order contracts. Time and financial costs involved with legal adjudication can be minimized. The parties can avoid the risks and uncertainties of litigation, which may involve all-or-nothing consequences. The negotiated outcome is more likely to be consistent with the preferences of each spouse, and thus more likely to be obeyed, than would a court-imposed solution. Most importantly, the child benefits because the parents know more about the child's circumstances than does the judge and are thus in a better position to decide what is best for the child and for themselves. Finally, a child's future relationship with each of his or her parents is more secure with a negotiated settlement than by one imposed by a court

after an adversary proceeding. For these reasons, some legal scholars conclude that the state has an interest in facilitating parental agreement outside the court and "see the primary function of contemporary divorce law not as imposing order from above, but rather as providing a framework within which divorcing couples can themselves determine their post-dissolution rights and responsibilities"⁶.

Another situation where private ordering is evident is in the post-divorce situation when, due to changing tastes and economic and personal circumstances over the family's life cycle, the parties wish to renegotiate the initial agreement (see Peters et al, 1992). However, as just described, it can be costly and risky to go to court. In Michigan, for example, certain divorce orders concerning custody, visitation, support, and domicile can be modified only if one of the following time-consuming and costly procedures occur: both parties have signed an agreement which, if approved by the court is entered as an order; or one party files a motion for a change, a hearing is held, and the court enters an order granting a change. The chance for legal alterations is further inhibited by the restriction that requests for order modifications cannot be made more than once every two years.

Wallerstein and Kelly (1980) inquired about post-

⁶Mnookin, R.H. and L. Kornhauser, "Bargaining in the Shadow of the Law", 1979, p. 1.

divorce litigation to change original financial agreements. They found that one-fifth of the women, and a slightly lower percentage of the men had initiated litigation to terminate alimony or reduce child support, to increase child support or recover payments in arrears, or to link payment of child support directly to visiting rights. Visitation was more likely to be litigated among families where child support was higher, while litigation over money occurred more often among the poorly supported families. Since litigation is costly, it was most often initiated by those who could afford it, who were still angry, and who felt they had a good chance of winning.

Because of these transactions costs, parents engage in private ordering to arrive at an outcome that is optimal in the face of changing circumstances. A divorcing couple attempts through bargaining to divide money and child-rearing responsibilities to reflect personal preference. However, another potential linkage between support payments and visitation rights is within the context of enforcement. Since it is often time-consuming and expensive to enforce promises in court, linking these two matters can serve to secure delivery of the promise. If a father fails to pay support, his spouse may reciprocate by cutting off the father's visitation or making it more difficult. Even though this tactic is illegal in most states since there is no legal connection between these two matters, it is nevertheless likely to be more effective than court

enforcement if the father cares about his visitation rights. Likewise, a father may believe that his ability to cut off support will ensure that the mother will keep her end of the bargain concerning visitation.

As Mnookin and Kornhauser note, it is not so distasteful in terms of its effect on the child as it may seem.

If withholding support payments is an effective way of ensuring that the custodial spouse will not interfere with court-ordered visitation, it is certainly not as potentially damaging to the child as the legally sanctioned alternatives of calling out officials to force surrender of the child, or moving for a contempt order that would put the custodial parent in jail until a promise to comply. (p. 965, fn 56).

D. Purpose of this Thesis

No game-theoretic model exists to predict and evaluate alternative outcomes in this strategic game situation. This thesis addresses this deficiency within a sequential bargaining framework, and solves for visitation rights and child support resulting from divorced parents' bargaining. It attempts to develop more fully the theory that child support payments and visitation rights are instruments in a strategic repeated game between the two parents. Rather than focussing on the demographic determinants of noncompliance, this thesis concentrates on explaining the behavior of the two parties involved in bargaining for their individual welfare maximization and the resulting outcome. It makes use of the theory of noncooperative games where

cooperation can emerge as a noncooperative equilibrium in repeated games.

In noncooperative games, attention is focused on the actions that each player is able to take, and how these actions jointly determine each player's payoff. Just how players achieve their outcomes, the strategies and bargaining levers they use, the institutional and legal framework within which bargaining takes place, is very important in determining what they achieve. The appropriate strategy depends on just how an offer will be received and responded to by the other side. Since many situations involve explicit or implicit bargaining, noncooperative games have dominated the literature over the past few years and is a particularly viable methodology in explaining the divorce and post-divorce environments.

This thesis is organized as follows. Chapter II formalizes a single-period model of the post-divorce situation. An important feature of the model is that the welfare of each parent depends directly upon the welfare of the child. When divorcing parents bargain over economic and custody issues, they make decisions that protect their children's interests as well as their own. Analysis shows that payment of child support by the noncustodial parent depends upon whether payment of child support will lead to the desired amount of visitation, and explains how underpayment of child support can result. Chapter III provides a repeated game model of the post-divorce

bargaining process. I show that the interactions can result in a Pareto improving outcome for both parents.

The theory suggests that the parents' and child's preferences, one parent's knowledge of the other's preferences, the state of the current relationship between the former spouses, and the costs of negotiating a divorce settlement affect the outcome as much as standard economic variables such as the noncustodial parent's ability to pay and the custodial parent's need, examined in previous papers. The single period and dynamic empirical analyses, presented in Chapters IV and V, respectively, use the National Survey of Children (NSC) data set. NSC is a longitudinal study of U.S. children that comprises three waves conducted in 1976, 1981, and 1987. Since this data set is national, it is broader than many of the sets used in previous analyses, such as Peters' et al (1992) data set which is restricted to families in two California counties. Most importantly, NSC contains data on visitation and preferences that allow the model to be tested.

The empirical analysis suggests that the proposed model is consistent with key features of the post-divorce situation, most importantly the strategic role of child support in the post-divorce environment. The thesis concludes with comments about policy implications and future research possibilities.

CHAPTER II. THE SINGLE PERIOD MODEL

In order to simplify the analysis, the female parent (f) is assumed to be the custodial parent, and the male parent (m) is assumed to be the noncustodial parent. The two players, the divorced parents, are assumed to operate with complete information. The non-custodial parent is assumed to move first.

A. The Strategic Case

Since the noncustodial parent does not directly decide the time he will spend with the child, or the child's consumption, a model in which the noncustodial parent takes the consumption of the child and his visitation with the child as fixed by the custodial parent appears appropriate. However, optimal behavior then results in a child support level of zero. If child support is not seen by the noncustodial parent as being directly related to the child's consumption (if the noncustodial parent feels the custodial parent is spending the support on herself) or visits with the child, the effect of support is the standard income effect and the optimal response is to pay nothing. Though this consequence is certainly the outcome in a large number of cases, it is only one of a number of outcomes in strategic bargaining.

A model in which the noncustodial parent anticipates the effect his payments have on the child's consumption and

on time spent with the child is thought more appropriate. If this parent acts first, the noncustodial parent takes into account the custodian's reactional choice of the child's time allocation to his choice of support payments when optimizing with respect to the payments.

1. The Custodial Parent's Problem

As standard in solving sequential problems, the second stage of the bargain is considered first. Taking the amount of child support, s , as given, the female's optimization problem is to maximize the following utility function:

$$(2.1) \quad U^f(x, t_f, t_m, l_f) = u^f(x, t_f, l_f) + a^f U^c(x, t_f, t_m)$$

subject to the following budget and time constraints:

$$(2.2) \quad w_f h_f + I^f + s = x$$

$$(2.3) \quad t_f + h_f + l_f = H$$

$$(2.4) \quad t_f + t_m = T^c.$$

The elements of the model are:

$u^f(x, t_f, l_f)$ = female's self-interested utility
function

$U^c(x, t_f, t_m)$ = child's utility function

x = goods consumed by the female and child

s = child support payments

t_f = time the child spends with the custodial
parent

t_m = time the child spends with the noncustodial
parent

T^c = total time the child has to spend with
parents

H = total available hours

h_f = time the female spends in the labor market

l_f = female's leisure time

I^f = female's non-support income

w_f = female's wage

a^f = weight the female parent attaches to the child's utility.

Each parent maximizes a weighted utility function in which the utility of the child is given some weight, a^f by the female parent, and a^m by the male parent. If the parents are altruistic, as they are assumed to be in this model, $a^i > 0$, $i = f, m$. If $a^i = 1$, the utility function maximized by a parent would be $U^i + U^c$, in which case the parent is indifferent between receiving utility directly, or indirectly through enjoyment of the child's consumption. If $a^i > 1$, the parent attaches more weight to the child's welfare than to his or her own.

According to the budget constraint, the custodial parent chooses goods for herself and the child, represented by x . Thus, x is modelled as a public good in the female's household. No distinction is made between goods consumed by the mother and goods consumed by the child in order to simplify the analysis. It is also a realistic assumption in that the mother and child usually have the same standard of living. The price of x is normalized to one.

The second constraint represents the mother's time constraint while the third constraint represents the child's

time constraint. The time the child spends with his or her parents is assumed fixed at T^c , again to simplify the analysis. This time is to be divided between time spent with the custodial parent, t_f , or the noncustodial parent, t_m . Since the custodian has control over the amount of time the child spends with his or her father, t_m and t_f become the other choice variables for the female.

The utility functions of the female and child are assumed to be positive and concave in their arguments. The following partials have the usual signs:

$U^c_1 > 0, U^c_2 > 0, U^c_3 > 0, u^f_1 > 0, u^f_2 > 0, u^f_3 > 0,$
where the subscripts on U represent partial derivatives.

The general form of the custodial parent's optimization problem becomes:

$$(2.5) \quad \text{Max } F^f = U^f(x, t_f, t_m, l_f) + \mu [w_f(H - t_f - l_f) + I^f + s - x]$$

$$(2.5a) \quad \text{Max } F^f = u^f(x, t_f, l_f) + a^f U^c(x, t_f, T^c - t_f) + \mu [w_f(H - t_f - l_f) + I^f + s - x]$$

where μ represents the Lagrange multiplier, and x , t_f , and l_f are the choice variables.

First order conditions necessary for a maximum are:

$$(2.6) \quad F^f_1 = u^f_1 + a^f U^c_1 - \mu = 0$$

$$(2.7) \quad F^f_2 = u^f_2 + a^f (U^c_2 - U^c_3) - w_f \mu = 0$$

$$(2.8) \quad F^f_3 = u^f_3 - w_f \mu = 0$$

$$(2.9) \quad F^f_4 = w_f(H - t_f - l_f) + I^f + s - x = 0.$$

Combining equations (2.7) - (2.8) gives

$$(2.10) \quad \frac{u^f_2 + a^f (U^c_2 - U^c_3)}{u^f_3} = 1 \quad \text{or}$$

$$(2.10a) \quad \frac{(U_2^f - U_3^f)}{U_4^f} = 1.$$

The private MRS between t_f and l_f is set equal to the ratio of the price of time spent with the child over the price of leisure, both equalling w_f , resulting in a ratio of one.

Under the assumption that U^f is quasiconcave and that the implicit function theorem holds, equations (2.6) - (2.9) define the following set of implicit (or reaction) functions:

$$(2.11) \quad x(I^f, s, w_f; a^f)$$

$$(2.12) \quad t_f(I^f, s, w_f; a^f)$$

$$(2.13) \quad l_f(I^f, s, w_f; a^f)$$

$$(2.14) \quad \mu(I^f, s, w_f; a^f)$$

2. Comparative Statics

Comparative static results for x , l_f , and t_f , assuming an interior solution, are:

$$\frac{dx}{ds} > 0, \quad \frac{dl_f}{ds} > 0, \quad \frac{dt_f}{ds} > \text{or} < 0$$

The amount of time allocated to the noncustodial parent will be affected in an undeterminable way by a change in support payments unless restrictions are placed on the utility function⁷. If t_f is a normal good for the female, then $dt_f/ds > 0$. Given time spent with the child is fixed, this means that t_m is an inferior good and the noncustodial parent is unable to "buy" more time with the child. However, the opposite could result if t_f is an inferior

⁷See Appendix 1 for a detailed derivation.

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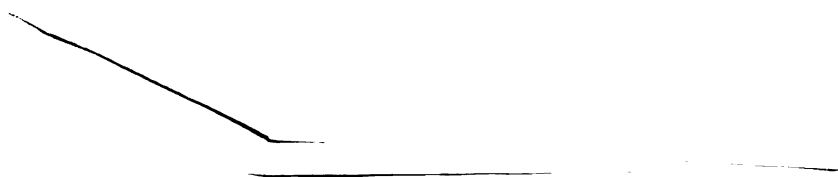
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The choice variables for this parent are s , l_m , and x_m where:

x_m = goods consumed by the male

I^m = male's income

h_m = time the male spends in the labor market

l_m = male's leisure time

w_m = male's wage

a^m = weight the male parent attaches to the preferences of the child.

The price of x_m is also normalized to one. The partials for the male are $u^m_1 > 0$, $u^m_2 > 0$, and $u^m_3 > 0$. Since t_m and x can be expressed in terms of child support payments, the male will incorporate this information into his utility maximization problem and choose s accordingly.

The noncustodial parent's optimization problem, after constraint substitution, becomes:

$$(2.19) \quad \text{Max } \mathcal{E}^m = U^m(x_m, t_f(s), t_m(s), l_m, x(s)) \\ + \sigma [w_m(H - (T^c - t_f(s)) - l_m) + I^m - s - x_m]$$

$$(2.19a) \quad \text{Max } \mathcal{E}^m = u^m[x_m, T^c - t_f(s), l_m] + a^m U^c[x(s), t_f(s), T^c - t_f(s)] \\ + \sigma [w_m(H - (T^c - t_f(s)) - l_m) + I^m - s - x_m]$$

where σ is the Lagrange multiplier, and s , x_m , and l_m are the choice variables.

The first order conditions with respect to 1) x_m , 2) s , 3) l_m , and 4) σ necessary for a maximum are:

$$(2.20) \quad \mathcal{E}_1 = u^m_1 - \sigma = 0$$

$$(2.21) \quad \mathcal{E}_2 = -u^m_2 dt_f/ds + a^m U^c_1 dx/ds + a^m (U^c_2 - U^c_3) dt_f/ds + w_m \sigma dt_f/ds - \sigma = 0$$

$$(2.22) \quad \varepsilon_3 = u^m_3 - w_m \sigma = 0$$

$$(2.23) \quad \varepsilon_4 = w_m(H - (T^c - t_f) - l_m) + I^m - s - x_m = 0.$$

The inclusion of dt_m/ds and dx/ds in these equations represents the female's reactions to his choice of s .

Combining equations (2.20)-(2.21) results in the strategic efficiency condition:

$$(2.24) \quad \frac{-u^m_2 dt_f/ds + a^m U^c_1 dx/ds + a^m (U^c_2 - U^c_3) dt_f/ds}{u^m_1} = 1 - w_m dt_f/ds$$

$$(2.24a) \quad \frac{(U^m_2 - U^m_3) dt_f/ds + U^m_5 dx/s}{U^m_1} = 1 - w_m dt_f/ds.$$

The private MRS between s and x_m is set equal to $(1 - w_m dt_f/ds)$.

Under the assumption that U^m is quasiconcave and that the implicit function theorem holds, (2.20) - (2.23) emerge as implicit functions.

$$(2.25) \quad s(w_m, I^m; a^m)$$

$$(2.26) \quad l_m(w_m, I^m; a^m)$$

$$(2.27) \quad x_m(w_m, I^m; a^m)$$

$$(2.28) \quad \sigma(w_m, I^m; a^m)$$

4. Comparative Statics

The effect of the custodial parent's income on support payments is given in equation (2.29) where H_s is the determinant of the bordered Hessian⁸.

$$(2.29) \quad ds/dI^m = 1/H_s \{ dt_f/ds [u^m_{21}u^m_{33} + u^m_{23}u^m_{31} + w_m(u^m_{11}u^m_{33} - u^m_{11}u^m_{23} - u^m_{13}u^m_{31} + u^m_{13}u^m_{21})] - u^m_{11}u^m_{33} + u^m_{13}^2 \}.$$

The sign of this comparative static depends upon the sign of

⁸See Appendix 2 for a detailed derivation.

dt_f/ds , or how the custodial parent reacts to an increase in support payments. In other words, as explained previously, whether or not time spent with the child is a normal good for the custodial parent determines how an increase in s will affect time the noncustodial parent spends with the child and thus whether he will increase support payments as his income increases.

5. Equilibrium

After eliminating x and x_m from the female and male utility functions using the budget constraints, and l_m and l_f using the time constraints, (s^*, t_f^*) is a Nash noncooperative equilibrium for this model, or a Stackelberg equilibrium, if:

$$(2.30) \quad U^f(t_f^*, s^*) = \max U^f[t_f, s^*] \quad \text{and}$$

$$(2.31) \quad U^m(t_f^*, s^*) = \max U^m[t_f^*(s), s]$$

B. The Pareto Optimal Case

The previous allocation is not optimal since Pareto-superior allocations exist. The Pareto optimal allocations of T^c and s are found by first solving the individuals' private optimization problems given t_f , t_m , and s are fixed. This results in the choice variables x_m , l_m , x , and l_f as functions of t_f , t_m , and s as shown below. The custodial parent's optimization problem is:

$$(2.32) \quad \text{Max } \mathcal{E}^f = U^f(x, t_f, t_m, l_f) + \tau[w_f(H - t_f - l_f) + I^f + s - x]$$

The first order conditions define the following implicit functions:

$$(2.33) \quad x^o(s, t_f, t_m, w_f, I^f; a^f)$$

$$(2.34) \quad l_f^o(s, t_f, t_m, w_f, I^f; a^f)$$

$$(2.35) \quad r^o(s, t_f, t_m, w_f, I^f; a^f)$$

The noncustodial parent's optimization problem is:

$$(2.36) \quad \text{Max } \varepsilon^m = U^m(x_m, t_f, t_m, l_m, x(s)) + f[w_m(H - t_m - l_m) + I^m + s - x_m]$$

which results in:

$$(2.37) \quad x_m^o(s, t_f, t_m, w_f, I^m; a^m)$$

$$(2.38) \quad l_m^o(s, t_f, t_m, w_f, I^m; a^m)$$

$$(2.39) \quad f^o(s, t_f, t_m, w_f, I^m; a^m)$$

The second part of this solution process involves the social planner solving the following problem to arrive at the Pareto optimal distribution of t_f , t_m , and s .

$$(2.40) \quad \text{Max } U^f(x, t_f, t_m, l_f)$$

subject to:

$$(2.41) \quad U^m(x_m, t_f(s), t_m(s), l_m, x(s)) \geq U^m_0$$

$$(2.42) \quad t_f + t_m = T^c$$

$$(2.43) \quad x_m = x_m^o(t_f, t_m, s)$$

$$(2.44) \quad x = x^o(t_f, t_m, s)$$

$$(2.45) \quad l_m = l_m^o(t_f, t_m, s)$$

$$(2.46) \quad l_f = l_f^o(t_f, t_m, s)$$

where U^m_0 is some arbitrary fixed utility level for the male.

The lagrangian for this problem is:

$$(2.47) \quad \varepsilon = U^f(x^o(t_f, t_m, s), t_f, T^c - t_f, l_f^o(t_f, t_m, s)) + \\ \Gamma[U^m(x_m^o(t_f, t_m, s), t_f, T^c - t_f, l_m^o(t_f, t_m, s), x^o(t_f, t_m, s)) - U^m_0].$$

Differentiating with respect to 1) s , 2) t_f , and 3) Γ

yields:

$$(2.48) \quad \varepsilon_1 = U_1^f dx^o/ds + U_4^f dl_r^o/ds + \alpha[U_1^m dx_m/ds + U_4^m dl_m^o/ds + U_3^m dx^o/ds] = 0$$

$$(2.49) \quad \varepsilon_2 = U_1^f dx^o/dt_r + U_2^f - U_3^f + U_4^f dl_r^o/dt_r + \alpha(U_1^m dx_m/dt_r + U_2^m - U_3^m + U_4^m dl_m^o/dt_r + U_1^m dx^o/dt_r) = 0$$

$$(2.50) \quad \varepsilon_3 = U^m(x_m^o(t_r, t_m, s), t_r, T^c - t_r, l_m^o(t_r, t_m, s), x^o(t_r, t_m, s) - U_0^m) = 0.$$

In comparing these first order conditions with those of the individual's strategic conditions, it is seen that their allocations of time and support payments are not optimal. After making the substitution $H - t_f - h_f$ for l_f in equation (2.49), it can be rewritten as

$$(2.51) \quad \varepsilon_2 = U_2^f - U_3^f - U_4^f + \alpha(U_1^m dx_m/dt_r + U_2^m - U_3^m + U_4^m dl_m^o/dt_r + U_1^m dx^o/dt_r) = 0$$

The custodial parent's private strategic first order condition with respect to t_r is found in equation (2.7), rewritten in a form below in which the lagrangian multiplier is substituted out.

$$(2.7a) \quad \varepsilon_2^f = U_2^f - U_3^f - U_4^f = 0$$

In comparing (2.51) and (2.7a), note that the female does not consider the effect of t_r on the male's utility, which results in an overallocation of T^c to herself, and an underallocation of t_m to the father, since t_m enters her utility function only indirectly through $a^f U^c$. A consumption externality is present since her consumption of t_r affects the father's consumption of t_m . The amount of the

externality equals the latter half of equation (2.51), or

$$(2.52) \quad \text{Externality}_f = \alpha(U^m_1 dx_m/dt_f + U^m_2 - U^m_3 + U^m_4 dl_m^0/dt_f + U^m_1 dx^0/dt_f)$$

The same result follows in the allocation of support payments. After substituting $H - t_m - h_m$ for l_m in equation (2.48), it can be rewritten as

$$(2.53) \quad \varepsilon_1 = U^f_1 dx^0/ds + U^f_4 dl_f^0/ds + \alpha[U^m_2 dt_f/ds + U^m_3 dx^0/ds] = 0$$

When compared to the noncustodial parent's private strategic first order condition with respect to s , equation (2.21), rewritten below in a slightly different form without the lagrangian multiplier, underallocation of support payments results because the noncustodial parent does not consider the effect of his actions on the custodial parent's utility.

$$(2.21a) \quad \varepsilon_2 = U^m_2 dt_f/ds + U^m_3 dx/ds - (1/w)U^m_3 = 0.$$

The amount of the externality is equal to

$$(2.54) \quad \text{Externality}_m = 1/\alpha (U^f_1 dx^0/ds + U^f_4 dl_f^0/ds) + (1/w)U^m_3$$

Let (s^p, t_f^p) represent the Pareto optimal allocation of these two goods. This can result with constant communication the two parents and/or if the two parents see each other frequently. Section III shows that this can also result in a dynamic model through the use of trigger strategies.

C. The Competitive Case

For sake of comparison with the strategic case, the competitive equilibrium is derived here. In the competitive equilibrium case, each partner takes the other's decision as given when making their own decision. In this case, the

custodial parent's optimization problem is the same as in the strategic case, found in equations (2.1) - (2.4). The noncustodial parent's problem changes in that his choice of s is not a function of how the custodial parent reacts to his choice in her choice of t_m . However, the noncustodial parent still does consider how the support payments affect consumption in the custodial parent's household in making his decision on s^9 . His objective function becomes:

$$(2.55) \quad U^m(x_m, t_f, t_m, l_m, x(s)) = u^m(x_m, t_m, l_m) + a^m U^c(x(s), t_f, t_m)$$

subject to the constraints found in equations (2.16) - (2.18), rewritten below.

$$(2.16') \quad w_m h_m + I^m - s = x_m$$

$$(2.17') \quad t_m + h_m + l_m = H$$

$$(2.18') \quad t_f + t_m = T^c.$$

The first order conditions with respect to 1) x_m , 2) s , 3) l_m , and 4) β , the lagrangian multiplier are:

$$(2.56) \quad \epsilon_1 = u^m_1 - \beta = 0$$

$$(2.57) \quad \epsilon_2 = a^m U^c_1 dx/ds - \beta = 0.$$

$$(2.58) \quad \epsilon_3 = u^m_3 - w_m \beta = 0$$

$$(2.59) \quad \epsilon_4 = w_m(H - (T^c - t_f) - l_m) + I^m - s - x_m = 0$$

Combining equations (2.56) - (2.57) results in the competitive efficiency condition:

⁹The assumption that the noncustodial parent acknowledges the linkage between support payments and custodial household spending is necessary to insure that the amount of support payments is positive in cases where the noncustodial parent cares about the child. This condition also incorporates those cases where the noncustodial parent is sensitive to how much of his support is being spent on the child.

$$(2.60) \quad \frac{a^m U_1 dx/ds}{u_1^m} = 1 \quad \text{or}$$

$$(2.60a) \quad \frac{U_1^m dx/s}{U_1^m} = 1 .$$

1. Comparative Statics

The effect of the noncustodial parent's income on support payments is given below, where H_c is the determinant of the bordered hessian¹⁰.

$$(2.61) \quad ds/dI^m = 1/H_c (-u_{11}^m u_{33}^m + u_{13}^m{}^2) .$$

In comparing this with the same comparative static in the strategic case found in equation (2.29), it is seen that s does not depend upon dt_i/ds , or the custodial parent's visitation decision reaction to the amount of support. The sign of this comparative static in the current scenario is also ambiguous, though the sign depends solely upon the relative size of $-u_{11}^m u_{33}^m$ versus $u_{13}^m{}^2$ rather than on this and the custodial parent's reaction to the amount of support payments as in the strategic case. This comparison underscores the advantage of examining the strategic case, which emphasizes the interdependence of the decision makers. This interdependence is tested in Chapter IV.

¹⁰See Appendix 3 for a detailed derivation.

CHAPTER III. REPEATED GAME MODEL

The primary limitation of the one-period model is that in reality the game continues for a long period of time. The parents will want to consider some other objective besides maximizing current utility. A dynamic, or repeated game, in which the players face the same game for a long period of time better represents the post-divorce situation. Further, since the static Nash equilibrium determined above is not Pareto optimal, there exists an incentive to cooperate which implies that cooperation rather than noncooperation may best characterize the post-divorce situation for many couples. It will be shown in this chapter that the cooperative outcome can be supported in a subgame perfect Nash equilibrium in the repeated game, given that each party cares enough about the future.

A. Equilibrium in a Dynamic Game

Let $U_i^j(t_m, s)$ be parent i 's utility as defined by equations (2.1) and (2.15) in the single period model at date t ($t=0, 1, \dots, T$), where T is infinite. Each parent wishes to maximize the present discounted value of his or her utility; that is:

$$(3.1) \quad \sum_{t=0}^{\infty} \delta^t U_i^j(t_m, s),$$

where δ is the discount factor ($\delta=1/(1+r)$, where r is the rate of time preference, and $\delta < 1$.) δ close to 1 means the

future is valued more than when δ is close to zero.

The two parents operate with common knowledge and complete information. The play of the game is sequential, i.e., at each date t , the male chooses the amount of support first and then the female chooses the amount of visitation. Because the players move one at a time, and each player knows all previous moves when making his or her decision, the game is one of perfect information.

The game is an infinite sequence of the single period game played at each iteration¹¹. Though the static Nash equilibrium of the previous single-period model played repeatedly is an equilibrium of this game, it is not the only equilibrium. Consider the following strategies: The noncustodial parent pays the Pareto optimal level of support in period t if the custodial parent delivered the Pareto optimal level of visits. Likewise, the custodial parent delivers t_m^p if s^p was paid in the previous period. If ever one of the players cheats, the game reverts to the static Nash equilibrium played repeatedly. Given h_t represents the history of the game's actions, this can be stated formally for the custodial parent:

$$(3.2) \quad \begin{aligned} t_{m,t}(h_t) &= t_m^p \text{ if } h_t = (t_m^p, s^p; \dots; t_m^p, s^p) \text{ and} \\ t_{m,t}(h_t) &= t_m^* \text{ otherwise for the current and all} \end{aligned}$$

¹¹This is equivalent to a finite game in which the number of periods is a random variable. Although most child support legally ends when a child turns 18, children often require financial support for further education and/or in getting started in a new life after high school.

previous t .

For the noncustodial parent:

$$(3.3) \quad s_i(h_t) = s^p \text{ if } h_t = (t_m^p, s^p; \dots; t_m^p, s^p) \text{ and} \\ s_i(h_t) = s^* \text{ otherwise for all previous } t.$$

These are the classic "trigger" strategies formalized in Friedman (1971). These form an equilibrium as long as both parties care enough about future utilities so that the threat of noncooperation in the future is sufficient to convince players to play the Pareto efficient strategy. Let $U^i(t_m^c, s^p)$ represent the utility to parent i when the female cheats, $U^i(t_m^p, s^c)$ the utility when the male cheats, $U^i(t_m^*, s^*)$ the utility when each play the static Nash outcome, and $U^i(t_m^p, s^p)$ the utility when each play the efficient outcome. If

$$(3.4) \quad \delta^f \geq \frac{U^f(t_m^c, s^p) - U^f(t_m^p, s^p)}{U^f(t_m^c, s^p) - U^f(t_m^*, s^*)}$$

and

$$(3.5) \quad \delta^m \geq \frac{U^m(t_m^p, s^c) - U^m(t_m^p, s^p)}{U^m(t_m^p, s^c) - U^m(t_m^*, s^*)}$$

then the Pareto optimal equilibrium can be sustained. In other words, as long as both parents' discount factors are high enough, this cooperative outcome is subgame perfect.

If, however, at least one parent's discount factor is sufficiently low, the agreement is destroyed. Consider the cases where fathers have no interest in maintaining contact with their children over the long run. Their discount factor is low and their incentive to pay support is diminished. This also extends to the cases where mothers

strategically forgo child support forever in order to absolve themselves from the obligation of granting visitation with the ex-spouse.

B. Balanced Temptation Equilibrium

Bargaining power can be introduced in this model using the discount factor. One component of bargaining power is the players' relative concern for the future. The parent who is less patient and is thus more likely to cheat on the agreement has more control over the situation. This player's relative indifference to the long run arrangement means the opponent must make concessions in order to maintain the relationship. For example, if the father is more likely to withdraw from the bargain (lower δ), he forces the mother to accept a lower level of support payments, resulting in a new equilibrium.

This equilibrium, (s^b, t_m^b) , formally the balanced temptation equilibrium (Friedman, 1971), is the highest supported level of t_m and s at which the two players' temptation to cheat, expressed in equation (3.6), is equalized. The one period gain from cheating for each player is given in the numerator and the per period loss following cheating is depicted in the denominator.

$$(3.6) \quad \frac{U^f(t_m^c, s^p) - U^f(t_m^p, s^p)}{U^f(t_m^p, s^p) - U^f(t_m^*, s^*)} = \frac{U^m(t_m^p, s^c) - U^m(t_m^p, s^p)}{U^m(t_m^p, s^p) - U^m(t_m^*, s^*)}$$

C. Conclusion

In this chapter I show how the repeated game developed by Friedman (1971), in which the players use a "tit-for-tat" strategy, can be applied to post-divorce bargaining. Each player is deterred from breaking an agreement, not by a legally binding contract, but by the credible fear that the opponent will cheat. This informal bargaining and an informal agreement outside the realm of the courts is the consequence of the transactions costs involved with going to court to revise the legal visitation and support payments agreement, mentioned in the introduction. Factors facilitating the cooperative agreement in this game include the fact that only two parties are involved in the game, and that the time it takes to detect a cheater and thus retaliate is short since payments are usually made monthly and visits are customarily made weekly. Since retaliation can be immediate, the cost of deviating is increased. Tacit collusion is thus easier to sustain.

One type of test of the empirical implications of the repeated game requires data proxying the parents' discount rates, which is not available in the National Survey of Children. Another test involves the relationship between visitation and child support in different periods. This is performed in Chapter V.

CHAPTER IV. A CROSS-SECTION, SIMULTANEOUS EQUATIONS MODEL

The previous theoretical chapters indicate how visitation can be treated as a variable in the decision about child support payments and how the amount of child support received can affect the amount of visitation between the child and the noncustodial parent. They also reveal the importance of pre-divorce and current negotiating costs, the preferences of all involved participants, information, and time preference, to the outcome. Despite the intuitive appeal of these models of strategic behavior, it is important to test their validity. The model gives rise to certain testable hypotheses described below. This chapter and the next develop a set of estimating procedures that incorporate these issues and present the results of these tests.

A. Data and Sample

Most past economic studies have made extensive use of data from a special supplement to the U.S. Bureau of Census' Current Population Survey, Child Support and Alimony, that provides information about child support arrangements of a nationally representative sample of women with children (Beller and Graham, 1985; Robins, 1986; Garfinkel and Oellerich, 1989; Beron, 1990). Though this data set contains much demographic and economic information for each family, there is little information on the noncustodial

parent and none on visitation. The Michigan Panel Study of Income Dynamics (PSID), a national longitudinal study that began in 1968, contains information on both parents if the parents were part of a nuclear family at some point during the survey period selected (Nichols-Casebolt, 1986). Another nationally representative sample that examines marital stability and divorce settlements is The National Longitudinal Study of the High School Class of 1972. Used by Weiss and Willis (1989), it contains data on the use of lawyers and the legal costs of divorce, and subjective measures of marital happiness and the bitterness of divorce, as well as standard sociodemographic variables available for both ex-spouses.

Richer data sets that contain more information on the noncustodial parent and procedures taken by the legal system to enforce court orders tend to be geographically limited (Del Boca and Flinn, 1990, use court data from 18 Wisconsin counties; Chambers', 1979, data is limited to 28 counties in Michigan.) This is also true of data sets that contain visitation details (Wallerstein and Kelly's, 1980, and Wallerstein and Huntington's, 1983, data on sixty divorced California families; and Peters' et al, 1990, data on 1,000 California families).

The data set used in this study is the National Survey of Children, a longitudinal study of U.S. children that comprises three waves. It was conducted in 1976, 1981, and 1987, and used by Furstenburg et al (1983) to study the

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incidence of marital disruption in children's lives, and the amount of contact children maintain with the noncustodial parent. In 1976, the Foundation for Child Development sponsored a survey in which the purpose was to study the well-being of children. The specific purpose of the first wave was to assess the physical, social, and psychological well-being of different groups of American children. For Wave 1, the original sample was a multi-stage stratified probability sample of households in the continental United States containing at least one child aged 7-11 and producing 2,193 households. Data were eventually gathered for 2,301 children in 1,747 households. Black households were oversampled in order to yield interviews with approximately 500 black children. The sample was weighted to adjust for the oversampling of black children, and to correct for differences between the Census and sample figures for several demographic characteristics.

Interviews were conducted with the children and with the parent most knowledgeable about the child (usually the mother) in 1976, and with the child's main teacher in 1977. Topics of the questions included family characteristics, including financial status; location; the parents' marital history, childbearing and childrearing patterns; the state of their relationship and their relationship with the child; the parents' employment history and education; and the child's friends, social activities, physical and mental health, personality, and academic performance.

In this survey, the child, rather than the family, is the primary unit of analysis. Up to two children from each family were eligible to be interviewed, along with the most knowledgeable parent. The researchers determined the number of eligible children by their birthdate. If more than two children were eligible, only two were selected at random to be interviewed. Since two children from one family and one set of parents were included in the sample, the information pertaining to these families was weighted by one-half in all analyses in order to avoid double-counting.

The specific purpose of the second wave was to determine the effects of marital disruption and conflict on children. To that end, the 1981 survey followed up all those children who were in a high conflict (as reported by the parents in the first wave) or disrupted family in Wave 1 plus a subsample of the others. 90 percent of the children were relocated and interviews were conducted with 1,423 children and the more knowledgeable parent. School information was also collected using a mailed questionnaire. The sample was weighted to adjust for the differentials between the Census and the sample populations. In addition to the information gathered in the first wave, Wave 2 contained considerable information for dissolved marriages on details of the marital dissolution, including components of the divorce/separation settlement and the divorce process; the relationship between the respondent and the former spouse; contact between the child and each parent;

and the child's feelings about his parents' break-up.

The purpose of the third wave was to examine the social, psychological and economic well-being of sample members as they became young adults, with particular emphasis on sexual and fertility behavior. A total of 1,147 children and the primary parent from Wave 2 were interviewed. Wave 3 respondents were asked about contraceptive use and family planning; receipt of child support and welfare; establishment of paternity; and attitudes regarding marriage, child support, and welfare.

The sample for my study is restricted to ever-divorced or currently separated families with an outside, or noncustodial, parent identified by the custodial parent. Since information relevant to the theory is available for the former spouse of the custodial parent which was not available for the outside parent in general, such as the former spouse's location, communication between the former spouses, and various aspects of the divorce or separation process, the sample was further restricted to those families in which the outside parent was a former spouse of the custodial parent. This provides a sample that consists of 228 children in 174 families¹². For the single-period simultaneous relationship analysis, Wave 2 data are used. The longitudinal analysis in Chapter V utilizes Waves 2 and 3.

¹²The sample changes slightly from one test to the next because of missing information.

B. Empirical Methodology

In the single-period model, the amount of the child's time the custodial parent allocates to the noncustodial parent is affected by the amount of child support received, though the sign of the effect is indeterminate: an increase in child support payments could result in an increase or decrease in the child's time allocated to the noncustodial parent, depending upon whether the child's time is a normal good for the custodial parent or not. Additionally, the amount of child support paid by the noncustodial parent is indirectly affected by how the support affects visitation. Therefore, an important test of the theory is whether a significant relationship exists between child support payments and visitation in the two equations in which child support and visitation are dependent variables. If a relationship exists, the issue then to be examined is the direction of the relationship.

However, a significant relationship between these two variables alone does not prove this thesis' strategic theory. A positive relationship supports other primary theories linking visitation and child support. One such theory is Weiss and Willis' (1985) monitoring theory where fathers who pay support want more contact with their child to assure that their payments are being spent on the child. Another possibility is that fathers who see their child regularly are more aware of the child's needs and so pay support regularly. However, one feature that separates the

strategic threat theory from these theories is the interdependence of the child support and visitation decisions. According to the theory, the noncustodial parent takes into account the custodial parent's reaction in terms of visitation granted when deciding how much support to pay. Likewise, the custodial parent considers how her decision will affect the noncustodial parent's decision. If both parents are determining child support and visitation, the ordinary least squares estimation procedure would not provide unbiased or consistent coefficient estimates and a simultaneous equation estimation procedure would be appropriate.

Another factor that separates this theory from the others is the significance of various strategic variables. Theoretically, the higher the negotiating costs, the less likely a child support/visitation agreement is reached and kept. If the divorce process was marked by conflict, it could indicate an unwillingness to cooperate post-divorce. Two dummy variables are used to estimate pre-divorce negotiation costs. If the custodial parent reported that the former spouses argued a lot before separation, or if this same parent asserted that child support was a difficult issue to work out at separation, the less child support paid or visitation will be granted¹³. Likewise, if the current, post-divorce relationship is one of conflict, it is less

¹³Complete definitions of the variables are given in Appendix 4.

likely that any agreement is upheld. Conflict in the current relationship is represented by a dummy variable equalling one if the conflict level between the custodial parent and the former spouse increased after separation according to the custodial parent.

The theory also showed that the parents' and child's preferences affect the outcome. The child's preferences with respect to time spent with each parent are incorporated into the decisionmakers' (his or her parents') utility functions and positively affect the parents' utility under the assumption of altruism. To test whether the child's desires are considered in making decisions, the significance of the variable measuring the child's closeness to the outside parent, as reported by the child, is tested. This dummy variable equals one if the child contends the relationship is extremely close or quite close, and zero otherwise. The custodial parent's preferences are taken into account with two dummy variables measuring preference for time spent with the child. The first measures the custodial parent's satisfaction with the current custody arrangements which equals one if the custodial parent is very satisfied with the arrangements, and zero otherwise. The second evaluates the child's relationship with the custodial parent, equalling one if the relationship is reported by the custodial parent to be extremely close or quite close, and zero otherwise.

As shown in Chapter II, Section B, the optimal

allocation of child support and visitation rights can result when each parent takes into account the effect of his or her decision on the other parent's utility. This occurs the more information one parent has about the other's preferences, or the shorter the time since the marriage ended, represented by the number of years since the divorce or separation.

The variables just mentioned are the primary ones in this strategic model. In addition, control variables are added that have been shown in other studies to affect child support and visitation. These include a dummy variable for race, equalling one if the respondent is black, and zero otherwise; a dummy variable signalling whether or not the custodial parent remarried¹⁴; and a dummy variable for the distance the outside parent lives from the child, equalling one if the noncustodial parent lives within a one hour drive from the child, and zero otherwise. Variables representing the custodial parent's need are also incorporated into the analysis. These are the total number of children, family income, and a dummy variable indicating whether the custodial parent received any post-high school education.

As is the case in most past studies, a good measure of the noncustodial parent's ability to pay is not available. Previous analyses used the custodial parent's age to proxy

¹⁴The marital status of the noncustodial parent is highly correlated with several of the explanatory variables, such as his or her closeness to the child, and so it was not included in the analysis.

this influence. Though considered a poor approximation, it is included here to conform with past work.

Information from the Office of Child Support Enforcement (1981) was used to classify the custodial parent's state of residence using a parameter measuring the effectiveness of the state's child support enforcement procedures. This parameter is the number of child support enforcement techniques available in the individual states' child support enforcement programs. These include: (1) wage garnishment - in response to a judicial proceeding, the employer of a noncustodial parent withholds wages only if child support payments are in arrears; (2) criminal contempt - nonpayment of child support is seen as an offense or injury against the court, as opposed to another party in the lesser charge of civil contempt, and a fine or imprisonment is imposed; (3) attachment - taking, apprehending or seizing property for the purpose of securing satisfaction of the child support judgement; (4) debt set-off - provides for the set-off of state or federal income tax refunds against child support debts; (5) liens - an encumbrance on real and personal property for the amount of overdue support; and (6) income withholding - a provision for the employer to withhold wages from an employee for current child support payment or arrearages and forward the sum to the family or the public assistance agency.

Since the theory is concerned with upholding an agreement, the ideal measure of child support is a

proportion of the child support due that is actually received. However, the amount due is available for only a limited subsample of the population, so the child support measurement used is the amount of child support that was received in the past year as reported by the custodial parent. Similarly, the amount of visitation agreed upon in the initial divorce settlement is not available, so visitation is measured as the number of days the child spent with the noncustodial parent in the past year, also as reported by the custodial parent.

C. Estimation

Past studies have investigated separately the affect of visitation on child support payments, and the affect of child support on visitation. This approach, however, ignores the complex interdependence between these two factors. A simultaneous equations approach is thus necessary to account for this situation in which two parties are jointly determining child support and visitation.

This section sets up the general simultaneous equations models. I have:

$$(4.1) \quad C^* = \alpha_1 V + B_1' X_1 + \Gamma_1' Z_1 + u_1$$

$$(4.2) \quad V = \alpha_2 C^* + B_2' X_2 + \Gamma_2' Z_2 + u_2$$

$$(4.3) \quad C = \max (0, C^*)$$

where C^* is the latent child support variable, C is the observed child support variable, V represents visitation and equals the number of days the child spent with the

noncustodial parent in the past year, the α 's and β 's are coefficients, the X 's are the control variables, and the Γ 's are the strategic factors. The u 's are the bivariate normal error terms with zero mean and independent of X and Z . The reduced forms of equations (4.1) - (4.2) are:

$$(4.4) \quad C^* = \pi_1'X + v_1$$

$$(4.5) \quad V = \pi_2'X + v_2$$

where (v_1, v_2) are also bivariate normal with zero mean, and independent of X .

1. Estimation of Child Support Equation

The estimation technique used here to estimate the child support equation in this simultaneous equation tobit model is one introduced by Smith and Blundell (1986). First, reduced form coefficients of (4.5) are estimated. Note that a reduced form of V can be estimated if what is included in the system is the latent variable C^* rather than the observed variable C . That is, because the system is linear in (C^*, V) , the reduced form of V can be determined and this specific estimation technique can be used. The advantage of using C^* is that it makes the simultaneous aspects of the problem solvable. The disadvantage arises in the interpretation of the coefficients: they no longer represent the partial effects of the individual variables on observed child support, but rather on the latent variable. Since the major tenet of the theory is the decision-makers' interdependence in arriving at equilibrium child support and visitation, a simultaneous equations solution to the model

will take precedence.

To continue, following Smith and Blundell I write u_i conditional on v_i as

$$(4.6) \quad u_i = p_i v_i + \epsilon_i$$

where ϵ_i is normally distributed with zero mean and is independent of V , X_i , and v_i . Substituting (4.6) into (4.1), I get the conditional model

$$(4.7) \quad C^* = \alpha_i V + B_i' X_i + \Gamma_i' Z_i + p_i v_i + \epsilon_i$$

$$(4.7a) \quad C^* = W' \delta + \epsilon_i$$

and the following conditional censoring rule

$$(4.8) \quad C = C^* \text{ if } \epsilon_i > -W' \delta$$

and

$$(4.8a) \quad C = 0 \text{ otherwise.}$$

Note that the parameters π_i enter C^* 's conditional density through v_i . I use the estimates for $\hat{\pi}_i$ from (4.5) to obtain an estimator for p_i , then estimate (4.7a) - (4.8a) using tobit estimation procedure¹⁵.

The noncustodial parent's driving distance from the child is assumed not to affect the amount of child support received given support does not have to be delivered in person, but can be sent through the mail. Additionally, though child support is assumed to be affected by the

¹⁵Because of the two-step estimation procedure, technically the standard errors in the second step should be adjusted. Here, computations were carried out using the statistical program STATA, which reports incorrect standard errors. Previous applications have shown this to make little difference (see Vella, 1993) so the uncorrected standard errors are reported.

noncustodial parent's relationship with the child, it is assumed not to be affected by the child's relationship with the custodial parent. These two variables, therefore, serve as identifiers for the child support equation.

2. Estimation of Visitation Equation

Nelson and Olson (1978) provide a computationally tractable method for computing visitation that is similar to two-stage least squares¹⁶. First I estimate π_i of equation (4.4) using a tobit estimation procedure and form the instrument \hat{C}^* . The structural coefficient estimates α_i , B_i , and Z_i are obtained using OLS, after replacing C^* by \hat{C}^* on the right hand side of equation (4.2). If the model were linear in (C, V) , this would produce the two stage least squares estimator.

Variables representing the financial need of the custodial family and the financial well-being of the noncustodial parent are assumed not to affect visitation. These variables, which include the custodial parent's age, education, number of dependents, and family income, serve as identifying variables of the visitation equation. The enforcement variable is also included in this group since the enforcement programs apply to child support rather than visitation awards.

¹⁶The reason this method was not used in the estimation of child support is that, as noted by Smith and Blundell (1986), Nelson and Olson's procedure inconsistent in the presence of censoring.

D. Empirical Results

After excluding observations with missing values, the samples for each of the analyses in this section contain 204 or 207 observations. Means and standard deviations of variables are presented in Table 4.1.

1. The Amount of Child Support Received

The tobit and the simultaneous equation results are presented in Table 4.2 in columns 1 and 2, respectively. A test for endogeneity of the independent variables is whether the residual \hat{v} , is significantly different from zero. It is at the 1% level, leading to the conclusion that this simultaneous equation system is the correct specification of child support receipt. It is this endogeneity and the interdependence of both the child support and visitation decisions that separates the strategic theory from other theories that link these two variables. The high significance of the strategic variables as a group in the model, evidenced by an F -statistic of 2.90 indicating significance at the 1% level, further supports the strategic aspect of the theory.

The outcome of the simultaneous equation system differs from the single equation model in that the coefficient on the number of visits is larger in the former and more significant, indicating that child support is more responsive to the number of visits than estimated in the single equation model. This is as expected given the positive relationship between the two variables and the

Table 4.1 Means and Standard Deviations of Sample Characteristics in Cross Section Analysis

VARIABLE	MEAN	STD DEV
Family/Demographic Characteristics:		
CP's Age	38.344	5.672
CP's Education	.210	.408
CP's Family Income	17419.590	11975.610
# of CP's Dependents	4.161	1.505
CP Remarried	.474	.500
NCP's Driving Distance From Child	.671	.471
Legal Climate:		
# of State Enforcement Techniques	5.195	1.609
Negotiating Costs:		
Argued Before Separation	.592	.493
Child Support Was a Difficult Issue to Work Out at Separation	.106	.309
Divorce Settlement Obtained	.853	.354
Preferences:		
Child's Closeness to NCP	.525	.500
Child's Closeness to CP	.842	.366
Settlement Has Changed Since Separation	.225	.419
CP's Satisfaction with Custody	.724	.448
Current Relationship:		
Conflict Between CP and NCP	.058	.235
Information:		
Years Since Divorced/Separated	5.782	3.879
Child Support:		
Child Support per Year	1163.344	1776.047
Visitation:		
# of Visits Between Child & NCP per Year	46.612	95.460

SOURCE: National Survey of Children, Wave 2, 1981. Divorced or separated families in which the outside parent is the custodial parent's former spouse. CP=Custodial Parent. NCP=Noncustodial Parent.

feedback relationship: child support is dependent upon visitation, but also affects the value of visitation. Within the context of the theory, the noncustodial parent's child support decision affects the custodial parent's visitation decision, which in turn affects the child support amount. The noncustodial parent's action in response to the custodial parent's reaction to his decision implies that child support is being used strategically by the noncustodial parent.

Both of the variables representing pre-separation negotiating costs are significant, though the results initially appear conflicting. The amount of arguing the couple did before separation is negative, meaning that the less the couple argued before the separation, the more child support paid. This supports the hypothesis that negotiating costs are important in upholding the outcome of a pre-separation agreement, and that the lower the costs, the more likely the agreement will be kept.

On the other hand, whether child support was a difficult issue to work out at separation suggests the opposite. However, rather than representing negotiating costs, the amount of time a couple spent hammering out a settlement could indicate the degree of commitment to making the arrangement work. If this were the case, it would lend additional support to the theory.

One possible explanation for the significance of these two variables is that they could be measuring the ability to

obtain a divorce settlement, and that whether or not a settlement was negotiated is what affects child support. To test this possibility, a dummy variable indicating whether or not a divorce settlement was obtained was included in the estimation. The results are reported in column 3 in Table 4.2. The positive sign on this variable is as predicted based on past studies, meaning that families with divorce settlements receive more child support. This could indicate something about the effectiveness of the enforcement - enforcement is more effective when an award exists - or about the state of the parent's pre-divorce relationship - similar to the argument in the previous paragraph, parents' who obtain a settlement are committed to making the arrangement work. The addition of this variable did not noticeably affect the estimated coefficients or standard errors on the two pre-divorce variables, nor of the other variables. I conclude that the state of the pre-divorce relationship influences bargaining in the post-divorce environment beyond their influence on the probability of obtaining a divorce award.

The state of the current relationship is also important in child support determination. If the level of conflict increased after separation, less child support is received. Under the negotiating cost premise, a harmonious relationship leads to lower negotiating costs, which facilitates compliance. Since high conflict relationships are more likely to use strategic weapons and threats, this

suggests that child support is being used as a strategic threat.

The significance of the variable representing the child's relationship with the noncustodial parent indicates that the child's preferences are being considered in the support decision. The negative sign on this variable means that the closer their relationship, the lower the child support. After controlling for visits, what may be happening is that the noncustodial parent is using money to compensate the child for a less-than-ideal relationship, or to relieve his or her own guilt about any emotional distance from the child.

The significance of the variable representing the custodial parent's satisfaction with the custody arrangements also indicates that the custodial parent's preferences are considered in the support decision, though this was not explicitly modelled in the theory. The results indicate that the less satisfied the custodial parent is with the current custody arrangements, the more child support paid. One explanation is that the noncustodial parent is compensating the custodial parent for his or her unhappiness with the custody situation.

The variable representing whether a change in the initial settlement occurred is significant but negative meaning that a settlement change brings about lower, rather than higher, child support. Either the optimal amount of child support was already being received, implying that a

change was not in the best interests of the custodial parent, or that a new settlement was not being enforced. Information on which parent initiated the settlement change would clarify whether child support or visitation was modified and which premise is supported.

The results on the demographic characteristics conform to past studies. African American families receive less child support per year than similar white families, estimated here at \$1,093, though the coefficient is not significant. The significance and positive sign on the family income variable and the negative significance of the number of dependents imply that the custodial parent's need is not a factor in the receipt of child support, supporting Beller and Graham (1985). The income result, along with the positive sign on the education variable, could mean that families with the knowledge and legal resources to get a child support award enforced receive higher amounts of support. Or, as hypothesized by Beller and Graham (1985), it could represent the fact that the standard of living to which the family is accustomed has increased, raising, rather than diminishing need.

The sign of the state's enforcement variable is the opposite of what I expected. It suggests that the more enforcement techniques used by a state, the less support received by the custodial parent. However, the coefficient on this variable is weakly significant, suggesting either that this is a poor measure of the state's enforcement of

child support laws, or that the enforcement mechanisms were in place, but were ineffective.

2. Visitation

The current relationship between each parent and the child can affect visitation. As discussed previously, visitation/intimacy will vary at different times in the parent's life (e.g., if the parent is dating, he or she might prefer less time with the child), and the child's life (e.g., younger children might enjoy their parents' company more than teenagers would). Therefore, visitation is expected to be higher the closer the child is to the outside parent and the less intimate the child's relationship with the custodial parent. It is also expected to be higher if the noncustodial parent is within one hour's drive from the child due to the lower cost of contact.

OLS and the Nelson and Olson (1978) two-step estimates of the number of days per year the child spends with the noncustodial parent are reported in columns 1 and 2, respectively, in Table 4.3. A Wu-Hausman [Wu (1973); Hausman (1978)] test of the appropriateness of the simultaneous equation specification involved arguments similar to those used to derive equation (4.7). First I define for $C > 0$

$$(4.9) \quad \hat{e}_i = C - \hat{C}^*$$

where \hat{C}^* is obtained from estimating equation (4.4). Then I estimate equation (4.10) using OLS for the observations for which $C > 0$.

Table 4.2 Estimates of the Amount of Child Support Received in Period 2*

	(1) OLS	(2) Smith-Blundell	(3) Smith-Blundell
# of Visits Between Child & NCP	6.044 *	63.004 ***	60.365 ***
	(1.935)	(2.934)	(2.815)
CP's Age	-11.276	-7.273	-9.071
	(-.312)	(-.207)	(-.260)
CP's Education	431.814	661.720	578.371
	(.876)	(1.353)	(1.192)
Number of CP's Dependents	-205.668	-291.835 *	-216.275 *
	(-1.162)	(-1.661)	(-1.232)
Race	-1864.681 ***	-1093.452	-1213.266 *
	(-2.879)	(-1.604)	(-1.772)
CP Remarried	-1168.434 **	193.272	-105.205
	(-2.176)	(.267)	(-.145)
CP's Family Income	.025	.067 ***	.063 **
	(1.272)	(2.693)	(2.508)
Enforcement Techniques	65.122	-295.258	-357.001 *
	(.478)	(-1.573)	(-1.960)
Years Since Divorced/Separated	-50.404	-17.110	-9.069
	(-.845)	(-.285)	(-.152)
Argued Before Separation	-1010.307 **	-745.466 *	-731.197 *
	(2.414)	(-1.792)	(-1.802)
Child Support was a Difficult Issue to Work Out at Separation	643.357	2018.026 ***	2067.181 ***
	(1.058)	(2.556)	(2.682)
Child's Closeness to CP	-121.902	-1553.277 **	-1482.992 **
	(-.300)	(-2.326)	(-2.266)

Table 4.2 (cont'd)

	(1) OLS	(2) Smith-Blundell	(3) Smith-Blundell
CP's Satisfaction w/Custody Arrangements	-1028.007 ** (-2.222)	-1699.892 *** (-3.258)	-1761.594 *** (-3.474)
Conflict Between CP and NCP	-397.325 ** (-491)	-1574.638 * (-1.745)	-1655.612 * (-1.895)
Settlement Has Changed Since Separated	-242.210 (-.475)	-1800.467 ** (-2.357)	-1849.172 ** (-2.473)
χ^2	-	-58.756 *** (-2.688)	-56.885 *** (-2.605)
Obtained a Divorce Settlement	-	-	1918.554 ** (-2.342)
Constant	2753.139 (1.581)	2122.507 (1.246)	792.939 (.448)
Chi-Square	48.82	56.13	68.64
N	205	205	205
Log Likelihood Function	-1002.631	-998.973	-992.720

SOURCE: National Survey of Children, Wave 2, 1981. Sample consists of divorced or separated families in which the outside parent is the custodial parent's former spouse. CP=Custodial Parent. NCP=Noncustodial Parent.

*T-statistics are in parentheses.

*** Indicates significance at the 1% level for a two-tailed test.

** Indicates significance at the 5% level for a two-tailed test.

* Indicates significance at the 10% level for a two-tailed test.

$$(4.10) \quad V = \alpha_3 C + B_3' X_3 + \Gamma_3' Z_3 + \tau \epsilon_1 + u_3$$

The significance of τ_1 is a test of endogeneity. The results are presented in Appendix 5. The insignificance of the residual term means I cannot reject the hypothesis that no endogeneity of the independent variables exists. OLS was thus determined to be the correct estimation procedure.

As shown in column 1, child support is positively and significantly related to visitation, as each additional dollar of child support results in approximately one-tenth of an additional day in visitation. The positive sign indicates that an increase in child support is an increase in the custodial parent's income, causing her to decrease the consumption of this particular good. This leaves more time for the child to spend with the noncustodial parent, meaning that the noncustodial parent is able to "buy" more time with the child.

As in the analysis of the receipt of child support, the positive relationship between visitation and child support by itself does not prove that visitation is being used as a strategic weapon by the custodial parent. Unfortunately, there is not much in these results that differentiates the thesis' strategic model from other theories that link these two variables. Though the vector of strategic variables is significant as a group at the 5% level (F -statistic = 2.58), few of the variables are significant individually. Neither the relationship between the child and the noncustodial parent, nor the custodial parent's relationship with the

child are significant. The custodial parent appears to have little control over visitation, discrediting the strategic game theory. Additionally, the level of conflict in the current relationship, and the number of years since separation do not appear to affect visitation.

If the custodial parent is satisfied with the custody arrangements, the more contact there is between the noncustodial parent and the child. This advances the original hypothesis that the closer the arrangement to the parents' preferences, the more likely the agreement is upheld, meaning higher visitation. This hypothesis is also supported by the significant, positive sign on the variable representing a change in the initial settlement. If I assume that a modification in the settlement occurs to correspond more closely with the preferences of the parties involved, and that more visits are optimal, a positive sign on this variable signifies that a modification in the initial settlement moves the couple closer to the optimal outcome for visitation.

One of the variables representing negotiating costs, whether child support was a difficult issue to work out, is weakly significant while the other one, the amount of pre-separation arguing, is insignificant¹⁷. This provides very little support for the theory as it relates to visitation.

¹⁷The addition of the dummy variable indicating whether a divorce award was obtained had no significant affect on the coefficient estimates.

The other variables are insignificant. Notably, if the noncustodial parent is within an hour's drive of the child, he or she spends more time with the child, though the coefficient is insignificant.

E. Conclusion

I hypothesize that the equations I seek to estimate are interrelated in a more complete model. In the child support case, a single equation tobit estimation procedure no longer provides unbiased or consistent estimators of all the coefficients because the endogenous variable used as a regressor, visitation, is contemporaneously correlated with the disturbance term. Due to the simultaneous equation bias, I use a two step procedure to arrive at consistent estimates of the parameters in the child support equation.

By including such strategic factors as the costs of negotiating a pre- and post-divorce settlement, the information one parent has about the other, the preferences of both parents and the child, and visitation in the child support equation, this empirical study expands previous models that include only estimates of the custodial parent's need and the noncustodial parent's ability to pay. The strategic variables are significant as a group and individually, supporting the theory.

Not much in the theory concerning the visitation decision is supported. First of all, the decision is not interdependent with the decision about child support, as

Table 4.3 Estimates of the Number of Days the Child Spent with the Noncustodial Parent in the Past Year^a

	(1) OLS	(2) Nelson-Olson
Child Support	.009 ** (2.352)	-.001 (-.065)
Race	-6.923 (-.437)	-18.524 (-.488)
CP Remarried	-17.485 (-1.309)	-27.248 (-1.288)
NCP's Driving Distance from Children	3.471 (.278)	15.848 (1.198)
Years Since Divorced/Separated	.075 (.045)	-.645 (-.421)
Argued Before Separation	5.477 (.460)	-4.788 (-.265)
Child Support was A Difficult Issue to Work Out at Separation	-33.179 * (-1.856)	-28.653 ** (-2.041)
Child's Closeness to NCP	17.773 (1.538)	26.500 *** (2.935)
CP's Satisfaction w/ Custody Arrangements	23.456 * (1.795)	13.349 (.697)
Child's Closeness to CP	9.137 (.559)	12.114 (.400)
Conflict Between CP and NCP	20.167 (.833)	17.667 (.863)
Settlement Has Changed Since Separation	40.314 *** (2.841)	29.398 *** (2.650)
Constant	-3.153 (-.135)	15.526 (.741)
F-statistic	F(12,195)=2.24	F(12,192)=2.87
N	208	205
R ²	.121	.152

SOURCE: National Survey of Children, Wave 2, 1981. Sample consists of divorced or separated families in which the outside parent is the custodial parent's former spouse.

^aT-statistics are in parentheses.

*** Indicates significance at the 1% level for a two-tailed test.

** Indicates significance at the 5% level for a two-tailed test.

* Indicates significance at the 10% level for a two-tailed test.

evidenced by the rejection of the simultaneous equation specification. Further, the only strategic variables that matter are those representing preferences, and child support. The significance of the preference variables in a single equation model, however, also supports other theories of visitation, such as Peters et al (1992) and Weiss and Willis' (1985) efficient contract theories. Therefore the evidence on the strategic use of visitation by the custodial parent is less compelling than the evidence of the strategic use of child support by the noncustodial parent.

CHAPTER V. A DYNAMIC MODEL

As indicated in Chapters 2 and 3, the parents interact with each other for a long period of time, so a dynamic empirical model is a better representation of the post-divorce situation. In this gaming model, each player is assumed to move sequentially, so the player knows all previous moves when making his or her move. That is, the noncustodial parent has the opportunity to pay or not to pay child support in one period, while the custodial parent responds by granting or not granting a certain amount of visits. The noncustodial parent reciprocates with child support after observing the visits bestowed by the other parent, and so on. Each player has the opportunity to establish a reputation for cooperation which might encourage the other player to do the same. The strategy used by both parties in their decisionmaking is the "tit-for-tat" strategy. This means that each player cooperates in the first round, then either cooperates on each round thereafter if the opponent cooperated, or abandons cooperation if the opponent did not cooperate. The tit-for-tat hypothesis suggests that a relationship exists between one player's actions in the previous period and the other player's actions in the current period.

To explore this possibility, I examine the relationship between current child support and past visitation. Data from the last two waves are used to observe the interactions

of child support and visitation decisions over time. The sample consists of those custodial families that report a child support amount in the third period equalling 0 or higher¹⁸, and visitation in the second period, resulting in 119 observations. Table 5.1 provides the means and standard deviations of variables used in this chapter's analysis.

Table 5.1 Means and Standard Deviations of Sample Characteristics in Dynamic Analysis

VARIABLE	MEAN	STD DEV
Family/Demographic Characteristics:		
Child's Age in 1987	19.578	1.530
CP's Family Income in 1987	3.360	1.669
# of CP's Dependents in 1987	3.043	1.269
Legal Climate:		
Total Enforcement Expenditure/Average Annual Child Support Enforcement Caseload	40.437	26.697
Preferences:		
Settlement Has Changed Since 1981	.084	.278
Child Support Variables:		
Child Support per Year in 1981	1163.344	1776.047
Child Support per Year in 1987	326.153	1207.592
Visitation:		
# of Visits Between Child & NCP per Year in 1981	46.612	95.460

SOURCE: National Survey of Children, Waves 2 and 3, 1981 and 1987. Divorced or separated families in which the outside parent is the custodial parent's former spouse. CP=Custodial Parent. NCP=Noncustodial Parent.

¹⁸That is, missing observations and those reporting "not applicable" were excluded.

A. Empirical Methodology

If the tit-for-tat strategy is employed, then child support in Wave 3 should rise with past visitation in Wave 2, all other factors held constant. Though the data set is not particularly well-suited to studying this connection since the six year hiatus between Waves 2 and 3 is so large, some of the findings are suggestive. The amount of child support received in Wave 2 is included in order distinguish between the dynamics of the tit-for-tat theory and the possibility that child support in period 3 is highly correlated with child support in period 2.

The control variables in Wave 3 are limited in comparison to Wave 2. For example, the visitation variable and variables representing the current relationships between the child and each parent are not available in Wave 3. However, other explanatory variables important in explaining child support in Wave 2 that are constant across time are thought important in explaining support in Wave 3. These include the pre-divorce "negotiating costs" variables, and the demographic variables of race, custodial parent's age, and custodial parent's education. Child support in Wave 2, included in the regression, captures these effects, so they are not included separately. The number of the custodial parent's dependents and family income in Wave 3 is included since they have changed since Wave 2 for many families.

A proxy for the effectiveness of a state's child support enforcement in Wave 3 is included, equalling the

total dollars spent on enforcement per child support enforcement case, according to the Office of Child Support Enforcement (1988). The child's current age is also included in this analysis. The children's ages in this wave range from 17 to 22, meaning some of these children are now self-sufficient and the custodial parent is no longer eligible for support. I expect, therefore, that families with children at the lower end of this age spectrum will receive more child support.

The explanatory variable of greatest interest is visitation in the previous wave, though whether the child support agreement has changed since the previous wave is also importantt. I hypothesize that a negotiated change in the agreement brings the two parties closer to their true preferences and an optimal outcome, which is assumed to be higher child support payments.

B. Estimation

Estimation techniques available for pooled cross-section and time series data such as random effects and fixed effects models are not an option here due to the data set's deficiencies. Specifically, the data set does not contain child support and visitation for all three time periods. I use an alternative test that examines the link between visitation in Wave 2 with child support in Wave 3. This test involves estimating the following system using a tobit approach

$$(5.1) \quad C'_3 = \alpha_3 V_2 + \tau C_2 + B_3' X_3 + \Gamma_3' Z_3 + u_3$$

$$(5.2) \quad C_3 = \max(0, C'_3)$$

where C'_3 is child support in Wave 3, and C_2 and V_2 are child support and visitation in Wave 2, respectively.

C. Empirical Results

Because of the possibility of sample selection bias, I use Heckman's (1979) two-step procedure to test for selectivity. This bias would exist if the fact that child support is reported in the third wave also determines how much the custodial parent receives. I find no evidence of sample selection bias: the coefficient on λ , the inverse Mills ratio, is insignificant¹⁹. No correction was made, therefore, for selectivity.

Table 5.2 presents the results of the tobit analysis regressing child support in Wave 3 on visitation in Wave 2 and other control variables. Lagged visitation is significant and positive at the 5% level, providing support for the hypothesis that a tit-for-tat game is being played. A change in the settlement is strongly significant and positive, indicating that those who obtain a change receive higher payments. This variable could be picking up something about the relationship of those parents who can get along well enough to negotiate a new settlement that results in higher child support. Or it could mean that the

¹⁹The coefficients of the probit equation used to estimate λ are given in Appendix 6.

bargaining gets them closer to their true preferences so they pay (or receive) higher amounts of child support. Variables on the current state of the relationship are necessary to investigate which of these explanations apply here. The child's age is significant and negative, as hypothesized. The rest of the variables are not significant.

Table 5.2 Tobit Estimates of the Amount of Child Support Received in Period 3^a

# of Visits Between Child & NCP in Wave 2 (V_2)	8.391 ** (2.061)
Child Support Received in Wave 2 (C_2)	.122 (.478)
Number of CP's Dependents	465.649 (1.312)
CP's Family Income	-.048 (-1.511)
Enforcement Techniques	12.511 (.634)
Settlement Has Changed Since Wave 2	3927.054 *** (3.171)
Child's Age	-804.483 ** (-2.229)
Constant	5863.733 (1.126)
Chi-Square	29.43
N	119
Log Likelihood Function	-250.022

SOURCE: National Survey of Children, Waves 2 and 3, 1981 and 1987. Sample consists of divorced or separated families in which the outside parent is the custodial parent's former spouse. CP= Custodial Parent. NCP=Noncustodial Parent.

^aT-statistics are in parentheses.

*** Indicates significance at the 1% level for a two-tailed test.

** Indicates significance at the 5% level for a two-tailed test.

* Indicates significance at the 10% level for a two-tailed test.

D. Conclusion

While the findings are suggestive, they do not clearly establish the causal role visitation plays in the child support decision, much less the tit-for-tat theory. Monthly data along with panel data estimation techniques are necessary to evaluate this theory of child support receipt more convincingly.

The fact that a settlement change positively and significantly affects child support receipt raises interesting lines of inquiry about the extent of private ordering. As advanced previously, this relationship could mean the parents are moving closer towards their true preferences, which are assumed to be higher child support payments. Peters et al (1992) analyze factors associated with informal changes and formal, or legal, changes in a divorce agreement about child support payments. As they hypothesize, changes in circumstances such as the employment situation, and the custodial arrangements lead to modifications in the agreement. They then look at the affect these changes in circumstances have on compliance and find that these same factors that lead to modifications significantly affect compliance with the formal agreement but not the informal agreement. What they conclude is that changing circumstances and preferences lead to modifications in the initial agreement, which lead to full compliance, albeit with an informal agreement, supporting the belief that a fair amount of private ordering is occurring.

It is unclear from the NSC data used in this thesis whether the settlement change was legally altered, or whether the change was merely an informal agreement between the two parties. If most of the changes were informal arrangements²⁰, the positive relationship between settlement change and child support receipt lends support to the private ordering theory. A settlement change could also divulge information about the parents' current relationship and ability to bargain. Better data on the parties' preferences, such as their preferred amount of contact with the child and the preferred amount of child support at a certain point in time; the parents' current relationship; and who initiated the change are necessary to distinguish these possible explanations.

²⁰Peters et al (1992) estimate that 80% of modifications in their study were informal rather than formal changes in the initial divorce settlement.

CHAPTER VI. CONCLUSION

This thesis deals with the issue of child support and noncustodial parent-child visitation in the post-divorce environment. The goal is to understand the dynamics of this situation in order to formulate intelligent policies. I propose a strategic bargaining model of post-divorce negotiations over child support and child visitation rights and emphasize the influence of the decision-makers' control of resources, which in this situation are child support and visitation rights, on the bargaining process and outcomes. Data from the National Survey of Children are used to test the theory.

The one-period Nash equilibrium leads to lower support payments and visitation than the efficient outcome. The optimal outcome can be supported in a repeated game with the use of trigger strategies. A repeated game is a better approximation of the post-divorce relationship where informal agreements are often used to enforce mutually beneficial trades due to the often excessive transaction costs of legally binding contracts. The repeated game leads to equilibrium outcomes that do not arise when the game is played only once, including the Pareto optimal and balanced temptation equilibria. The parents cooperate because they hope that cooperation will induce further cooperation in the future. As long as both parties care enough about future utility, the threat of noncooperation in the future makes

the informal agreement self-enforcing. Various ways exist to enrich the basic theoretical model, discussed in the next section.

The empirical cross-section analysis considers the interrelationship of the child support and visitation decisions made by each parent by specifying a pair of simultaneous equations. Applying the theory to the data presents many difficulties, specifically how to determine whether the relationship is strategic or not. One crucial test of this analysis focuses on whether these decisions are interrelated. This is shown to be true for child support where child support is best specified in a simultaneous equation system. The amount of child support affects the custodial parent's visitation decision, which in turn affects the noncustodial parent's child support decision. This empirical analysis provides support for the strategic theory as it relates to child support. This suggests certain policy implications, discussed shortly, beginning with a brief review of the current child support system in the United States and how these laws are implemented in the state of Michigan.

A. Possible Extensions of the Model

It is likely that the noncustodial parent's decision on child support is a function of whether his payments are being spent on the child. A distinction could be made in the model between the consumption of the child and mother,

x_c versus x_r . This allows for consideration of the cases where the custodial parent banks the support payments, while the noncustodial parent legitimately prefers his payments to be used immediately.

Additionally, it is likely that each parent is more concerned over non-market issues, such as values the child is developing while in the company of the other parent, and less concerned about pecuniary matters. This can be incorporated into the model by having the child's utility function develop over time via a taste parameter that is constantly evolving. This extension of the basic model then permits analysis of situations where payment of child support or visitation allowance is conditional on the giving parent's perception of the other parent's behavior while in the company of the child. For example, the custodial parent might withhold visits because she disapproves of the places the noncustodial parent frequents while the child is in his company. Or she disapproves of the way the noncustodial parent disciplines the child while in his company.

This model assumes no informational disparities exist, though in reality one parent could have private information about the opponent's risk-aversion, or his or her ability to deliver the promised goods, as in the case where the noncustodial parent knows more about his own ability to pay child support than the custodial parent. Suppose, for example, that the noncustodial parent is pleading poverty but the custodial parent does not believe him. She

withholds visits until she becomes convinced that he is telling the truth or he pays up. From a policy perspective, legal intervention whereby the court has the right to all income sources of the noncustodial parent, would lead to substantial gains in the efficiency of the bargaining process. [See the following for examples of games of incomplete, or private, information: Bebchuk (1984); Spier (1992); Reinganum and Wilde (1986); Nalebuff (1987); Shavell (1989); and Rubinstein (1985)].

The existence of private information can lead to bargaining power disparities. Bargaining power was modelled here using the parties' discount rate, though this was not tested empirically due to the difficulty in measuring it. The idea is that the more impatient player will accept a smaller share. Finding a proxy for this variable leads to a test of this idea. Other measurements of bargaining power that are empirically easier to measure are also possible. One is each party's ability to handle transaction costs whereby the party better able to handle costs has an advantage. Another is the degree of uncertainty concerning the legal outcome if the parties go to court, which is linked to the parties' attitudes towards risk. Substantial variance among the possible court-imposed outcomes is more of a disadvantage to the more risk-averse party. Uncertainty about the outcome could increase transaction costs.

The possibility of forgiveness once an opponent cheats is a plausible outcome in this highly emotional game. It is

very likely that the efficient outcome can be achieved once the agreement has been broken, if the cheater "repents" and adequately compensates the opponent (Segerstrom, 1988).

If, for example, a noncustodial parent who has cheated in the past, can repent by paying back child support, cooperation can resume. The introduction of a "repentance" strategy in this game would make for a richer model.

B. The Current System of Child Support and Visitation in the United States and Michigan

Aid to Families with Dependent Children (AFDC) was enacted as part of the Social Security Act of 1935 to provide for the needs of poor fatherless children, most of whose fathers had died (Garfinkel, 1988). However, as welfare costs mounted, enthusiasm for public support of children who had able-bodied fathers diminished as congressional interest in private child support payments grew.

Between 1950 and 1988, Congress enacted a series of bills to strengthen public enforcement of private child support. The most significant legislation was passed in 1975, when Congress added Part D to Title IV of the Social Security Act, thereby establishing the Child Support Enforcement (IV-D) program. States, which are responsible for running this program under federal guidelines, are reimbursed by the federal government for about 70% of the cost of establishing paternity, locating noncustodial

parents, and collecting child support.

In 1984, Congress voted unanimously to require all states to automatically withhold child support from the wages of noncustodial parents who are delinquent in their child support payments for one month, under the Child Support Enforcement Amendments of 1984. It also requires the states to extend the period during which paternity suits can be initiated to the child's eighteenth birthday, to expedite the process for enforcing support orders, and to establish statewide child support guidelines. The Family Support Act of 1988 requires all states to impose immediate wage withholding at the time a child support order is established by 1994, whether the absent parent is delinquent or not. Currently, federal lawmakers are calling for a federalized system to enforce child support payments and remove the burden from the states. The reasons include standardizing the child support collection and enforcement system across states, and instituting a method of enforcing child support awards when the noncustodial parent moves out of state. To this end, the lawmakers are calling for making use of the IRS to withhold wages across state lines²¹.

In Michigan, one of the top states in terms of collection, a public agency called the "Friend of the Court" is responsible for all official matters relating to divorce

²¹"Federal Plan to Enforce Child Support is Pushed by Liberals and Conservatives", Wall Street Journal, May 10, 1992.

and paternity for nonwelfare as well as welfare cases. Its duties include investigating, reporting and making recommendations to the court on child custody, visitation, and support; providing mediation as a way of settling disputes over custody and visitation; collecting, recording, and releasing all support payments ordered by the court to the parent, guardian or welfare department; and enforcing all custody, visitation, and support orders. (See Friend of the Court Act, Michigan Compiled Laws (MCL) 552.501-552.535). Michigan's Friend of the Court was founded in 1917 because the private system of support enforcement had proven ineffectual (Chambers, 1979). "Friend of the Court" is the title for both the person heading the agency in each county and for the agency itself. The Friends of the Court themselves are appointed by the governor at the recommendation of the local circuit judges.

State and federal law require that a child support guideline be used by Friends of the Court, prosecuting attorneys and judges when recommending or ordering appropriate child support amounts (MCL 552.519; Federal Child Support Enforcement Amendment of 1984). Deviation is possible if a judge or the Friend of the Court determines that use of the guideline would result in an unjust or inappropriate order. Reasons for deviation must be set forth in a report and recommendation by the Friend of the Court and on the record or in writing by the court. In Michigan, the child support guidelines consider both the

noncustodial and custodial parent's income. As to visitation, if the parents agree on visitation terms, the court shall order the visitation terms unless the court determines on the record that the visitation terms are not in the best interests of the child (Child Custody Act, MCL 722.21-722.29).

In Michigan, the Friend of the Court does not wait for a complaint from the custodial parent to begin enforcement efforts if the noncustodial parent misses one month of support. The agency can issue an income withholding order, a lien on a payer's property, civil contempt proceedings, and if necessary, jail (Support and Visitation Enforcement Act, MCL 552.601-552.650). Effective January 1, 1991, all new and current support orders that have been modified must provide for immediate income withholding similar to the deductions for income taxes. A delinquency does not have to occur before income withholding takes place.

If the parent required to pay support leaves the State of Michigan, he or she must continue to pay support through the Friend of the Court. If child support payments stop, the parent receiving support has the right to request that an action under the Revised Uniform Reciprocal Enforcement of Support Act (RURESA) be filed. A RURESA order establishes a support order in the state where the noncustodial parent lives and this state then has the responsibility for enforcement.

Contrary to child support delinquency, the Friend of

the Court begins enforcement proceedings of visitation orders only after it receives a written complaint stating specific facts including dates, times and reasons given about an alleged denial of visitation, and when the Friend of the Court determines that there is reason to believe the court's order has been violated. The Friend of the Court can schedule a meeting with the parties and attempt to reconcile differences, or refer the parties to a mediator. If these fail, the Friend of the Court can begin a civil contempt proceeding, or petition the court for a change in the existing visitation order.

C. Policy Implications

The theory and empirical analysis emphasize the importance of the parents' relationship, both in the pre-divorce negotiation process, and in the post-divorce use of child support as a strategic weapon. These are found to be more important than many of the economic and demographic factors. This suggests that policies addressing family dynamics must be examined along with the implications of enforcing the current laws outlined above in order to alleviate the child support problem.

Specifically, this thesis has shown that child support is an instrument in a strategic game between the two parents. It can be used to punish, threaten, signal, or enforce a bargain. If perfect enforcement of child support awards and visitation awards existed, these strategic uses

would not be possible, and the Pareto optimal amount of both would be realized. However, perfect enforcement does not exist, especially in the case of visitation.

Legal enforcement of child support awards such as programs that automatically withhold support from noncustodial parents' paychecks are expected to lessen the strategic function of support payments as they diminish the parents' ability to negotiate private contracts and enforce agreements. However, given that this enforcement will still be imperfect, and given the weakness of visitation awards' enforcement relative to that of child support awards, these policies might serve to increase bargaining costs unnecessarily, increase the custodial parent's bargaining power, and lead to a demand by the noncustodial parent for higher visitation rights. The benefits of a nonvoluntary system of child support in terms of increased collection must be weighed against the costs²², primarily the spillover effects of decreasing the strategic functions of child support just mentioned, and the reduction in individual responsibility as the government not only handles the

²²Whether child support withholding from paychecks will increase the amount collected is questionable. It is speculated by David L. Levy, President of the National Council for Children's Rights, Washington, D.C. that the majority of those affected by the law are those who pay close to the full amount of child support anyways. A third party is introduced unnecessarily, resulting in an increase in the child support bureaucracy. (Testimony before the Committee on Finance, United States Senate, One Hundredth Congress, Second Session (February 4, 1988), on welfare reform and the problem of child support and ways to improve the current system).

collection and distribution of support, but also starts guaranteeing minimum payments for those due child support.

What this thesis implies for policy in the absence of perfect enforcement is that allowing a link between visitation and child support would move the amount of both commodities received by both parties towards the efficient level. This occurs because an informal, relatively low cost enforcement mechanism is now at the disposal of each parent. This link can be explicitly written into the divorce settlement, stating in the legal record that child support does not have to be paid if visitation is withheld. Or states could allow judges to consider frustrated visitation rights in cases where the noncustodial parent has been accused of child support nonpayment.

These recommendations are controversial as most state statutes do not accept a guardian's refusal to allow a noncustodial parent to visit his children as an excuse for the noncustodial parent to stop or reduce child support payments. The reason is that society's first objective is to protect the child²³. A child should not lack support because of harmful actions taken by the parent. However, though it has become illegal to stop support payments if the custodial parent does not deliver visitation, in exchange the courts do not enforce visitation orders to the same extent they do support awards. The system appears to be

²³Child Support in America by Joseph Lieberman, p. 54.

working against itself when it should be working to bring these areas together under one coherent policy.

A less controversial recommendation is to institute policies encouraging visitation. These include granting visitation awards to noncustodial parents, stricter enforcement of these awards to insure compliance on the part of the custodial parent, and joint custody in custody disputes. Concerning the latter recommendation, the effect of joint custody on children has been explored in much detail elsewhere and so is not discussed here. (See Joint Custody and Shared Parenting, edited by Jay Folberg, for a collection of diverse views on this subject.) My study underscores the benefits of joint custody, as it maximizes the contact the child has with the noncustodial parent.

The imbalance in the enforcement of visitation awards as compared to child support awards has generated the creation of fathers' rights groups, dedicated to helping fathers gain equal rights in divorce matters. These groups argue that the system is biased against them, with evidence to support them. As cited in the previous section, many laws have been enacted at the federal level to enforce child support payment, but none concerning visitation. Michigan is considering a bill that would confiscate the driver's license of a noncustodial parent who is delinquent for one month or \$1,000 in support and who repeatedly ignores collection efforts, but is doing nothing to punish custodial parents who renege on a visitation agreement. Additionally,

enforcement in Michigan is quicker and therefore less costly for a custodial parent with a support complaint than for a noncustodial parent with a visitation complaint. A noncustodial parent just has to miss one month of payments before enforcement proceedings begin, while enforcement proceedings of visitation orders begin only after the noncustodial parent files a complaint with the Friend of the Court stating specific details of the visitation denial.

One reason fathers' rights groups give for the imbalance in the post-divorce debate is the sexism of the court system which reflects society's view that women need to be protected, while men do not, and that men are the ones who provide for the family's financial needs while women provide for the family's emotional needs²⁴. The idea that fathers have nurturing relationships with their children and want to continue that after divorce is counter to society's view of the traditional roles of men and women. Whether this is true is speculation at this point, but is a possibility that should be investigated in the future.

To determine whether this or the other allegations are true, and whether policies encouraging visitation recommended in this thesis would insure higher child support payments requires better data. Statistics on the current status of visitation in particular, and on the noncustodial parent in general, are in short supply. The Current

²⁴Al Lebow, Executive Director of Fathers for Equal Rights of America, Southfield, MI in an interview July 15, 1993.

Population Reports, cited in the introduction, provide some data concerning the percentage of noncustodial parents with visitation awards, though nothing on compliance with these awards, and enforcement of awards. Further, this information is provided by the custodial, rather than the noncustodial parent. This information is necessary in order to assess just how big a problem this is, and to have a benchmark to compare any policies that seek to remedy this situation. Therefore, a related recommendation is to devote more resources to the collection of this information.

D. Future Directions

Estimates of how many families experience this situation is necessary before appropriate policies are implemented. This requires a more extensive and detailed survey. Longitudinal data are necessary to test many aspects of the repeated game, including whether a repeated game leads to a Pareto optimal solution. Better data are needed on each parent's discount rate, their preferences at different points in their child's life, and other circumstances surrounding and following separation and divorce over a period of time. The use of panel data allows for a richer dynamic specification so that an individual's past behavior can affect current behavior. Documentation on the absent parent such as ability to pay, employment status, and education for which inadequate proxies are substituted, is particularly needed in order to obtain a

more accurate picture of the child support and visitation situation. The same care that is used in collecting child support award and receipt information should be used to collect equally important but ignored information on visitation for noncustodial parents, such as how many parents are covered by a visitation award, and the compliance rate. These data and more sophisticated longitudinal analysis will lead to additional valuable insights into the actual dynamics of the post-divorce situation.

Noncustodial parents' child support behavior has not changed much over the past decade despite strict laws designed to enforce payment: only about 50 percent of noncustodial parents paid the full amount of support in 1989, the same as in 1979. This thesis suggests it is time to examine reasons for this noncompliance rooted in family dynamics, particularly related to the link between child support and visitation.

APPENDIX 1

APPENDIX 1

Differentiating the custodian's first order conditions, equations (2.6) - (2.9), results in:

$$\begin{bmatrix} 0 & -1 & -w_f & -w_f \\ -1 & u_{11}^f + a^f U_{11}^c & u_{12}^f - a^f (U_{13}^c - U_{12}^c) & u_{13}^f \\ -w_f & u_{12}^f - a^f (U_{31}^c - U_{21}^c) & u_{22}^f + a^f (U_{22}^c - 2U_{23}^c + U_{33}^c) & u_{23}^f \\ -w_f & u_{31}^f & u_{32}^f & u_{33}^f \end{bmatrix} \begin{bmatrix} d\mu \\ dx \\ dt_f \\ dl_f \end{bmatrix} = \begin{bmatrix} -1 \\ 0 \\ 0 \\ 0 \end{bmatrix} ds$$

The system implies the following equations:

$$dx/ds = 1/H [(u_{23}^f)^2 - u_{22}^f u_{33}^f + u_{12}^f u_{33}^f w_f - u_{12}^f u_{23}^f w_f - u_{13}^f u_{32}^f w_f + u_{13}^f u_{22}^f w_f]$$

$$dt_f/ds = 1/H [u_{21}^f u_{33}^f - u_{23}^f u_{31}^f + u_{11}^f u_{33}^f w_f - u_{11}^f u_{23}^f w_f - (u_{13}^f)^2 w_f + u_{13}^f u_{21}^f w_f]$$

where H is the determinant of the bordered Hessian. $dx/ds = dx/dI^f$ since s is nonwage income for the female. Thus, $dx/ds > 0$ and $dl_f/ds > 0$, assuming normality. This also applies to dt_f/ds ; that is, $dt_f/ds > 0$ if time spent with the child is a normal good.

APPENDIX 2

APPENDIX 2

Differentiating the noncustodian's first order conditions, equations (2.20) - (2.23), results in:

$$\begin{bmatrix} 0 & -1 & w_m dt/ds - 1 & -w_m \\ -1 & u_{11}^m & -u_{12}^m dt_f/ds & u_{13}^m \\ w_m dt/ds - 1 & -u_{21}^m dt_f/ds & A & -u_{23}^m dt_f/ds \\ -w_m & u_{31}^m & -u_{32}^m dt_f/ds & u_{33}^m \end{bmatrix} \begin{bmatrix} d\mu \\ dx_m \\ ds \\ dl_m \end{bmatrix} = \begin{bmatrix} -1 \\ 0 \\ 0 \\ 0 \end{bmatrix} dI^m$$

where $A = dx/ds [a^m(U_1^c + U_{11}^c dx/ds + dt_f/s (U_{12}^c - U_{13}^c + U_{21}^c - U_{31}^c))] + dt_f/ds [-u_2^m + a^m(U_2^c - U_3^c) + dt_f/s (u_{22}^m - U_{22}^c + U_{23}^c + U_{33}^c) + \sigma w_m]$.

σ measures the sensitivity of the constrained objective function to changes in the constraint, which, in this case is income. The system implies the following equation:

$$ds/dI^m = 1/H_1 \{ dt_f/ds [u_{21}^m u_{33}^m + u_{23}^m u_{31}^m + w_m (u_{11}^m u_{33}^m - u_{11}^m u_{23}^m - (u_{13}^m)^2 + u_{13}^m u_{21}^m)] - u_{11}^m u_{33}^m + (u_{13}^m)^2 \}$$

where H_1 is the determinant of the bordered Hessian. The sign of this comparative static depends upon the sign of dt_f/ds , or how the custodial parent reacts to an increase in support payments.

APPENDIX 3

APPENDIX 3

Differentiating the noncustodian's first order conditions, equations (2.56) - (2.59), results in:

$$\begin{bmatrix} 0 & -1 & -1 & -w_m \\ -1 & u_{11}^m & 0 & u_{13}^m \\ -1 & 0 & a^m dx/ds(U^c + U_{11}^c) & 0 \\ -w_m & u_{31}^m & 0 & u_{33}^m \end{bmatrix} \begin{bmatrix} d\beta \\ dx_m \\ ds \\ dl_m \end{bmatrix} = \begin{bmatrix} -1 \\ 0 \\ 0 \\ 0 \end{bmatrix} dI^m$$

The system implies the following equation:

$$ds/dI^m = 1/H_c [-u_{11}^m u_{33}^m + (u_{13}^m)^2]$$

where H_c is the determinant of the bordered Hessian.

APPENDIX 4

APPENDIX 4

DEFINITION OF VARIABLES

VARIABLE	DESCRIPTION
Race	Dichotomous variable is equal to 1 if respondent is black, 0 otherwise.
Custodial Parent's Education	Education of custodial parent equalling 1 if post-high school education was achieved, and 0 otherwise.
Custodial Parent's Age	Custodial parent's age.
Child's Age	Child's age.
Custodial Parent's Family Income in Wave 2	Categorical variable of the custodial parent's total family income. If income fell between \$0-\$5,000, variable equals \$2,500; if between \$5,000 and \$10,000, variable equals \$7,500; if between \$10,000 and \$15,000, variable equals \$12,500; if between \$15,000 and \$20,000, variable equals 17,500; if between \$20,000 and \$25,000, variable equals 22,500; if between \$25,000 and \$35,000, variable equals \$30,000; if between \$35,000 and \$50,000, variable equals 42,500; if over \$50,000, variable equals \$65,000.

Custodial Parent's Family Income in Wave 3	Categorical variable of the custodial parent's total family income. If income fell between \$0-\$10,000, variable equals \$5,000; if between \$10,000 and \$20,000, variable equals \$15,000; if between \$20,000 and \$30,000, variable equals \$25,000; if between \$30,000 and \$40,000, variable equals 35,000; if between \$40,000 and \$50,000, variable equals 45,000; if between \$50,000 and \$60,000, variable equals \$55,000; if between \$60,000 and \$70,000, variable equals 65,000.
Number of Custodial Parent's Dependents	Number of people depending on custodial parent's family income.
Custodial Parent Remarried	Whether respondent has remarried or living with partner of opposite sex (1), or otherwise (0).
NCP's Driving Distance From Child	Dichotomous variable is equal to 1 if former spouse lives an within an hours drive away, 0 otherwise.
State Enforcement Variable in Wave 2	Number of child support enforcement techniques used by custodial parent's state in 1981.
State Enforcement Variable in Wave 3	Total enforcement expenditures per child support enforcement caseload in 1987.

Argued Before Separation

Dichotomous variable is equal to 1 if the former spouses argued often before separation according to the custodial parent, 0 if they argued occasionally or not at all.

Child Support was a Difficult Issue to Work Out at Separation

Dichotomous variable is equal to 1 if child support was a difficult issue to work out at separation according to the custodial parent, 0 otherwise.

Divorce Settlement Obtained

Dichotomous variable is equal to 1 if a settlement over custody, visitation, and finances was obtained at divorce or separation, 0 otherwise.

Child's Closeness to Noncustodial Parent

Dichotomous variable is equal to 1 if the child is extremely close or quite close to the noncustodial parent according to the child, 0 if the child is fairly close or not very close to the noncustodial parent.

Child's Closeness to Custodial Parent

Dichotomous variable is equal to 1 if the child is extremely close or quite close to the custodial parent according to the custodial parent, 0 if the child is fairly close or not very close to the custodial parent.

**Custodial Parent's Satisfaction
With Custody Arrangements**

Dichotomous variable is equal to 1 if the custodial parent is very satisfied with current custody arrangements, 0 if the custodial parent is somewhat satisfied or not at all satisfied with current custody arrangements.

**Conflict Between Custodial and
Noncustodial Parents**

Dichotomous variable is equal to 1 if the conflict level between the custodial parent and former spouse increased after separation according to the custodial parent, 0 otherwise.

**Settlement Has Changed Since
Divorce**

Dichotomous variable is equal to 1 if settlement changed since divorce, 0 otherwise.

**Settlement Has Changed Since
Wave 2**

Dichotomous variable is equal to 1 if settlement changed since Wave 2, 0 otherwise.

Years Since Divorce/Separation

Years since divorce or separation.

Child Support in Wave 2

Current child support per year in 1981 as reported by the custodial parent.

Child Support in Wave 3

Current child support per year in 1987 as reported by the custodial parent.

of Visits Between Child & NCP

The number of days the child spent with the noncustodial parent in the past year as reported by the custodial parent.

APPENDIX 5

APPENDIX 5

ENDOGENEITY TEST ON VISITATION EQUATION

OLS Estimates of the Number of Days the Child Spent with the Noncustodial Parent in the Past Year^a

Child Support	-.027 (-.942)
Race	-66.441 (-.996)
NCP's Driving Distance from Children	54.355 ** (2.006)
Years Since Divorced/Separated	1.786 (.694)
Argued Before Separation	-22.036 (-.640)
Child Support was A Difficult Issue to Work Out at Separation	-51.290 ** (-2.366)
Child's Closeness to NCP	19.582 (1.303)
CP's Satisfaction w/ Custody Arrangements	-8.157 (-.223)
Child's Closeness to CP	80.938 (1.399)
Conflict Between CP and NCP	-8.629 (-.282)
Settlement Has Changed Since Separation	46.205 ** (2.614)
\hat{e}	.027 (.912)
Constant	-12.283 (-.311)
F-statistic	F(13,89)=1.66
N	103
R ²	.195

SOURCE: National Survey of Children, Wave 2, 1981. Sample consists of divorced or separated families in which the outside parent is the custodial parent's former spouse.

^aT-statistics are in parentheses.

*** Indicates significance at the 1% level for a two-tailed test.

** Indicates significance at the 5% level for a two-tailed test.

* Indicates significance at the 10% level for a two-tailed test.

APPENDIX 6

APPENDIX 6

Probit Estimates for Receipt of Child Support in Period 3 used to Estimate λ and Determine Selectivity^a

# of Visits Between Child & NCP in Previous Period 2	.002 (1.318)
Child Support Received in Previous Period 2	-.000 (-.196)
Number of CP's Dependents	.127 (1.061)
CP's Family Income	-.000 (-.555)
Enforcement Techniques	.001 (.097)
Settlement Has Changed Since Wave 2	1.459 *** (3.153)
Child's Age	-.409 *** (-3.314)
Constant	3.961 ** (2.151)
Chi-Square	34.76
N	119
Log Likelihood Function	-42.351
$\lambda = f(BX/\sigma)/F(BX/\sigma)^b$	-397.493 (-1.337)

SOURCE: National Survey of Children, Waves 2 and 3, 1981 and 1987. Sample consists of divorced or separated families in which the outside parent is the custodial parent's former spouse. CP= Custodial Parent. NCP= Noncustodial Parent.

^aT-statistics are in parentheses.

^b f and F are the standard normal density and standard normal cumulative distribution functions, respectively. B represents the probit maximum likelihood estimates, reported in this table. X is the vector of independent variables.

*** Indicates significance at the 1% level for a two-tailed test.

** Indicates significance at the 5% level for a two-tailed test.

* Indicates significance at the 10% level for a two-tailed test.

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