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Interspousal property ownership and the optimization of the marital deduction in estate planning

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by

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CHAPTER I. INTRODUCTION

The Problem

The purpose of this work is to research interspousal property ownership and to determine how to optimize the marital deduction in its relationship to the estate planning objectives held by the spouses. Consideration of the objectives of interspousal and intergenerational transfer of property at death should be emphasized in the decision to hold property, as between spouses, during the marriage. The pattern of property ownership may have a direct and determining effect upon the efficacy of an estate plan in transferring property at the death of the spouse(s).

Estate planning is used within to mean developing a plan to transfer all of one's property from one generation to the next or within one generation (23). Property transfer at death occurs via various mechanisms designed to meet the estate owner's objectives. Every estate plan has a unique set of planning objectives, and as such they cannot be generalized. However, to the extent that basic planning objectives have been identified they typically include: i) to provide adequate retirement income security for the spouses (40, p. 1398); ii) to provide for the management of the estate at the death of the first spouse (27, p. 5161); iii) to pass the maximum amount of after-tax wealth to the surviving spouse (27, p. 5161); iv) to transfer the largest amount of property from the parents to the heirs (and/or

to favored charitable organizations) (10, p. 177); and v) to allow the estate owners the direction of the distribution of their property (26, p. 3).

As discussed in Chapter III, there is a direct linkage and causal relationship among the pattern of interspousal property ownership, the transfer objectives that are likely to be held by the spouses and the ability of the estate plan to optimize the objective function. Therefore, the pattern of property ownership may impinge upon the objectives by acting as a constraint in the optimization process.

The most important element in developing an effective estate plan to transfer property after death is the identification of transfer objectives. The goal of an estate plan is to meet these objectives to the fullest extent possible within given constraints. Generally this process, referred to as optimization, simultaneously considers all variables (both exogenously and endogenously determined) and the constraints that are present and given in the process, and determines the level which each variable must reach in order for the dependent variable to reach the optimal level. It should be clarified at this point that in the relatively new arena of optimization of after-tax wealth across both deaths, not all variables have been incorporated into the optimization process. Within the scope of work set herein, only property transfer at death, and not inter-vivos gifting, will be considered in the optimization process.

The Federal estate tax (FET) marital deduction is an extremely powerful variable in the optimization procedure. In the past, the superficial tax saving advantages of the use of the maximum FET marital deduction, that of postponing the maximum amount of estate tax until the second death, has been recognized by estate owners. This recognition has led to the practice of claiming the maximum allowable marital deduction at the death of the first spouse, assuming that the first death is that of the propertied spouse. The critical point is that claiming the maximum allowable FET marital deduction, if such use is to be beneficial to the estate owner(s) as an aid in fulfilment of transfer objectives, is predicated on several assumptions: i) the majority of the property is held by one spouse (typically the husband); ii) the major transfer objective held by the propertied spouse is to minimize the tax impact at the first death; and iii) the propertied spouse dies first. If any of these conditions does not hold, then the use of the maximum allowable FET marital deduction could result in non-satisfaction of the objective(s).

Economic analysis has provided new insights into the use of the marital deduction. For each dollar claimed as qualifying for the marital deduction, the size of the adjusted gross estate of the first to die is reduced by that dollar. Consequently, the estate of the second spouse is increased by more than one dollar (assuming that there is a separation in time between the spouse's deaths, that there is no inter vivos gifting and that there is a positive after-consumption rate

of growth of assets in the estate). There is a multiplier effect due to the time value of money, such that the deferred dollar has earning power, and the rate of return will depend upon the rate of investment of the deferred amount. The deferred amount may be in the form of business property that need not be liquidated to pay estate tax on that extra amount in the decedent's estate, or in cash that may be invested in market securities or invested in the family business at a rate of return commensurate with the surviving spouse's time and risk preferences with respect to investments. At whatever rate the assets are earning, the total assets in the estate of the second spouse will grow over the time period between deaths. The additional tax on the estate of the surviving spouse due to the use of the marital deduction at the first spouse's death must then be considered as a cost, assuming a sufficient property base to result in estate tax liability. The time value of money is discussed in greater detail in Chapter III.

Economic theory of marginal analysis suggests that the benefit deriving from the use of deferred tax dollars over the period between the spouses' deaths should be compared with the cost deriving from the increased tax liability in the estate of the second spouse in maximizing the net savings. The optimal size of the FET marital deduction is determined and the net savings is maximized at the point where the marginal present value of benefit equals the marginal present cost.

Study Objectives and Organization

The objectives of this study are: i) to illuminate the philosophy of interspousal property ownership in the United States; ii) to describe the optimization of the objective function (maximization of after-tax wealth across both deaths); iii) to define the variables of this objective function and their interrelationships; and iv) to develop a mathematical model which will determine the optimal size of the marital deduction which is capable of being integrated into a larger computer assisted estate planning model as a sub-routine.

The organization of the study follows the objectives. Chapter II is concerned with property ownership as held by husbands and wives in the United States. It should be made clear that, in terms of the philosophy of property ownership, this study is not based upon historical manifestation. To do this requires an historical view of the various philosophies of property ownership that have influenced jurisprudence in the United States. Chapter III deals with the theory of optimization in estate planning, and provides the link between the philosophy, pattern of property ownership and the choice of estate transfer methods with explicit consideration of the FET marital deduction and the theory of the time value of money. Chapter IV reviews the limited work that has been done in the area of computer assisted models for the optimal marital deduction determination. The larger computer assisted estate analysis model developed by Boehlje and Harl is presented briefly because the model developed in Chapter V

is suitable for inclusion into such a model for wealth optimization. Chapter V presents a discussion of several theoretical concepts including marginal analysis, rates of return, and discount rates as they apply to the development of the model. The specific model is then developed and the variables are defined. Finally the empirical results are presented in summary and some conclusions and recommendations are made for further research. The Appendix provides the relevant tax schedules used.

CHAPTER II. INTERSPOUSAL PROPERTY OWNERSHIP AND TRANSFER

In General

The predominant socio-economic unit in most societies is the nuclear family, headed by the husband and wife. This discussion does not include reference to decision making based upon the extended family model as is extant in countries of the Far East. Within the nuclear family unit, production, consumption and savings decisions are theoretically made possible through the cooperation of the husband and wife. Despite a cooperative agreement at marriage, the husband has throughout English, and subsequently American[1], history been recognized as the primary provider for his family needs and therefore the superior claimant to the family income and to the family estate.

"Under old English common law (which has been so influential in the development of American jurisprudence) on marriage, husband and wife become in legal contemplation only one person, and that person is the husband; the separate legal existence of the wife is merged into that of the husband" (2, p. 30). Sir William Blackstone, well-known legal historian, has provided the following rendition of the

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[1]The term "American" in its use throughout refers only to the United States.

legal status of married women in his discussion of the legal consequence of marriage (7, p. 83).

> By marriage, the husband and wife are one person in the law, that is, the very being of the woman is suspended during the marriage or at least incorporated and consolidated into that of the husband under whose wing, protection and cover she performs everything . . . for this reason a man cannot grant anything to his wife, or enter into covenant with her; for the grant would suppose her separate existence and to covenant with her would be to covenant with himself.

Prior to the enactment in England of statutes called "Married Women's Acts" over the last century, the married woman was at a complete disability to enter into contracts and to acquire or dispose of property (2, p. 31). "These personal disabilities, though imposed partly for the protection of the husband, are considered to be principally for her protection" (2, p. 31). Blackstone observed that "the disabilities which the wife has been under are for the most part intended for her protection and benefit, so great a favorite is the female sex of the laws of England" (7, p. 83). Generally, under these Married Women's Acts, capacity and ability in the wife is the rule, and disability the exception. "The trend of modern authority is to regard the Married Women's Acts, particularly the more recent ones, as remedial in their nature, and to construe them liberally in favor of the diversity and equality of legal personality and capacity of husband and wife . . ." (2, p. 31).

The patterns and forms of interspousal property ownership used currently in the United States are primarily derived from ancient

English common law. To that extent, there are many factors which have heavily influenced the development of these different forms of property ownership between spouses, such as the socio-religious influences and relative ages of the spouses at marriage and at death. Further, within the context of the socio-economic development of the United States such factors as increasing estate size and value, and increasing estate tax liability may have further influenced the adoption of various ownership patterns. It is hypothesized that these factors have also greatly influenced interspousal and intergenerational property transfer. In order to understand the decisions made as to form and balance of property ownership between spouses, it is prudent to recognize the historically predominant imbalance favoring male property ownership (7, p. 251) during the marriage relation present in the English and American societies, the legal and institutional provisions made for the widow, and how changing American socio-economic conditions may render the efficacy of an estate transfer plan primarily dependent upon the form and balance of interspousal property ownership.

Religious Influences

Many property law historians have noted that the United States has derived its major forms of interspousal property ownership from England (43). With this recognition many, such as Moynihan, have chosen the starting date of 1066 A.D. and the Norman Conquest (43, p. 1). However, it is possible and more complete to begin with an investigation

of ownership rights of husband and wife as presented in the major religious literature, both because the references antedate the Norman Conquest by many centuries, and because the effects of these religions have been so pervasive in the development of societal institutions. In fact, if one considers the Bible and Koran as representative of the Hebrew and Islamic cultural philosophies, and is aware of the impact of these religious beliefs (through migration and war as traditional vehicles of ideological transmission across continents) then it is easy to realize the importance of the tenets which these major religions set forth on the patterns of interspousal property ownership and provisions for the security of the widow.

Biblical scholars have pointed out that "In every code except the Hebrew, the widow has rights of inheritance, but in the Hebrew law she is completely ignored" (51, p. 842). One reason for this neglect may be in the Hebrew belief that death before old age was a calamity, a judgment for sin which was extended to the wife (51, p. 843). It was, therefore, a disgrace to be a widow and hence she maintained an inferior position in the community (50, Ruth 1:20-2; Deut. 14:29). The widow was then considered among the helpless and pitiful and was dependent upon God for provision of life's necessities (50, Jer. 49:11; Ps. 68:5). In reality, she could return to live with her parents or remarry. In the case of a childless widow, there was a special arrangement called levirate marriage, whereby a widow was remarried to her husband's brother (50, Gen. 38:11). Although it

was true that daughters could inherit and thereby own their father's property, the wife derived her legal identity only as an integral part of her husband; thus when he died she lost that identity, having no rights in her husband's property.

In the Islamic code, as embodied in the Koran, specific provision is made for the widow (18, Ch. 4:12). "Your wives shall inherit one-quarter of your estate if you die childless. If you leave children they shall inherit one-eighth, after payment of your debts and any legacies you may have bequeathed." In other words, one-eighth of the total was to be divided among all the children. The wife (or wives) receives one-quarter of the estate if she (they) is (are) without children. The remainder goes to the parents (18).

English Common Law

In an effort to gain insight into the dominant philosophy of property ownership between husband and wife in the United States today, it is necessary to turn to the development of English common law, upon which American jurisprudence has drawn heavily.

One of the most significant, totally pervasive and long-lived institutions of land tenure (in a global context), feudalism, was initiated by King Richard the Lionhearted with the Norman Conquest in 1066 A.D. From this time forward, the English countryside was strategically separated into parcels of land, most of which were given to the King's best military officers in return for their loyalty to him and military commitment during the campaigns. These parcels,

manors, were then further subdivided into feuds which were granted by the manor lord, in like manner, in return for a commitment of either military or economic service to him. The rationale for property ownership begins to be unveiled in this simple exchange of land use in return for services. At first, these feuds were gratuitous (given in the spirit of noblesse oblige) and were held at the will of the manor lord (19). The feuds were not inheritable, for although the feudholder had the use of the land and profits derived therefrom, absolute seisin (ownership) was with the manor lord, the immediate superior of the holder, and absolutely in the monarch. This meant that in any failing of the commitment to the manor lord, the land automatically reverted to him. According to Blackstone, in practice, if a male heir existed who was capable of rendering the required economic services or bearing arms (in knight service) in support of the manor lord, "frequently land was granted to him until through the process of time, it became unusual and difficult to reject the heirs . . . infants, women and professed monks were incapable of succeeding to a feud" (19, p. 142). Bennett draws a further refinement among those having rights to land use between freeholders and serfs (those bound to the land and owned by the manor lord) (5). The provision made for the widow of a serf was specified by manorial custom (5, p. 251). In theory, the manor lord had the right of reversion; when the husband (serf) who was the recognized tenant died, the right in the land would automatically

revert to the lord. However, in practice, the widow was allowed to remain holding the tenement for the remainder of her life (a type of conditional life estate) (19). This practice was called the "free-bench" and was considered to be a form of villein tenure (19, p. 167).

Provisions for the widow of a freeholder were also dictated by custom; however, it appears that through time the customs were institutionalized and a major form is referred to as dower. Generally, the widow's dower right in the property of the last husband was one-third of his holdings (6, p. 124). Whatever the specific provision made for the widow, it should be noted that the widow who found herself holding land was not, ipso facto, in an enviable position. It could not be expected that the manor lord would allow his lands to lie idle, nor could he afford to lessen the military potential of the manor, therefore, a widow who could not carry out these liabilities was forced to surrender the holdings, thenceforward seeking the charity of a relative or neighbor.

The charter of Henry I (King: 1100-1135) acted to relieve these hardships experienced by widows by offering custody of both the lands and the children to the widow (19, p. 193). Later, in action known as gavelkind tenure, the widow become entitled to a conditional life estate in one-half of the lands held by her husband during life, as in free-bench. This life estate was provisional upon her remaining unmarried and chaste (19, p. 193).

An extremely important convention developed into common law during this period (between the reigns of Kings Henry I and II) and has in some form been maintained today, known as dower. Historically, there have been several different forms of dower, each deriving its sanction from a different source (7, p. 480). They are: i) by common law; ii) by particular custom; iii) ad ostium eclesiae (at the church porch); iv) ex assensue patris (by assent of the father); and v) de la plus belle (by knight service conveyed). Dower by common law is the type of dower found most frequently in English and American law. It consists of "a life interest in one-third of all lands of which the husband was seised in fee simple (unqualified ownership and power of disposition) at any time during the coverture" (3, p. 80).

During the reign of Henry II (King: 1154-1189) a man's goods were to be divided into three equal parts upon his death; one part to his heirs, one to his wife, and the third was at his disposal assuming the spouse and heirs survived him (19, p. 427). The shares of the wife and children were called their reasonable parts and the "Write de Rationabile Parte Bonorum" was given to insure their shares were distributed to them after his death (19, p. 427). With specific respect to the third share left to the man's disposal, this action implies the power to designate through a testament during life what specific property would go to whom. However, the Statute of Wills was not legislatively enacted until 1540 A.D., some three hundred years

later. Again, Blackstone is not clear as to this seeming discrepancy between practice (or charter) and legislation. Ehrlich states that "testaments are of very high antiquity (and variety) . . . this variety may serve to evince, that the right of making wills and disposing of property after death is merely a creature of the civil state . . . this [that arrangement which existed under Henry II] continued to be the law of the land at the time of the Magna Carta (1215)" (19, p. 426).

Thereafter, a widow's endowment changed significantly, in degrees and specification of right, eventually evolving into an entitlement to endowment of all her husband's property. Under Henry IV (King: 1399-1413) the widow was denied endowment of a husband's goods or chattels upon his death (19, p. 196). However, under Edward IV (King: 1461-1483) the widow was endowed with more than one-third of her deceased husband's property (both real and personal), at her option (19, p. 196). At the end of the nineteenth century, the widow was "by law entitled to be endowed of all her husband's property of which he was seised in fee simple or fee-tail [a freehold estate inheritable only by children of the grantee and their descendants] at any time during the marriage" (19, p. 198). The reason for this endowment, cited by English law historian, Blackstone, is a "plain and sensible one"; it (the endowment) was for the sustenance of the wife and the nurture and education of the children (19, p. 193).

Ehrlich suggests that as the average estate size grew over time, the consequences of a wife's inchoate right or claim to dower in any

lands held by the husband became especially burdensome to intended alienation (sale) due to the husband's inability to sell land and to give good title (19, p. 198). Consideration of possible entanglements with the intended buyer (due to the wife's inchoate dower right to her husband's property) may provide partial rationale behind the development of new species of interspousal property ownership. Jointure, for example, as regulated by the Statute of Uses (1535) signifies a joint estate limited to the husband and wife. This type of ownership in jointure, if entered into before marriage, is a full satisfaction and bar of the woman's dower (19, p. 229). Prior to this statute, the husband had the use of said land in fee simple; however, the lord was absolutely seised of said lands (19, p. 198). The Statute of Uses expressed that the person who had the use of the land should also be taken as absolutely seised thereof. In common acceptance, this concept of jointure defined a "competent livelihood of freehold for the wife, of lands and tenements, to take effect in profit and possession presently after the husband's death for the life of the wife at least" (19, p. 198). However, a specific clause stated that the creation of such an estate in jointure, before marriage, barred her from her dowable right. Further, by common law, estates held by dower right were not subject to taxation, whereas tenants in jointure were so subject.

The Statute of Wills (1540) which also affected the process of interspousal transfer of property, stated that all male persons being seised in fee simple might by will and testament, devise to any other

person the whole of their landed property. However, the Magna Carta had previously provided priority for the payment of the "King's Debts" over other claims provided for in the will. However, "a married woman is utterly incapable of making a testament of chattels, without the license of her husband, for all her personal chattels were absolutely his" (7, p. 497). Hence, the married woman was excepted from the Statute of Wills.

The dower concept is an important key to understanding the English attitude toward interspousal property ownership. It is an inchoate right and, as such, subverts the wife's legal claim to property and decision making authority until after death of the husband, at which time the dower provision may be characterized as a type of social welfare provision for the widow. During the early stages of English feudalism, the woman (wife) was viewed as incapable of bearing arms in defense of the manor or of rendering the economic service required. Therefore, she received no reward in the form of the right to income property use or ownership. The married woman was viewed by English society as under the care of the husband who provided life's necessities. After his death, however, the community recognized the needs of the widow and her children for these necessities. At first, the widow's endowment was in the form of the gratuitous free-bench, which was later modified and institutionalized in the Magna Carta as the dower (57, p. 44). Until modern times it appears that even with the

institutionalization of the dower right of the widow, which was a recognition of the needs of the widow and children after the husband's death, the wife was viewed as having no need to own property in fee simple during or after the marriage.

Other European Influences

In the United States the only major type of interspousal property ownership that was not derived from the English common law is that of community property. It is described as "a species of partnership which a man and a woman contract when they are lawfully married to each other" (2). This form, as practiced in Arizona, California, Idaho, Nevada, New Mexico, Texas and Washington was drawn from the Spanish and Mexican "Ganancial" system. Under the ganancial community property system the property which is formed "durante el matrimonio" (during the marriage) belongs to both spouses in common and upon the dissolution of the marriage is divisible in equal shares. All that which is increased in profit during the marriage and is treated as community property is confined to that of which was earned by labor and not obtained through inheritance or gift (2). In the state of Louisiana the French "dotal" system was adopted. This system provides a distinction between the portion of the woman's pre-marital property which she brings to her husband in bearing the expenses of the marriage, referred to as dowry, and that which she retains in her own right. The dowry was considered part of the community property, whereas the extra-

dotal property rights were retained by her (2). Community property is not known to common law and in the United States it derives its existence from express legislation (2). Community property is, therefore, a creature of statute and differs among the states that recognize it.

The ganancial system under Mexican law made the distinction between property acquired by payment or by rendering valuable service and that acquired by gift or inheritance or before marriage. All property acquired by either the husband or the wife by payment or the rendering of service was considered common property to both, while that acquired by gift, inheritance or before marriage constituted the property of the acquiring spouse (Fuller v. Ferguson; Schneider v. Biberger).

The community property system can be viewed as a marital partnership though not a legal one. With the marital or community partnership, the division of the total property in the community is equal among the marital partners.

One concept behind the community property system is that, with certain exceptions, property acquired during the marriage is viewed as much that of the wife as that of the husband. "In general, the basic intent of the community property laws is to provide a return to the wife for her labors in the home, which are legislatively considered to be substantially commensurate with the efforts of her husband in

marital economic gain and to place the husband and wife on equal footing as to their property rights. In theory, the marital relationship, in respect to certain property acquired during its existence is a community of which each spouse is a member contributing by his or her industry to its prosperity, and possessing an equal right to succeed to the property as survivor" (Meyer v. Kinzer). On the death of either, the community is dissolved (In re Chavez estate) and the surviving spouse's share is not part of the deceased spouse's estate (United States v. Merrill).

The succession to property on the death of either spouse is entirely dependent upon statutory provision. Under some statutes, after payment of community debts, half of the estate belongs to the survivor; under other statutes, the husband, on the death of his wife, has succeeded to the entire estate, while the wife as survivor has succeeded to only half of the estate (King v. Pauly). If a spouse dies intestate, the survivor automatically takes that share. Essentially, it is a matter of the individual state's statutory specifications.

Interspousal Property Ownership and Transfer in the United States

The dower concept

In the forty-two common law states, the wife's dowable interest has been held basically as at common law. However, it is true that the old English common law estate of dower has been modified significantly

and in many states has been abolished completely. Due to the fact that the husband has predominantly been the property owner, the dower concept has played an impressive role in American legal history as regards the wife's dowable rights in the property of her husband.

It has been held that dower is an inchoate right which attaches upon marriage, and is practically based on the valuable consideration of marriage (Green v. Estabrook). Dower does not become consummate until the death of the husband (Matthews v. Marsden). Consequently, the common law right of dower is a creature of the law, (Griswold v. McGee) entirely within the control of the legislature (Chrisman v. Linderman) and is subject to abolition by statute while it remains inchoate (Schoellkopf v. DeVry). Although referred to as "a cherished and immediate jewel to whit all doubts must be resolved in its favor because dower keepeth the company of life and liberty," (Chrisman v. Linderman) there is a basic institutional instability in dower that lies with the legislative prerogative, in that, although "cherished" dower is not an inalienable right.

Investigation of the contention that dower is a "right" in the widow, reveals that there are several degrees associated with the concept of right. The highest and most absolute (in that it may not be altered or transferred) is the inalienable right; the dower right is not inalienable. The concrete definition of right, "a power, privilege, faculty or demand inherent in one person," (6, p. 1486) was upheld in

one South Carolina case when it was ruled that the "right to dower is undoubtedly a clear legal right" (Callaham v. Robinson). Whereas, the abstract definition, "ethical correctness consonant with the principles of morals" (6, p. 1486) was held by the court in a rather famous New York case (In re Barnes Estate).

> Dower is an equitable and moral right favored in a high degree by the law and next to life and liberty held sacred. But, dower exists also for reasons of public policy not dependent entirely upon the maintenance and nurture of the widow and her children. It is recognized in this country as a positive and definite institution of the state.

It appears then, that dower is definitely not inalienable, considered by some as a legal right and by others as a moral right, for if the claiming of the dower right is subject to judicial interpretation, then it is not inalienable. It is a right that derives its sanction from the philosophical exigencies of society. It is a creature of the law; public legislation has created it, may modify it and may destroy it as societal conditions dictate. Further, as is shown by the above cases, the dower right is subject to various judicial interpretations.

Throughout the judicial and legislative literature it is documented that the wife's interest in the husband's property (estate) is a matter of statutory interpretation. The problem of inconsistency of interpretation revolves around the question whether the wife claims on the basis of descent or has an accrued interest in the husband's estate. At common law, the dower estate is one that is gained via the

marriage contract and, therefore, the surviving wife is not technically an heir. It appears that the real problem lies with the fact that the wife's dowable interest is simply inchoate and does not become consummate until the death of the husband. Therefore, some have equated the concept of inchoate with that of expectancy, and have deducted that she inherits. "The extreme minimzing view is that during the life of the husband the right of dower is merely an expectancy or possibility, contingent rather than vested and on the same footing with the expectancy of heirs, apparent or presumptive, before the death of the ancestor" (3, p. 85). In an Indiana court, the ruling reinforced the view that if the husband died testate or intestate leaving a widow, one-third of his real estate shall descend to her in fee simple. The widow in this case received as an heir to the husband (Rossing v. Rossing). According to Black's Law Dictionary, there are over fifty legally recognized definitions or characterizations of "heir", none of which specifically names or characterizes the wife explicitly. An opposing view which is not consonent with the Indiana court ruling is stated well in a New Jersey case by Chancellor Walker (Reese v. Stires).

> These estates of dower and curtesy, it will be observed, arise out of the marriage relation and become consummate in the wife and husband respectively upon the death of the other spouse, but they cannot be said to have descended to those persons. They become inchoate and are vested in interest during the lifetime of the ultimate beneficiary in the widow or tenant in dower. The husband and the wife are not the heirs of their deceased spouses. Heirs at law stand on a different footing. Their estates are essentially derivative and successional.

In an Iowa case, an insight may be gained into what might lie at the very center of the controversy: the individual state codes (Rausch v. Moore).

> In Section 2440 of the Iowa Code the estate of dower is abolished and in Section 2441 the estate given to the widow is designated as the distributive share of the widow, yet under the code as well as the Act of 1862 it is a materially different estate from that derived by descent.

Perhaps the real confusion is in the fact that the specific languages and interpretations of the statutes and codes of the various states differ, and an aggregate statement cannot be made. In general, it is necessary to investigate the intricacies of each particular state code in its interpretation of the inheritance question as regards the widow; however, this type of research falls outside the scope of work set herein.

The transition of the wife's vested interest: alternative interspousal property ownership methods

It must be concluded that notwithstanding the legislative prerogative, the concept of dower in its derivation, modification and application is after all a vital recognition of the widow's rights both in the personalty and realty of the estate which she may have helped to build, although there is no requirement that she did.

One may conclude from reading Blackstone that the adaptation of the old English common law by the United States has reinforced the

societal view that placed the wife in a childlike status in relation to the husband (7, p. 83) and recognized the widow as a helpless person (50, Jer. 49:11). Therefore, although she has been considered non compos mentis (Haggerty v. Wagner) and not capable of legally owning in fee simple her husband's property upon his demise, she could have a conditional life estate composed of some portion of this total estate, upon assignment to her by her son. As time progressed, so did the law in its reflection of societal philosophy. Various options for interspousal property ownership were developed. The specific intent that would necessarily serve as a catalyst for these new developments is not clearly stated in the literature. It is doubtful that these new forms of joint ownership were in recognition of the wife's contribution, or in response to any increased awareness of the woman's rights, as the expression of these sentiments is a modern day phenomenon. More probable sources of sensitization and subsequent change might be found in: i) the institutional instability of dower in its judicial interpretation and legislative metamorphosis; ii) the increasing estate taxation (or "death duties" as referred to in England); and iii) the increasing estate size.

The institutional instability of dower has been discussed and is hypothesized to be of secondary or minor importance as a catalyst for the development of alternative forms of property ownership among spouses because the dower effect can be created or even exceeded (if desired) by bequest in the property owner's will.

Further, it is suggested that the increasing estate size and the accompanying effects of a progressive federal estate tax schedule have directly influenced the transition from sole-husband property ownership to an alternative form of joint ownership among spouses. The data presented in Table 2.1 suggest that the value by gross estate size has increased by more than a factor of four in all size classes (except 4) during the years 1937 to 1960 in the United States. According to Shoup, there is also an increasing trend in the number of total federal estate tax returns over the period. This can be seen in Table 2.2. Summarily, there is an increasing number of estates of increasing size and value. Consequently, an increasing number of estates are becoming subject to federal estate taxation.

One of the major impediments to research on the various forms of interspousal property ownership in the United States is the paucity of aggregated data with regard to the types, incidences of and method of value of interspousal property ownership. The data exist in disaggregated form in bank mortgage departments, savings and loan mortgage departments, county courthouse probate records, and lawyer's offices across the country. Hence, the data are not readily accessible to the researcher due to the accompanying time and cost constraints involved in the recovery process.

One such study, of limited geographical scope, was conducted by Lanpher and reported in an unpublished 1955 dissertation (39).

Table 2.1. Trends in estate size in the United States[a]

Class #	Size of Gross Estate (000s)	1937 Value	1937 %	1949 Value	1949 %	1958 Value	1958 %	1960 Value	1960 %
1	0- 200	1,065.3	35	2,120.7	43.2	4,594.5	39.4	5,259.5	36.0
2	200- 500	592.7	19.5	1,194.0	24.3	2,762.0	23.7	3,399.0	23.2
3	500- 1,000	350.9	11.5	657.8	13.4	1,530.0	13.1	1,864.0	12.8
4	1,000- 5,000	618.8	20.3	752.0	15.3	1,890.8	16.2	2,559.8	17.5
5	5,000-10,000	175.4	5.8	133.8	2.7	383.5	3.3	442.9	3.0
6	10,000-over	243.9	8.0	56.3	1.1	487.0	4.2	1,096.8	7.5

[a]Source: Shoup (47), p. 11.

Table 2.2. Federal estate tax returns in the United States[a]

Size of Gross Estate (000s)	1937	1949	1958	1960
	Number of Returns			
0- 200	12,986	20,345	42,980	48,868
200- 500	2,046	4,065	9,322	11,420
500- 1,000	524	961	2,242	2,747
1,000- 5,000	337	420	1,056	1,399
5,000-10,000	28	19	57	65
10,000-over	11	4	28	39

[a]Source: Shoup (47), p. 11.

In this study a random sample of courthouse records and personal interviews with farm real estate owners concluded that joint tenancy ownership of land was increasing in use in Iowa. Later, in a 1974 study by Achterhof (1) a random sample of 22 Iowa counties provided the data base. From an estimated 20,000 estates, for which probate was completed during the year of the study, a sample of 1,000 estates was selected. It was found that 72.8 percent of the estates whose net value was $130,000 or less (considered a small estate), and 25 percent of the estates of larger value were held in joint tenancy (limited to real estate). It is suggested that one probable reason for the past popularity of the joint tenancy form of property ownership may lie in its major characteristic: the right of survivorship.

Currently, among the fifty states, there are several forms of property ownership used by spouses. The choice among them depends upon statutory specifications of the individual state where the property is located, to a large extent upon the advice of legal counsel in the individual family case and the preferences of the parties involved. The various major types of property ownership which a husband and wife may utilize during life are relatively few in number, but among these types is found the variability to meet most types of property ownership and transfer objectives of the spouses. Those available for use are: i) fee simple; ii) tenancy in common; iii) tenancy by the entirety; iv) joint tenancy; v) community property; and iv) the life-estate remainder.

Property ownership in fee simple is a complete right (subject to the powers of the state) to the use of the property and all profits derived from that property with no other person having interests or rights therein (6, p. 179). Upon the death of the property owner, if testate (with a will), the devolution of property is in accordance with the provisions of the will. If the owner dies intestate, the state in which the estate is located provides the specific rules which govern property devolution.

Tenancy in common is ownership by two or more persons holding distinct titles, neither having the complete rights of the fee simple form (Fullerton v. Storthz Bros. Inv. Co.; Fry v. Dewees). There is

no right of survivorship with this form of ownership; upon the death of one cotenant the rights of the others are not reduced in any way. Each cotenant may sell his or her portion.

Tenancy by the entirety may be used only by married persons and has the right of survivorship. Neither spouse may sell without approval of the other (Dutton v. Buckley; Milan v. Boucher). Not all states recognize this form of ownership; for example, Iowa does not.

Joint tenancy is a form of ownership where specific property is owned jointly by two or more persons. There is a right of survivorship associated with joint tenancy (Simons v. McLain; Thornburg v. Wiggins). This form of ownership is not limited to spouses as is the case with tenancy by the entirety.

Community property ownership, as has been discussed, is based on the idea that all property acquired during the marriage by either spouse (except that by inheritance or gift) is owned equally by both spouses in common as a kind of marital partnership, though not a legal one (Coleman v. Coleman; Brown v. Cobb). This form of ownership is recognized in seven states, plus Louisiana with its peculiar form derived from the French.

The remainder according to Black is "the remnant of an estate in land, depending upon a particular prior (life estate created at the same time and by the same instrument, and limited to arise immediately upon the determination of that estate, and not in

abridgement of it" (5, p. 1456). In the interspousal context, one spouse, seised in fee simple, may grant lands to the other spouse (as tenant for life) for the remainder of that person's life, and to the children and their heirs (as remainderpersons in fee) after the second spouse's death.

The above distinctions and refinements on the principles of property ownership in the marital framework represent to a large extent the diversity of human desires, the need to protect and pass one's property to a surviving spouse and to provide a steady stream of income for one's family after death. It is hypothesized that the choice of a particular form of property ownership, and the implied balance of property ownership between spouses, decidedly affects the ability of the particular estate plan to achieve the objectives of the property owner(s). This is discussed in Chapter III.

The Wife's Contribution in Estate Building

Due to the adoption of, or the influence of English common law among forty-two of the American states the dominant pattern of interspousal property ownership seems to be that property is held in the husband's name alone. This pattern apparently reflects the philosophy that the husband is assumed to be the spouse employed in business activities outside the home for which pecuniary remuneration is realized. However, within the sphere of the family household the wife has contributed directly to the processing and manufacture of a vast array

of goods consumed in the household. In addition to this material production effort she has performed in the routines of homemaking, such services as: education, nursing, counseling, household investment and accounting, gardening, cleaning, cooking, etc. The list is long and the goods and services are real, yet in the end these are considered as marital duties by the law which have no cash value, and therefore have not been used in estimating the wife's contribution to the purchase of and participation in the ownership of the realty or personalty which comprise the family estate (41, p. 278). Therefore, given the apparent societal commitment to the pecuniary income as a measure of worth in the United States, the estate, which is comprised of various types of property and purchased with the income derived from the husband seems to have been considered owned solely by him (41, p. 278). In one court case it was held that the ordinary domestic services which might be expected of a wife will not constitute a contribution on her part to jointly held property (Bushman v. United States). The wife assisting her husband in the family business (without formal contractual agreement to share profits) does so out of love and affection. Therefore, any property purchased with the income from that business was deemed to have been purchased exclusively from the husband's funds. However, in a recent case, the court held a partnership to exist on the strength of the wife's post death arguments of contribution to the farming operation (Craig v. United States). Although, in recent years this dominant philosophy has been challenged

by an increasing sensitivity to women's rights, the problem of recognition of and valuation of the homemaker's contributions still exists.

The problem of non-recognition of the wife's role as a participant in the accrual of the family wealth is essentially two-fold: i) being able to lay claim to part of the family income; and ii) being able to build up an estate of her own.

In the case of joint tenancy and tenancy by the entirety, the surviving spouse is required to bear the burden of proof of contribution in money or money's worth toward the purchase of real and personal property in the gross estate for federal estate tax purposes. It should be noted that this is true only if the 1976 "fractional interest rule" is not applicable. In the case of the surviving wife, proof must be submitted that money (or money's worth) contributed was her own and in no way was derived from her husband or earnings of assets owned by the husband (53). In the fee simple and tenancy in common types of property ownership there is no right of survivorship; therefore, the property in the decedent's estate is not automatically that of the survivor, but must pass through probate. In the joint tenancy and tenancy by the entirety forms which possess the right of survivorship, the property is said to "pass" to the survivor(s) and it is only for estate and inheritance tax purposes that the property is brought back into the decedent's estate. It is at this point that the proof of contribution may be required of the survivor(s).

There was at one time question of the constitutionality of the tax on jointly held property. According to Lowndes, Kramer and McCord "There is no transfer from the decedent to the survivor(s) because the title to the property held in joint tenancy or tenancy by the entirety is one and indivisible. Each tenant has the whole title. Therefore, when one tenant dies his interest is obliterated and title to the property continues in the survivor(s)" (41, p. 290). However, the court held that, from a practical viewpoint, upon the death of one of the tenants the effect was that of passing to the survivor(s) substantial rights in respect to the property (Tyler v. United States).

In 1976, many farm families joined in the movement for estate tax relief that confronted Congress. One of the major concerns was expressed by farm wives and widows who claimed that, although the estate tax was intended as a tax on intergenerational transfer, the method governing the attribution of property ownership held in joint tenancy had become outdated and for all practical purposes made the estate tax a "widow's tax" (49, p. 12). Many farm wives believe they have contributed substantially to the net worth of the estate. However, unless the wife could demonstrate actual cash contribution (independent of the husband), she was in a position of inheriting assets that were arguably already hers in an equitable sense. The problem generally centered around the documentation of contribution to the estate building process.

The Revenue Act of 1978 legislated an alternative provision to the special husbands' and wives' "qualified joint interest" provision of the Tax Reform Act of 1976 for certain farm and closely held business property held in joint tenancy or by the entirety (16, p. 148). For joint tenancies created prior to 1976, the portion to be included in the deceased joint tenant's gross estate is based upon the percentage of his or her contribution to the total cost. However, after 1976, spouses may create a joint tenancy or tenancy by the entirety in property and only one-half of its value will be included in a decedent joint tenant's gross estate regardless of which spouse furnished the consideration for the property if it meets specified requirements (16, p. 148). The alternative provision (1978 rule) reflects recognition of contributions made to acquire such jointly held property and for materially participating in the operation of these enterprises. "This alternative also reflects Congressional intent to not penalize spouses for lack of legal counsel in arranging the property business entity, such as a family partnership, so that some recognition would be given to the services performed by the spouse" (16, p. 148).

Time valuation studies

It is assumed that if a material contribution were made by the wife, in the marital context, it would be counted. Therefore in consideration of the requirement of proof of contribution, research is needed to develop methodologies for the valuation of the homemaker's

contribution, both within the home and with the family business as an unpaid laborer. Of course, monetary contributions by the woman employed outside the home as paid labor would be easier to ascertain since the remuneration information is provided annually on income tax returns filed with the Internal Revenue Service.

With the objective of valuation of the homemaker's time spent as unpaid family labor within the family business, research has been done by Huffman (32) using Census of Agriculture data. The data indicate that farm wives contribute significantly to farm output and that the marginal products of their time in farm work compare favorably with their non-farm wage potential. In view of the fact that much of American agriculture continues to be organized around the family farm, of which husband-wife families are the predominant type, and considering that evidence has shown a rising participation of farm wives in work outside the home and on the farm, Huffman suggests the need for determining the value of the production time of farm wives. He cites a 1968 United States Department of Commerce report in which the data show an annual participation rate in farm work by farm wives of 42.8 percent. Wives reporting farm work devoted an annual average of 19.9 hours per week (32, p. 837). Huffman's studies empirically offer the comparison of marginal products of labor of husband and wife in Iowa, North Carolina and Oklahoma, shown in Table 2.3 below.

Table 2.3. Marginal products of labor of husband and wife[a]

Variable	Marginal Products of Farm Labor		
	Iowa	North Carolina	Oklahoma
Husband (man day/year)	19.49	17.26	15.25
Wife (woman days/year)	14.65	23.73	12.16

[a]Source: Huffman (32), p. 840.

These figures suggest that the productivity rates of husband and wife are reasonably comparable (32, p. 840).

Valuation of the production of goods and services performed in the more traditional role of the wife, homemaking, has been addressed by home economists since the early twentieth century. However, as in most areas of economic research, the laboratory is a nation of households and the experimental units are as varied as human nature permits.

In 1960, Gage attempted to identify how the homemaker spends her time, and then valued these activities (23). Using a sample of fifty homemakers in one New York county, Gage determined the average amount of work performed in a designated period of time. The research followed the standard practice of determining the average cost of production, which is frequently expressed as average cost measured in units of time or average output per worker per unit of time.

Since the early 1970's, Cornell University has been engaged in extensive research in the area of identification of family characteristics which serve as variables in the determination of homemaker's work activities, methods of measurement and data collection, and measurement of production by the housewife. As one component of this ongoing research project, Gauger and Walker placed a monetary value on time homemakers spent in specified activities in the family home. In a later study, Gauger attempted to incorporate the valuation of household work into the National Income and Product Accounts, which have never valued the homemaker's services in the home due to the fact that they are not sold in the marketplace (24).

The Cornell study was concerned with two measurable aspects of household production: i) the amount of time spent to keep a household running; and ii) the amount of goods and services resulting from the time spent. The term "running" was not defined explicitly; it is, therefore, suggested that measurement of the amount of time spent to keep a household running necessarily requires a good deal of standardization and assumptions to account for obvious differences between different households across differing ethnic, socio-economic and geographic groupings in the United States. For the purposes of quantifying the non-market household production Walker and Woods used the equation: $T = G + S$. This input/output relationship expresses the hypothesis that the time (T) spent in household production equals

the goods (G) and services (S) produced (58). Of course, the assumption being made is that labor is the only input such that known quantities on the left hand side of the equation (T) could be used to determine the value of the right hand side (G + S). Since household work by the homemaker has no monetary value set in the marketplace, some factor must be used on which a value can be placed.

The advantages of time as a measure of household production are that it varies principally with the amount of work accomplished in each activity, is additive and is expressible in divisible units. It can also be expressed in terms of wage rates. In this Cornell study, time was the resource used. The study resulted in a confirmation of a direct relationship between family composition and the time spent on household work. One shortcoming of the study was the failure to devise an appropriate means of attaching monetary value to time use. That is, once the time measurements for individual household tasks were taken, appropriate standards to be used for placing a monetary value on time spent in various tasks became the problem.

According to Gage, a widely used procedure for valuing homemaker's labor time, referred to as the "Chase Procedure" (after the original study by the Chase Manhattan Bank), has little conceptual merit (23, p. 43). This procedure involves identifying an array of occupations that appear to be analogous to the tasks performed by the housewife, and then valuing the homemaker's time at average wages received in those occupations in the market. The problem with the

procedure is that the wages paid in the market to those occupations are based on training, experience, union-membership, licensing and other criteria that the homemaker in a majority of cases would not meet.

It appears that much more work will be required before a commonly accepted procedure can be developed for use by the homemaker, as related to her contributions to the accrual of the family estate and right to property ownership. The implicit distinction is made here that demonstrations of the value of the wife's contribution is quite a different endeavor from securing the credit for those services in the form of property ownership. There is a need to provide a formal niche for the wife in the family business that will allow her legitimate claim to part of the income from that business. This would be a significant step toward solving the problem of ex poste valuation of services for use in proving contribution during probate procedures for federal estate and inheritance tax purposes.

CHAPTER III. A THEORY OF OPTIMIZATION IN ESTATE PLANNING

In General

The major goal and central rationale for estate planning is the realization of the intertemporal objectives of the estate owner(s). The planning horizon stretches from the time of property accumulation across the deaths of both spouses. In decades past, estate planning activities were at a minimum level for most individuals with attitudes revolving around the notion that estate planning was for the wealthy or elderly. Current economic realities, such as the trend toward larger estates, inflation and relatively rapid price appreciation of real estate have made planning more profitable (in terms of tax savings) and subjected an increasing number of estates to federal estate and state death taxes. This trend can be seen by examining the number of taxable estate tax returns filed as a percentage of adult deaths for selected years: 1939 (1.06%); 1949 (1.36%); 1959 (2.57%); and 1972 (6.51%) (44, p. 269; 56, p. 1-87; 36, p. 27). Under current laws, estates in excess of $250,000 may encounter significant federal estate tax, at the death of the surviving spouse, without appropriate planning (28, p. 1). Hence, estate planning is becoming a necessity for an increasing number of estate owners who wish to realize their property transfer objectives, under the assumption that the property transfer objectives include tax minimization or wealth maximization over both deaths.

Every estate plan assumes the existence of a unique set of planning objectives. To the extent that basic planning objectives have been identified they typically include: i) to provide adequate retirement income security for the spouses (40, p. 1398); ii) to provide for the management of the estate at the death of the first spouse; iii) to pass the maximum amount of after-tax wealth to the surviving spouse (27, p. 5161); iv) to transfer the largest possible amount of property from the parents to the heirs or their favorite charitable organizations (10, p. 177) and v) to allow the estate owner(s) to direct the distribution of their property (26, p. 3).

It should be recognized that the estate planning, which involves concepts from both law and economics for optimization of the estate owner's objectives, is based on the idea that the rational decision maker wishes to realize all expectations to the fullest extent possible, given certain constraints. Toward this end, the decision maker relies on economic analysis to determine the conditions necessary to satisfy these objectives. Optimization in estate planning is a legal/economic process of determining the best choice among several alternatives in order to achieve the estate owner's objective(s). Although many different estate planning objectives have been identified, the work herein focuses on maximization of after-tax wealth over the death of both spouses.

In the arena of estate planning it is usually assumed that the estate owner derives negative marginal utility from paying an additional

dollar in tax. Given this, the question of optimality could be represented as a dual objective function, the maximization of after-tax wealth across both deaths or the minimization of cost across both deaths. However, these objective functions are not equivalents. Careful consideration should be given the time factor in terms of when taxes and costs are paid and the element of uncertainty in the minimization of cost across both deaths. The usual case involves a separation in time between the deaths of both spouses. If the dates of both deaths were known with certainty, minimization of cost across both deaths would be relatively easy to achieve. However, there are two variables, exogenous to the individual, which must be estimated across the time period between deaths: i) the interest rate to be applied to deferred tax dollars; and ii) the rate of inflation (or deflation) as it would affect the size and composition of assets. It is necessary to discount potential asset earnings to their present value in order to achieve equivalence between the dual objective functions. Hence, in the presence of uncertainty, maximization of wealth is not necessarily the same as minimization of cost across both deaths.

The Time Value of Money

To the individual utility maximizer, the choice of receiving a dollar today and a dollar a year from now, in a world of certainty would be an easy one, predicated on the notion of utility maximization.

To the individual, immediate satisfaction derived from current consumption is preferable to postponement. However, from the point of view of a family firm the time preference pattern of receiving that dollar is determined by considerations of investment opportunity.

Given the assumptions of perfect capital markets and certainty, the capital market in equilibrium will have some unique rate of interest, i, and an investment, Io, can always be invested at a rate of i percent per annum, realizing an amount, $Vt = Io(1 + i)^t$ at the end of year t (45, p. 9).

The basic discount rate or "opportunity cost", i, establishes the time value of money, a concept by which one can compare the present value of amounts received at different times in the future. If i is assumed to be constant for all future periods, then the value of V_{t+1} in period t will be $V_{t+1}/(1 + i)$. In this case, the cash flow V_{t+1} is said to be discounted to the period t by the factor $1/(1 + i)$. "In general, the present value of an investment is the sum of the future cash flows, V_t, received as a result of the investment, discounted to the present, minus the value of funds invested in period t = 0. That is, PV = Vo - Io, where PV equals the present value of the investment" (45, p. 9). The given pattern of future cash flows represents a rate of return of exactly i if PV is zero. If the investment earns a return greater than (or less than) i, the present value, PV, will be greater than (or less than) zero. Thus, profitability of an investment can be

determined by its present value (45). The dollar in hand today may be put to work and earn a return over the period it remains in the investment. If the dollar is taken out for consumption or payment of taxes, there is an opportunity cost in foregoing the interest earnings from that dollar over the time period in question.

The underlying concept of the time value of money is that the invested dollar to be received tomorrow does not have the same present value as a dollar received today. The discounted present value is a reliable tool for decision making with regard to alternative investments under the assumption of a perfect capital market, the market rate of interest is known with certainty and the time period of investment is known. However, the notion of the discounted present value of an investment is based on expectations in a world of uncertainty and risk.

Surrounding the concepts of investment, risk, uncertainty and utility maximization is a voluminous body of literature; a survey of this literature is not conducted herein. It is sufficient to understand that to the individual utility maximizer, in a world of uncertainty as to the time and risk elements of alternative investments, subjective judgment (in most cases) will determine the rate of return required of an asset invested. The discounted present value method assists the rational individual in making investment decisions that will allow maximization of utility. Hence expectations of interest rates to be received or return on investment, in an environment of uncertainty and risk, give money its time value.

The Importance of the Time Value of Money in Estate Planning

A general decision problem in estate planning that requires consideration of the time value of money involves the discounted present value of tax dollars deferred into the future. The use of the FET marital deduction (33) reduces the size of the estate of the first spouse to die, by shifting assets that are not consumed or transferred by gift before the survivor's death, to the survivor's estate. That amount of property is not then taxable in the initial decedent's estate, but it increases the tax liability in the surviving spouse's estate under the assumption that the property is not consumed or transferred by gift during the survivor's lifetime.

If the objective of the decedent's estate plan is to pass the maximum amount of assets to the surviving spouse with little regard for wealth transfer beyond the death of that spouse, the increased tax liability in the estate of the surviving spouse is not a decision variable. However, if one's objective is to maximize after tax wealth across both deaths, the concept of the time value of money is of crucial importance. The use, by the surviving spouse, of deferred tax dollars has a value (benefit) which at the margin should just equal the additional tax paid (cost) at the death of the survivor, when compared on present value bases.

Considering the time value of money, ceteris paribus, it is advantageous to postpone the tax (to the extent allowable by law) at

the death of the first until the death of the second to the point where the marginal present benefit just equals the marginal present cost of doing so. The benefit of using deferred tax dollars must be compared to the cost of the increased tax bill at the death of the survivor if the objective function is to minimize the total estate tax paid over both deaths or to maximize after tax wealth over both deaths. Wealth is measured in present value terms at the first death. This is important because the optimality of the specified size of the marital deduction is dependent upon maximizing the savings across both deaths (e.g. an actuarily determined time period). However, the decision period is the current period, the bounds of which are from the time of property accumulation to the death of the property owner. Therefore, the flow of net benefit derived from the use of the marital deduction amount, must be discounted back from period t (the period of the survivor's death) to the present for decision making purposes. Mathematically, the decision problem could be represented by equation 3.1.

$$(3.1) \qquad Bpv = \frac{D(1+r)^n - C(r)}{(1+r)^n}$$

Equation 3.1 states that the present value of the benefit (Bpv) of deferring tax dollars into the future at the death of the first spouse via the use of the FET marital deduction equals the total revenue $[D(1+r)^n]$ derived from the use of those dollars over the period, minus the increased tax liability $[C(r)]$ in the estate of the survivor,

discounted back to the present period (at the death of the first spouse). It is important to understand that both revenue and cost are dependent upon the magnitude of the adjusted growth rate of assets in the estate portfolio. The magnitude of r determines the size of the estate at the survivor's death, consequently the FET bracket into which the estate will fall taxable, and the FE tax liability in the survivor's estate. The size of the FET marital deduction amount claimed in the initial decedent's estate is critical (in relation to the rate of return) in that the value of Bpv must be positive for the use of the FET marital deduction to have positive utility for the property owner in terms of meeting the objective(s) of the estate plan for wealth maximization over both deaths. If Bpv is zero or negative, then the amount claimed as the FET marital deduction is in excess of that amount necessary to maximize the objectives of property transfer, under the assumption that the objectives of property transfer include maximization of wealth or minimization of tax across both deaths. It may be concluded that part of the information required for rational decision making in estate planning is that needed to permit the optimal use of the FET marital deduction. Alternative models for determining the optimal size of the marital deduction are discussed in Chapters IV and V.

Interspousal Property Ownership in Estate Planning

Recognizing that an estate plan embodies specific transfer objectives held by the spouse(s) that are implemented in the pattern

(i.e. balance) of property ownership, it is appropriate to investigate the connection between the pattern of property ownership as between spouses and the estate plans chosen for implementation.

The assumed dominant philosophy of interspousal property ownership, discussed previously in Chapter II, has been hypothesized to be based on many factors, such as: religious influences, the increasing estate size, the desire to retain wealth within the nuclear family unit, and that the husband (being the spouse employed outside the home in an income earning capacity) maintains the title and rights to the estate property in his name. Given the historical pattern of concentration of property ownership in that of one spouse, it is more easily understood why the most employed estate planning model has been that which Harl terms Model I (26, p. 41).

However, this assumed historical philosophy and consequent pattern of interspousal property ownership is being challenged by spouses with the realization of the wife's possible contributions to the accrual of the family wealth during the marriage. In correlation with this changing philosophy there is expected to be a shift in the patterns of interspousal property ownership. An estate plan which most nearly incorporates this idea is what Harl has called Model II (26, p. 45).

The effective coordination of pattern of property ownership and objectives held by the property owner(s) in the creation of an estate plan may not allow for the economic optimization of the objectives. In

an attempt to optimize the property owner's objective function Harl has developed a third model plan, Modified Model II (26, p. 47).

Model I

The Model I estate transfer plan is the "the most widely used approach to death tax savings since the introduction of the marital deduction in 1948" (27, p. 5163). Notwithstanding the popularity of the approach, it must be recognized that this plan may be misunderstood in terms of its outcome. The misunderstanding may be seen in its assumptions, which must be fulfilled or the resulting tax impact could be far from that which was expected. These critical assumptions are: i) that one spouse, typically the husband, owns all or most of the property; and ii) the propertied spouse dies first. The mechanics of the model are exemplified in Figure 3.1.

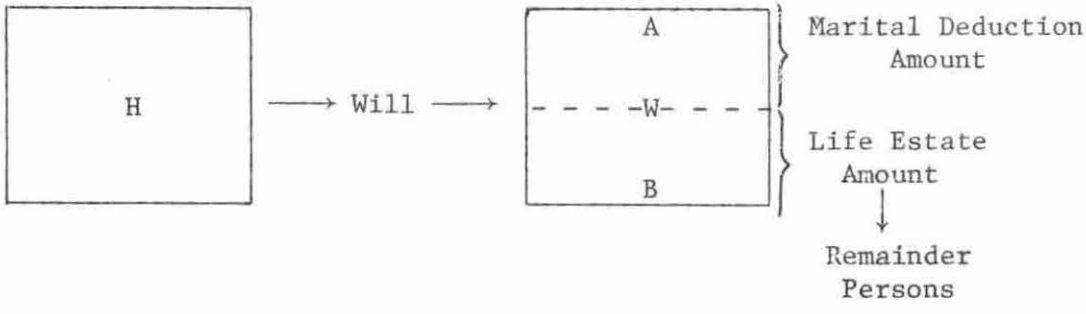

Figure 3.1. Model I estate planning schematic (Source: Harl (26), p. 41)

The propertied spouse, shown here to be the husband (H) passes his property through the will to his wife (W) in two amounts "A" and "B". "A" is designed to qualify for the marital deduction and is usually set at the maximum level, the greater of fifty percent of the adjusted gross estate or $250,000 (34). The wife may be free to dispose of or consume any or all of "A" with no constraint; therefore, at her death the residue of "A" is taxed in her estate. "B" is left to the surviving wife in a life estate with a remainder interest passing to the remainderpersons (typically the children). The wife's right to consume or otherwise dispose of the principal of "B" is limited by the law (54).

Owing to its perceived tax saving potential, models similar to Model I are presented in many estate planning manuals. In one such manual, Hoffman states without reservation, "Keep in mind that the maximum estate tax advantage to be derived from the marital deduction involves passing enough to the surviving spouse to secure the full deduction " (31, p. 65). Unfortunately, the critical importance of the two assumptions is overlooked completely, for there would be no tax advantage if the non-propertied spouse died first, followed by the death of the unremarried surviving spouse.

Model II

The major distinction between Models I and II is in the pattern of property ownership from which the operative assumptions flow.

With Model II, it is assumed that the property is held in balanced amounts between the spouses. This can be accomplished in a variety of ways: i) through the separate ownership of various items of property; or ii) by tenancy in common (25, p. 9). Further, it is inconsequential which spouse dies first, for there is no actual marital deduction being claimed because the balancing of estates occurs during life. Figure 3.2 illustrates the mechanics of Model II.

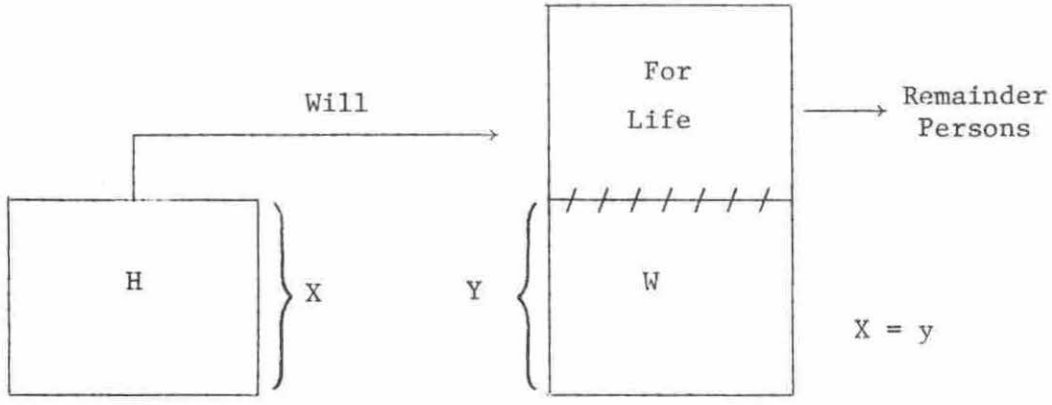

Figure 3.2. Model II estate planning schematic (Source: Harl (27), p. 5161)

Model II assumes each spouse leaves his or her property to the surviving spouse in a life estate. That property is taxable in the estate of the initial decedent. The survivor has the right to income from the entire amount of property with the usual "life estate" limitations on the disposition of the principal held in the life estate portion. Under this simple model, half of the property is taxable in

the estate of the first to die, and the residual is taxable at the death of the surviving spouse. Since optimization of a wealth objective over both deaths requires the consideration of the time value of money, this is generally not an economically optimal estate planning procedure.

Modified Model II

The central feature of Model II, balancing of the estates of the husband and wife during life, is preserved in modified Model II. It remains unimportant which spouse dies first with regard to the operation of the plan. The key feature of this modified model is the unbalancing of the estate of the first to die via the use of the marital deduction. By so qualifying a portion of the estate of the initial decedent, the tax burden on that estate is reduced. Because there is an opportunity cost associated with this tax differential, that of the interest-free use of the deferred tax dollars over the period between the spouse's deaths, it is desirable to reduce the size of the first estate. This is accomplished by increasing the marital deduction to the point that the marginal revenue from deferred tax dollars equals the marginal cost of the additional taxable property in the survivor's estate, in present value terms. Schematically, modifed Model II can be shown in Figure 3.3.

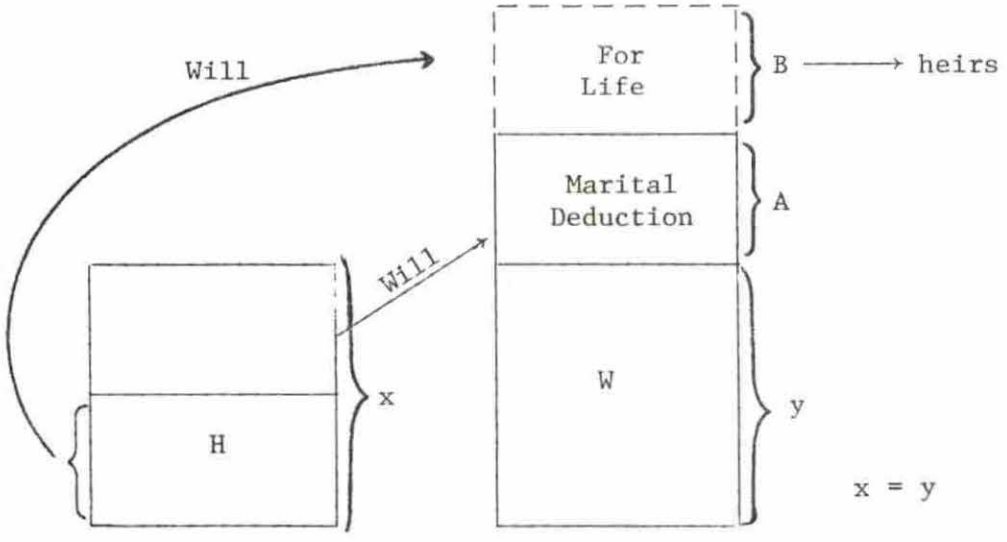

Figure 3.3. Modified model II estate planning schematic (Source: Harl (27), p. 5166)

The optimal marital deduction

The optimal size of the marital deduction under an assumption of wealth maximization over both deaths is a function of several variables specific to the individual estate and estate owners. Borcherding (11, p. 8) has identified the optimal marital deduction as a function of twelve exogenous variables, as represented in Equation 3.2.

$$\text{M.D.} = f(\text{OEh}, \text{OEw}, \text{CRh}, \text{CRw}, \text{LE}, g, r, d, \text{CHh}, \text{CHw}, \text{C}, \text{I}) \tag{3.2}$$

These variables are, in order: the size of the husband's (OEh) and wife's estates (OEw) respectively; the size of the unified credit (33)

available to both spouses (CRh, CRw); the life expectancy of the surviving spouse (LE); the expected growth rate (g) of property taxable in the surviving spouse's estate; the expected rate of return (r) on deferred tax dollars; the discount rate (d); the number of children inheriting at the death of each spouse (CHh, CHw); possible changes in the tax policy (C); and the eligibility for the "fifteen year" installment payment provision (I) for the federal estate tax due on business property (34).

Of these twelve variables, values for eight are determined and four must be estimated: the life expectancy of the survivor which is actuarily determined and adjusted for the state of health; the growth rate of assets; the rate of return to be applied to deferred tax dollars; and the discount rate. It should be noted that Borcherding assumes that there is a difference in magnitude (by definition) among the variables g, r, and d. This assumption does not apply herein. The theoretical framework for the model developed in this research is provided in Chapter V.

CHAPTER IV. ALTERNATIVES FOR THE DETERMINATION OF THE OPTIMAL MARITAL DEDUCTION

The Isolated Model

The determination of the optimal marital deduction under an assumption of maximization of wealth over both deaths entails simultaneous consideration of many variables. Complex computations of this type are facilitated by computer assistance. Because the area is relatively new, little research work has been done in the area of computer assisted models for the determination of the optimal marital deduction for estate planning purposes. Relatively more work has been done in the area of optimization in estate planning in general; however, those studies seemingly have failed to recognize the critical importance of the marital deduction (40).

In 1973, Schnee designed a computer assisted simulation model to indicate the optimum marital deduction (46). In his model he identified six variables: the estate size of the decedent and spouse, after-tax rate of return to the spouse and other beneficiaries, the life expectancy of the surviving spouse, and the amount of property transferred to the spouse (in twenty percent intervals). The empirical work was used to formulate "rules of thumb" as to relative rates of return to be received by recipients of the decedent's estate with emphasis on the survivor's life expectancy as it affects these returns. The objective function includes maximization of the rate of return on

the qualified marital deduction property. This approach is a comparative one, and as such seems to discount the objectives of the estate owner(s). More specifically, the implicit assumption made is that the property owner, in creating an estate plan, is indifferent as to whether the spouse or others are the beneficiaries of the property. The relevant criterion for decision making is the highest rate of return determined among the classes of beneficiaries. In addition, Schnee's model did not provide a uniquely optimal marital deduction for specific estates.

A more extensive model was developed by Borcherding in 1977 (11). Assuming that maximization of after-tax wealth across both deaths (wealth measured in present value terms at the first death) was an objective of the estate owner(s), the focus of the study was the calculation of the optimal marital deduction specific to any estate for which individual values of the relevant decision variables were determined. Borcherding adopted the basic modified Model II estate planning technique, discussed in Chapter III. Selecting a bounded programming approach, he observed that the tax due is a linear function of the size of the taxable estate within each federal tax bracket. The use of this method allows for continuous observation of the marital deduction as it changes over all possible ranges. The optimal size is then easily determined.

Borcherding's model is the most advanced operational model available for the computation of the optimal size of the marital

deduction to be used, given specific estate values for the variables. However, there are limitations and problems which should be mentioned.

Borcherding used computer assistance in the form of a linear programming (LP) approach to perform the required iterative mathematical calculations in solving for the optimal value of the marital deduction that will allow the estate owner(s) to maximize their objective function. The linear program is designed to calculate the optimal combination of activities given certain constraints and variable costs (Cj) in matrix form. The Cj coefficients in Borcherding's linear program were defined to be the marginal final effective combined tax rates of the surviving spouse and the inheriting children. One practical problem with the LP approach is that a considerable number of hand calculations is required to specify the Cj coefficients in the LP matrix. Further hand calculations are required after the LP program has been run to discount the net savings to present value. Therefore, although the model does provide a unique solution, it is not an efficient method.

The model specifically assumes the estate owner's objective to be the maximization of after-tax wealth over both deaths as the estate passes to the heirs. This has been found to be an objective held by estate owners (27, p. 5161); however, to the extent that other objectives are held, this model does not provide an optimal solution.

Consumption is explicitly considered in the computation of the growth rate (though not in the rate of return) as a constant value of

three percent per annum over the time period between deaths. Although consumption by the surviving spouse is not a stochastic term, it is considered to be a function of the size of the property not in the life estate, the income derived from the life estate and of individual utility. Therefore, to the extent that this model strives to individualize the results to specific estates and estate owners it is suggested that the assumption of a specific percentage consumption rate over all estate owners may not be acceptable.

Under the assumption that there is a difference between the rate of return applied to the deferred tax dollars and the growth rate assumed for assets in the survivor's estate, Borcherding has shown that the rate of return (r) must always be greater than the growth rate (g) for the marital deduction to come into solution at a positive level. In fact, the rate of return must be a minimum of three to four percentage points larger that the growth rate for the marital deduction to be positive (11, p. 34). Therefore, an estimated constant growth rate of eight percent would require a minimum of eleven percent rate of return on deferred tax dollars for any use of the marital deduction. However, one must consider that the available rates of return may be less than this value. The calculations at less than eleven percent, ceteris paribus, can mathematically provide a negative value which, although having no meaning with the law, theoretically indicates the "shadow size" of the marital deduction. That

is, the amount of property which should be placed back into the estate of the actuarily determined spouse to be the first to die, for an optimal solution to the stated objective function, given all the values of the relevant variables. Theoretically, this suggests even greater flexibility than Borcherding had realized in the unbalancing of the estates at the death of the first spouse, along the lines of modified Model II. Whereas, previously the use of the marital deduction was supposed to allow for the maximization of after-tax wealth over both deaths by unbalancing the estates at the actuarily determined first death by decreasing the estate size of the first, the "shadow marital deduction" could be used to indicate what steps should be taken to unbalance the estates before the first death by increasing the estate size of the first in the amount that is computed in negative ranges. However, the important underlying assumption of a magnitudinal difference between the rate of return to deferred tax dollars and the rate of growth of assets in the portfolio remains an important theoretical question.

Borcherding's results shed considerable light on the traditional use of the marital deduction by many estate planners (31), that of claiming the maximum deduction allowable. This practice appears to have been widespread due to the immediate benefit derived from the use of those dollars by the surviving spouse. Borcherding's results indicate that although the marital deduction was designed as a method of reducing the tax burden of the surviving spouse, in many cases

(depending on the expected values of the critical variables) any use of the marital deduction may be at a cost to the heirs, and at the expense of the objective function held by the estate owners of passing the greatest amount of wealth to those heirs.

Finally, Borcherding's model produces acceptable results, given the assumptions, with regard to the optimal size of the marital deduction. However, for each estate specific values for the coefficients must be manually calculated before the optimization work is performed with computer assistance. The optimal solution can then be considered as a further factor in the larger estate planning procedure as a separate item of information. It is suggested that increased efficiency could be gained by the incorporation of this type of model as a sub-routine in a larger estate planning model such as the Boehlje-Harl model (28).

The Integrated Model

The Boehlje-Harl computer assisted estate analysis model is currently operational as a planning instrument at Iowa State University. The model comprehensively incorporates economic theory and estate law that together form the basis of evaluation of individual estate plans relative to the stated objectives of the estate owner(s). Boehlje has summarized the estate owner's decision problem (8, pp. 2-3).

> Estate management planning requires the simultaneous analysis of estate creation and estate transfer decisions in an environment where time is considered explicitly . . . . Creation

> decisions involve selecting among various consumption and investment alternatives . . . . Transfer decisions include the choice among alternative types of wills, types of property ownership, sales agreements, gift arrangements, trust and business organization. . . the specific transfer methods, the type and amount of property and the recipient of the property . . . . Each set of creation and transfer decisions results in a different level of satisfaction of the estate management goals.

Considering that this model is a realistic and operational technique designed to provide the estate owner the comparative information necessary to choose the best plan, it is obvious that rather specific and personalized information is required from the family in question. The input necessary for analysis falls into three categories: i) family characteristics; ii) estate characteristics (in terms of size and asset composition); and iii) the estate plan(s) as desired or given.

Relevant estate characteristics may be obtained, with some augmentation, from information on the family's current financial statement. Property is identified by type (business real, non-business real, business personal, non-business personal--both tangible and intangible, and life insurance) and by method of ownership (fee simple-husband, fee simple-wife, tenancy in common and joint tenancy). Other useful information is the current or special use valuation of business real property, and the income tax basis of all property.

The current estate transfer plan and/or alternative plan(s) to be evaluated must be specified. If no estate plan is specified, the

program automatically inserts the current state intestacy provisions. The estate plan may identify a gifting strategy and the provisions of the wills of both spouses because the analysis is done both in the short and long run time frameworks.

Given the appropriate input, the output is formatted in four sections: i) summary of family characteristics; ii) estate summary and net worth statement; iii) alternative estate creation-transfer plans and financial consequences; and iv) comparison of estate plans. The computer analysis performed initially considers the current estate transfer plan for an immediate death sequence. In the first case, the husband dies first. Using the data input, the computations estimate the total tax liability of his estate based on current law. Computations of the settlement costs, fees and court costs are based on the current fee schedules, and are added to unsecured debts and funeral expenses. Next, the magnitude of any liquidity problem that may exist is considered. The value of liquid assets is identified and specific assets that should be liquidated to settle the estate are indicated, and the order of liquidation is specified. Liquidation costs are minimized during this procedure to avoid the need to liquidate business property. Finally, the division of the property by type and amount to the various beneficiaries is indicated. This is repeated for the second death and the final disposition of the estate is then indicated. The entire procedure is then repeated for analysis of the current estate plan for the immediate death sequence considering the reverse order of spouse's deaths.

The third major run is for the analysis of the current estate creation-transfer plan for the expected life sequence. The order of death is determined by the ages and states of health of the respective spouses, with the time period specified by actuarial tables. A simulation procedure is implemented to consider explicitly the income generation process, required family consumption, asset purchases, inflation and growth impacts on the estate size and a gifting program. The series of computations described in the immediate death sequence is activated for the completion of the analysis of the current plan.

At this point, any alternative estate plans are considered following the same computational routine.

The final output section allows for the comparison of the plans in terms of their capabilities of meeting the estate owner's objectives and the effects of the plans on the final disposition of the estate.

In its present form the integrated model does have the capabilities for wealth maximization, primarily due to the fact that a routine for the optimization of the marital deduction has been incorporated. The inclusion of this factor as a sub-routine enables the analytical process to specify the results of the current estate plan and the size of the marital deduction to be provided by the estate owner in order to maximize the after-tax wealth over both deaths in the transfer of the estate to the heirs.

CHAPTER V. SOLVING FOR THE OPTIMAL SIZE OF THE MARITAL DEDUCTION

In General

The model presented in this chapter is based on the concepts of marginal analysis within a maximization framework. It has been recognized that the major goal of estate planning is the full realization (optimization) of intertemporal objectives held by the estate owners(s). The optimization problem herein assumes Harl's modified Model II (26). It is recalled that under this model the balancing of the property held by the spouses occurs during life. The marital deduction may then be used to unbalance the property holdings between the spouses at the first death to achieve the objective of maximization of after-tax wealth over both deaths. The decision problem is the determination of the optimal size of the marital deduction, within legal bounds, which allows for wealth maximization.

The Model Assumptions

The assumptions of Harl's modified Model II, as presented in Chapter III, are necessary in that they forward the idea of the creation of nearly balanced estates between the spouse during life. This pattern of interspousal property ownership embodies the recognition, albeit a crude and gross recognition, of contributions made by the spouses in the process of the accrual of the family wealth. This estate planning

approach is expected to increase in use in the future due to the increasing sensitivity to women's contributions. In addition, modified Model II is not dependent upon any particular death sequence. The importance of this should not be minimized in an estate planning process because of the obvious uncertainty surrounding death. Further, the marital deduction is used, at the first spouse's death, to unbalance the property holding for objective function optimization. This type of use of the marital deduction considers the time value of money (e.g. deferred tax dollars).

It is assumed that the surviving spouse remains unmarried until death, and that the only beneficiaries, beyond the surviving spouse, are the surviving children. This last assumption is not critical to the theoretical model; however, expansion of the class of beneficiaries beyond the nuclear family would require the inclusion of additional operational considerations in the mathematical specifications of the model. Hence, the assumption of limited beneficiaries is made to place bounds on the number of necessary tax calculations required in solving the final marginal tax rate schedules to be applied at the first and second deaths.

It is assumed that the state of health of the surviving spouse is normal for age. Also, it is assumed that the tax rate schedules remain constant over the deaths of both spouses and no uncertainty exists as to the tax rate in the second estate. All parameters are assumed to

be exogenously determined and given to the model, with the exception of the size of the marital deduction to be claimed. Finally, an estate planning objective of the spouses is assumed to be the maximization of after-tax wealth over both spouse's deaths.

The Model

In this model, the size of the marital deduction, as a major estate planning decision variable, is determined by the maximization of after-tax wealth over both deaths. The conceptualization of this problem is shown in Figure 5.1.

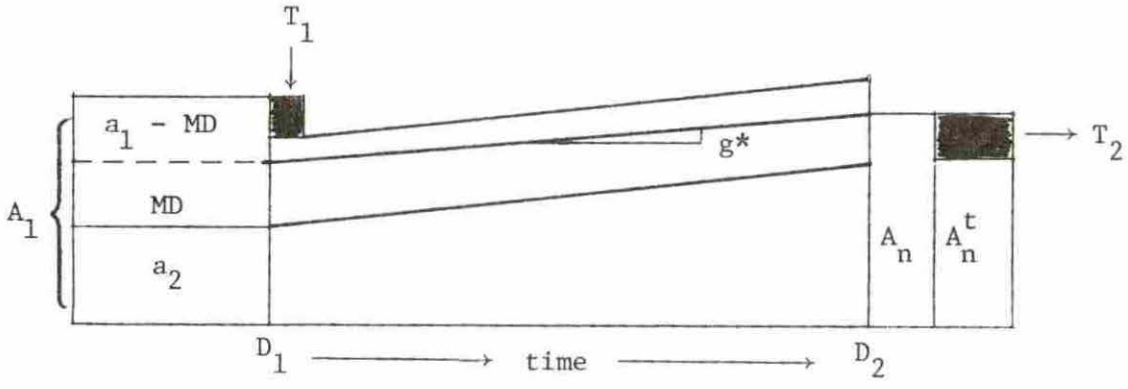

Figure 5.1. Schematic of the intertemporal estate transfer problem

At the death of the first spouse, D_1, the total assets held by the spouses, A_1, is composed of that property held by the husband, a_1, and that property held by the wife, a_2. The dashed dividing line indicates the size of the marital deduction claimed in the decedent's estate (if one is claimed). At the first death, an amount of estate

tax and inheritance tax is paid, T_1, with the magnitude of T_1 depending upon the reduction in size of the decedent's estate by the use of the marital deduction. Stated alternatively, T_1 depends upon the amount of property in the estate and the proportion of the property qualifying for the marital deduction. The after-tax assets in the survivor's estate, at D_1, composed of three amounts (the qualified marital deduction amount, the amount not qualifying for the marital deduction and the property originally owned by the surviving spouse), grows at the after-income tax/after-consumption growth rate, g*. In fact, all property amounts now held in the asset portfolio of the surviving spouse earn this rate of return, g*. It is assumed that this asset portfolio composition (and implied time and risk preference) does not change during the time period between the spouse's deaths.

At the second death, D_2, after n years, the total estate is A_n. The estate assets, excluding the life estate portion which was taxed at D_1, are subject to estate and inheritance taxes, T_2. The resulting after-tax wealth passed to the heirs is A_n^t.

This decision problem is mathematically presented in Equation 5.1.

$$(5.1) \qquad \underset{\frac{A_n^t}{(1+r)^n}}{\text{MAX}} = [(a_1 - MD) - T_1\,(a_1, MD)]\,(1+g^*)^n + [(MD + a_2)\,(1+g^*)^n] - T_2\,(a_2, MD, g^*, n).$$

Where: A_n^t is the total after-tax wealth over both deaths which is passed to the heirs.

$A_1 = a_1 + a_2$ = the total combined property of both the husband (a_1) and the wife (a_2) before death.

a_1 is the size of the initial decedent's estate.

a_2 is the size of the second (surviving) spouse's estate.

MD is the qualified marital deduction amount.

$T_1 = f(a_1, MD)$ = the total tax amount in the initial decedent's estate.

$T_2 = f(a_2, MD, g^*, n)$ = the total tax amount in the second spouse's estate.

$$(5.2) \qquad \frac{\partial A_n^t}{\partial MD} = \overset{(-)}{-\frac{\partial T_1}{\partial MD}} \overset{(+)}{-\frac{\partial T_2}{\partial MD}} \longrightarrow \frac{\partial T_1}{\partial MD} = \frac{\partial T_2}{\partial MD}$$

The asset portfolio, after taxation at the first death, is composed of three distinct property "packages": 1) the after-tax amount of the initial decedent's estate which did not qualify as the marital deduction; 2) the marital share; and 3) the property owned outright by the surviving spouse. From this "grown" amount the applicable taxes are subtracted at the second death (assuming a significant separation in time between deaths). All variables, except the size of the qualified marital deduction, are exogenously determined. This optimization problem centers around the determination of the size of the marital deduction which maximizes total after-tax wealth over both deaths, assuming this objective. However, it is important to note that there are many factors, other than the marital deduction, which need to be considered in this maximization problem.

The first order condition derived (and simplified) in Equation 5.2 states that the optimal size of the qualified marital deduction

is determined at the point where the marginal tax at the initial spouse's death, due to the addition of one more dollar to the qualified marital deduction, just equals the marginal tax at the second spouse's death.

Determination of the Marginal Tax Rates

The effective marginal tax rate structures which determine T_1 and T_2 (total tax liability at the first and second deaths) are the result of several adjustments for credits and exemptions.[1] Specifically, there are three tax equations which play a role in the total tax determination, and are activated in the model as the situation requires: i) the aggregate combined federal estate tax (T_f); ii) the state inheritance tax schedule for the surviving spouse (T_{si}); and iii) the state inheritance tax schedule for the surviving children (T_{ci}). It should be noted that the tax equations are limited in number due to assumption of limited beneficiaries. However, additional equations would be needed if additional groups inherit, where groups are separable for state inheritance tax purposes. A graph of the three marginal tax rate schedules is presented in Figure 5.2. The equations for these individual schedules, given the tax rates and schedules in effect, are presented in Equations 5.3, 5.4 and 5.5.

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[1] The simplifying assumption has been made herein that no part of the available "unified credit" provided under the Tax Reform Act of 1976 has entered into the analysis.

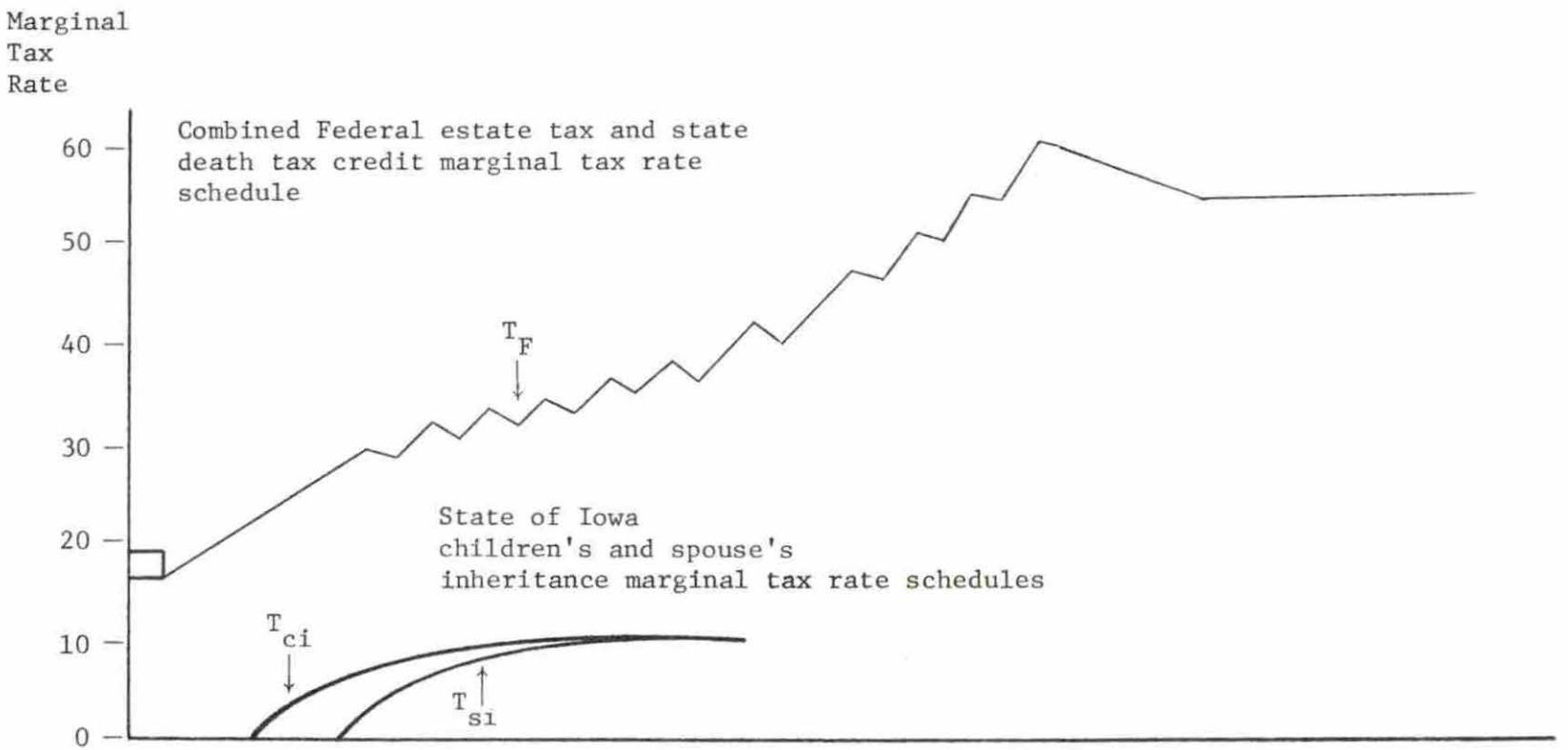

Figure 5.2. Marginal tax rate schedules

$$(5.3)\quad T_f = .18(X-0) + .02(X-10,000) + .02(X-20,000) + .02(X-40,000) + .02(X-60,000) + .02(X-80,000) + .12(X-100,000) + .012(X-150,000) - .008(X-200,000) + .02(X-250,000) - .008(X-300,000) + .022(X-500,000) - .008(X-700,000) + .02(X-750,000) - .008(X-900,000) + .02(X-1,000,000) - .008(X-1,100,000) + .02(X-1,250,000) + .02(X-1,500,000) - .008(X-1,600,000) + .04(X-2,000,000) - .008(X-2,500,000) + .032(X-2,600,000) + .04(X-3,000,000) - .008(X-3,100,000) + .04(X-3,500,000) - .008(X-3,600,000) + .04(X-4,000,000) - .008(X-4,100,000) + .04(X-4,500,000) - .008(X-5,100,000) - .008(X-6,100,000) - .008(X-7,100,000) - .008(X-8,100,000) - .008(X-9,100,000) - .008(X-10,000,000).$$

$$(5.4)\quad T_{si} = .01(X-80,000) + .01(X-85,000) + .01(X-92,500) + .01(X-105,000) + .01(X-130,000) + .01(X-155,000) + .01(X-180,000) + .01(X-230,000).$$

$$(5.5)\quad T_{ci} = .01(X-30,000) + .01(X35,000) + .01(X-42,500) + .01(X-55,000) + .01(X-80,000) + .01(X-105,000) + .01(X-130,000) + .01(X-180,000).$$

It should be noted that T_f, the federal estate tax schedule has been combined with the state death tax credit for Iowa, resulting in a $60,000 required deduction from the federal estate tax (FET) taxable

estate to produce the adjusted taxable estate for use in calculating the credit for state death tax paid. This adjustment yields an effective combined marginal tax structure which is not continuously progressive. T_{si} was adjusted for an $80,000 exemption (under Iowa law) applied to the surviving spouse; and T_{ci} was adjusted for a $30,000 exemption for the surviving children. Other inheriting groups, should there be any, would have different exemptions.

At the death of the first spouse, how will T_1 be determined? Further, at the death of the surviving spouse, how will T_2 be determined? The flow chart presented in Figure 5.3 conceptually simplifies these questions.

At the death of the first spouse, there is a total estate (A_1) composed of the separate property holdings of both the husband (a_1) and the wife (a_2). The initial decedent (assumed to be the husband) has presumably decided to whom, how much and in what form the property in his estate (a_1) will pass. In the framework of this problem, the property may pass totally or partially to the children (C) outright, to the wife via the marital deduction (MD), or to the wife in a life estate (LE) with the children as remainder persons at her death. Different results occur depending upon how the property is transferred. The proportion of the estate which passes to the wife as the qualifed marital deduction is referred to as "e". This proportion, e, is not subject to taxation in the initial decedent's estate. Therefore, this marital share amount grows at the rate $(1+g^*)^n$ over the time period between deaths (n) and is available for use by the surviving spouse until death.

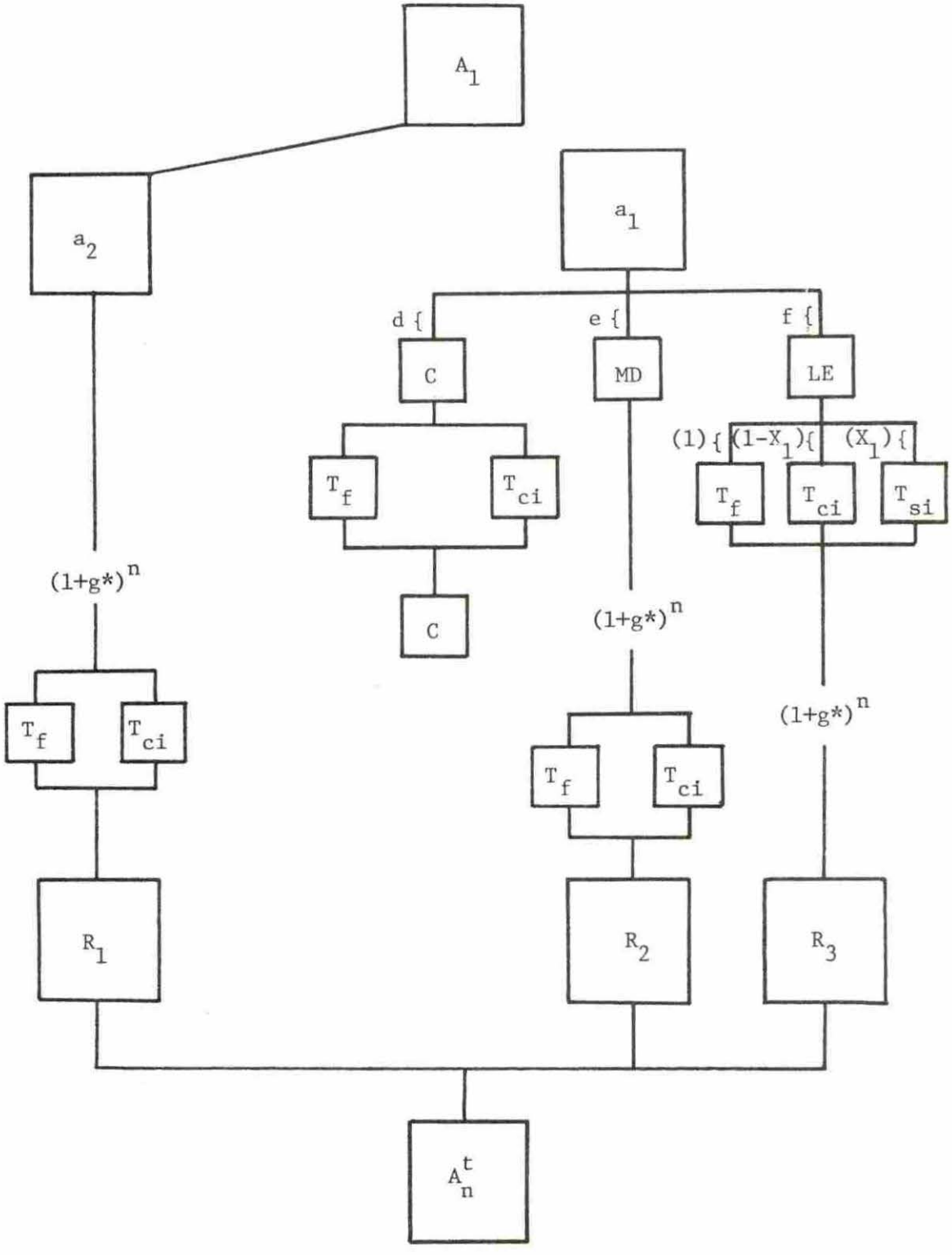

Figure 5.3. Flow chart diagram of property passage and taxes applied to each estate analysis procedure

The proportion of the estate which passes into a life estate is referred to as "f" and is subject to federal estate taxation in the initial decedent's estate. The wife has a life interest in this property (f) and therefore must pay the state inheritance tax on this interest. The tax base is adjusted by a percentage factor derived from the age of the surviving spouse, X_1. The adjustment schedule is taken from Section 451.2 of the 1979 Code of Iowa and is reproduced in Appendix A. Similarly, the inheriting children have remainder interests in this life estate and must also pay state inheritance tax on their interests. The base is adjusted by a percentage factor $(1-X_1)$, and is given in the same schedule found in Appendix A. The after-tax amount of the life estate grows at the rate $(1+g^*)^n$, as does the property owned outright by the surviving spouse (a_2).

At the death of the second spouse the three distinct property amounts (a_2, MD, and LE) have grown in value over the period between the deaths. However, only a_2 and MD amounts are subject to federal estate taxation (T_f) and children's state inheritance tax (T_{ci}). The life estate amount was taxed at the first death. A_n^t, the after-tax wealth, is then composed of $R_1 + R_2 + R_3$ following Figure 5.3.

The optimal proportion of the initial decedent's estate, a_1, which should be qualified as the marital share (within legal constraints) in order to maximize the total after-tax wealth across both deaths is determined through an iterative procedure. This procedure is presented

in Appendix B. Of course, the proportion of the initial decedent's estate which passes to the surviving spouse under a life estate is dependent upon the size of the marital deduction. This is because the after-tax amount, a_1, is composed of d, e and f. The proportion which passes to the children outright, d, is predetermined and given to the model.

The Input Data Required for Computer Assisted Solution

The variable input data necessary for the solution of this problem model are: the size of the total combined gross estates of the spouses (A_1); the adjusted gross estate size of both spouses (a_1, a_2); the specified testamentary provisions of the spouses which determine the proportion d; the ages of the spouses; and the clients' (spouses) expectations of the after-income tax/after consumption rate of return, g*, on the assets in the estate portfolio. Again, g*, is a weighted average of rates of return applied to the individual assets in the portfolio.

The empirical results presented in this chapter were obtained with the assistance of an IBM 370 computer. The mathematical equations presented in Equation 5.3 were programmed in the Fortran computer language. The choice of programming language was made to be compatible with a larger model, such as the Boehlje-Harl Computer Assisted Estate Analysis Model. A print-out of the program is presented in Appendix B.

One purpose of this model development is to optimize the marital deduction in the estate planning process and to allow incorporation into

a larger model, as a sub-routine. Therefore, it is recognized that all of the above-mentioned data, except the client specified interest rate to be applied to the asset portfolio, could be drawn from the larger model with the use of further interfacing programming.

Methodology and Results

The empirical work and conclusions are based on thirty-six test case calculations representing various combinations of six key variables: A_1, a_1, d, g*, n, X_1. Parameter specifications are presented on a case-by-case basis in Table 5.1. The thirty-six cases were calculated with computer assistance. Calculations were made following an imposed pattern of parameter variation allowing for consideration of test case results in groups. This pattern was imposed to allow for the detection of sensitivity of results to changes in the magnitude of one variable while holding the magnitude of the other variables constant. The essential information generated for each test case is presented in Table 5.2.

The spouse's combined adjusted gross estate (A_1) is given at two levels over the thirty-six cases. In cases #1-12, A_1 is set at $1,000,000, with the spouses holding balanced estates during life. In cases #13-24, A_1, is set at $500,000, with the spouses holding balanced estates during life. Cases #1-24 are set up in direct recognition of the assumption of nearly balanced property ownership of the spouses during life, which is employed in Harl's modified Model II.

Table 5.1. Parameter Specifications for 36 test cases

Case ID	A_1	a_1	a_2	d	g*	n	X_1
1	1,000,000	500,000	500,000	0	.05	10	.42652
2				0	.05	5	.29282
3				0	.08	10	.42652
4				0	.08	5	.29282
5				0	.10	10	.42652
6				0	.10	5	.29282
7				.10	.05	10	.42652
8				.10	.05	5	.29282
9				.10	.08	10	.42652
10				.10	.08	5	.29282
11				.10	.10	10	.42652
12	1,000,000	500,000	500,000	.10	.10	5	.29282
1A	500,000	250,000	250,000	0	.05	10	.42652
2A				0	.05	5	.29282
3A				0	.08	10	.24642
4A				0	.08	5	.29282
5A				0	.10	10	.42652
6A				0	.10	5	.29282
7A				.10	.05	10	.42652
8A				.10	.05	5	.29282
9A				.10	.08	10	.42652
10A				.10	.08	5	.29282
11A				.10	.10	10	.42652
12A	500,000	250,000	250,000	.10	.10	5	.29282
1B	500,000	400,000	100,000	0	.05	10	.42652
2B				0	.05	5	.29282
3B				0	.08	10	.42652
4B				0	.08	5	.29282
5B				0	.10	10	.42652
6B				0	.10	5	.29282
7B				.10	.05	10	.42652
8B				.10	.05	5	.29282
9B				.10	.08	10	.42652
10B				.10	.08	5	.29282
11B				.10	.10	10	.42652
12B	500,000	400,000	100,000	.10	.10	5	.29282

Table 5.2. Results of 36 test case calculations

Case ID	Optimal marital deduction	Maximum after tax wealth	Total tax	Tax on first estate	Tax on second estate
Case 1	0	1,151,556	477,461	168,664	308,797
Case 2	0	870,511	405,828	169,756	236,072
Case 3	0	1,569,596	589,551	168,664	420,887
Case 4	0	1,024,260	445,152	169,756	275,396
Case 5	0	1,910,696	683,356	168,664	514,692
Case 6	0	1,135,960	474,670	169,756	304,914
Case 7	0	1,151,342	477,674	168,877	308,797
Case 8	0	870,072	406,267	170,195	236,072
Case 9	0	1,569,383	589,764	168,877	420,887
Case 10	0	1,023,821	445,591	170,195	273,396
Case 11	0	1,910,482	683,569	168,877	514,692
Case 12	0	1,135,521	475,109	170,195	304,914
Case 1A	0	596,918	217,641	74,160	143,481
Case 2A	0	453,116	185,084	75,862	109,222
Case 3A	0	809,647	270,029	74,160	195,869
Case 4A	0	530,914	203,840	75,862	127,978
Case 5A	0	982,487	314,669	74,160	240,509
Case 6A	0	587,810	217,556	75,862	141,694
Case 7A	0	596,508	218,053	74,572	143,481
Case 8A	0	452,622	185,635	76,413	109,222
Case 9A	0	809,236	270,441	74,572	195,869
Case 10A	0	530,360	204,391	76,413	127,978
Case 11A	0	982,076	315,081	74,572	240,509
Case 12A	0	587,256	218,107	76,413	141,694
Case 1B	0	634,964	179,575	130,386	49,189
Case 2B	0	469,976	168,194	131,964	36,230
Case 3B	0	879,924	199,711	130,386	69,325
Case 4B	0	559,534	175,191	131,964	43,227
Case 5B	0	1,080,796	216,334	130,386	85,948
Case 6B	0	624,882	180,463	131,964	48,499
Case 7B	0	634,608	179,933	130,744	49,189
Case 8B	0	469,507	168,663	132,433	36,230
Case 9B	0	879,568	200,070	130,744	69,326
Case 10B	0	559,066	175,660	132,433	43,227
Case 11B	0	1,080,440	216,692	130,744	85,948
Case 12B	0	624,414	180,932	132,433	48,499

Following Harl's model, the marital deduction may be used to unbalance the estate of the initial decedent as part of the strategy to maximize after-tax wealth over two estates. However, cases #25-36 represent a departure from the modified Model II assumption of nearly balanced property ownership during life. In these cases the spouse's estates are substantially unbalanced during life, such that the initial decedent (assumed to be the husband) holds most of the family property. In these cases, the size of the combined property is $500,000, while the size of the initial decedent's holdings is $400,000. This variation is included to test the impact of relaxing the assumption of balanced property ownership on the optimal level of the marital share, as determined in the computer assisted calculations.

Once the size and balance of the property ownership between the spouses are set for the six test cases within a group, the decision to pass property outright to the children, as beneficiaries, at the first death is made. The proportion of the initial decedent's estate which is transferred in this manner is set at zero and ten percent within each predetermined size and balance group (e.g. #1-12, 13-24, 25-36).

Finally, within each group of six the growth rate of assets applied to the estate portfolio (g*), the time period between deaths (n), and the age of the surviving spouse at the time of the first death are varied significantly.

Given the objective function, assumptions underlying the model development and the magnitudes assigned to the variables in the 36 test

cases, the results, presented in Table 5.2, indicate that to claim any amount of the marital deduction would not be optimal in terms of maximization of after-tax wealth over both deaths. The results indicate a great degree of insensitivity to changes in the magnitudes of all parameters as regards the use of the marital deduction. In each case, the total tax paid (e.g. federal estate tax, state children's and spouse inheritance taxes) was minimized and after-tax wealth over both deaths was maximized by not claiming a marital deduction at the death of the first spouse.

The amount of the initial decedent's property, if any, which passes directly to the children (as beneficiaries specified in the testament) is determined before death and is given to the problem. That amount (net of FET) is subtracted out and is no longer part of the optimization problem. The iterative computer procedure is programmed to test alternative magnitudes of the marital deduction and the life estate until an optimal level is found. The calculations begin by assigning all qualifying property passing to the spouse through the marital deduction, with the remainder in the life estate. Iterative calculations of the total tax due and asset growth continue until the maximum after-tax wealth is found. When the objective function is satisfied the level of the marital deduction associated with that maximum is then optimal. The result of significant variation in magnitudes of all exogenously determined parameters over 36 test cases has shown that a

zero amount of the marital deduction is optimal for maximization of after-tax wealth. Further analysis is needed to determine outcomes under other assumptions.

One area of inquiry which seems logical to pursue is the rate of interest applied to the asset portfolio. There are many implicit assumptions and underlying relationships supporting the decision to use a weighted average to represent the rate of return of the asset portfolio. The single interest rate represents a weighted average of the returns available on each asset type in similar risk and time preference classes in the portfolio. It is assumed that the composition of assets in the family portfolio was selected by both the husband and wife during life and that composition represents the aggregate utility maximizing composition of assets which reflects adequately the combined attitude toward risk and time preference of the spouses. It is further assumed that this composition remains optimal to the surviving spouse over the period until death. However, the critical aspect of the procedure used, applying a single interest rate in determining the growth of asset value, is seen in the fact that the same magnitude is used to discount the future assets back into present value. Although, the magnitudes of these two rates could be equivalent, there is a possibility that a differential could exist. Therefore, it is of importance to test the impact of altering these magnitudes on the resulting size of the marital deduction determined by this procedure as optimal. The results of such variation are summarized and presented in Table 5.3.

Table 5.3. Results of using alternative growth and discount rates

A_1	a_1	g*	Discount rate	n	Optimal size of marital deduction
1,000,000	500,000	.05	.08	5	-0-
		.05	.08	10	250,000
		.08	.05	5	-0-
		.08	.05	10	-0-
500,000	250,000	.05	.08	5	101,370
		.05	.08	10	101,370
		.08	.05	5	-0-
		.08	.05	10	-0-
500,000	400,000	.05	.08	5	247,832
		.05	.08	10	247,832
		.08	.05	5	-0-
		.08	.05	10	-0-

The results of the 12 case variations, which were obtained from the running of another computer model[1], indicate that the size of the marital deduction determined as optimal is sensitive to differential rates of growth and discounting. The results indicate that if the growth rate is of lesser magnitude than the discount rate some positive value of the marital deduction would be determined as optimal. Comprehensive research on the use of different magnitudes of interest rate and discount rate is being conducted by Reinders, Boehlje and Harl.[2]

[1]The model used to obtain results presented in Table 5.3 is distinguished from the model used herein only by differential value of growth and discount rates.

[2]The modelling and computer work used to produce Table 5.3 is attributed to Reinders, Boehlje and Harl at Iowa State University.

Another critical assumption is made that income derived from the use of the assets in the portfolio is predictable, the spouse's annual consumption (plus taxes) just equals the annual income produced from the use of the assets, and the spouse does not dispose of any of the property which qualified under the marital deduction. Therefore, the rate of return, g*, represents the net-of-tax/net-of-consumption rate of return on the assets in the portfolio. The assumptions which are implicit herein deny the existence of rapid price appreciation among any classes of assets and relatively high inflation/deflation in the economy. Such external economic conditions need to be considered explicitly in the context of developing a strategy for wealth maximization over the deaths of both spouses. To analyze adequately the potential impact of price appreciation, inflationary pressure and consumption on the asset portfolio, it is necessary to examine the composition of assets. In periods of rapid price appreciation, certain types of real property (such as U.S. farmland in the 1970-80 period) is responsible for a relatively more rapid increase in family wealth over any given time period. Implicit in such an increase is a commensurate increase in potential tax liability. Hence, under such conditions, property in the intial decedent's estate which may qualify under the marital share could appreciate so greatly over the period between deaths that the second spouse's estate may fall into higher tax brackets with higher marginal tax rates applied to the estate.

Such a scenario may result in greater total tax liability over both estates than would have been the case if no marital deduction were claimed. In the latter case, all available property passing to the surviving spouse would pass into a life estate to the wife for life, with the children as remainderpersons. FET and state taxes are paid at the time of the first death. Appreciated property in a life estate is not taxable at the second death.

Under an alternative assumption of sustained relatively high inflation during the period between deaths of the spouses it is important to re-examine the assumption that the net-of-tax income equals the consumption of the surviving spouse on an annual basis. During periods of relatively high inflation, the cost of living increases, and so must the amount spent for a given level of consumption, unless the standard of living and/or the rate of consumption decreases. Further, the domestic buying power of the currency erodes, at a rate approximately equal to the domestic inflation rate. Therefore, the buying power of the income earned from the assets (e.g. rent, interest, dividends, etc.) decreases. The result is that the surviving spouse, wishing to maintain a standard of living, must spend more for it. Assuming this condition, it is expected that liquidation of assets occurs at an increasing rate over the time period between deaths. Under this scenario, it would seem optimal to claim some amount of marital deduction at the first death. The asset worth would be declining as the portfolio size decreases resulting from an increased level of

consumption by the surviving spouse. Hence, depending on the magnitudes of the parameters involved, the estate of the second spouse may fall to lower tax brackets with lower marginal FET rates.

It may be concluded that periods of rapid price appreciation and/or relatively high inflation are expected to have significant impact in the determination of the optimal use of the marital deduction. This conclusion is not relevant to the results of the test model executions because the assumption is implicitly made that these external economic conditions do not exist. However, relaxation of these and other critical assumptions need further analytical research.

In conclusion, this study has accomplished the selected objectives of: 1) researching the historical development and philosophical underpinnings related to property ownership between spouses; and 2) development of a model which determines the optimal marital deduction in the transfer of property through both spouses' estates to the inheriting children. However, the results obtained from the model application suggest that before interpretation into an action strategy to maximize after-tax wealth over both deaths, additional research is needed in the determination of the optimal marital deduction for estate planning purposes. It is suggested that future research focus on the relaxation of certain assumptions which are explicitly and implicitly used in the construction of the model used herein. Assumptions which should be explored are: 1) the application of a weighted average return to the family asset portfolio in the

determination of asset growth over the period between the deaths of the spouses; 2) the estate planning objective(s) of the spouses; 3) the non-existence of rapid price appreciation and inflationary pressure in the economy; 4) the assumption that the consumption rate of the surviving spouse just equals the income derived from the assets in the portfolio; 5) the assumption that none of the unified credit is used at the death of the first spouse; and 6) the assumption that no gifting occurs during life.

Finally, a research topic which is tangentially related to the optimal use of the marital deduction in the estate planning process is analysis of the potential impact of federal legislation, such as the Equal Rights Amendment to the United States Constitution, on the entire estate planning process. If such an amendment were adopted by Congress, current options of property ownership as held between spouses during life could change significantly. A movement toward the community property model of interspousal property ownership might be precipitated by such legislation. Presumably, if such changes occurred, the use of the marital deduction as a tool in the estate planning process could be modified.

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APPENDIX. TAX TABLES AND SCHEDULES

Table A-1. Tax schedule[a, b]

Age of Life Tenant	Life Estate	Remainder
0	.90164	.09836
1	.89936	.10064
2	.89900	.10100
3	.89676	.10324
4	.89396	.10604
5	.89104	.10896
6	.88792	.11208
7	.88464	.11536
8	.88120	.11880
9	.87756	.12244
10	.87380	.12620
11	.86984	.13016
12	.86576	.13424
13	.86152	.13848
14	.85716	.14284
15	.85268	.14732
16	.84808	.15192
17	.84336	.15664
18	.83852	.16148
19	.83356	.16644
20	.82840	.17160
21	.82308	.17692
22	.81756	.18244
23	.81184	.18816
24	.80592	.19408
25	.79976	.20024

[a]The two factors across the page equal one hundred percent. Multiply the corpus of the estate by the first factor to obtain value of the life estate.

Use the second factor to obtain the remainder interest if the tax is to be paid at the time of probate, or to determine if there would be any tax due.

All figures are based on the 1958 CSO Mortality Table with interest at four percent.

This table to be used for estates of decedents where death occurs on or after July 4, 1965.

[b]Source: Chapter 450, 1979, Iowa Code.

Table A-1. continued

Age of Life Tenant	Life Estate	Remainder
26	.79336	.20664
27	.78672	.21328
28	.77984	.22016
29	.77268	.22732
30	.76524	.23476
31	.75756	.24244
32	.74960	.25040
33	.74132	.25868
34	.73280	.26720
35	.72392	.27608
36	.71476	.28524
37	.70532	.29468
38	.69560	.30440
39	.68560	.31440
40	.67536	.32464
41	.66488	.33512
42	.65412	.34588
43	.64316	.35684
44	.63192	.36808
45	.62044	.37956
46	.60872	.39128
47	.59680	.40320
48	.58464	.41536
49	.57228	.42772
50	.55972	.44028
51	.54700	.45300
52	.53412	.46588
53	.52104	.47896
54	.50788	.49212
55	.49452	.50548
56	.48108	.51892
57	.46746	.53244
58	.45392	.54608
59	.44024	.55976
60	.42652	.57348
61	.41280	.58720
62	.39908	.60092
63	.38538	.61462
64	.37174	.62826

Table A-1. continued

Age of Life Tenant	Life Estate	Remainder
65	.35817	.64183
66	.34471	.65529
67	.33140	.66860
68	.31829	.68171
69	.30542	.69458
70	.29282	.70718
71	.28048	.71952
72	.26840	.73160
73	.25653	.74347
74	.24481	.75519
75	.23322	.76678
76	.22175	.77825
77	.21045	.78955
78	.19938	.80062
79	.18863	.81137
80	.17826	.82174
81	.16830	.83170
82	.15876	.84124
83	.14960	.85040
84	.14078	.85922
85	.13224	.86776
86	.12395	.87605
87	.11584	.88416
88	.10785	.89215
89	.09990	.90010
90	.09192	.90808
91	.08386	.81614
92	.07563	.92437
93	.06715	.93285
94	.05826	.94174
95	.04866	.95134
96	.03801	.96199
97	.02595	.97405
98	.01275	.98725
99	.00000	.00000

Table A-2. Federal estate tax rate schedule[a] (effective January 1, 1977)[b]

If taxable estate value is at least[c] (Dollars)	Tax liability (Dollars)	Plus (Percent)	Of excess value over (Dollars)
0	0	18	0
10,000	1,800	20	10,000
20,000	3,800	22	20,000
40,000	8,200	24	40,000
60,000	13,000	26	60,000
80,000	18,200	28	80,000
100,000	23,800	30	100,000
150,000	33,800	32	150,000
250,000	70,800	34	250,000
500,000	155,800	37	500,000
750,000	248,300	39	750,000
1,000,000	345,800	41	1,000,000
1,250,000	448,300	43	1,250,000
1,500,000	555,800	45	1,500,000
2,000,000	780,800	49	2,000,000
2,500,000	1,025,800	53	2,500,000
3,000,000	1,290,800	57	3,000,000
3,500,000	1,575,800	61	3,500,000
4,000,000	1,880,800	65	4,000,000
4,500,000	2,205,800	69	4,500,000
5,000,000	2,550,800	70	5,000,000

[a]Before allowance of credit for state death tax paid.

[b]Source: 49, p. 6.

[c]The taxable estate is defined as the gross value of the estate less the total exemptions and deductions allowed by the Internal Revenue Code of 1954, as amended.

Table A-3. Table for computation of maximum credit for state death taxes[a, b]

(A) Taxable estate equal to or more than . . . ($)	(B) Taxable estate less than . . . ($)	(C) Credit on amount in col. (A) ($)	(D) Rates of Credit on excess over amount in Col. (A) (%)
40,000	90,000	---	.0
90,000	140,000	400	1.6
140,000	240,000	1,200	2.4
240,000	440,000	3,600	3.2
440,000	640,000	10,000	4.0
640,000	840,000	18,000	4.8
840,000	1,040,000	27,600	5.6
1,040,000	1,540,000	38,800	6.4
1,540,000	2,040,000	70,800	7.2
2,040,000	2,540,000	106,800	8.0
2,540,000	3,040,000	146,800	8.8
3,040,000	3,540,000	190,800	9.6
3,540,000	4,040,000	238,800	10.4
4,040,000	5,040,000	300,800	11.2
5,040,000	6,040,000	403,800	12.0
6,040,000	7,040,000	523,800	12.8
7,040,000	8,040,000	650,800	13.6
8,040,000	9,040,000	786,800	14.4
9,040,000	10,040,000	930,800	15.2
10,040,000	---	1,082,800	16.0

[a]Amount of credit: If the decedent's taxable estate does not exceed $40,000, the credit for State death taxes is zero. If the decedent's taxable estate does exceed $40,000, the credit for State death taxes is limited to an amount computed in accordance with this table. Due to an amendment made by the Tax Reform Act of 1976, to compute the "adjusted" taxable estate a subtraction of $60,000 is made from the taxable estate. (Treasury Reg. § 20.2011-1(b), Commerce Clearing House, Federal Estate and Gift Tax Reports, ¶ 1085).

[b]Source: 25, p. 27.

Table A-4. State of Iowa inheritance tax[a,b]

(1) Taxable amount equaling ($)	(2) Taxable amount not exceeding ($)	(3) Tax on amount in col. (1) ($)	(4) Rate of tax on excess over amount in col. (1)
----	5,000	---	1
5,000	12,500	50	2
12,500	25,000	200	3
25,000	50,000	575	4
50,000	75,000	1,575	5
75,000	100,000	2,825	6
100,000	150,000	4,325	7
150,000	----	7,825	8

[a]For property passing to the deceased's wife or husband ($80,000 exemption each), father or mother ($10,000 exemption each), child ($30,000 exemption each) or other lineal descendants.

[b]Source: 25, p. 27.

Table A-5. Combined effective marginal estate tax brackets and rates

Combined brackets[a] ($)		Federal estate combined rates[b] (%)
100,000 --	150,000	29.2
150,000 --	200,000	30.4
200,000 --	250,000	29.6
250,000 --	300,000	31.6
300,000 --	500,000	30.8
500,000 --	700,000	33.0
700,000 --	750,000	32.2
750,000 --	900,000	34.2
900,000 --	1,000,000	33.4
1,000,000 --	1,100,000	35.4
1,100,000 --	1,250,000	34.6
1,250,000 --	1,500,000	36.6
1,500,000 --	1,600,000	38.6
1,600,000 --	2,000,000	37.8
2,000,000 --	2,100,000	41.8
2,100,000 --	2,500,000	41.0
2,500,000 --	2,600,000	41.0
2,600,000 --	3,000,000	44.2
3,000,000 --	3,100,000	48.2
3,100,000 --	3,500,000	47.4
3,500,000 --	3,600,000	51.4
3,600,000 --	4,000,000	50.6
4,000,000 --	4,100,000	54.6
4,100,000 --	4,500,000	53.8
4,500,000 --	5,000,000	57.8
5,000,000 --	5,100,000	58.8
5,100,000 --	6,100,000	58.0
6,100,000 --	7,100,000	57.2
7,100,000 --	8,100,000	56.4
8.100,000 --	9,100,000	55.6
9,100,000 --	10,100,000	54.8
10,000,000.....		54.0

[a]Combined bracket is composed of "credit for state death taxes paid" and "federal estate tax" brackets.

[b]Federal estate combined rates are derived from those marginal rate schedules corresponding to the tax tables described in (a) above.