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Market Insurance Versus Self Insurance: The Tax-Differential Treatment and Its Social Cost

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ABSTRACT

Much resources have been expended over the years debating the tax treatment of insurance versus self insurance. This article reviews and analyzes the principal concepts and inconsistencies that have evolved in dealing with the issue of premium tax deductibility. The Internal Revenue Service considers market insurance as the only visible means of risk shifting and therefore the only one worthy of tax deductibility. It is argued that other forms of risk reduction can be equally effective in reducing risk. The social cost associated with the present tax policy that favors market insurance over other forms of pre-loss risk financing are evaluated and depicted. The implicit objective of the article is to shift the debate by refocusing on the question of an appropriate tax policy concerning risk financing, one that maximizes social welfare.

On July 27, 1989, the U.S Court of Appeals of the Sixth Circuit Court rendered its decision in the case of Humana Inc. versus Commissioner (No. 88-1403), upholding the lower court's decision that premiums paid by a parent company to its captive insurance subsidiary shall not be deductible for income tax purposes. The same court reversed the decision with regard to premiums paid by an affiliated subsidiary to a captive, allowing their deductibility. The underlying principle is based on appearance rather than economic substance. Later dubbed "the balance sheet theory," the guiding principle is the effect of the premium on the insured's consolidated balance sheet figure. If the premium is paid to a captive, there is no direct effect on the consolidated balance sheet of the parent and the wholly owned captive, there is no risk shifting, and therefore the expense is not recognized. In contrast, if the premium is paid by a subsidiary, who may insure itself with the same captive,

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the expense is recognized because the subsidiary's balance sheet is not consolidated with that of the captive's parent. The court agreed that premium payments made to a sibling subsidiary constitute risk shifting.[1]

In general, the U.S. Internal Revenue Code allows the deduction of ordinary and necessary business expenses, including premiums paid to purchase property-liability insurance in protection against accidental fortuitous losses.[2] Yet the U.S. Internal Revenue Service (IRS) is steadfast in its objection to accord a similar treatment to funds placed in reserves (via self insurance, captives, or other retention and funding arrangements) to protect against similar losses. Despite numerous challenges over many years, the IRS appears to be satisfied with a principle which does not recognize expenses associated with all pre-loss risk-financing methods, except for paid market insurance.

The objective of this article is to reconsider the IRS policy in terms of its cost to society. This most fundamental issue has largely been neglected. After describing the evolvement of the relevant tax doctrines in the next section, the tax bias favoring market insurance in view of modern financial theory is considered. An analysis of the conditions in a tax-free world under which market insurance would be inferior to some form of self insurance (hereafter this term is used generically, denoting non-market insurance) follows. Subsequently a model is developed to calculate the social cost of a tax policy discriminating in favor of market insurance. Implications for public policy are discussed in the final section.

The Dispute as Manifested in Evolving Legal Doctrines

U.S. Treasury Regulation Section 1.162-1(a) provides the sole statutory authority for the tax deductibility of amounts paid or incurred with respect to insurance. To qualify, an expense must be: ordinary and necessary; incurred in trade or business carried out by the taxpayer; for insurance premiums against fire, storm, theft, accident, or similar losses in the case of a business; and other than a capital expenditure.

Based on Internal Revenue Code Sections 165 and 461(h), losses are generally deductible as they accrue. It is well established in case law that amounts set aside as a reserve to fund future losses or other forms of self insurance are not currently deductible.[3] The IRS has a long-standing policy of denying deductibility for premiums paid in self-funding arrangements. This policy was intensified in the early and mid 1970s, with the growth of the captive insurance movement. To this end, the IRS published Rev. Rul. 77-316,

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[1] Since the Humana Case, three additional cases were rendered by tax court in January 1991 involving the wholly owned captives of AMERCO, Sears Roebuck and Harper. In all three cases premium deduction was allowed due to the presence of substantial amounts (at least 30 percent) of unrelated risks in the captives' underwriting portfolios.

[2] Internal Revenue Code Sec. 162 and Treasury Regulations Sec. 1. 162-1(a).

[3] This was established in the case of Spring Canyon Coal Co. (1931).

describing three types of wholly-owned foreign insurance subsidiaries with respect to which premium payments are fully or partially non-deductible.

The growth of captive insurers and their prevalence among large corporate taxpayers resulted in a significant increase of court challenges against IRS rules on various conceptual, economic, technical, or accounting grounds. Over the years, tax courts, the IRS and other branches of government have advanced several arguments which evolved into a common jargon used by practitioners and professionals in the risk management and insurance field. A brief review of the most important concepts follows.

Paid and Incurred - Fixed Liability and Reasonable Accuracy

One of the first tax law doctrines developed was associated with self insurance reserves in the case of Spring Canyon Coal Company (1930 and 1931).[4] The company established a fund equal to the amount of premiums that would have been payable had the state insurance fund been utilized. The court held that the arrangement did not meet the "paid and incurred" requirement of Treasury regulations and that the reserve was not an expense. This and subsequent cases and rulings evolved into a tax doctrine by which accruals are not deductible until the "liability is fixed" and the amount of accrual is "determinable with reasonable accuracy". This doctrine set the base for a statistical-actuarial determination as a means of establishing liability with reasonable accuracy.

Risk Shifting and Risk Distribution

The definition of what constitutes insurance for federal income tax purposes is traced to the case of Helvering v. LeGierse, 61 S. Ct. 646 (1940). The doctrine created by that case identifies an insurance transaction as one that involves "risk shifting and risk distribution." Risk shifting is the transfer of risk of loss from the insured to the insurer, and it involves a premium that is less than the amount of risk exposure. The insurer must have the financial capacity to accept the risk of loss and indemnify the insured. Risk distribution is a method of spreading the risk where the insurer has sufficient exposures for the operation of the Law of Large Numbers. It requires mass (sufficient number of exposures), homogeneity, and independence among underwritten exposure units. In the presence of these conditions, an insurer can assume risks in excess of its surplus, since an adequate risk distribution implies that only a limited number of losses will occur in any time period, enabling the insurer to make good on its claims. This was the first and only legal definition of insurance at the supreme court level. It has been frequently interpreted with the result that the distinction between risk shifting and distribution has become blurred.

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[4] Other landmark decisions concerning the same issue involved Pan American Hide Co. (1925), Thriftmart (1973), and Midwest Motors Express (1956).

Economic Family

Although risk distribution in the context of the Law of Large Numbers can occur within one entity of a sufficiently large number of exposures, the IRS has held the position that risk distribution should involve the risks of various unrelated parties rather than a single party. Advanced by the IRS in Revenue Rulings 77-316 and 78-338, this concept has become known as the "economic family" doctrine.[5] The basic premise of this doctrine is that no risk shifting or risk distribution exist within an affiliated group of companies, since those who bear the ultimate economic burden of loss are the same entities that suffer the loss. In most cases involving captive insurers, the courts have upheld IRS denial of premium tax deductibility though, generally refusing to apply the economic family doctrine.[6] The courts have often been uneasy with this doctrine which, in principle, contradicts the separation and limited corporate liability of independent legal entities.

Capitalization and Financial Capability to Meet Maximum Obligation

Captive insurers, particularly offshore ones, are often formed with a small capitalization base. In such cases, reinsurers and others involved in fronting arrangements with captives require a parent's commitment to increase capital as needed.[7] The existence of such a commitment, or even the court's judgment that only the parent can respond to a loss exceeding a certain amount, warranted an interpretation that no insurance transaction has taken place. In one case, the sufficiency of capitalization to meet regulatory requirement was cited as evidence for the viability of an insurance transaction. However this was only the dissenting judge's opinion.[8] The IRS argued that the danger of a captive's insolvency due to insufficient capitalization, and the parent's need to support the captive, imply that the parent-captive contract is not an insurance contract. According to the IRS, such a contract is a hoax since there is no transfer of risk when the entity taking the risk is financially unable to meet its maximum obligation. In other words, a test of an insurance transaction should determine the financial capability of the captive, independently of its parent, to meet its maximum obligation. This determination is often a statistical one, depending on the type and number of exposures and the nature of their loss distributions. The necessary quantitative standards have never been officially established.

Practical Certainty or Presence of Risk

The IRS advanced the idea that the portion of risk retained by captives tends to be sufficiently small to make it a "practical certainty" that this layer

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[5] The concept of economic family was introduced in Revenue Ruling 77-316 (1977).

[6] Only in the Stearns Roger Case (1983), the District Court has ruled on that basis. On appeal, the Tenth Circuit rejected the theory of economic family but upheld the decision comparing the situation to a self insurance reserve.

[7] The classic case in point is Carnation v. Commissioner, (1978).

[8] The case involved the Clougherty Packing Co. (1985).

of retention will be used. Namely, that a transaction with a captive and, more broadly, self-insurance is in effect a "dollar trading" mechanism where there is no presence of risk and therefore no transfer of risk (or insurance) occurs.[9] Thus, the "capitalization" doctrine has been advanced against under-capitalized captives and the "practical certainty" doctrine against entities retaining a small initial layer of retention. In some way, there is a contradiction between the two doctrines, because "practical certainty" implies the ability of the captive to pay for its losses (dollar trading) as effectively as sufficient capitalization.

Step Transaction

The courts argued that imposition of a tax must be based on economic reality. Therefore, transactions which do nothing else but achieve different tax consequences should not be recognized as separate transactions. If taxpayers set up separate legal entities solely to achieve a tax benefit, transactions among the entities should be aggregated into one identifiable substantial transaction. The rationale of this doctrine goes beyond the insurance issue and is consistent with the public interest in preventing transactions designed merely to avoid taxation. Each case therefore, has to be considered on its own merits.[10]

Unrelated Risks

The case of LeGierse defined insurance as involving risk shifting and risk distribution. When risk distribution focuses on the insured, the test of deductibility may depend on whether the insured pools its risks with unrelated parties. Risk distribution is described by the court as a method of spreading the cost of losses throughout a mass of separate contracts (parties) using the law of averages.[11] Thus it would seem that sufficient risk distribution can exist when related risks are mixed with unrelated ones (perhaps this method can even avoid the economic family theory, which rejects the existence of risk distribution in case of a large number of risks of the same entity).

A question that has dominated the scene for some time is what mixture of related and unrelated risks is sufficient to demonstrate risk distribution. Early in this debate, the consensus among practitioners was that 20 percent of

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[9] This concept was advanced in the case of Beech Aircraft Corp. (1984). Beech's captive retained the first $2 million of the annual products liability exposure of its parent. The $2 million policy was written by the captive for $1.675 million, which was just about the discounted value of future claims' payments in this layer.

[10] This doctrine was advanced in the Beech case to deny tax deductibility. But it was also used in support of the taxpayer in the case of Crawford Fitting Co. (1985). In the latter case, the parent company did not hold direct ownership in the captive. This case was unique. In the Court's opinion it was evident that the taxpayer did not form the captive to avoid taxes, the captive was a separate entity, the premiums were actuarially based, and the taxpayer was not a shareholder of the captive. The court said that in this case the insured, shareholder, and captive were all separate entities, and their transactions should not be aggregated.

[11] The issues involved in risk shifting and risk distribution were further elaborated in the case of Commissioner v. Treganowan, (1950).

unrelated risks would suffice. The IRS's position as reflected in some private rulings was that 50 percent or more were necessary.[12] However, in a technical memorandum dated 1984, the IRS revoked previous percentage thresholds, and its position since then has been that no premiums are deductible regardless of the amount of unrelated risks in the insurance portfolio.

In sum, it is apparent that the dispute over premium tax deductibility evolved into a war of legal doctrines and nuances of legal definitions. Starting with the basic issue of defining insurance, the dispute now revolves around bookkeeping matters such as the "balance sheet theory" advanced in the recent Humana case. From the vantage point of risk and insurance theory, it is apparent that self insurers whose loss exposure meets the criteria for the application of the Law of Large Numbers, can match the risk-return characteristic of market insurers. Nevertheless, at this time the criteria for premium tax deductibility are based on tangential issues rather than the actuarial or financial characteristics of risk exposure, and the manifestation of risk reduction. The government and the courts have followed a tax policy feeding on itself rather than on the public interest. That policy accords tax deductibility to premiums paid to market insurers or captives owned by multiple parents, as well as to subsidiaries of parents, but not to the parent itself. That policy does not accord a similar treatment to captives writing unrelated business and to legitimate self insurance reserves. In the following sections, it is demonstrated that removal of this tax discrimination against captives and the legitimate accumulation of reserves for self insurance will serve public interest objectives by encouraging policies that stabilize firms' cost of risk, foster economic growth, and enhance loss prevention and the preservation of life and property.[13]

Market Insurance Versus Self Insurance In Modern Financial Theory

Modern financial theory explains why insurance at the corporate level is consistent with value maximization by equityholders in the presence of other insurance-seeking stakeholders.[14] It also provides a variety of reasons as to why paid market insurance usually dominates self insurance.[15] Even when the two alternatives are actuarially equivalent and self insurance offers more economic incentives, market insurance may dominate because of tax considerations.

A major tax advantage of market insurance stems from the opportunity of insurance companies to take present deductions in setting aside reserves equal to discounted future payments, or reserves for estimated losses incurred but not reported. In contrast, self insurers can only deduct the losses themselves,

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[12] For example, see private ruling LTR 8111087 of December 18, 1980.

[13] A more detailed discussion of these issues can be found in Head and Porat (1990).

[14] Mayers and Smith (1982) and (1987), and Williams and Heins (1989).

[15] These issues were argued by Mayers and Smith (1982), Main (1983) and Chen and PanArul (1989).

when they occur.[16] A second tax advantage of market insurance concerns the replacement of a damaged asset. If a damaged asset is replaced using market insurance proceeds, the insured is not taxed on any difference between those proceeds and the book value of assets destroyed. In contrast, if replacement for the damaged asset is financed by self insurance proceeds, any difference between those proceeds and the book value of the destroyed asset becomes tax- deductible only after further delay, through annual depreciation. A third tax advantage of market insurance stems from the interaction of insurable losses with the corporate tax rate paid by the insured. Market insurance premiums are typically paid and deducted when the insured is profitable and subject to the maximum tax rate. In contrast, the deductible losses of a self insurer — especially large losses — may occur when the insured is unprofitable and subject to a low tax rate or no tax at all. The insured may be forced to carry losses forward in order to get the tax benefit with further delay. In other words, the tax code favors market insurance as a mechanism to stabilize earnings when the firm suffers large casualties in a single accounting period. Under self insurance, losses contribute to the firm's business risk.

In sum, modern financial theory reconciles the purchase of insurance with value maximization of the firm, making no general statement on the relative merit of market insurance versus self insurance. The only clear exception is the corporate tax effect, which systematically lowers the relative cost of market insurance as perceived by the insured. The public welfare implications of a tax policy discriminating against self insurance are considered in the next section.

A Model of Choice Between Market and Self Insurance

A firm seeking to protect its assets can choose among market insurance, self insurance, and loss-prevention activity, or combine these options. Loss-prevention activity can be pursued independently, but it is often stimulated by self insurance or market insurance. The analysis below incorporates the following assumptions and variables:

(i) Full insurance can be purchased in the market place at the annual rate P_1 per dollar of exposure value (insured assets), A, spending AP_1 per year.

(ii) The same protection can be obtained by self insurance, incurring a fixed annual cost, F, plus a variable cost AP_2 at the unit rate P_2.

(iii) A firm can invest, I, dollars per year in efforts to reduce the exposure of its assets or activities to the risk of loss. It is assumed that the optimal investment in loss prevention depends on the type of exposure value (asset, activity), A. It is argued below that, other things equal,

[16] In contrast to statements made in the literature, Mayers and Smith (1982) and Chen and PanArul (1989), there is generally no net advantage in the tax deductibility of premiums to the insured. This apparent advantage is offset by income tax paid on those premiums by the insurer. Consistently, when both buyer and seller, are considered the net corporate income tax collected from an inter-corporate insurance transaction is roughly zero.

the optimal investment in loss prevention is likely to be greater under self insurance than under market insurance.

At this stage, the objective is to show that, in general, market competition will lead to the relationship $P_1 \geq P_2$. This will serve the argument against the present tax policy which favors market insurance. The claimed relationship $P_1 \geq P_2$ stems from the following considerations.[17]

Adverse Selection

Market insurance policies are usually priced according to the average risk within an underwriting classification, offering only nominal discount to clients of a lesser risk within a given classification. Therefore riskier firms have a greater incentive to seek market insurance than less risky ones, especially during "soft market" cycles. As a consequence, equilibrium market insurance rates are likely to be higher than self insurance rates.[18]

Moral Hazard

Since (according to the above argument) the insured is not fully penalized for exposing the insurer to a higher risk, the insured has an uneconomically small incentive to undertake loss- control measures. In contrast, a self insurer will incur loss- prevention costs to economize on overall self insurance expenditures.[19]

Asymmetric Information

Unlike self insurers, market insurers must incur cost searching for information to facilitate the underwriting of desired risks. The cost of this information increases with a faster pace of change in market conditions.

Loss Control and Insurance Cost

Both market insurers and self insurers can decrease the unit insurance cost, P, by increasing investment in loss-prevention, I, but self insurers can do so more economically. In view of the phenomena of asymmetric information and moral hazard, it is clear that $\frac{\partial P_2}{\partial I} < 0$, but $\frac{\partial P_1}{\partial I} \simeq 0$ so that the optimum I is greater under self insurance.

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[17] The analysis assumes that market insurance and self insurance are facing equivalent actuarial and financial conditions, which enable the application of the Law of Large Numbers. Specifically, it is assumed that (a) the loss is objective and accidental, (b) the exposure units are homogeneous, (c) the exposure units are spatially and temporally independent, (d) there is a large number of exposure units, and (e) there is a buffer fund (surplus) to absorb deviations form expectation. Also assumed is equivalency in the quality of the insurance units produced by market and self insurance. These assumptions allow quantification of the differences between the two alternate sources of risk financing. For a detailed discussion of these issues see for example David Houston (1964).

[18] The consequences of adverse selections under imperfect market information are analyzed by Rothschild and Stiglitz (1976).

[19] The phenomenon of moral hazard is analyzed by Ehrlich and Becker (1972), Steven Shavell (1979), and Diallo and Kim (1989).

Diversification to Reduce Risk

Self insurers may not be able to effectively reduce risk through the Law of Large Numbers in dealing with large nonrepetitive losses. Those risks are excluded from this discussion, where the focus is on risks with respect to which market insurance and self insurance are actuarially and financially equivalent (see footnote 17). With respect to the latter, self insurers have an advantage in their freedom to reduce their pure risk by investing in assets of unrelated speculative risks. The opportunity of insurers to do so is limited by strict regulations.

The annual cost functions associated with market insurance (C_1) and self insurance (C_2) are displayed in Figure 1. The market insurance cost function is assumed linear and homogeneous in the exposure value, A: $C_1 = AP_1$.[20]

In contrast, self insurance cost C_2, is stated as a sum of three components: a fixed annual cost F, a semi-fixed loss-control cost I(A), and a variable cost $AP_2[I(A)]$. That is, $C_2 = F + I(A) + AP_2[I(A)]$. The self insurance cost function is an envelop curve that monotonically increases in A at a diminishing rate. Each point on this curve represents a minimum cost attainable through the use of an optimal combination of loss-control efforts, I, and variable costs, AP_2, subject to the relationship $\frac{\partial P_2}{\partial I} < 0$. For each value of A, the slope of the cost curve tangent measures the optimal P_2, while the intercept of that tangent measures the optimal sum $F + I$. The diminishing slope of the cost curve implies that a larger exposure value invites a larger investment in loss-prevention efforts, leading to a lower variable cost.

It is apparent from Figure 1 that there is a critical exposure value A_0 below which the firm prefers market insurance to self insurance, and above which the order of preference is reversed. Market insurance is preferred if the additional fixed cost associated with self insurance exceeds the saving in variable cost: $F + I > AP_1 - AP_2$. Self insurance is preferred if this relationship is reversed: $F + I < AP_1 - AP_2$. The next section analyzes the

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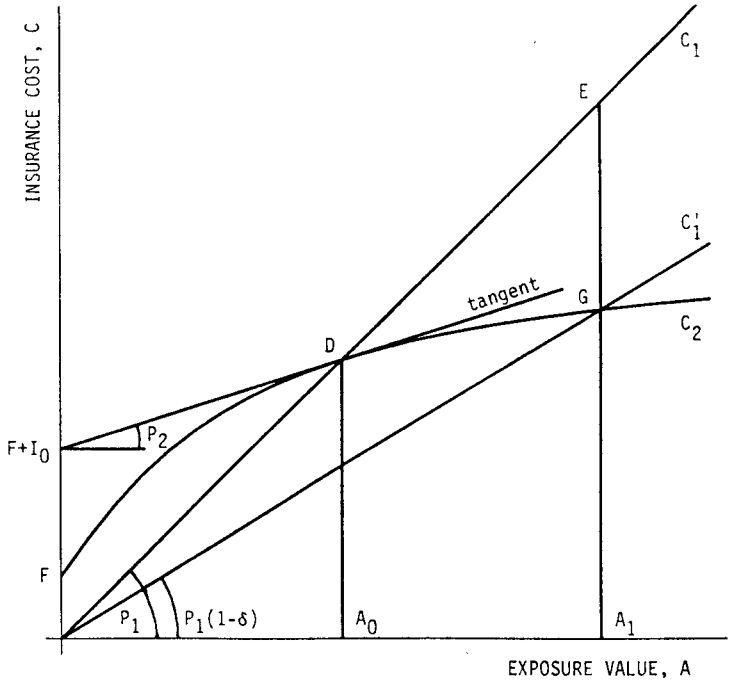
[20] Insurance costs are related to a variety of exposure bases in a variety of ways. The simplified stylized relationships assumed are useful for clarifying the issue of tax discrimination and its social cost. The self insurance cost function drawn in Figure 1 is based on three conditions: $\frac{\partial P_2}{\partial I} < 0$, $\frac{\partial P_2}{\partial I} < -1$ at $I = 0$ (since $\frac{\partial P_2}{\partial I} > -1$ leads to a corner solution at $I = 0$), and $\frac{\partial^2 P_2}{\partial I^2} > 0$ (since $\frac{\partial^2 P_2}{\partial^2} < 0$ leads to a corner solution at $P_2 = 0$). The management objective is to select the level of I which minimizes C_2 for any given value of A. This is accomplished by differentiating C_2 $\frac{\partial C_2}{\partial I} = 1 + A(\frac{\partial P_2}{\partial I}) = 0$. This equation implies the optimization condition $\frac{\partial P_2}{\partial I} = -\frac{1}{A}$. To interpret this result, I, is restated as $Ai = I$, where i denotes the average loss-prevention cost per dollar of A. For a given A, the optimization condition $\frac{\partial P_2}{\partial I} = -\frac{1}{A}$ is equivalent to the condition $\frac{\partial P_2}{\partial i} = -1$, which has an intuitive explanation. At a given exposure value, A, minimum cost is achieved where an increase in the loss-prevention unit cost, i, equals the resulting decrease in the unit price P_2.

FIGURE 1

The Social Cost of Subsidizing Market Insurance



social cost of a tax regime such as that prevailing in the U.S., where accumulation of reserves to meet future payment for losses is tax deductible only for those selling market insurance and premiums are tax deductible only if paid for market insurance.

The Social Cost of Tax Discrimination

The General Case

The cost advantage of paid insurance created by the present tax regime can be described as a subsidy at a flat rate δ, causing a decrease in the price of market insurance from P_1 to $(1-\delta)P_1$. The subsidy rate will vary across assets, activities, and risks, depending upon the insurer's corporate tax rate and cost of capital, and the average time period between retention and payment. The effect of the subsidy on the cost of market insurance is illustrated in Figure 1 by a clockwise rotation of the cost function about the origin, from C_1 to C'. From the perspective of the insured comparing the cost of market and self insurance, the subsidy causes an increase in the breakeven point from A_0 to A_1. All firms insuring up to A_1 in exposure value benefit from the subsidy, whereas firms insuring between A_0 and A_1 in exposure value voluntarily switch from self insurance to market insurance. The direct social loss caused by this discriminatory subsidy is measured by the additional resources

required to sustain market insurance between A_0 and A_1. That loss can be expressed as a product $K \cdot S_{DEG}$, where S_{DEG} is the area bounded between the cost functions C_1 and C_2 over the interval $A_1 - A_0$, and K is a coefficient determined by the distribution of exposure values between A_0 and A_1. In the simplest case of a uniform distribution, K = 1, and the average social loss, L, asset shifted from self insurance to market insurance is

$$L = \left(\tfrac{1}{2}\right)(A_1^2 - A_0^2)\, P_1 - \int_{A_0}^{A_1} C_2(A)\, dA \tag{1}$$

An Example

Specifying the cost functions: Suppose the cost function of market insurance is $C_1 = AP_1$ and that of self insurance $C_2 = F + I + AP_2$, where $F = 1$ and $\frac{P_0}{(1+I)}$, P_2 is inversely associated to investment in loss control efforts, and where P_0 is the variable unit cost at $A = 0$. The cost function of self insurance can then be written as $C_2 = 1 + I + \frac{AP_0}{(1+I)}$.

Since the objective is to minimize C_2, this function can be further specified by differentiating it with respect to the decision variable, I, and setting the derivative at zero: $\frac{\partial C_2}{\partial I} = 1 - \frac{AP_0}{(1+I)^2} = 0$

This condition yields the following details:

(i) The optimal I for a given A is $I^* = (AP_0)^{\frac{1}{2}} - 1$.

(ii) The unit variable cost associated with I^* is $P^*_2 = \frac{P_0}{(1+I^*)} = (\frac{P_0}{A})^{\frac{1}{2}}$.

(iii) The minimum total cost of self insurance for a given A is

$$C_2 = F + I^* + AP^*_2 = 2(AP_0)^{\frac{1}{2}}.$$

Finding the breakeven point: Indifference between market and self insurance occurs at the critical exposure value A_0 where $C_1 = C_2$. Based on the last expression of C_2, the critical A_0 occurs where $A_0P_1 = 2(A_0P_0)^{1/2}$, implying the breakeven point

$$A_0 = \frac{4P_0}{P_1^2} \tag{2}$$

With a subsidy rate δ, market insurance is priced according to $C_1' = (1-\delta)AP_1$, and breakeven occurs at A_1 defined by the equality $(1-\delta)A_1P_1 = 2(A_1P_0)^{1/2}$, so that

$$A_1 = \frac{4P_0}{[P_1^2\,(1-\delta)^2]} = \frac{A_0}{(1-\delta)^2} \tag{3}$$

The relationship $A_1 > A_0$ for any $\delta > 0$ implies that the discriminatory subsidy increases the reliance on market insurance at the expense of self insurance over the interval $A_1 - A_0$ of exposure values.

Social loss caused by a discriminatory subsidy: The social loss caused by a shift from self insurance to market insurance can be specified by adding the

assumption that exposure values are uniformly distributed over the interval $A_1 - A_0$.

The average social loss per displaced asset with insured exposure value between A_0 and A_1 is derived by spelling out equation (1):

$$L = \left(\tfrac{1}{2}\right)(A_1^2 - A_0^2)P_1 - 2P_0^{1/2}\int_{A_0}^{A_1} A^{1/2}dA$$
$$= \left(\tfrac{1}{2}\right)(A_1^2 - A_0^2)P_1 - \left(\tfrac{4}{3}\right)(A_1^{3/2} - A_0^{3/2})\,P_0^{1/2}.$$

Finally the last expression can be freed of parameters A_0 and A_1 by substituting their values based on equations (2) and (3): $L = 8P_0^2P_1^{-3}\{[(1-\delta)^{-4} - 1] - \left(\tfrac{4}{3}\right)[(1-\delta)^{-3} - 1]\}$ where the loss is stated as a function of only three parameters, the unit costs P_0 and P_1, and the effective subsidy rate of δ. This expression is strictly positive for $0 < \delta < 1$ and positive P_0 and P_1. If this is the loss per insured asset, the aggregate social loss is measured by this value times the number of insured assets in the interval $A_1 - A_0$, or, based on equations (2) and (3), in the interval $A_1 - A_0 = 4P_0P_1^{-2}[(1-\delta)^{-2} - 1]$.

Implications for Public Policy

Much resources have been expended in years of debate over the questions of what forms of self insurance schemes should benefit from tax deductibility. It is apparent from the position of the U.S. Internal Revenue Service that this tax authority considers market insurance as the only visible means of pre-loss risk reduction, and therefore the only one worthy of tax deductibility. Consistent with modern financial theory, we argue that risk reduction via self insurance can be equally effective in reducing risk and often more economic in doing so. Based on this observation, we argue that the focus of the debate should be on the question of which tax policy maximizes social welfare. Consistently, the objective of this paper is to describe the social cost associated with the present tax policy that favors market insurance over competing pre-loss risk-financing methods. The nature of that cost and its potential magnitude indicates a need to reevaluate the present tax policy with a view toward equal tax treatment for all sound methods of pre-loss risk financing. The pursuit of such a policy is likely to raise difficult questions in defining, measuring, and monitoring legitimate means of pre-loss risk financing. Nevertheless, an imperfect tax system recognizing the legitimate role of self insurance is likely to be superior to the present one which arbitrarily ignores it.

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