consequences, then simply maintaining the alternative that informed consumers would choose avoids the costs of search that would otherwise be necessary. For example, virtually all consumers would presumably choose a non-carcinogenic color additive over a carcinogenic one. Licensing requirements that ban carcinogenic additives when virtually perfect substitutes are available are likely superior to certification systems. On the other hand, consumers may differ substantially in their willingness to make other quality tradeoffs. Because consumers may differ in their willingness to trade off small cancer risks for reductions in calories, a certification (or disclosure) approach to regulating artificial sweeteners may be superior to licensing.

In general, certification appears to be a superior policy solution to problems of asymmetric information. Certification leaves choices to consumers and market the process, rather than imposing an a priori judgment that some products or services are not worth buying.

J. Howard Beales III

See also CONSUMER PROTECTION; DISCLOSURE AND UNRAVELLING; PHARMACEUTICAL REGULATION; PRODUCTS LIABILITY; REGULATION OF THE PROFESSIONS; TRADEMARKS.

Subject classification: 6b.

Bibliography

limited and extended liability regimes.

The economic historian of the future may assign to the neoclassical inventor of the principle of limited liability, as applied to trading corporations, a place of honor with Watt and Stephenson, and other pioneers of the Industrial Revolution. The genius of these men produced the means by which man's command of natural resources was multiplied many times over; the limited liability company [provided] the means by which huge aggregations of capital required to give effect to their discoveries were collected, organized and efficiently administered (Economist, 18 December 1926).

In 1855 English companies were permitted to operate under limited liability following the passage of the Limited Liability Act. Contrary to the quotation above, the virtues of limited liability were not accepted by all participants in
The debate surrounding the introduction of limited liability. The defenders of the then prevailing unlimited liability rule argued that limited liability would result in uncompensated wealth transfers from shareholders to creditors and ultimately result in a reduction in the availability of credit in corporate activity. The proponents of limited liability argued that investment would be facilitated both by wealthy investors who understood joint and several liability fixed significant potential loss, and by the poor and middle classes who would not worry about their personal wealth when they made an investment in equity. (See Hahn et al., 1980 for a discussion of the arguments presented in the debate and for citations to other work.) It has been noted that limited liability in England was slow to spread (see Smart, 1996, who argues that companies were signalling high-risk activities when they selected limited liability). At that time, the arguments did not need to address the situation of large tort damages that potentially could bankrupt the firm. In the United States, the joint and several unlimited liability regime was the general American rule until the early nineteenth century. By 1850, most states had enacted statutes providing for limited liability but, even after the change to limited liability, provisions for double liability were prevalent. In California, pro rata shareholders liability (defined below) survived until 1931. While the virtues of limited liability and its positive effect on the growth of capital markets have remained unassailed for many years, in the early 1980s a number of articles were published that evaluated possible liability regimes and presented an efficiency argument for limited liability as the default regime in corporate law. Subsequent research has confirmed the efficiency of limited liability in this context. With the rise of large tort damages, there has been renewed interest in identifying a liability structure that will provide incentives to companies to take appropriate amounts of care if they operate in hazardous industries. While hinted at in earlier studies, two papers focus on this issue in recommending pro rata unlimited liability regimes for widely held companies. One of the papers has generated responses which suggest the unlimited liability in torts would be neither feasible nor viable.

INTRODUCTION. When, due to operating reasons or a judgment against the firm, the firm cannot meet its liabilities by liquidating its assets, the impact on shareholders will depend upon the liability rule in operation. If there is a limited liability rule, the company liquidates its assets and from this value covers some of the claims to creditors and claimants. If there is a deficiency of assets over claims, the creditor loses since the shareholders are not responsible for meeting any of this deficiency. In an unlimited liability regime, the equity holders are responsible for this deficiency. There is a range of liability rules that can and have been utilized. At one extreme is the pure limited liability rule, under which shareholders have no additional financial obligation. The limited liability rule can be extended to cover some of the deficiency based on a multiple of the book value of equity per share. Alternatively, if the shares have no book value, the excess can be stated as a fixed dollar amount per share. This form of liability is referred to as assessability and is an example of extended or excess liability. An example is "double liability" where the shareholders are responsible for unpaid claims up to the share book value of equity (see Macey and Miller, 1992) and the history and implications of this form of excess liability and joint and several liability as applied to the banking system in the United States). While this rule is not joint and several liability, it is possible to construct such a rule in this situation, the creditors could pursue each shareholder and shareholders could sue each other. Unlimited liability is also an excess liability regime but instead of pure unlimited liability in which each shareholder faces joint and several responsibility, there can be pro rata liability under which the shareholder is responsible for his or her proportionate share of the deficiencies of assets over claims. A shareholder owning ten percent of the shares of the firm will be responsible only for ten percent of the deficiencies. Note that any excess liability regime is de facto limited to values less than the contracted amounts since it is also limited directly by the shareholder's personal wealth determined in accordance with bankruptcy law.

The literature has considered the efficiency of various liability rules described above and whether or not there are inherent benefits to a particular liability rule. The analysis is usually undertaken with respect to different credit classes and different ownership structures. The literature has considered creditor class, the distinction between voluntary and involuntary creditors. Included in the first category are individuals who purchase products or services, tort creditors, and situations where damage is to the environment. The relevant difference between creditor classes is the ability of creditors to negotiate terms of the credit and engage in monitoring behavior to ensure that certain situations do not occur. For the creditor, negotiations are impossible and, unlike voluntary creditors, internalization by the corporation of costs imposed on these parties, ex ante, is not possible in the absence of a particular liability regime.

The ownership structure refers to close corporate control of sole proprietors, and widely held companies. For widely held firms, management typically owns a small percentage of the equity and receives little direct benefit from shifting wealth from creditors to equity holders. It is observed that small sole proprietors typically have contracts around pure limited liability to generate unlimited liability when dealing with voluntary creditors. This is observed through the use of personal guarantees by owner managers. In the case of involuntary creditors there remains serious concern over the inadequate incentives reducing risk provided by limited liability. The close corporation is typically distinct and the bulk of the analysis focuses on the widely held company.

EXAMPLE OF LIABILITY RULES AND WEALTH EFFECTS. A simple example is presented to capture the essence of liability rule issues. The example considers contract creditors only. Consider a firm which starts today with an initial capital of $10,000 and has issued debt that has promise to pay of $60,000 at the end of the period. Assume the initial book value and the par value of the equity is $10,000. The funds are invested in a project which will last only one year. At the end of the year, the company
is liquidated and the funds distributed first to the debt- holders to cover principal and interest payments and any remaining funds to the equity holder. There are no corporate taxes and assume the equity is owned by one individual. In addition, there are no transactions or information costs incurred by either creditors or shareholders, both ex ante and subsequent to the liquidation of the assets. This is an unrealistic assumption which is relaxed in the subsequent analysis. In fact, it is the relationship of ex ante and ex post transactions costs to the liability structure that leads to recommendations concerning the appropriateness of particular liability regimes. The market value of the company at any point in time during the period is equal to the present value of the expected company cash flows at the end of the period. The market value of equity will equal the residual cash flows after the payment of debt obligations from the liquidation value of the firm's assets; the equity cash flows in turn depend upon the liability structure under which the company operates.

Table 1

Panel A: Unlimited Liability

<table>
<thead>
<tr>
<th>State</th>
<th>Probability</th>
<th>Asset</th>
<th>Debt</th>
<th>Equity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good</td>
<td>0.6</td>
<td>15,000</td>
<td>6,000</td>
<td>9,000</td>
</tr>
<tr>
<td>Bad</td>
<td>0.4</td>
<td>5,000</td>
<td>6,000</td>
<td>-1,000</td>
</tr>
<tr>
<td>Market value</td>
<td></td>
<td>10,000</td>
<td>5,714</td>
<td>4,286</td>
</tr>
</tbody>
</table>

Panel B: Limited Liability

<table>
<thead>
<tr>
<th>State</th>
<th>Probability</th>
<th>Asset</th>
<th>Debt</th>
<th>Equity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good</td>
<td>0.6</td>
<td>15,000</td>
<td>6,000</td>
<td>9,000</td>
</tr>
<tr>
<td>Bad</td>
<td>0.4</td>
<td>5,000</td>
<td>5,000</td>
<td>0</td>
</tr>
<tr>
<td>Market value</td>
<td></td>
<td>10,000</td>
<td>5,286</td>
<td>4,714</td>
</tr>
</tbody>
</table>

Consider first the situation of unlimited liability. With a single owner, the issue of joint and several liability is not relevant. Under unlimited liability, the equity investor is responsible for any excess of creditors' claims over and above the liquidation value of the firm. For the purpose of the example assume when the assets of the firm are liquidated, the equity holder will have sufficient personal assets to pay any deficiency value and will not declare personal bankruptcy. In Table 1, Panel A, there are two possible outcomes, a good state with a probability of 0.6 and a bad state with a 0.4 probability. If the good state occurs, the assets have a liquidation value of $15,000, whereas in the bad state the value of the asset is $5,000. In the good state there is no credit facing the debt holders the full value of $6,000 and there is $9,000 available to the equity holders. Under the bad state, the liquidation value of the assets is $5,000 and not sufficient to cover the creditors' claims. This results in an additional claim on the equity holder of $1,000. Thus the equity holder have a negative payoff - a contribution of $1,000 to the creditors.

Under unlimited liability and the assumptions used, the debt is riskless since there is no question that the creditor will receive full value on the credit and the interest rate will equal a risk-free interest rate. The market value of the project cash flows is equal to $10,000, the value of the initial capital. Since the debt is riskless, assuming a 5% risk-free discount rate, the market value of debt is $5,714, leaving a market value of equity of $4,286.

Note that the market value of the corporation as of the start date is the same as if it would be if no debt were introduced. The unlimited liability regime does not change the overall risk of the assets and the size of the potential debt payment does not affect the market value of the assets. Second, the market value of the equity falls but this reflects the issuance of risk-free debt and the repurchase of equity to alter the capital structure. The creditors before investing their funds would evaluate the expected cash flows they would receive at the end of the period and set the terms of the credit in order to protect themselves. Since they have a risk-free position, the equity holder has a very risky position. This is reflected in the spread of the payoffs to the equity holder. However, the actual per share value of the equity will not be affected by the debt-equity shift under unlimited liability (Modigliani and Miller 1958). The number of shares has been reduced and the increased risk to the equity is offset by the higher expected return.

Now consider the same firm, project and financing but under a limited liability regime - the equity holder is not responsible to cover any deficit of the creditors' claims over and above the cash flows available from the liquidation of the firm's assets. Thus the equity value is derived from the value of the underlying firm assets at the end of the period and the debt obligations that have first priority. In Table 1, panel B, the cash flows to all investors in the firm are presented along with the market values of the claims. Since we have assumed no transactions costs in the event of default, the market value of the assets, i.e. the market value of the firm, remains at $10,000. The creditors, while receiving the full value of their claim in the good state, receive only the liquidation value of the assets, which is less than their claim of $6,000, in the bad state. Thus creditors now face a risky cash flow stream and must adjust the terms of their credit including a higher interest rate on credit.

Note that the equity of the firm receives either a positive amount or zero at the end of the period, depending on the exercise price of the call option written on the underlying assets of the firm, with a strike or exercise price equal to the promised debt payments at the end of the period. Options are called derivative securities since their value is derived from the cash flow characteristics of the underlying securities (Hull 1995). Using option theory, the value of the equity is calculated to be $4,714 and the market value of debt is equal to $5,286. Just as in the previous example, the movement from an unlevered to a levered firm has no effect on the market value of the assets, decreases the market value of equity, and has no impact on the share price of the equity. The equity holder now has a risky stream and the expected return on the equity is sufficient to just compensate for the added risk. These observations are consistent with the Miller and Modigliani propositions in a no-tax world. The independence of the share price from the form of liability regime depends upon the fact that the creditors can negotiate the terms of their credit and hence the market value of the credit based on the liability structure.
Comparing the limited and unlimited liability scenarios we observe that the market value of equity is higher by $428 in the limited liability regime. This increase is exactly equal to the lower market value of the creditors’ claims. Suppose there were a unilateral change in liability regime from limited to unlimited liability. We know that this would result in a higher risk to equity holders and a lower risk to bondholders. Market prices of equity would be unchanged after the announcement as long as the terms of the credit are renegotiated so that the increase in market value of the debt is passed on to the equity holders, who now have a higher risk. If, however, there is no chance of renegotiating, the shift to the unlimited liability regime will result in a windfall to the creditors.

Notice that in this example the overall risk and value of the enterprise along with the cost of capital are unaffected by the liability structure of the firm. The liability structure shifts risk and values among the various claimants to the cash flow. While we have chosen the two extreme or pure cases of liability regime, the intermediate positions, pro rata and assessability, would have impacts on the equity value and the risk to the creditors (and thereby the yields charged for credit) between the two extremes. For example with pro rata liability, the risk to the creditor is greater and the risk to the equity holder is less than under a pure unlimited liability regime.

The above conclusions assume that the creditors are able to collect from the equity holders the full amount of the excess liability up to the legal amount. However, this assumption becomes the crux of the debate among the researchers as to the efficacy of extended liability. For any specific form of extended liability, the creditors will assess the probability of collecting in the event of a bankruptcy; this probability will depend upon the wealth of the investors and their ability to circumvent the excess liability structure. For the former, the creditors must incur search costs which are unrelated to the underlying profitability of the firm. Clearly if the liability rule has a joint and several element to it, the information costs are larger. The creditors then determine a yield on the credit based on their ability to collect. The less likely they are to collect, the higher their risk, the larger the yield and the less risk to the equity holders – given that overall risk remains constant. If the creditors believe that they will be unable to collect anything in the event of a default, even in a excess liability regime, the regime is effectively a limited liability. If it is observed that transactions costs are higher under unlimited liability, contractual provisions may be introduced to convert unlimited to limited liability.

Also of concern to researchers are the attempts by equity holders to frustrate an unlimited liability regime and generate uncompensated shifts in wealth. Suppose the firm operates in an unlimited liability regime and the creditors have evaluated the risk of default and their expected payoffs in the event of liquidation and have set the yields appropriately. While equity holders have a riskier stream there is the offsetting benefit of a lower cost of credit. However, it is in the equity holder’s interests to institute various techniques ranging from hiding personal assets to selling (in the extreme giving) shares to low-wealth individuals. To the extent the current equity holders are successful in these operations and this behaviour is unexpected by creditors, they convert unlimited liability closer to limited liability. The equity holders now have claims worth more to them than before and their wealth has increased at the expense of the wealth of debt holders. The incentive to engage in this behaviour increases with the probability of default, the risk of the assets, and the amount of debt.

In the original arguments concerning the introduction of limited liability, the major concern was increased risk taking by owners of companies to the detriment of the corporation and its creditors. It is necessary to understand the situations in which this risk taking will arise. With an unchanged cost of capital, there should be no bias toward riskier projects. However, the concerns raised in the original arguments are correct and are quickly demonstrated in the following examples.

### Table 2

**Limited Liability**

<table>
<thead>
<tr>
<th>State</th>
<th>Probability</th>
<th>Asset</th>
<th>Debt</th>
<th>Equity</th>
</tr>
</thead>
<tbody>
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<td>1,000</td>
</tr>
<tr>
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<tr>
<td>Market values</td>
<td></td>
<td>4,737</td>
<td>4,267</td>
<td>470</td>
</tr>
</tbody>
</table>

**Panel A: Shift risk**

<table>
<thead>
<tr>
<th>State</th>
<th>Probability</th>
<th>Asset</th>
<th>Debt</th>
<th>Equity</th>
</tr>
</thead>
<tbody>
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<td>0.05</td>
<td>50,000</td>
<td>6,000</td>
<td>44,000</td>
</tr>
<tr>
<td>Bad</td>
<td>0.95</td>
<td>100</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Market values</td>
<td></td>
<td>1,996</td>
<td>324</td>
<td>1,672</td>
</tr>
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</table>

**Panel B: Double Liability**

<table>
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<tr>
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<th>Asset</th>
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<td>50,000</td>
<td>6,000</td>
<td>44,000</td>
</tr>
<tr>
<td>Bad</td>
<td>0.95</td>
<td>100</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Market values</td>
<td></td>
<td>1,996</td>
<td>3,981</td>
<td>-1,985</td>
</tr>
</tbody>
</table>

**Panel C: Unlimited Liability**

<table>
<thead>
<tr>
<th>State</th>
<th>Probability</th>
<th>Asset</th>
<th>Debt</th>
<th>Equity</th>
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<tr>
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<td>0.05</td>
<td>50,000</td>
<td>6,000</td>
<td>44,000</td>
</tr>
<tr>
<td>Bad</td>
<td>0.95</td>
<td>100</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Market values</td>
<td></td>
<td>1,996</td>
<td>5,714</td>
<td>-3,718</td>
</tr>
</tbody>
</table>

Limited liability introduces the prospect of opportunistic behaviour – moral hazard and adverse selection (Milgrom and Roberts 1992, chs 5 and 6) – which are attempts by equity holders under certain situations to shift wealth from creditors.
limited and extended liability regimes

is liability by which creditors will have to bear the risks entailed by extending credit to themselves. An example of moral hazard is that bondholders evaluate the credit worthiness of a company and adjust the terms of credit accordingly. However, once the credit is in place, under certain circumstances the company may undertake behavior which was not anticipated in order to increase the equity holders' wealth at the expense of the creditors. The bondholder claim is most susceptible to this problem since it has a long-term contract.

To demonstrate the situations under which this opportunistic behavior will arise and how the liability regime will impact on the incentive to engage in this behavior, consider the examples presented in Table 2. Our illustrative limited liability firm invests its $10,000 and immediately after the investment the economy goes into a recession and the outcomes in the good and bad states are reduced to $7000 and $3000 respectively. The value of the firm falls to $4737, the market value of debt is $4267 and equity, $470. (As a point of comparison the market values of debt and equity under unlimited liability are $5714 and $977 respectively.) This firm faces a substantial risk of default and the equity holders have an incentive to undertake actions that will shift wealth from the creditors to themselves. To do this, the assets of the firm are liquidated and invested in a very risky project, one which has a low probability of a very high payoff and a high probability of effectively a zero payoff (see panel A, Table 2). In this situation, the total value of the assets fall to $1996, the value of debt falls to $324 but the value of equity increases to $1672. The creditors' loss in value, related to the increased risk they now face in the firm's operations, reflects the loss in value of the assets and the gain to the equity holders. The equity holders are clearly better off compared to the previous situation. (Smith and Warner (1979) identify other methods by which wealth can be shifted from bondholders to equity holders.) The incentive to engage in these actions increases with the amount of debt outstanding and the probability of default. Clearly if the firm is successful, the benefits provided by limited liability are not as valuable as the situation in which the firm is likely to be in default. The creditors are not powerless to prevent some of these actions since they can incur expenses and monitor more closely and introduce covenants in the trust indenture which will curtail certain types of behavior and force provision of information to creditors before the firm undertakes certain actions.

Would the incentive be the same under different liability regimes? In panels B and C the payoffs and values of creditors' and equity holders' claims are presented under a form of excess (double) liability and unlimited liability. Under double liability with a risk increase, in the very likely event of default, the equity holder would have to make a payment to the creditors equal to the difference between the liquidation value of assets and the debt claim up to a maximum of the original book value of the equity, $4000. The value of the debt would thus be higher ($3981) and the value of the equity is now negative, $1985. Since the likelihood of default and a payment by the equity holder is so high, the equity holder by undertaking risk increasing decisions would lose value and hence would not do it.

Under the pure unlimited liability regime, the payment by the equity holder conditional on the bad state occurring will cover the complete excess of the creditor claim above the value of the assets and this claim must be paid by the equity holder. In this case the debt is riskless and the shares of the firm have a value of $3718. Again the incentive to engage in risk increasing behavior is blunted significantly. Therefore, under any excess liability regime, the incentive to engage in wealth shifting behavior is reduced since the value of the equity expected by this behavior is reduced.

The example demonstrates one of the shortcomings of any excess liability regime: to the extent that the equity holder can reduce or eliminate payments to creditors in the event of default, the incentive to diminish risk-taking behavior is frustrated and there are again uncompensated shifts in wealth. For example, in the double liability case, if investors can structure their affairs such that there is no collection in excess of the amount under limited liability, the equity holder has returned the situation to one of unlimited liability. The problem of avoiding the excess liability payoffs becomes increasingly severe with the amount of the excess liability and if it is joint and several liability. Thus the incentive to avoid payments is greatest under the joint and several rule, decreases under the pro rata unlimited liability and continues to decrease under excess limited liability as the deviation from pure limited liability is reduced. Of course, bondholders are not unaware of the possibility of frustration of the excess liability rule and will adjust the credit terms appropriately. In the extreme, the limited liability rule is found.

EFFICIENCY OF LIABILITY REGIME: CONTRACTUAL CREDITORS.

In concluding which liability regime is efficient, all researchers identify two issues: the relationship between liability regime and the functioning and efficiency of the capital market and the transactions costs imposed on creditors and investors. Consider first the capital market issue. In order to have correct corporate investment decisions, there must be a separating between corporate investment and production decisions and owners' personal consumption decisions. The existence of a capital market in which shares can be freely traded facilitates this separation. Individuals who own shares need not be concerned about the dividend policy of the firm in respect of their consumption decisions but can sell sufficient number of shares to generate funds for consumption. A shareholder with a particular risk preference who finds that a firm in which he or she owns shares makes a good investment decision but of above-average risk need only sell some shares to reduce its exposure or her portfolio to the desired risk exposure. In addition there should be no incentive for investors to accumulate shares and thereby reduce the liquidity of the market.

Finally, the information costs of both equity investors and grantees of credit should be minimized. In all of these factors, the liability structure has an important impact. In the pure unlimited liability world, the rate of return earned by any investor depends not only on the cash flows of the firm and the wealth of the individual investor but also the wealth of other investors. If a wealthy investor purchases one share and there is a default, creditors in a cost-minimizing strategy will aggressively pursue the wealthy shareholder. If this individual has sufficient wealth.
to cover the excess of claims over assets, the individual faces a very unusual probability distribution of possible returns: with no default there is a payoff related to the cash flows for one share, yet in the event of default the investor is exposed to the loss of the entire firm. This is not the probability distribution faced by an investor who has less or no personal wealth. Therefore, under the pure unlimited liability regime, investors have different probability distributions for the same share and hence pricing securities becomes very difficult for the market. In addition, as long as the wealthy investor maintains his or her private wealth available in event of default, this investor would prefer to alter the probability distribution by owning an increasing amount of the shares of the firm. Since the outcome in the event of a default is the same, the greater number of shares provides a greater payoff in the good states. This result is recognized in the literature and for this reason, a pure unlimited liability regime is mentioned as a possible rule but quickly dismissed. Note that in the pure limited liability rule, each individual investor faces the same probability distribution, there is no incentive to accumulate shares for risk modifying reasons, and securities markets can price securities. Under this rule, shares are transferable and markets can perform their function.

It is also true that any excess liability rule which does not have a joint and several element will permit markets to price securities. For each equity investor, the distribution of outcomes is the same provided payment is made. Thus, security holders need not worry about the wealth of other equity investors and each investor faces the same probability distribution. Note, however, that creditors are not indifferent between the liability regimes since with extended liability they incur transactions costs to assess the capacity of investors to pay to the event of a default. On the investor side, the sale of shares by a wealthy investor to a poorer one will have an impact on the amount of recovery and hence creditors will take this into consideration. One way to ensure the full benefit of unlimited liability through lower credit costs is to have majority holdings and limitations on transactions so that the creditor can have an easier time assessing the wealth and capacity to pay. Thus, extended liability rules may generate a problem of reduced trading. The stronger the excess liability, the more the reduced trading. While securities can be priced, transactions may not occur, thereby inhibiting the functioning of markets.

In considering the transactions costs of creditors, an extended liability regime will introduce significant costs both ex ante and ex post. All of the costs are related to the amount of the payments to the creditors in the event of default relative to the actual amount that should be paid and the probability that equity holders will engage in activities that reduce the payout in the event of default.

On an ex ante basis, creditors need to identify the terms under which they will grant credit and this requires identification of the wealth of all individual investors and assurances that the wealth will be available in the event of default. Thus search costs prior to the initiation of the credit and ongoing monitoring costs of the shareholders' identity and wealth as the firm approaches default are necessary. The ongoing monitoring will be costly, and, in some situations, impossible. The costs are greatest in a joint and several regime but any excess liability regime will require ongoing monitoring of shareholder wealth and ownership structure.

After a default, the transactions costs incurred will depend upon the liability rule in operation. Under a joint and several rule, the creditors will pursue all shareholders but clearly will anticipate collections from the wealthiest shareholder(s). Collection costs can be very large, especially in a widely held company. As the excess liability rule becomes weaker, the creditors will still pursue the wealthiest shareholders since they have the greatest likelihood of making payments in the event of default in amounts equal to those implied by the liability regime.

There is very little empirical work undertaken on the impact of liability structure. One interesting piece is the analysis of extended liability presented in Macey and Miller (1992) in the context of 'double' liability in the banking industry. Over the period roughly from the Great War to the Great Depression, during which the extended liability regime was in force, most small banks were owned and the large banks were parts of holding companies. Macey and Miller observed that recoveries for depositors and other creditors were about 31%, of the amount assessed, arguably a small proportion given the less developed capital market and the closely held status of the companies. Also they found that most banks were liquidated voluntarily before they went into insolvency, thereby keeping losses to creditors low. However, this observed behaviour is more likely due to a management owning the bulk of the shares and thus by liquidating while they can still obtain a payoff. They also note a number of administrative issues that had to be faced.

One that has direct relevance to our discussion is the determination of who is liable in the event of a default and judgment against shareholders. It was determined that liability followed ownership provided the shares had been sold in good faith at a time when the bank was solvent. In addition, there were opportunistic transfers to insolvent parties in an attempt by shareholders to evade liability for default. Rules were established in order to determine whether the transactions undertaken either in insolvent or prior to insolvency were undertaken with the purpose of avoiding assessment. Finally, enforcement of assessment in the event of a default presented problems. Suing a large number of shareholders was costly and cumbersome and enforcing assessments in remote jurisdictions was problematic. In the latter case receivers did not pursue shareholders.

Even though the liability structure was operational in the context, it may not provide much information as to the operation of extended liability regimes in the context of well-developed capital markets, widely held shares, and foreign investors. It is interesting to note that the excess liability was removed since it 'effectively bankrupted many innocent stockholders who have taken no part in the active management and control of the bank' (Macey and Miller 1992: 37). The idea that innocent shareholders are being punished for actions of others is an important issue in applying extended liability in the context of tort credit.
in which mandated unlimited liability results in a higher cost of capital, smaller firms and less growth. Intuitively the cost of capital is higher due to higher transactions and monitoring costs under unlimited liability. Unlimited liability must be mandated, otherwise firms would either shift to limited liability or would write contracts with creditors to introduce limits to their liability. The authors test their theory on two different data sets: Scottish banks over the period 1795 to 1882 and US law firms. The authors find evidence consistent with their position in both data sets. In the Scottish banking system there were three Edinburgh banks that had limited liability while entry was open to others, provided the entrants' shareholders accepted unlimited liability. While a public policy argument could be made that an unlimited (joint and several) liability regime would reduce risk taking behaviour, thereby lowering the probability of default and hence increasing the stability of the banking system (see Macey and Miller 1992 for a similar argument), Carr and Mathewson argue that there was a private interest explanation for mandated unlimited liability. They find limited liability banks were more profitable and larger than unlimited liability banks. Findings on average size of law firms and lawyers' incomes based on liability regime are also consistent with their hypothesis. A comment on the paper by Gilson (1991) concerning the law firm data set suggests that Carr and Mathewson have the causation of liability status and growth reversed. The reason for incorporation of legal professionals reflects a tax advantage, and those firms which have grown the most and have the most to lose will incorporate while those with low growth will not. Gilson is of the view that liability status has no influence per se. There continues to be disagreement over the interpretation of new empirical evidence.

Finally, there is some empirical evidence presented for German start up companies (Horvath and Woywode 1996) which suggests that holding constant size, age, and industry, the growth rates of companies differ according to the liability structure chosen. Those which choose limited liability have higher growth rates compared to those which choose unlimited liability, even after controlling for a number of variables. The paper also observes firms with limits on the owners' liability display an increased likelihood of exiting via filing for bankruptcy.

CONCLUSION ON LIABILITY REGIME: CONTRACTUAL CREDITOR. For contractual creditors the research has recognized that there are problems with limited liability in terms of the incentive to engage in risk enhancing and other wealth diverting behaviour. However, all researchers have concluded that limited liability should be the default rule. This conclusion rests on the observation that creditors in a limited liability regime can protect themselves ex ante by choosing appropriate terms for the credit instruments they provide to the firm including restrictive covenants, monitoring, information provision requirements, and personal guarantees. In addition, transactions costs to creditors, both ex ante and ex post, are lower under limited liability than under any of the excess liability regimes. The transactions costs faced by shareholders are lowest under limited liability, although the excess liability rules without joint and several elements will permit transactions costs to approach but not equal those under limited liability. With limited liability as the default rule, companies are free to contract around it as they see fit.

TORT CREDITORS: LARGE COMPANIES WITH PUBLICLY TRADED EQUITY. The conclusion to maintain limited liability in the context of voluntary creditors is a result of the costs and benefits of limited liability and the observation that any risk increasing behaviour is partially internalized due to the behaviour of creditors. However, there are situations in which negotiations with a potential creditor are indirect or even non-existent. For example in a product liability situation, the consumer purchases the product and potentially could have included in the purchase decision and hence in the price paid, the probability of a product liability claim. In other situations, the consumer may take the service provided but not be able to differentiate in price based on the probability of a problem. There are also environmental torts such as the Exxon Valdez oil spill which can have significant costs. These are examples of corporate torts and the issue of the impact of the liability regime on the incentive to undertake behaviour which can increase the likelihood of tort claims is an important one in the literature.

Consider a company with limited liability in an industry that is prone to high risk events. Note that high risk industries can be identified ex ante by market participants. In this industry, the firm would typically engage in costly risk reducing activity, however, in order to increase cash flows, the firm decides to reduce or eliminate the risk reducing investments. Analogously, the firm may decide not to undertake needed risk reducing investment activity. The probability of a harmful event occurring increases, and even though the probability is very small, given the size of some tort claims the potential expected costs to the firm can be substantial. Note that the gain in wealth by eliminating the risk reducing activity or not engaging in it is at the expense of the tort creditors who are unable to negotiate with the corporation and require the risk reducing activity. If potential tort victims could identify that the company altered its risk strategy and consequently could adjust the product prices appropriately and engage in monitoring to ensure that the company does not engage in opportunistic behaviour concerning the product liability risk, there would be no gain to equity holders of risk changing behaviour in high risk industries. Even though the relative infrequency of these types of risk increasing activities is accepted by Hansmann and Kraakman (1991), they still believe that the incentives provided by an excess liability scheme are important and should be introduced.

With proportionate liability the market will assess the expected value of the possible tort claims and the share price will fall to reflect the incorporation of this information. The reduced price will provide an incentive to the firm to increase the funds devoted to risk reducing activities and thereby result in an increase in share price. The risk reducing activities will continue up to the point where the marginal cost equals the marginal benefit. In this way the risk of tort claims is internalized in the decision making of the corporation. However, given the structure of the
marginal costs and benefits, it may be rational for the company not to engage in any risk reducing activities.

Another way to internalize the costs of tort damages is through the purchase of insurance by the corporation. The premium paid for the insurance will reflect the expected damages and thus the incentive for risk reducing is manifest in a reduction in the insurance premium. However, there is a question whether the insurance company will write an unlimited payoff policy and the monitoring costs incurred by the insurance company may be substantial.

Leebron (1991) investigates proportionate liability for tort claims and concludes that the case for limited liability for corporate torts has been overestimated and other liability regimes should be investigated. In the absence of enforcement transactions costs, which Leebron considers may be significant, the optimal liability rule would be pro rata (proportional) unlimited liability, at least for severely injured tort victims. However, any decision as to the appropriate liability rule requires a context-specific analysis and an examination of diversification opportunities, risk bearing, and transactions costs (Leebron 1991: 1306). In addition, he suggests that a final resolution of liability regimes for closely held companies awaits more theoretical and empirical work.

Hansmann and Kraakman (1991) argue that a well-designed pro rata unlimited liability rule is feasible, can be introduced at the state level, and will neither impair the marketability of securities nor impose excessive collection costs. The authors recognize that the rule has to be designed very carefully, collection costs could be large, and there could be collection only against the large/wealthy shareholders. In an attempt to address the collection costs issue, they introduce a concept of portfolio insurance - insurance that covers the individual investor's portfolio in the event of a tort claim. This type of insurance does not currently exist and it is not obvious that this type of insurance will be written. What distinguishes this insurance from the traditional type of insurance is the open-ended nature of the possible loss. Equally important is the possibility of evasion of payments in the event of a tort liability. Evasion techniques have been described above (see Macey and Miller 1992), and Hansmann and Kraakman add to the list the issuance of debt and the repurchase of equity in order to reduce the amount of assets available to the tort creditor and the disaggregation of companies into less risky assets held by the company and higher risk assets that are sold to individuals who have few personal assets. Note that risk is in the context of potential tort liability and not underlying operating risk. These individuals who acquire the risky assets are described by the authors as 'high rollers'; they suggest that high rollers are limited in supply and hence not an important problem is the operation of the pro rata rule in the event of a tort. With the size of environmental tort claims, high rollers exist even under a limited liability regime. These individuals stand ready to purchase the risky assets of companies and thus remove the tort risk exposure from the original company.

Independent of the theoretical arguments for and against the use of proportionate liability in corporate torts, two papers suggest that the use of extended liability will not achieve the results strongly supported by Hansmann and Kraakman. The reasons proposed are the existence of 'liquid equity traded in a world with innovative capital markets and minimal transactions costs' (Grundfest 1990), and procedural problems of implementation, especially in the context of obtaining funds to cover the expected liabilities in the event of tort liability (Alexander 1991: 394). The papers are complementary; Grundfest considers the influence of capital markets on the efficacy of liability regimes and Alexander considers the administrative problems encountered in implementing proportionate liability for tort claims at the state level. Taken together, these papers suggest that the expected reduction of share price of risky firms will not arise. Without the reduction in the price, the incentive to reduce tort risk is diminished and corporate behavior is no different than under limited liability.

The Alexander paper is a compelling argument concerning the difficulty of implementing (pro rata) unlimited liability, focusing on the problems of the choice of law and personal jurisdiction. She argues that without federal legislation, it would not be feasible to adopt unlimited liability in tort and thus individual states cannot proceed on their own. Hansmann and Kraakman (1992) acknowledge the importance of procedural issues and agree that federal legislation is the preferred mechanism to implement unlimited liability in torts but disagree that it is the only route. Their comment on the Alexander paper addresses the issues of jurisdiction and conflicts of law which the conclude would still permit implementation of unlimited liability at the state level.

Grundfest presents an intriguing argument for the inability of any extended liability regime to influence share prices. His position is based on the reactions of sophisticated, well-functioning capital markets to the introduction of unlimited liability, the response of corporations to high tort risk activities by issuing equity-like securities that do not have unlimited liability, and the reaction of financial intermediaries. Grundfest argues that the response expected if excess liability for torts is instituted is identical to the arbitrage of tax and regulatory barriers by imaginative wealth maximizing capital market participants. In contrast, regulatory constraints intended to stop the arbitrage lead to further arbitrage behavior.

From the investor perspective, Grundfest argues that any reduction in share price for risky firms will result in the emergence of a clientele composed of attachment point investors who will hold the risky securities and pay the same price as would exist under limited liability; shareholders with substantial assets will form another clientele that holds the securities of less risky companies in more risky industries. Grundfest refers to this behavior as arbitrage and, if successful, there will be no price sign associated with the introduction of excess liability, reduction in risky activities, and no increase in the pool of assets available to satisfy claims. The arbitrage results in restricted only by transactions costs. The attachment point investors need sufficient wealth in aggregate to be effective in the arbitrage and must be without assets available to satisfy a claim at the individual level.

The clientele arises as a result of US constitutional issues at the state level and from the practical and juridical
tional problems arising from attempts to collect from domestic and foreign shareholders of firms that have insufficient assets to satisfy tort claims and the fact that jurisdiction cannot be established for foreign investors. In making these arguments Grundfest relies on the paper by Alexander (1992), who deals in depth with these issues. Alexander uses an example where the tort occurs in an excess liability state and the firm and some shareholders are found in different limited liability states. Alexander argues as summarized in Grundfest (1992: 395–6):

... the simple passive ownership of stock in a corporation that commits a tort cannot satisfy the minimum contacts test for assertion of jurisdiction. This holds true even if the tort occurs in the forum state, the corporation is incorporated in the forum state, and the shareholders derive economic benefit from the corporation's activity in the forum state (Alexander, citing *World-Wide Volkswagen v. Woodson*, 444 US 286 (1977)). For jurisdiction to lie, the corporation’s shareholders would probably have to be subject to personal service in the forum state, reside in the state, engage in continuous and substantial business dealings in the state, or have litigation-related contacts with the forum state. Because of these constitutional limitations, only a fraction of any corporation's shareholders would be subject to excess liability in any given state, and that fraction would depend on random factors, such as the location of the specific tort at issue and the residences of each of the corporation's shareholders. Moreover, because it would be against a state's self-interest to make its residents liable for torts while residents of other states could readily avoid jurisdiction, the prospect that proportionate liability would be adopted at the state level seems doubtful.

With respect to obtaining jurisdiction over foreign shareholders and attaching their assets, the problems here may make the collection problems associated with smaller domestic shareholders seem trivial. First, courts may not assert jurisdiction over foreign shareholders. Further, any attempt to extend jurisdiction will face potential impacts on international relations. Even if the jurisdictional issue is solved, the problem of collecting is challenging. Foreign courts may not enforce US court judgments in their country, may not recognize default judgments, and may only enforce judgments that are consistent with their corporate law. Further, it will be difficult to identify ownership of the shares, especially where shares are held in street or bearer name or where the shares are held in account in countries with bank secrecy laws. Finally, the cost of pursuing foreign shareholders will be very high and greater than the cost of pursuing domestic shareholders.

Grundfest also notes that the formation of client elites can result in unbalanced portfolios compared to the set of portfolios each investor would have under limited liability. However, he notes that the same portfolio risk that obtained under limited liability can be obtained under pro rata liability through the use of derivative securities such as futures, options and swaps of index portfolios composed of risky and non-risky stocks. Thus, what could be done under limited liability can be attained under unlimited liability. Further, these derivative securities are attachment proof in the sense that they do not reflect direct ownership of any equity security. In addition to the clientele effect, corporate issuers can react to the instability of pro rata liability by reconstucting balance sheets towards attachment proof securities. Issues. Debt-equity exchanges will reduce the equity component and the use of convertible debt, high risk debt, warrants and complex securities, all of which have equity characteristics but are attachment proof, will arise. Hansmann and Kraakman (1992) respond that these reactions will just focus the unlimited liability in the remaining equity. While this is true, it does not negate the argument that arbitrage will occur on this smaller remaining equity and in fact the arbitrage may be easier since there is less equity outstanding. Finally, Grundfest suggests that intermediaries such as investment banks, commercial banks and mutual funds will arise to provide investment vehicles that are attachment proof. For example, a foreign government or governmental agency can issue foreign debt that has a value that is contingent on the price of a security of a domestic company which is risky in respect to tort liability. This structure provides an attachment proof position to the domestic investor since the investor is not an equity holder in the domestic corporation directly and the tort claims would have to assert jurisdiction over lenders in a foreign government. To similar effect, foreign companies in safe industries can issue debt that has value contingent on the price of a security of a domestic risky company. The most direct methods to avoid a payment in the event of a tort claim are the use by domestic investors of offshore mutual funds which hold the shares of risky domestic companies or the direct investment in the equity of risky companies by wealthy individuals through their foreign accounts. In these situations there will be significant difficulty in attaching the assets of the investors. The resolution of the Grundfest and Hansmann–Kraakman positions will be based on empirical evidence. The empirical evidence available on the reaction of capital markets to certain factors such as tax differences and differential regulatory requirements both domestically and internationally provides support to the Grundfest position.

TORT CREDITORS: CLOSELY HELD COMPANIES. In any discussion of liability rules, especially in the context of tort liability, the close corporation takes up a large amount of energy and passion. It is generally accepted that for most close corporations the entrepreneur or small ownership group has invested a substantial amount of its personal wealth in the venture. This results in an undiversified portfolio and generally a higher cost of capital than a comparable corporation in which the owners have been able to diversify their risk. In addition, the ability to bear loss in the close corporation is much restricted compared to a company with a large number of shareholders. These arguments suggest at first blush that a limited liability regime is appropriate for the close corporation.

The owner/manager of the close corporation obtains the full benefit of any opportunistic behaviour with respect to involuntary creditors. Thus there is the strong incentive for opportunistic behaviour. The paradigmatic example of
the problem of limited liability in torts is Walterszky v. Carlton, in which the owner of a fleet of taxicabs separately incorporated a company for each taxi cab. The owner is thus able to limit his potential liability exposure to the assets within the individual company in the event of a tort claim. The result is an incentive to increase opportunistic behaviour.

Recognizing the problem, the research papers suggest resolutions ranging from the introduction of unlimited liability, to a more vigorous approach to piercing the corporate veil, to the retention of limited liability in conjunction with the introduction of other mechanisms intended to reduce the opportunistic behaviour.

Piercing the corporate veil permits creditors to reach the personal assets of the shareholder of the firm. Easterbrook and Fischel (1985: 109) argue that veil piercing can be understood as an attempt by the court to trade off the benefits of limited liability against its costs. They note that almost every veil-piercing case has involved a close corporation. However, Leebrook (1991: 1628, fn. 19) notes that even in the close corporation, courts are more inclined to pierce the veil in order to hold a parent corporation liable for debts of a subsidiary than reaching the personal assets of the shareholders (Walterszky v. Carlton).

Alternatively, to veil piercing which retain limited liability have been discussed by many of the authors. These alternatives include the identification of minimum capital requirements in order to reduce the impact of thin capitalization on incentives to undertake risky behaviour, changing the priority of tort claimants to a position prior to the secured creditors in the event of a tort claim, mandatory corporate insurance, introduction of managerial liability (which is often eliminated through the purchase of insurance) and finally the regulation of inputs in a risky industry (gatekeeper function). These approaches may be workable but would require a number of administrative costs and questions and significant difficulties in identifying the correct levels of intervention. As an example Leebron concludes that in situations in which limited liability is irrelevant because controlling shareholders and other investors taking an active role in the enterprise may be held directly liable... the shareholders ought to be granted limited liability subject to the three constraints put forth. First, controlling shareholders should not be able to limit their liability by artificially separating a unitary business. Or closely related enterprises, into separate corporations. Second, shareholders of close corporations should not be allowed to unilaterally determine the capital available to involuntary creditors by using personally guaranteed corporate debt instead of equity to finance the enterprise. Finally, shareholder/managers should have an obligation to provide adequate insurance to meet the claims of foreseeable tort victims (Leebron 1991: 1636).

Finally, the argument for unlimited liability is presented by Hansmann and Kraakman (1991) in which they conclude that some small firms may not be viable under unlimited liability due to the diversification and risk bearing arguments presented before, but there is no reason to believe that such small firms should exist. Further, they argue that the presence of liability insurance for businesses strengthens the argument for unlimited liability. However, as noted above, insurance is costly and limits on the liability coverage due to difficulty of monitoring may make unlimited liability less feasible than the authors suggest. The ultimate resolution of the appropriate liability regime is again an empirical issue; the lack of empirical evidence on important issues is best demonstrated in Hansmann and Kraakman (1991: 1890) where they quote a telephone conversation that 'writers of liability insurance for business claim to be able to control moral hazard by inspecting the insured and employing experience rating'. There is a doubt this is true, but it is coverage of well-known risks and limited, not unlimited, coverage. (Paul Halpern et al.)

See also Bankruptcy and its Reform: Corporate Bankruptcy; Corporate Law; Joint and Several Liability; Partnership; Products Liability; Professional Corporations and Limited Liability; Unlimited Shareholder Liability.

Subject classification: 59g(ii).

CASE


BIBLIOGRAPHY


