



Systemic risk, coordination failures, and preparedness externalities

Applications to tax and accounting policy

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Abstract

Purpose – Sometimes resources are badly employed because of coordination failures. Actions by decision makers that affect the likelihood of such failures are sometimes said to cause “systemic risk.” This paper seeks to consider the externality in the choice of *ex ante* risk management policies by individuals and firms, concerned with private risk, not with their contribution to systemic risk.

Design/methodology/approach – The implications for debates over fair value accounting are considered.

Findings – One consequence is that individuals and firms become overleveraged from a social viewpoint. The recent credit crisis exemplifies the importance of this problem. The US tax system taxes equity more heavily than debt, and therefore exacerbates the bias toward overleveraging. A possible solution is to reduce or eliminate taxation of corporate income and capital gains. Preparedness externalities can also cause firms to become too transparent, and thereby subject to financial runs.

Originality/value – The paper offers insights into systemic risk, coordination failures, and preparedness externalities, focusing on tax and accounting policy.

Keywords Risk analysis, Taxation, Accounting policy, Economic conditions, United States of America

Paper type Research paper

1. Introduction

1.1 Preparedness externalities, coordination failures, and crises

According to macroeconomic theory, sometimes coordination failures cause resources to be badly employed. During recessions, individuals have trouble finding jobs and, despite the availability of cheap labor and other inputs, firms stockpile cash and refrain from hiring and investing.

Discussions of financial crises often consider “systemic risk” that arises from the possibility that the failure of one or a few large financial firms could create a chain reaction that damages the entire financial system. The recent financial crisis has highlighted the interdependence of financial firms and the importance of systemic risk.

Failure of the financial system in turn can cause coordination failures in the real economy. If firms cannot raise capital easily, they need to reduce investment, cut employment, and stockpile cash. So the problem of managing systemic risk is part of the general problem of avoiding coordination failures.



Problems of systemic risk are usually discussed from the viewpoint of regulators limiting the excessive risk-taking of financial firms. However, this begs the question of why private firms would want to take excessive risk. There is an obvious explanation in the case of banks, since deposit insurance provides a government subsidy to risk-taking. But more generally, setting aside the prospect of *ex post* government rescues or bailouts[1], it is not entirely clear why hedge funds, investment banks, insurance companies, and other financial entities – as well as industrial firms – would want to take excessive risk.

There are of course, several specific explanations that have been offered. For example, it is often said that the compensation contracts of fund managers or investment bankers encourage excessive risk-taking. Corporate managers are said to be driven to risk by stock option compensation. Alternatively, equity-based compensation and reputational considerations are said to provide excessive incentives to focus on the short-term, so that during a bubble, while the music is playing, financial managers feel they have to keep dancing.

Regardless of their validity, at least some of these arguments are not fundamental. For example, if hedge fund compensation encourages excessive risk taking, it would be feasible to offer a more concave compensation scheme that encourages less risk-taking. Corporate managers could be given more salary and fewer options[2].

We argue that the more fundamental problem is a mismatch between the private and social costs of risk-taking. An investor does not mind that the fund or firm he invests in contributes to systemic risk, because the investor does not bear the full cost of this contribution. It is this externality which allows compensation contracts and institutional forms to persist that result in excessive risk from a social point of view.

In general, individuals and firms can take many kinds of prior actions that prepare them for adverse macroeconomic shocks. They can undertake formal risk management strategies such as a program for hedging, deleverage, and maintain a higher cash buffer, follow disclosure and reporting policies that make it hard or easy for stakeholders to see whether the firm is in trouble, and design contracts, institutions, and incentive schemes that prevent agents from taking excessive risk. We call choices that make the firm more resilient to bad states of the world preparedness activities.

Our thesis is that because of the possibility of coordination failures, there is a positive externality in preparing for bad times. An example makes this concrete. Suppose that an automobile firm has low preparedness, i.e. it has high leverage and low cash. Then in the event of a recession, the firm is more likely to need to lay off workers and cut back on investment. This harms workers and suppliers, who in turn will need to cut back on their demands from other firms. The firm's cutbacks can contribute to a chain reaction and to a general recession. Such a chain reaction could instead start with a shock to financial firms.

Ex ante, the owners of the automobile firm do not like the prospect that their firm may have to cut back on needed investment. But they are not concerned about the fact that should they lay off employees, those employees will cut their demands for the products of other firms. Similarly, the owners of the auto firm do not care that their suppliers will be hurt, and the suppliers of their suppliers. So in choosing its optimal level of preparedness, the owners and managers of the auto firm will not take into account the benefit that preparedness confers upon others throughout the economy –

the benefit of mitigating coordination failures. Our purpose here is to explore the policy implications of these preparedness externalities.

Regardless of whether there is complementarity or substitutability in the preparedness choices of different parties, it remains the case that the incentive to invest in preparedness is, from a social viewpoint, insufficient. As argued above, a prepared party does not absorb the full benefit of preparedness, because the party does not bear the full cost of its contribution to coordination failure.

1.2 Policy implications

We will mainly consider two applications of preparedness externalities, to tax policy and to accounting policy. Minimizing systemic risk has been a key concern of financial regulators[3]. Regulators often choose extremely costly *ex post* responses to financial crises[4]. Given the high *ex post* costs of bubbles and panics, it is important to step back and think about whether existing rules of the game contribute *ex ante* to their occurrence. Just as it is often cheaper and more effective to prevent a disease than to treat it, *ex ante* policy tools to prevent the formation of bubbles may be much cheaper than *ex post* treatments.

We focus on how taxes and accounting policy can exacerbate systemic risk. Our argument with respect to taxes focuses on financial slack as a means of preparing for bad times. Inversely, a key source of systemic risk is leverage. At the level of the individual firm, an overhang of excessive debt creates costs of financial distress. The firm is forced to cut investment, and engage in renegotiation with creditors. If a firm's stock price drops and it has an overhang of debt, it becomes hard to raise new capital to cover needed expenditures. This adversely affects its employees and suppliers. A financial firm cuts back on supplying capital to other firms.

During bad times, problems of debt overhang, risk-shifting, and renegotiation become severe, causing underinvestment, and risk-shifting by individual firms. For the economy, owing to credit linkages between firms, a financially distressed firm's default can trigger distress of its lender, and thereby infect other firms in turn. Similarly, default can create distress for firms that have provided insurance to other creditors through interest rate swaps. Chains of credit across firms, the complexity of risk sharing arrangements, and intransparency in the reporting of who holds exactly what risks and claims make valuation and renegotiating capital structure difficult[5].

In discussions of systemic risk, financial crises, and macroeconomic fluctuations, tax policy has had a very low profile. Similarly, discussions of tax policy seldom consider the effect on preparedness and systemic risk. For example, in an extensive overview of what we know about corporate taxation and possible ways to reform it, Auerbach *et al.* (2008) devote little attention to leverage, and do not discuss the effects of tax policy on coordination failure or systemic risk.

We will argue that this is a major neglected issue in the design of tax policy. Owing to preparedness externalities, individuals and firms become overleveraged from a social viewpoint. Current tax policy perversely taxes equity more heavily than debt, and therefore exacerbates the bias toward overleveraging. A possible solution is to reduce or eliminate corporate income taxes and capital gains taxes.

In contrast, there has been a great deal of discussion about accounting rules as a source of market crises. Many have placed a major part of the blame for the recent financial crisis on fair value (mark to market) accounting. One argument is that fair

value accounting actually adds noise to accounting reports, because market values are hard to assess when markets are illiquid[6]. In contrast, another criticism in the popular business press seems to assume that marking to market provides accurate information. This argument is often made naively – that when the market environment turns bad, marking-to-market makes financial firms look bad, and that this creates a positive feedback that makes things even worse. The conclusion drawn is that marking to market is bad.

Such an argument is too simple. It focuses on a single *ex post* realization, and there may be other possible realizations in which fair value accounting has good effects. For example, during bad times, if people are on average unbiased, they will, in realization, sometimes be too pessimistic about firms. Transparent reporting that reveals that things are not as bad as they fear could help end a crisis.

Building on work of Teoh (1997), we will argue here that preparedness externalities can make better sense out of the casual popular arguments. In other words, a meaningful argument can be made that a degree of accounting opacity can sometimes help firms be prepared for financial crisis, and hence can help reduce systemic risk. Opacity of course, has costs as well.

1.3 *Bailout moral hazard problems*

Two topics that have led to attention to preparedness problems are the moral hazard problems of deposit insurance (creating a need for banking regulation), and the too-big-to-fail moral hazard problem. The idea of too-big-to-fail is that *ex post* large financial firms will be bailed out, so *ex ante* they will take imprudent actions. More generally, the prospect of bailouts reduces the incentive for preparedness. The problem is essentially the same if the firm is too regulated to fail, or too politically connected to fail. We therefore refer to these as bailout moral hazard problems.

Owing to preparedness externalities, bailout moral hazard problems reduce *ex ante* preparedness relative to a baseline that is already too low from society's viewpoint. Even in the absence of these moral hazard problems, private parties would choose too little preparedness.

Given the attention to too-big-to-fail, it is surprising that most discussion takes size as exogenous, so that the moral hazard problem is about risk-taking rather than about choice of size. However, as we will discuss later, existing regulatory policy (even apart from the prospect of bailouts) supports large-scale of firms. Given the *ex post* systemic risk cost of firms that are too big to fail, a cost-benefit evaluation of policies should take into account whether such policies pressure firms (especially financial firms) to expand.

1.4 *Strategic complementarity versus substitutability of preparedness activity*

A subtler issue is the extent to which there is strategic complementarity in preparedness activity across individuals and firms. This issue is not critical for our main conclusions, but would be relevant for developing the implications of preparedness externalities for macroeconomics. For example, if general motors (GM) were to choose low preparedness, that might increase the benefit to Ford of choosing high preparedness, so that Ford could clean up in the event of recession. This is not entirely obvious, however.

For vertically placed firms, it also seems that preparedness activities could be either strategic complements or substitutes. If an auto firm has low preparedness, it will have

low demand during a recession. If so, its suppliers may have little need for investment. This suggests *ex ante* that a supplier to an unprepared firm has little benefit to preparedness. On the other hand, there may be a benefit to the supplier of high preparedness in order to be able to make the investment needed to switch to a more prepared buyer.

To the extent that preparedness investments are strategic substitutes, preparedness mistakes by particular firms may have little effect on the overall preparedness of the system. If GM prepares too little, in compensation its competitors and suppliers prepare more. Overall, the resilience of the system with respect to shocks may be similar.

If, on the other hand, there is strategic complementarity, there may be a multiplier effect wherein the low preparedness of some firms drags down the preparedness of others. There can even potentially be multiple equilibria with very different levels of preparedness. In this scenario, when other firms are well-prepared, coordination failures are unlikely to be severe, so that even in a recession my firm can benefit from holding on to employees and investing. So *ex ante* it pays for my firm to prepare as well. But if other firms are ill-prepared, there is no point in my firm being prepared.

Focusing on the vertical channel, strategic substitutability is likely to result when suppliers and buyers do not have to make large fixed investments. In the event of recession, if it is easy to switch to a better prepared supplier or buyer, then *ex ante* even if my supplier or buyer is unprepared, it is valuable for me to prepare so that I am well positioned to switch as needed. In contrast, if there was no way ever to switch, then there is no benefit to any firm along the vertical chain of being prepared for a state of the world in which the chain will be broken anyway.

2. Tax policy

2.1 Anti-equity tax bias as a source of systemic risk

Existing regulation and tax law contributes to systemic risk by distorting the economy toward excessive leverage in both general and financial firms. At least from the time of the classical economists (such as John Stuart Mill), business fluctuations have been attributed to expansions and contractions of credit (Kindleberger, 2005).

The recent credit crisis has focused attention on the *ex post* problems of leverage, but much less to the incentives that create leverage in the first place. Preserving financial slack is a costly form of preparedness. Some basic features of tax law and regulatory policy encourage individuals, firms, and financial institutions to take on high leverage.

At the individual level, the deductibility of interest (for a given interest rate) encourages borrowing. At the corporate level, the tax asymmetry between debt and equity, wherein interest payments are deductible whereas dividend payments are not, discourages equity in favor of debt. Tax law also encourages high leverage of financial institutions[7]. The anti-equity bias of existing government policy increases systemic risk. Shifting these policies would be win-win because it would reduce the firm-level distortions toward excessive leverage, and at the same time reduce systemic risk.

In principle, the risks of high leverage can be offset by firms through derivative hedging (Titman, 1985). This can reduce the risk and cost of financial distress. Unfortunately, this solution is imperfect for several reasons. First, systemic risk creates an externality problem, even if only because of the expensive *ex post* government

interventions in the economy following bubbles and crashes. Individual firms therefore have insufficient incentive to hedge from a society's viewpoint. This is especially the case for potential beneficiaries of government rescues. Second, liquid option markets do not exist for all firms, especially for smaller firms. Third, there is an adverse selection problem with firms trading in their own option, since other market participants may suspect that the firm is trading on inside information. Fourth, hedging by trading the firm's own stock creates moral hazard problems, since managers and large shareholders have less incentive to operate efficiently or monitor when the firm is generally hedged against declines in firm value, not just against external shocks. Finally, empirically some firms choose not to hedge even when good hedging vehicles are available (Tufano, 1996).

Although the importance of leverage for systemic risk is obvious, as discussed in the introduction, policy discussions about systemic risk usually do not consider how government policy, and especially the tax system affect leverage; and policy discussion about the tax system in general also usually ignore possible effects on systemic risk.

In choosing their desired level of debt, individuals, and businesses do not have an incentive to take into account the effect of their leverage on overall systemic risk. Systemic risk is costly to society, because of coordination failures and because of costly government bailouts and regulation taken in response to disasters. The party that takes higher risk *ex ante* bears only a small part of the incremental *ex post* costs resulting from that party's decision.

Given this externality problem, it would be perverse to design a tax system to push firms toward high leverage. However, this is what the current US tax system does. Equity financing is penalized relative to debt financing. Income that passes through the corporate sector into the hands of equity holders is doubly taxed – at the corporate level, and then the personal level. Income destined for debt holders is singly taxed, at the personal level.

The magnitude of the anti-equity bias of the tax system is immense. The corporate income tax in the USA is 35 percent (for income over \$181/3 million). This imposes a massive tax penalty on firms that finance with equity. In effect, the government forces businesses to be in the business of leveraged speculation.

In equilibrium, theory predicts that this pressure will lead to a big increase in the equilibrium level of debt in the economy. In the simplest models such as the Modigliani and Miller model with corporate taxes, firms choose 100 percent debt financing, i.e. a level of leverage high enough that all payout will occur as interest payments. In more complex models there is still a big shift[8].

There are some counterarguments to the argument we have made about general firms:

- The tax system already offers an offsetting benefit to equity over debt: equity holders can defer their taxes by waiting to realize capital gains.

However, in equilibrium in a steady state this does not create any tax benefit for equity, because for people to consume, resources have to move out of the corporate sector and into the hands of individuals. This requires some kind of payout by the firm, not just deferred capital gains:

- Firms can help equity investors avoid paying personal taxes on dividends by paying out through repurchase of shares. There are two arguments here. One is valid, the other has only a minor degree of validity.

The valid argument is that in the USA the capital gains rate is lower than the personal income tax rate, and in some countries is zero.

The argument with only a slight degree of validity is that repurchase is more attractive than dividends because the tax in a repurchase is only on the gain, not the full amount of the repurchase. To see why this has a bit of validity, think of an all-equity firm that is founded with an investment of \$100, and makes profits of \$5 per year forever which it pays out. It can throw profits off as dividends, or it can continually repurchase \$5 worth of shares each year[9]. Since the firm is not growing in value, realized capital gains are always zero. So repurchase allows equity investors to completely avoid personal taxation on their investment.

However, this argument is almost completely invalidated in a growing economy. Suppose that a firm has a steady state growth path in which it makes 10 percent profits per year, and pays out half of them each year. Suppose the firm is originally financed with an investment of \$100. Then over a long period of time dividends or repurchases will rise to arbitrarily high levels. But the capital gains basis remains unchanged; in any given repurchase, this will shield only some small fraction of the original \$100. Since the capital gains basis becomes a vanishingly small fraction of the dollar value of the repurchase, it shields only a miniscule fraction of equity-holders' investment income. So repurchases are taxed virtually as much as dividends.

It can be objected that when people buy and sell shares, the new owner gets a higher tax basis, the purchase price. This is true, but is offset by the fact that the seller immediately pays a capital gains tax on the price increase. So such trades do not reduce the total tax paid in the repurchase scenario.

2.2 The effects of regulation and taxation on size of the corporate sector and firm scale

A fundamental regulation in modern capitalism creates the limited liability corporation. This creates a bias in favor of large-scale, and creates a corporate sector with limited liability as distinct from the non-corporate sector. The regulatory creation of the limited liability sector is presumably a solution to externality problems which make it hard to spread risk and create large-scale enterprises. We do not consider in detail the nature of these problems. But even taking as given that having a corporate sector and large firms is desirable, in evaluating tax and regulatory policies, we still need to take into account how they shift the size of the corporate sector and the scale of individual firms.

More generally, existing tax and regulatory policy toward enterprise scale is mixed. Limited liability encourages scale by making it feasible to have a broader shareholder base, and too-big-to-fail implicit bailout policies subsidize size as well. On the other hand, there are policies that discourage large-scale such as antitrust laws, the progressive feature of the corporate income tax, and double taxation of corporate income (which discourages incorporation)[10]. We argue that in evaluating alternative regulations and policies, the effects on optimal enterprise scale, and thereby systemic risk, should be taken into account.

As discussed earlier, because of too-big-to-fail, large-scale of individual enterprises can result in bailouts. This creates *ex ante* moral hazard problems in risk-taking that exacerbate preparedness externalities. To the extent that the state (rightly or wrongly) is implicitly committed to costly bailouts, there is a negatively externality in having large firms, especially in the financial sector.

A notable example of government promotion of large-scale is the creation of gigantic government sponsored enterprises, Fannie Mae and Freddie Mac, to promote home ownership. There are no obvious economies of scale that would require them to be so large. This suggests that (if nothing else) they should be broken up.

Antitrust legislation is motivated by a negative externality of size, that high market share can help a firm gain (temporary) monopoly power. Even in the absence of any market power, large-scale creates a systemic risk externality. This is especially the case for those financial firms such as hedge funds that are in the business of taking substantial risky bets. There has been little recognition that existing policy distorts the scale of firms, and that such policy should be managed to reduce systemic risk. As far as solutions go, the tools of antitrust (government imposed breakup of firms) seems too blunt an instrument to use on private firms to address systemic risk. A less intrusive approach is to modify the existing policies that create incentives for large-scale.

2.3 Solutions to anti-equity bias for general firms

Tax policy can be changed to avoid overleveraging. A number of different possible changes in tax policies could reduce or eliminate the anti-equity/pro-debt bias. One is to eliminate the capital gains tax. Indeed, many countries have a zero capital gains tax. Firms would need to be permitted to use regular repurchase to perform regular payout.

Another solution might be to allow partial, equal deductibility at the corporate level for both interest and dividends payout. For example, of every dollar paid as either interest or dividend income, 50 cents (say) would be deductible. This would help level the playing field between debt and equity (though it would be an overcorrection in favor of equity unless the capital gain rate were raised to match personal income tax rate), and would result in a shift away from corporate leverage. The tax revenue could be adjusted by calibrating the percentage deduction (instead of the arbitrary example of 50 percent of the payout).

In addition to the distortion away from equity toward debt, double taxation also discourages the net flow of capital into the corporate sector. Under the current system, debt provides a back door route through which capital can flow into the corporate sector without any double-taxation. This proposed remedy for the anti-equity bias, by reducing deductibility of interest income would close this debt “back door.” So overall we might expect it to further reduce investment in the corporate sector. This could be a good or bad thing overall – again, we are not analyzing here the reasons for the existence of limited liability and the existence of a corporate sector. From the viewpoint of systemic risk, by making it harder to take advantage of limited liability, the scale of firms tends to be reduced, which will tend to reduce risk-taking based upon the expectation of bailout.

On the other hand, the debt back door route is very costly to firms because of the risk of financial distress, and to managers because of the risk of being fired. So even though the back door route right now is a good deal from the tax viewpoint, it could be

that by making the equity route a better deal, the reform would in total increase investment within the corporate sector.

There are other possible ways of address the tax system's anti-equity bias. One is to eliminate the penalty to equity financing by making dividends tax deductible at the corporate level. Or, more simply and with similar effect, eliminate the corporate income tax. This solution solves the bias between debt and equity. Lower corporate income taxes strongly encourages putting resources into the corporate sector, which however, encourages larger scale of firms. The encouragement of larger scale could increase systemic risk, though this would very likely be outweighed by the effect of deleveraging.

In summary, double taxation has an immense hidden cost – systemic instability. This cost can be reduced by changes in tax law to reduce its anti-equity/pro-debt bias. Some possible changes are politically easier than others.

3. Leverage and regulation of financial firms

In the aftermath of Bears Stearns's demise there has been an increased interest in regulating investment banks and hedge funds. The prospect that the Fed will bail out financial institutions *ex post* creates a moral hazard problem in *ex ante* risk-taking. This moral hazard problem exacerbates the *ex ante* negative preparedness externality. If government is going to provide bailouts *ex post*, this suggests that the tax and regulatory system should not be designed to bias firms toward greater risk-taking *ex ante*.

It is well understood that high financial leverage causes systemic propagation of a financial crisis. Highly levered institutions that are hit by a negative shock to their value are forced to sell assets. These fire sales reduce the value of the assets that are sold, further reducing the value of the selling institution as well as the values of other highly levered institutions or portfolios that happen to hold similar assets. This will, in turn, lead to additional forced sales, creating a systemic downward spiral. Such a feedback loop is considered in Krishnamurthy (2000).

This feedback loop would be self-correcting if forced sales had no effect on the fundamental value of the securities that were being sold. If there were no deterioration of the fundamental values, then when the securities become sufficiently cheap, better capitalized individuals and institutions could profit by buying the cheap securities and holding them until the crisis subsides.

However, there can be feedback from the financial system to the real economy. For example, a crisis in the mortgage market leads to less capital available for new mortgages, which results in lower property prices. This affects the construction industry, which in turn affects the aggregate economy, leading to a deterioration of the fundamental value of the underlying real estate. Such negative feedbacks can explain the poor economic performance of Japan in the 1990s.

Preparedness externalities and the systemic risk associated with high leverage suggest that it is important to consider how regulatory policies affect the financial structures of investment banks and hedge funds as well as commercial banks. To evaluate leverage-influencing regulation, it is important to understand why financial institutions tend to be so highly levered. For corporations like Bear Stearns, Lehmann Brothers and Goldman Sachs, just as with non-financial firms, there is a clear tax advantage associated with leverage. Given their lines of business, they require

cheap capital to compete, and because of the tax deductibility of interest payments, the USA. Tax code makes debt a cheap form of capital for public corporations.

To the extent that taxation is the source of leverage, the problem can be corrected by allowing publicly held financial institutions to organize as pass through investment trusts, which pay no direct taxes and thus have no tax incentive to lever up. Examples of such trusts include real estate investment trusts, royalty trusts, and mutual funds. This, of course, would result in a reduction in tax revenues. However, the loss in tax revenues would be small relative to the likely benefits of having lower leverage and a more stable financial system. Alternatively, as discussed for the case of non-financial firms, modifications to the tax code could be made that retain corporate taxation, but level the playing field between income paid out as interest versus dividends.

The tendency of financial institutions to lever up does not seem to be driven solely by tax considerations. For example, hedge funds do not have a tax advantage to higher leverage. There are other possible explanations for leveraging in terms of agency problems and misperceptions of investors. However, to the extent that leverage is a problem, it is at least in principle possible for financial contracts and institutions to address it. More fundamentally, we believe that the key problem is that there are negative preparedness externalities. A financial institution that levers up takes into account possible private costs of distress, but not the costs imposed on others in the event of a general coordination failure. This results in socially super-optimal levels of leverage.

4. Accounting policy, disclosure policy, and systemic risk

Accounting rules, such as requirements for marking-to-market of illiquid assets, and tolerance toward off-balance sheet leverage, also contribute to preparedness or to systemic risk. The effects of accounting rules on preparedness should be weighed in designing accounting rules and regulation.

Accounting and disclosure policies emerge in part through a political process involving regulators, politicians, voters, and lobbying activities. Owing to preparedness externalities, firms will lobby for rules that confer private advantages upon them even if this reduces preparedness of the overall financial system. Similarly, to the extent that disclosure policy is discretionary with the firm, it will tend to be chosen in a way that results in suboptimal preparedness.

In some cases it is fairly clear how accounting rules affect preparedness. When investors have limited attention, they neglect and misinterpret accounting information, and neglect the strategic motives of managers to conceal adverse information (Daniel *et al.*, 2002; Hirshleifer and Teoh, 2003). For example, if investors have limited attention, they may not discount sufficiently for the presence of off-balance sheet leverage, and therefore fail to sufficiently impound the expected costs of financial distress. If so, this increases the incentive for firms to lever up, further contributing to socially insufficient levels of preparedness.

Off-balance sheet financing such as special purpose entities (SPEs) have been used to obscure leverage or to circumvent regulatory requirements[11]. If investors have limited attention, they may not be adequately skeptical about entities that are not integrated into the balance sheet (Daniel *et al.*, 2002). As a result, firms may not be adequately penalized by the market for the risk of financial distress that such entities create[12]. This creates an incentive for excessive off-balance sheet leverage, which

adds to systemic risk. The externality costs of systemic risk therefore weigh in favor of relatively tight restrictions to force integrated reporting instead of allowing relationships with off-balance sheet entities.

Fair value accounting (marking to market) has received a great deal of criticism as an alleged cause of the recent credit crisis. One of the issues of debate is whether fair value accounting makes reporting more transparent or less so, and whether fair value accounting induces systematic reporting biases. A second issue is whether, in the event of crisis, greater transparency is a good or bad thing. A third issue (interrelated with the first two) is the effect of marking to market on the perceptions of irrational investors. The desirability of requirements for marking-to-market of illiquid assets, and their effects on *ex ante* preparedness, depends on the answers to these questions.

With respect to whether fair value accounting improves transparency, a key problem is that it is hard to place a fair market value on an illiquid asset, and during bad times assets tend to become much less liquid. Some assets will have to be marked down severely not because their long-term fundamental value is low, but because a distressed seller has been forced to unload the asset at an artificially low market price. In other words, all firms that hold assets similar to that sold by a distressed seller will suffer a similar devaluation. Therefore, mark to market accounting hardwires the downside risks of one firm to other firms. If investors fixate on accounting numbers without regard to the fact that the long-run value of the illiquid assets is greater than the short-term value, or if contracts in place are based on accounting numbers, marking-to-market creates systemic risk.

This argument does not mean that fair value accounting deserves general condemnation. For highly liquid assets this concern is much reduced. However, moving down the scale toward less liquidity, at some point a line needs to be drawn at which marking-to-market becomes marking to an unavailable or fictional price. On the margin, the problem of systemic risk suggests placing this line more toward the side of high liquidity.

With respect to the desirability of transparency when investors are irrational, even if there is a good market price to mark to, marking-to-market causes firms' accounting measures to seem worse when financial asset markets are doing badly simply by virtue of reflecting the bad news. If investors have limited attention, viable firms may be revalued downward under marking-to-market than under an historical cost system because of fixation upon accounting numbers[13]. So fair value accounting can be said to reduce firms' preparedness for bad times.

Many other accounting rules affect transparency, especially when investors with limited attention focus on earnings and are not able to fully "undo" the accounting adjustments implied by different accounting rules or discretionary choices by managers. Thus, the effects of accounting rules on preparedness and systemic risk should be weighed in designing accounting rules and regulation.

If investors are rational in their assessments of accounting numbers, they will not revalue a firm downward on average just because it has updated its accounting numbers to fair market values. Consider a public state of the world in which asset values have dropped. Investors do not know how much a given firm's assets have dropped, but their assessments are correct on average. Specifically, these assessments already reflect a good judgment of the losses incurred by the firm. If the firm then reports new numbers based on fair market values, investors will sometimes be

positively surprised and sometimes negatively surprised, but on average their assessments are correct.

It might then be concluded that when investors are rational there is little effect of having firms mark-to-market (assuming that there are meaningful market values to mark to). However, this turns out to be incorrect. By providing investors with more precise information about the status of the firm, marking-to-market can create financial market runs. For a general analysis of financial market runs, Bernardo and Welch (2004).

We can consider creditors (or suppliers) to a distressed firm as engaged in creating a public good. Each creditor can contribute to the survival of the firm by extending further credit, making concessions, or forgiving part of the debt. However, this confers a benefit upon other creditors, so (if negotiation is imperfect) concessions will be too small. Teoh (1997) analyzes the general effect of greater information disclosure on equilibrium contributions in public goods games. She finds that bad news disclosures can trigger complete collapse of cooperation, which in this context would mean liquidation of the firm.

This does not mean that a policy of greater transparency or disclosure is, *ex ante*, a bad thing. On the up side, a favorable disclosure can induce greater concessions and greater success of the firm (because contributors believe that their concessions will not be wasted). So, discussions in the popular business press about how marking to market in some particular case contributed to firm failure are naïve in concluding that marking to market must inherently be bad. Whether greater transparency is, on average, good or bad depends on the specific shape of the payoff functions of the parties involved.

What this analysis does show, however, is that greater transparency can reduce preparedness, and can set the firm up for a greater likelihood of financial market runs. The model indicates that for firms that are close to the edge of complete failure, the balance of benefits can favor intransparency because of an asymmetry in the effects of good versus bad news. A small amount of bad news may tip the firm to an equilibrium in which creditors' willingness to make concessions essentially ceases completely – they just fight over the remains. On the upside, a small amount of good news only increases concessions marginally. So overall, on average transparency reduces firm value.

This suggests that even with rational investors, committing to a policy of intransparency can be a means of preparedness. If so, regulatory policies that pressure firms into greater transparency, especially during crises periods, may have perverse effects. Thus, the usual presumption of the desirability of transparency may need to be qualified.

We do not wish to overstate the case, especially when fair value accounting is being widely criticized in popular discussions in often-unsophisticated ways. There are also well understood benefits to transparency for purposes of contracting and corporate governance; the case of Enron, which was famous for intransparency even before disaster hit is a case in point. We do not provide an overall assessment of the pros and cons of transparency. We merely point out that it is possible to make a logical case that a commitment to intransparency can help a firm be better prepared for financial crisis.

5. Conclusion

We consider here an externality in the choice of *ex ante* risk management policies by individuals and firms: they are concerned with private risk, not with their contribution

to systemic risk. This preparedness externality causes excessive risk-taking from a social viewpoint. A general policy implication is that government should avoid regulatory and tax policies that push individuals and firms toward greater risk-taking.

The recent credit crisis has focused attention on the *ex post* problems of leverage and of having financial firms that are “too big to fail,” but there has not been enough attention paid to the incentives that create leverage and large firms in the first place. The anti-equity bias of the tax system encourages individuals and firms to borrow, distorting the economy toward excessive leverage. Hedging can in principle help reduce the effects on systemic risk, but does not solve the problem. By leveling the playing field of the tax system, the distortion away from high leverage and low preparedness can be greatly reduced. We therefore suggest that discussion of policies to avert financial crises should place more emphasis on taxation, and its effects on leverage and systemic risk.

Existing government policy toward firm scale is more mixed. Overall, regulation favors large firm scale through the creation of the limited liability corporation, but various other regulations create biases in different directions. There is a moral hazard problem in risk taking associated with the government’s tendency to bail out firms in trouble; such bailouts are directed especially toward big firms. This moral hazard problem further exacerbates preparedness externalities. Therefore, on the margin regulatory policies that affect firm scale should take into account the adverse effect of size on systemic risk.

Accounting rules, such as requirements for marking-to-market of illiquid assets, and tolerance toward off-balance sheet leverage, also contribute to systemic risk. When the asset market is so illiquid that there is not a good market price to mark to, fair value accounting can add noise. Furthermore, investors with limited attention do not always fully undo the effects of different accounting rules and choices. Since marking-to-market will tend to mark down during a crisis, fair value accounting can exacerbate crises, especially when there is feedback from market prices to the real economy. This problem is exacerbated when contracts and regulations (such as bank reserve requirements) are based on accounting numbers.

Furthermore, even when investors are rational, transparency can trigger financial market runs by reducing the average willingness of creditors to make concessions in the event of distress. Naïve popular arguments along these lines implicitly focus only on the adverse realizations in which marking to market leads to asset values that are even worse than investors are expecting. However, even in a setting where creditors are rational and on average foresee write-downs correctly, it can still be the case that transparency increases the probability of firm failure.

The problem is that for a firm at the edge of disaster, there is an asymmetry between the large loss in willingness of creditors to make concessions when a little more bad news arrives, versus a relatively modest increase in willingness when a little more good news arrives. It follows that a commitment to opacity either in reporting or disclosure policies can help a firm be better prepared for a future crisis. We do not claim that this consideration necessarily overrides the good reasons for transparency in general. However, this shows that a logical case for greater opacity is possible to make. More generally, we suggest that in designing accounting rules and regulation, the effects on systemic risk should be considered.

Notes

1. Such prospects are quite important. But concerns about excessive risk-taking were raised even before the recent crisis caused a general upward reassessment in beliefs about the willingness of the USA Government to engage in bailouts of financial firms.
2. Theoretical modeling indicates that the effects of reputational concerns of managers on risk-taking can vary depending on regulation of financial reporting. Furthermore, the effects of optimal contracting to deal with these concerns are subtle and in some cases can reverse the direct effect of reputational concerns (Holmstrom and Ricart i Costa, 1986; DeMarzo and Duffie, 1995).
3. The concern for systemic risk is the source of the too-big-to-fail agency problem. *Ex ante*, large or important entities such as Fannie Mae, Freddie Mac, or American International Group have reason to expect to be bailed out in the event of problems, creating an implicit insurance policy. *Ex ante* this insurance creates a moral hazard problem.
4. For example, the Fed expands money supply to try to provide softer landing after bubbles. Government spending is increased in the hope of stimulating the economy, and new regulation is created.
5. We will later argue, however, that transparency is a double-edged blade in its effects on systemic risk.
6. Under full rationality, however, individuals would be free to dismiss those component numbers that they regard as unduly noisy and adjust their assessments accordingly.
7. Discussion often focuses on the deductibility of interest as the driving force, but the anomaly is really the non-deductibility of dividends. In general, payouts to all providers of resources to the firm (including providers of capital) are deductible as expenses at the corporate level, except for equity holders.
8. The Miller (1977) model of corporate and personal taxes has capital structure irrelevance at the firm level, but the aggregate equilibrium level of debt is still determinate and increases when the corporate tax rate increases.
9. If repurchases are performed so regularly that they are viewed as a substitute for dividends, the internal revenue service can treat the repurchase as a dividend payout. For simplicity we set this issue aside.
10. Furthermore, limited liability does not always encourage large-scale, since a firm that is subject to lawsuit (e.g. tobacco companies) may have an incentive to focus to prevent lawsuit from extracting rents from its less lawsuit-prone divisions.
11. SPEs have been replaced by variable interest entities with stricter accounting reporting rules that require consolidation with the parent company.
12. Zhang (2008) finds that a new accounting regulation (financial accounting standards board Interpretation No. 46) that forced consolidation of SPEs on financial statements resulted in firms taking actions to decrease book leverage by replacing conventional debt with equity. Furthermore, after the adoption of this change, on average the S&P credit ratings of firms with SPEs deteriorated, suggesting that prior to consolidation credit agencies did not adequately discount for the leverage implied by SPEs.
13. Furthermore, some contracts and regulations (such as bank reserve requirements) are written based upon accounting numbers, so even if investors are sophisticated enough to see through the accounting numbers, marking-to-market can exacerbate the troubles of distressed firms during a downturn.

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