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Abstract

This paper presents a proposal for a regulatory regime aimed at reducing systemic risk effectively and internationally. Systemic relevance should be *internalized with a levy (or "tax")*, the level of which *(or "tax rate")* rises with the systemic relevance of an institution (Pigouvian taxation). The levy should be complemented by a *Systemic Risk Fund* which is endowed with *control rights*, in particular early intervention and resolution powers. The Systemic Risk Fund should be funded by the proceeds from the levy; if the Fund reaches a certain *threshold size*, the continuing flow of contributions *is distributed to the government(s)*. Systemic Risk Funds implemented on the *global, European, and national level* would solve the issue mitigating risks also *cross-border* and provide a framework for burden-sharing.

JEL: G01, G15, G18, G28

Keywords: Systemic Risk Fund, systemic relevance, levy, tax, surcharge, financial institutions, Basel II.

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I. Introduction

The financial crisis that started in 2007 has brought about a flurry of reform proposals. In recent months, an increasing number of these proposals are centred around the idea to introduce taxes on either financial institutions or activities: The U.K. announced an ex-post levy on bonus payments in banks, France quickly followed, the U.S. announced plans to tax (certain) liabilities of large financial institutions and the G20 is evaluating a financial sector levy and a tax on (excess) profits and bonuses to extract a contribution from the financial sector to the cost of crisis resolution. The motivation behind many of these taxes seems to be a combination of frustration with ongoing reform efforts, the desire to tame the financial system, to placate public anger, to re-appropriate windfall profits and to raise general revenues.

Unfortunately, most of these taxes will *not* contribute to preventing future crisis. Most of them are not designed to reduce the systemic risk posed by the existence of large, highly interconnected and complex international financial institutions. The exception is the Financial Stability Contribution proposed in the interim report of the IMF to the G20, which could evolve into a systemic risk adjusted levy. In 2009, the German Council of Economic Experts (GCEE) had already advocated a similar levy on the systemic relevance of financial institutions as the key element of any system of financial regulation that takes the lessons of the crisis seriously (see GCEE, 2009).[1] In the view of many observers, the single most important lesson is that the priority of any coherent reform should be *to reduce the systemic relevance of individual players*. It is the many facets of the "too-systemic-to-fail" problem that created the incentives to become excessively leveraged. In this respect, governments' need a wider set of tools to bail in the private sector during a crisis and to enable the winding-down of financial institutions that are active across borders. This, in turn, requires arrangements for burden-sharing.

The cornerstone of any reform has to be the idea that "being systemically relevant" has to come with a cost, as it is otherwise attractive for financial institutions to choose to be systemic and enjoy the benefits of implicit government guarantees. As pointed out by Alessandri and Haldane, 2009, the progressive rise in financial fragility during the last decades was accompanied by a widening and deepening of the implicit safety net for the creditors of financial institutions, which are, in many cases, other financial institutions. Whenever banking crises strike, the safety net has bulged. Thereby, there has been a dramatic expansion in both the scale and scope of the state's insurance to the banking system. This pattern has been repeated in the majority of recent systemic banking crises (see Laeven and Valencia, 2008). As contracts between the state and the banks are incomplete, a problem of time-consistency emerges: authorities tend to talk tough, but act weak. If the protection of depositors and the preservation of systemic stability is felt to be a public good – as historical evidence suggests – financial institutions in general and systemically important financial institutions in particular have a strong expectation that they will be bailed out in case of a crisis. As a consequence, the gains through funding advantages and also excessive risk taking are privatized while the losses in event of a crisis are socialized.

Surprisingly, only a few studies illustrate the financial privilege that results from too-big-to-fail policies. Baker and McArthur, 2009, show that large banks enjoy a substantial funding advantage that increased dramatically after the near collapse of the system in September 2008. Similar information can be obtained from looking at the difference between bank ratings on a stand-alone basis, and ratings taking into account the likelihood of government support (see e.g. Haldane, 2010). Thus, there are strong incentives for financial institutions to become systemically relevant. In particular, such institutions gain lower funding costs, yield higher revenues, and face a higher probability of being bailed out in a crisis event. However, from a general welfare

[1] Elements of this proposal have in the meanwhile been taken up by the German government.

perspective, there is no convincing evidence that the presence of systemically relevant market participants increases economic efficiency. Thus, it is the responsibility of the political system to offset the "unfair" advantages of institutions that excessively emit systemic risk to the wider economy.

A number of academic and policy proposals aimed at mitigating the too-big-to-fail problem have recently been advanced. On the academic side, Acharya and Richardson, 2010, argue that guaranteeing the liabilities of large financial firms offers them an unfair advantage, because they can raise funds at *lower cost*. Because the guarantee is so valuable and pervasive, these firms face little market discipline and have incentives to expand their scope, scale, risk exposure, leverage, opaqueness, and interconnectedness. They therefore propose to make deposit insurance premia sensitive to the systemic risk posed by a contributing bank. In contrast to them, we would not restrict systemic levies, charges or premiums to deposit-taking institutions, which is one of the reasons why we would propose a separate framework independent of current deposit insurance regimes. Moreover, we offer concrete details with respect to further features of such a regime. Perotti and Suarez, 2009, call for the implementation of a form of liquidity insurance scheme, that is, a mandatory liquidity charge. Again, our proposal is partly congruent with theirs, as we choose a tax base that takes into account the structure of refinancing.

On the policy side, U.S. plans to tax (certain) liabilities of large financial institutions have spurred a debate on charges at the G20 level. The Obama administration suggested charging banks a fee related to the costs of the government bailout of the financial industry. The tax would hit around 50 banks and insurance companies. The levy will go into effect June 30 and last at least 10 years. It would amount to 0.15% of total assets minus high-quality capital, such as common stock, and disclosed and retained earnings. Federal Deposit Insurance Corp (FDIC)-covered deposits and insurance-policy reserves will remain untaxed because such assets are already subject to federal fees. The U.S. tax therefore is an ex post tax, which is aimed at recovering the fiscal cost of the past crisis.

Sweden has set up a stability fund in October 2008, which is meant to cover the cost of future crises. The Stability fund, which in 15 years is targeted to reach 2.5 percent of GDP, will be built up with the help of fees paid by banks and other credit institutions. The fee, which amounts to 0.036 percent per year, is levied on certain parts of the institutions' liabilities. Like the U.S.-tax proposal, however, the setup is not designed to reduce systemic risk of financial institutions. Finally, the German government has recently decided to adopt a bank levy which should be higher for larger institutions that are particularly interconnected. The levy would be combined with a resolution fund and would thus share two important elements of our proposal.

The rest of the paper is organized as follows. The next section explains why we would favor a Pigouvian levy (combined with a resolution fund) over alternative approaches to solve the problems posed by systemic financial institutions. Section III contains the details of our proposal, section IV concludes.

II. Why a levy, not a charge?

Financial institutions have a strong incentive to become systemically relevant.[2] The larger the financial institution and the stronger the propagation effects in case of a problem, the higher is the probability that it will be bailed out in case of financial distress. This ensures that not only small insured but also uninsured depositors as well as senior creditors experience no losses.

[2] See Klueh and Weder di Mauro, 2010, for a more extensive discussion of the incentive distortions on the side of the financial institution as well as on the side of the supervisor.

Hence, the higher the systemic relevance of a financial institution, the lower is the risk premium that investors require to put their money at stake. As a consequence, the cost for funding is directly related to the systemic relevance of the financial institution. This is not least reflected in rating reports that explicitly distinguish between "stand-alone" ratings and ratings taking into account implicit public guarantees (see section III below). For the decision-maker of an individual financial institution, being systemically relevant thus comes with an important advantage. The return on equity (ROE) can be increased by increasing the negative impact of one's own failure on the rest of the system. This effect is magnified when incentives to excessively leverage balance sheets are taken into account. The systemic risk that results from such behavior, however, is a negative externality.

There is a broad support for measures to reduce the externality of interconnectedness by improving market infrastructure, for example through increasing the cost of trading over the counter. But there are widely diverging views on additional measures to address the too-big-to-fail problem, or more precisely, the externalities of size, interconnectedness and complexity of financial institutions. There are two basis types of regulatory approaches; those that regulate quantities and those that influence prices.

The most radical examples of quantity regulation include direct limits on size and type and of business model. In the U.S., there are initiatives on limiting bank size and restricting the activities of depository institutions. The proposal would (i) limit an institution's scope by prohibiting banks to own, invest in or sponsor a hedge fund or a private equity fund, or carry out proprietary trading unrelated to serving customers and (ii) limit an institution's size by setting broad limits on the growth of the market share of liabilities at the largest financial firms, and supplement existing caps on the market share of deposits. The problem with such direct quantitative restrictions is that they are likely to be inefficient. There are advantages of having certain types of activities carried out jointly, usually related to economies of scale and scope. The technology of each firm determines the extent of these advantages and is usually private information. Consequently, cutting off a certain activity from a financial institution could be beneficial in some cases, but counter-productive in others. Ideally, one would like to allow the bank to keep a certain systemic activity when economies of scope are pronounced, but take it away when the joint operation is just the reflex to perverse incentives to become large and complex. Similar problems occur with other quantity tools like living wills, but these carry the additional disadvantage that the institutions themselves keep too much sway with respect to the identification of critical breaking points.

Supervisors also tend to favor quantity tool, in particular systemic surcharges on capital requirements. Usually, surcharges are considered a quantity-type regulation, as the minimum capital requirement represents a direct restriction on the amount of debt instruments that can be held. As knock-on and contagion effects are often (but not always) related to certain forms of debt, such as interbank loans and credit lines from broker dealers to asset managers, still, they provide more flexibility than direct restrictions on quantity, such as activity or even size restrictions: In the case of a surcharge for systemic relevance, for example, the additional equity requirement imposed on an institution would present shareholders with a choice. Either they would have to reduce systemic relevance (for example by shrinking total assets and accordingly debt levels up to the point where new requirements are fulfilled), or they would need to pay the price of issuing new equity. If the value of being systemic is large enough to compensate for the dilution of the equity holdings, they would rather choose the second option.

A similar mechanism is at work when a Pigouvian tax or levy is applied. In fact, under certain assumptions, surcharges on capital and levies can be shown to be equivalent with respect to their effect on incentives and on those features of a financial institution that determine systemic

relevance. The only difference between the instruments is then that levies take off the funds from an institution's balance sheet, surcharges result in additional buffers on the balance sheet. Consider, for example, a situation in which the size of the externality is purely related to the size of the balance sheet. Any sensible regulation would need to reduce size to be effective. Assuming that an institution is currently operating at or close to minimum capital requirements, and that the actual ROE is equal to the required rate, the introduction of a surcharge would work as follows. The institution would first look at the effects of just swapping existing debt for the needed amount of additional capital. It would observe that this would lead to a ROE lower than that required from investors. The latter would demand a reduction in balance sheet size, which would eliminate or lower the surcharge. The reduction would go hand in hand with a reduction in liabilities. Taking into account that this reduction in systemic relevance would increase the cost of external funds (as part of the implicit subsidy or bail-out guarantee is taken away), the surcharge has to be defined such that this effect is in fact achieved. It has to be high enough to ensure that equity-holders are willing to reduce balance sheet size, even though this goes hand in hand with higher funding costs. The same mechanism is at work with a levy: Introducing the latter would directly lower the ROE, forcing the institution to shrink. Again, the levy has to be just high enough to force equity-holders to accept the higher funding costs associated with this shrinking.

Many supervisors' current policy stance is that there is a strong case for applying some form of capital surcharge to systemically important banks. The aim is to reduce the probability of them failing and to internalize the externality which their systemic importance produces. There are several possible explanations for this preference for an add-on to capital adequacy regulation. One may be a sense of security: "You know what you get", you can control it, and there is a process in place and 20 years of experience with this process of negotiating Basel II. Banks may prefer this quantity tool for similar reasons: they are also experienced with the process of Basel II and have successfully influenced this process in the past.

The main problem with systemic risk capital charges is that related requirements are already used for multiple goals: they are supposed to act as a buffer against unexpected loss as well as limit risk taking. These two goals are not necessarily compatible. In addition there are proposals to use capital requirements to control liquidity risks and to introduce adjustments that reduce pro-cyclicality. The result is a system with three to four goals and only one instrument. This will inevitably involve trade-offs, lead to a system of capital requirements which is highly complex, in-transparent, and prone to manipulation, constant re-interpretation as well as capture. Therefore it seems advisable to use another instrument to control systemic risk.

Another problem with using capital adequacy regulation to make systemic relevance costly is that it could lead to a further surge of the less regulated parts of the system, sometimes called the shadow banking system. The aim of surcharges on capital would be to internalize the negative externality of being too-systemic-to-fail, but capital remains on-balance sheet, and the control over funds remain largely within the banks. Banks with plenty of capital on their books will try to lever it up through loopholes in the system. Not only do financial institutions have strong incentives to find loopholes in regulatory capital requirements to take a highly leveraged, one-way bet on the economy, they also create loopholes by creating new financial innovations.

A final and related problem of systemic risk capital surcharges is that non-bank systemic financial institutions would be difficult to incorporate in such a regime. Prudential minimum capital requirements are and should be confined to certain institutions, not least because the presence of entities that operate without strict requirements can be beneficial for financial stability: Regulatory constraints on minimum capital can lead to negative feedback loops, and financial institutions operating without them can act as buyers of last resort whenever capital restrictions cause fire sales. This does not imply, however, that some of these institutions pose systemic risks

that should be internalized. Thus, a sensible approach should in principle enable the public to impose costs on non-banks, including insurance companies and hedge funds. Docking on to Basel II would make this nearly impossible.

Against this backdrop, we think it is better to go another route, and focus on price regulation. In particular, a more effective way of enforcing the responsibility of financial institutions is to internalize the negative externalities by taxing systemic relevance directly, through a Pigouvian "tax", or levy. Implemented optimally, the tax rate should be set at such a level as to eliminate the implicit funding cost advantage of systemic institutions. The main conceptual difference to systemic risk capital charges would be that the resulting levy would be taken off the balance sheet of an institution. This would allow us to combine the systemic risk fee with a Systemic Risk Fund, which would serve as an at least partially pre-funded (cross-border) resolution tool. Note that the systemic risk levy would continue to apply (Pigouvian taxation) even if the fund reaches the threshold from which on it is considered "full", but the surplus goes to governments as compensation for the residual public risk of taxpayers.

III. Reshaping the financial safety net: A proposal

This section provides the details of our proposal for reducing systemic risk and improving crisis management. Summarizing the following proposal, systemic relevance should be *charged with a levy (or "tax")* the level of which *(or "tax rate")* rises with the systemic relevance of an institution. The levy should be complemented by a *Systemic Risk Fund* which is endowed with *control rights*, in particular early intervention and resolution powers, to discipline systemically relevant institutions. The Systemic Risk Fund is financed by the proceeds from the levy; if the Fund reaches a certain *threshold size*, the continuing flow of contributions *is distributed to the government(s)*. Systemic Risk Funds implemented on the *global, European, and national level* will take care of *cross-border active* institutions (global and pan-European, respectively) as well as institutions that operate within the *national range*. *All systemic institutions* should be charged. This means that also insurance firms and hedge funds can be too-systemic-to-fail – they can be too-interconnected with the banking system to fail, they can be too-complex-to-fail, they can cause fire sales and they can be involved in maturity transformation. Certainly, adjustment factors for the tax base would need to be formulated, as "uninsured liabilities" at banks and insurance companies, for example, mean very different things. In what follows, we detail our proposal and answer a number of questions that have been raised.

A. Features of a levy for systemic relevance

The primary intention of our proposal is to neutralize the "unfair" advantage from which shareholders, debt-holders and management of systemically relevant institutions profit in contrast to non-systemic institutions. This unfair advantage gives rise to a situation in which, all else equal, the return on equity for an institution will increase with the expected damage for the wider economy in case of a failure. As bailout probabilities of debt-holders rise with the expected damage, the cost of funding decreases, allowing shareholders to increase the return on their investment. For several reasons, we believe that the best way to neutralize this effect is to tax it away by charging a levy for systemic relevance. The levy would be based on an overall *risk score* derived from a scoring model.

Like with any Pigouvian tax, a number of crucial questions emerge. Most importantly, a measure of the contribution of a specific institution to systemic risk has to be determined. In terms of the tax itself, one has to first find a *tax rate* that effectively internalizes the externalities without crowding out too many socially beneficial activities. Moreover, an economically meaningful *tax base* has to be determined. In terms of economic effects, the crucial question is *tax incidence* and

the *effectiveness of the tax*, taking into account evasion strategies. With respect to incidence, a major fear is that a levy on systemic relevance would lead to disintermediation and increase the cost of external finance. Since any instrument that effectively reduces incentives to overextend balance sheets will reduce credit growth, the question is not so much whether an increase will lead to smaller balance sheets, but whether the macroeconomic effects of the envisioned instrument will be more restrictive than those of alternative solutions such as systemic surcharges on capital.

Quantifying contributions to systemic risk

The crucial pre-condition for any policy that aims at reducing the contribution of individual financial institutions to systemic risk is to quantify the amount of systemic risk emitted. The desired incentive effects will only be achieved when the proposed levy is based on a measure with a minimum degree of accuracy. Perverse incentives and evasion strategies will only be avoided if, in response to the shifting of systemic risks to other types of institutions or refinancing strategies, the tax rate of an individual institution shifts accordingly. For example, if holders of certain debt instruments with systemic implications start perceiving the levy as an insurance premium, and if as a reaction funds are shifted to these instruments, the levy would need to take this into account.

Generally, there are three types of methodologies to measure systemic relevance: newly developed statistical methods, newly developed network models, and descriptive indicators. *Newly developed statistical methods* use market data to measure systemic relevance of financial institutions. Huang et al., 2009, use data on credit default swaps (CDS) and stock return correlations across financial firms to estimate expected credit losses above a given share of the financial sector's total liabilities. Similarly, Adrian and Brunnermeier, 2009, measure the financial sector's Value at Risk (VaR) given that a bank has experienced a VaR loss, which they denote CoVaR. Tarashev et al., 2009, present a game-theoretic approach that also provides a possible allocation of capital charges to each institution based on their systemic importance. Segoviano and Goodhart, 2009, consider the financial sector as a portfolio of individual financial firms and estimate the financial institutions' contribution to a potential distress of the system by using the CDSs.

Network models on the other side are supposed to fully map all possible channels of propagation. Using this approach, the size of the externality of each too-systemic-to-fail institution which is due to propagation could theoretically be precisely determined. However, the implementation of these models for policy purposes faces severe challenges, limiting the practicability of related approaches. Apart from methodological problems, the most important challenge is data. Supervisors do not possess sufficient information to really map inter-institutional exposures, in particular between institutions operating across different jurisdictions, but also nationally. Even direct interbank exposures through loans are only recorded partially, and mostly at the national level. Many observers, including the GCEE, have therefore repeatedly called for improvements in this area, which are a pre-condition for a truly macro-prudential approach to supervision.

Newly developed sophisticated statistical methods and network models are promising areas for future research. However, they are not yet sufficiently advanced, and their conceptual elegance does come at the cost of limited practicability. For these reasons, we propose to estimate the extent of the externality of each financial institution with a *scoring model which uses primary descriptive indicators*. The main advantage of the scoring model is that it can be used to combine different factors related to systemic importance in one overall measure. As a well accepted definition, systemic relevance is the potential of an institution to substantially weaken the stability of the financial system as a whole through propagation effects originating on the asset and the liability side of balance sheets. It is a function of the size, interconnectedness and complexity of a financial institution.

These three overall factors can be determined by different descriptive indicators:

- The size of an institution is the gauge of the too-big-to-fail problem. Measures of size – like assets divided by GDP or assets of an individual institution in terms of the overall system's assets – have the advantage that they provide a simple and very transparent indicator. Moreover, it can be shown that indicators of size are highly correlated with more sophisticated indicators of systemic relevance (Huang et al., 2010).

- The degree of interconnectedness with the rest of the system should be taken into account by using measures correlated with the intensity with which the failure of one node in the network adversely impacts other nodes. Exemplarily, interbank lending divided by assets, short-term funding divided by liabilities and correlation of asset positions are descriptive indicators measuring interconnectedness of financial institutions.

- The degree of complexity of an institution is the measure of the too-complex-to-fail problem. The collapse of a highly complex financial institution can heighten uncertainty among other market players. This uncertainty is particularly prevalent among the counterparties of the counterparties of the complex financial institution since they cannot be sure to what extent their business relations will be affected by indirect contagion effects. Thus, holdings of certain derivatives, international claims and off-balance-sheet activities are descriptive indicators measuring complexity of financial institutions.

After collecting the single entries to the scoring model along the three dimensions, the descriptive indicators are aggregated to generate an *overall risk score* which represents the systemic relevance of the financial institution under consideration. Although it is a priori a challenge to give weights to alternative dimensions of the scoring model, the weights in principle can be determined by various other statistical approaches, such as factor analysis. The desired threshold which distinguishes systemic from non-systemic institutions can be calculated by using qualitative or systemic approaches like cluster methods (see IMF, 2009, and IMF et al., 2009). After determining the systemic relevance, each risk score is mapped to a specific tax rate which is supposed to capture the degree of systemic relevance (see below).

The simplicity and admittedly fuzzy nature of such a scoring model should not conceal its appealing features. Most importantly, simplicity implies that attempts to game the system become more difficult. Moreover, the simple model provides an open architecture to take newly developed statistical and network models on board to enhance its accuracy. As soon as the required data and methodology are sufficiently advanced, these methods could be easily integrated in the scoring approach.

"Tax" rate

Optimally, the tax rate should be chosen such that any implicit advantage from becoming systemically relevant is reduced to zero. Since it is likely that financial intermediation activities are at least to some extent characterized by economies of scale and scope, the main danger of choosing a tax rate too high is to reduce financial institutions to inefficiently small sizes and inefficiently narrow scope. Empirical studies give no clear picture as to the extent of economies of scale and scope in financial firms. Earlier assessments do not find strong evidence for such effects, especially not above certain size thresholds; more current studies give a more mixed picture (see for example Huizinga et al., 2001 and Cornett et al., 2006). A potential explanation for the fact that more recent data point to the existence of scale economies might be the strong growth of certain broker-dealer and prime brokerage activities, which usually involve a sizable fixed cost element. Overall, uncertainty about economies of scale and scope should be factored in

when devising a new framework for systemic risk regulation. This is one reason why we would favor instruments such as charges or taxes over quantitative measures, such as proposals to break-up big and complex banking institutions.

Before discussing ways to differentiate the tax rate according to the systemic relevance of an institution, it is useful to provide a range of *average tax rates* that would be consistent with alternative measures of the externality that we address to internalize. This is also important as existing frameworks, such as the one in Sweden, and policy proposals, such as the one in Germany, appear to choose rather low levies in the low single digits. In our view, evidence on the size of the advantage that institutions enjoy as a consequence of their systemic relevance is inconsistent with such low rates.

At first sight, an obvious approach would start at the fiscal costs of systemic banking crises and the frequency at which they occur. One could then calculate the amount a system would need to accumulate over the average time span between crises. In our view, such an approach would miss the crucial point: While we argue below that part of the levy should serve to build up a Systemic Risk Fund, its primary purpose is not to serve as an insurance fee. We want to make clear at this point that we are not intended to propose a scheme with insurance character, as this would only set wrong incentives and contribute to moral hazard. Rather, we would like to determine the tax rate such that it indeed has the desired steering effects. This would require measures of the fiscally induced advantage of being systemically relevant.

As a first approximation to such a measure, one can compare the cost of funding of small and large institutions. By using the recent crisis as an example for an event in which the implicit guarantee has been made explicit, one can even try to control for the fact that part of the funding advantage may be the consequence of potential economies of scale and scope. Baker and McArthur, 2009, investigate the spread between the average cost of funds for smaller U.S. banks and the cost of funds for U.S. institutions with assets in excess of 100 billion US-dollars over the period from 1Q 2000 to 4Q 2007 – before the collapse of Bear Stearns – and compare the results with the spreads over the period from 4Q 2008 to 2Q 2009 – when the "too-big-to-fail" policy was made explicit. A predicted consequence of the adoption of this formal "too-big-to-fail" policy is that the gap between the interest rate that smaller banks must pay to obtain funds and the interest rate paid by large banks would increase. Baker and McArthur, 2009, find that the funding advantage of large banks before the collapse of Bear Stearns was 29 bp. After September 2008 the funding advantage of large banks increases to 78 bp. Starting from the (probably unrealistic) assumption that the pre-Bear Stearns funding advantage mostly reflected economies of scale and diversification effects, the value of the too-big-to-fail guarantee would be nearly 50 bp. As it is highly likely that the increase in the spread as a result of updated beliefs on bail-out probabilities comes on top of already existing implicit guarantees, the difference of 49 bp might even be considered a conservative estimate for the size of the "unfair" funding advantage that should be eliminated through the tax.

A second approach to gauge the funding advantage of large institutions is to determine the rating "bonus" such institutions receive from rating agencies, and then translate them into refinancing bonuses. Moody's and Fitch assign two main types of rating to banks: First, an "issuer rating" which considers all factors influencing the capacity of the bank to repay its debt, including a possible external support; second, a "financial strength" or "individual rating" reflecting only the intrinsic capacity of the bank to repay its debt. To measure the effect of too-big-to-fail expectations, Rime, 2005, uses a sample of banks of different size in 21 industrialized countries. He regresses bank issuer ratings on the respective financial strength ratings as well as on variables controlling for different types of external support, such as total assets as a proxy for too-big-to-fail support. The study finds that the largest banks in the sample (i.e. banks with assets larger than

100 billion US-dollars) receive a rating bonus of up to three notches. This finding is in line with the results of other studies. Soussa, 2000, – investigating a sample of 120 banks form six countries (France, Italy, U.K., Germany, Spain and Japan) – finds that the implied rating subsidy for a too-big-to-fail bank over a small bank is about three rating notches. Moreover, Haldane, 2010, – focusing on U.K. banks – finds that in 2007, large banks received a rating bonus of about 2.5 notches over small banks.

What do these findings imply for the magnitude of the funding advantage enjoyed by large institutions with implicit guarantees? Already a rating difference of just one notch can make a sizeable difference for the cost of funds a specific institution enjoys. To approximate the impact of the rating bonus on bank refinancing costs, one could for example use the relationship between bond spreads and issuer ratings estimated by Sironi, 2002. According to this, a rating bonus of three notches corresponds to a refinancing bonus of up to 80 bp (see Rime, 2005). In this respect, it is important to take into account that the difference in funding costs for a given change in notches is not independent from the point of departure, i.e. the stand-alone rating itself. Specifically, riskier institutions usually benefit more from government guarantees. For example, Soussa, 2000, finds that the rating bonus of a too-big-to-fail institution amounts up to 128 basis points.

Overall, the findings from a number of empirical studies indicate that the funding advantage enjoyed as a consequence of the implicit guarantees provided for systemically relevant institutions is sizeable. Most importantly, and judging from publicly available information, it is much larger than what is currently envisioned in existing proposals, for example the one by the German government. This finding is consistent with several other approaches that can help to establish a rough range for a reasonable tax rate, although they do not represent direct measures of funding advantages:

- One possibility is to consider the elements of the national stabilization programs during the crisis. In these programs, one could argue, that what has been in the shadow came out in the open, as particularly large systemic banks have applied for and taken out guarantees, while in at least some countries such as the U.S., smaller institutions have been wound down. Governments have asked for fees in return. For instance, the German government used a fixed charge of 50 bp for explicit guarantees of less than one year maturity, while charges on guarantees of longer maturity were based on CDS and rating information (with an average of 120 bp).
- Another alternative is to consider the pricing of existing deposit insurance funds. For instance, the FDIC charges 12 - 70 bp on deposits. The various German deposit insurance funds charge between 16 bp and 50 bp.

Following these considerations, we would argue that levies in the single digits are probably substantially below of what would be required to make up for the funding subsidy that systemically relevant institutions enjoy. Even though further analysis is necessary, a levy substantially above the ones envisioned in Sweden and Germany, and also the 15 bp advocated by the Obama administration appears much more reasonable, as it is consistent with evidence on existing implicit subsidies and also with data on observable explicit insurance schemes. According to the above considerations and with particular reference to the findings of Baker and McArthur, 2009, we suggest 50 bp as our reference value for further calculations.

We are aware of the fact that such a rate would not only be high compared with similar proposals currently underway, but might create concerns about curbing lending excessively. While we understand the dangers of setting the levy too high – the same would apply to a surcharge on capital – we would at the same time caution against a premature bias against a rate that is indeed

noticeable and consistent with evidence on implicit subsidies. At the same time, it is clear that the data presented above can only be considered a first approximation to the size of the subsidy, and more work needs to be done to arrive at a more reliable assessment.

As one (constant) tax rate for institutions with different degrees of systemic relevance would provide relatively more systemic institutions with an unfair advantage and thus bias incentives, a certain degree of granularity will be necessary. As the basic idea of our levy is that the tax rate should eliminate extra profitability resulting from being able to exploit "too-systemic-to-fail" guarantees of different value, the tax rate should vary with the size of the negative externality and thus the degree of systemic relevance. An important question is then how granular the system should be, taking into account the trade-off between the better incentive effects of a more granular system and the difficulties in exactly quantifying small differences in systemic relevance.

A rather granular approach would aim at a one-to-one mapping between the systemic relevance of an institution (measured by its overall risk score) and the tax rate. Each risk score would be assigned to a specific tax rate. In a first step, the taxing scheme should be characterized. Based on the discussion above, we choose an average tax rate of 50 bp. Around this rate, a bracket or interval is established. In our baseline case, it ranges from a lower bound of 30 bp to an upper bound of 70 bp. In a second step, the overall risk score is calculated and calibrated to range from a score of 0 to a score of 100. In a third step, a threshold for the risk score is defined above which an institution is considered systemically relevant. The separation of financial institutions into non-systemic and systemic could be performed, for example, through a clustering methodology (see IMF, 2009, and IMF et al., 2009). In a final step, the tax range of 30 bp to 70 bp is mapped to the overall risk score for systemic institutions. Institutions with a risk score just above the threshold would pay the minimum tax rate, institutions with a higher score a linearly increasing rate. Each institution would then pay a levy that corresponds to its score, provided that its overall score is higher than the threshold level.

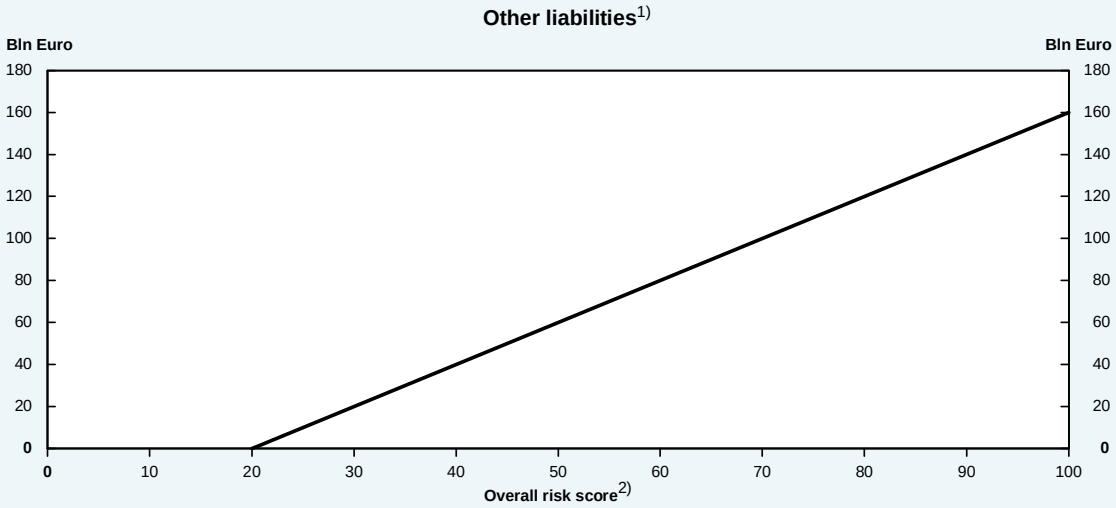
The main advantage of such a scheme is its (quasi-)continuous and progressive character; the marginal tax to be paid increases with the systemic relevance of the financial institution. This can be illustrated with a hypothetical example. To keep things simple, we only vary the amount of non-insured or "other" liabilities, measured in billion Euros. The overall risk score is an equally weighted average of a financial institution's size, interconnectedness and complexity. Holding constant the latter two parameters, financial institution's size is the only variable to increase in a linear manner, and in line with "other liabilities". The level of insured deposits and equity are held constant. Thus, financial institutions are solely heterogeneous in the amount of taxable liabilities (see Chart 1, top panel).

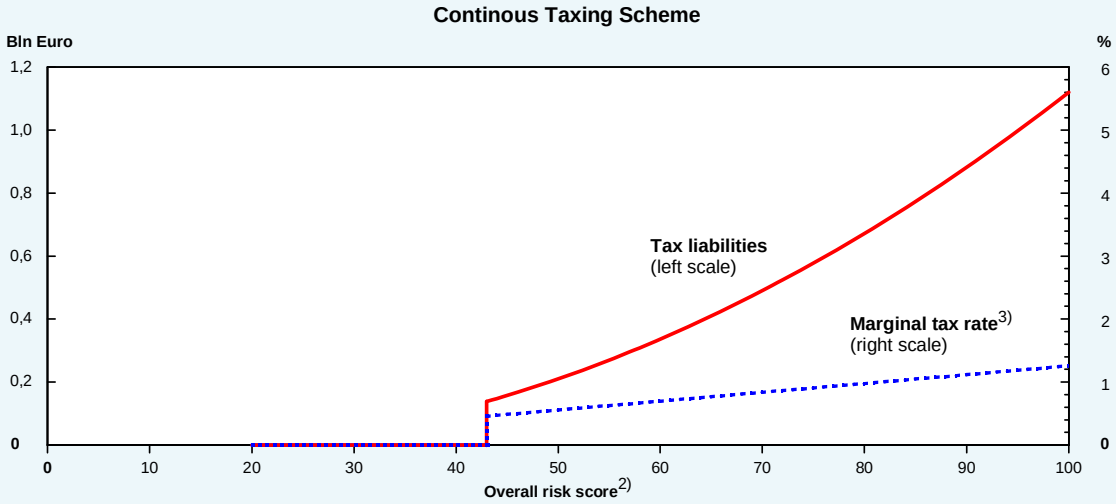
Since interconnectedness and complexity are held constant, size is the only element influencing the risk score. As the overall risk score is translated into the tax rate, the latter is also linearly associated with other liabilities as soon as the threshold is crossed[3]. Charging other liabilities with the respective rates (ranging from 30 bp to 70 bp) generates progressively increasing tax liabilities collected by the sovereign authority (the black line in Chart 1, middle panel). The reason for this is that the size of a financial institution is accounted for twice in our model: first, it is one of the components in calculating the overall risk score; second, size constitutes the tax base. The "marginal tax rate" (i.e. the increase in tax liabilities relative to a unit increase in the tax base) increases linearly.

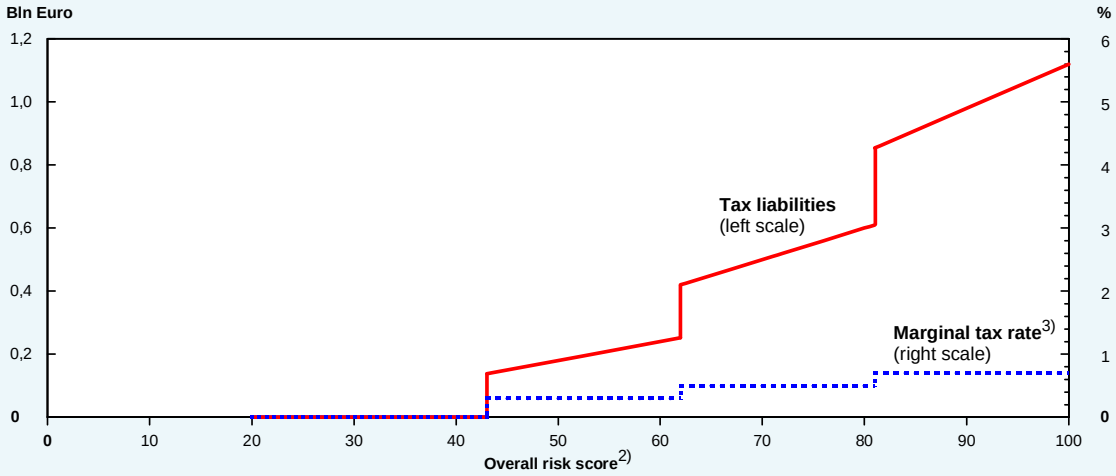
[3] Note that in the example the threshold is chosen arbitrarily.

Chart 1

Taxing Scheme Comparison







1) Total liabilites less insured liabilities.– 2) Own calculation.– 3) Marginal tax rate at each threshold is not shown, as they would display one-time jumps to very high levels that are followed by an instantaneous return to the levels depicted.

Owing to the difficulties in measuring the marginal funding cost advantage for each degree of systemic relevance, such a continuous taxing system could be difficult to implement. Setting up such a system would be very time-consuming, and prone to complaints and lawsuits by individual players. For this reason, one could also begin with a less granular system. In this case, two additional thresholds have to be determined selecting institutions into buckets with low, medium and high systemic relevance (see Chart 1, bottom panel). Financial institutions having the highest systemic relevance should be charged with a tax rate around 70 bp. Systemic institutions with intermediate scores should pay 50 bp; systemic institutions with low scores should pay 30 bp; non-systemic financial institutions would be free of charge. In contrast to the linear scheme, a taxing system with three tax brackets causes tax liabilities to increase linearly in tax base, apart from the threshold values at which there is a jump in marginal tax rates. It is clear that such a discrete system does not come without its own incentive problems. In particular, one would expect the generation of clusters at the upper end of each tax bracket as financial institutions are supposed to prevent a jump onto the next higher tax trajectory.

"Tax" base

In addition to the tax rate, an economically meaningful tax base has to be determined. This comprises the determination of taxable entities as well as the assessment base for each institution. For the purpose of increasing the overall stability of the system, it is necessary to reduce the systemic relevance of each entity that has the potential to destabilize the system as a whole. Therefore, *all systemic financial institutions* should be charged with a levy. This includes banks, certain insurance companies as well as hedge funds. Certainly, adjustment factors for the tax base would need to be formulated, as "uninsured liabilities" at banks and insurance companies, for example, mean very different things (see IMF, 2010).

This broad coverage is consistent with the experience of this and previous crises as also insurance companies or hedge funds can become too-systemic-to-fail, be involved in maturity transformation and cause substantial shocks to the overall financial system. Moreover, as a consequence of regulatory reform and financial innovation, systemic risks might migrate to other – both existing and newly created – institutions or instruments. Therefore, the identity of taxable entities (the "perimeter" of the levy) would need to be re-assessed constantly anyway. This would provide supervisory agencies with an additional instrument, as the list of institutions covered by the scheme becomes a control-lever of its own. The frequency of re-assessments could either coincide with the re-assessment of the risk score for the purpose of tax rate determination, or be performed less often to take into account the bureaucratic costs probably involved in forcing new entities into the regime.

The tax assessment base should comprise *all liabilities, excluding deposits which are already insured by deposit insurance funds*. By taxing uninsured liabilities, there is a built-in incentive to reduce the proportion of those instruments in the balance sheet that usually play a crucial role in the propagation of shocks and that have proven to be crucial in the current crisis. In particular, business models largely relying on wholesale funding will confront higher tax burdens. Moreover, deposits which are already insured by deposit insurance funds should be excluded for two reasons. For one, we intend to avoid to tax systemic institutions twice – with the levy for systemic relevance and the premium for deposit insurance. Second, in the event of financial distress, we do not intend to protect private creditors and do not want to raise false expectations; in times of crises, it is rather necessary to protect the financial system from destabilizing shocks which implies the funding of pending operations of the failing institution. As a matter of fact, this will probably mean to primarily fund the operations between institutions. An important point to note is that the tax assessment base should comprise implicit liabilities from off-balance-sheet activities. This is a challenge, as judgment would be necessary to determine whether and to what degree a certain activity constitutes an implicit liability.

Combining the proposed tax rates and assessment bases, it is worth noting that the proceeds from such a tax would probably be sizeable, and also the burden on those financial institutions that are very large and at the same time not very profitable. First calculations for the 20 largest German banks suggest that it would take between one and two decades to generate revenues in terms of GDP that roughly equal the average fiscal costs incurred during systemic crises in the past. Turning to individual institutions, the respective tax burden would indeed represent a strong incentive to change course and business model. For example, in 2007, Hypo Real Estate, the biggest German bank that effectively went bust in the course of the crisis, boasted on-balance-sheet assets of 400 billion and own funds of 10 billion Euros. Insured deposits represented a very small part of the balance sheet, but even assuming that 50 percent of all liabilities would be excluded from the tax assessment base and not taking into account implicit liabilities, applying a tax rate of 50 bp would yield revenues totaling of 1 billion Euros per year, roughly equal to its earnings before taxes.

Tax incidence

A potentially important objection against our proposal is that, ex ante, it is difficult to determine who would bear the final burden of the tax. In particular, chances are that the real sector would suffer disproportionately from such an overhaul of the regulatory regime, through a reduction in credit and/or an increase in borrowing costs. A related concern that is particularly relevant for banking systems with low profitability such as in Germany is that the proposed levy might lead to a financial burden that cannot be shouldered by the taxed institutions.

Before answering the crucial question of tax incidence, it is useful to highlight that similar concerns are relevant for all proposals currently discussed, in particular systemic risk capital surcharges. As pointed out in section II above, the two instruments should be expected to yield equivalent results under certain assumptions. In particular, if too-big-to-fail is a problem and one chooses an instrument that effectively reduces the problem, the balance sheets of *certain institutions* have to shrink by construction.

The fact that the effect of a tax on credit extension should not be very different from a similar increase in capital requirements does not preclude the potential of damage to the real economy, though. However, we do not expect the damage to be large when introducing the levy for at least three reasons. First, our proposed framework charges only systemically relevant institutions, while non-systemic institutions remain unaffected. If those institutions that do not become subject to systemic risk regulations can take over, adverse effects on credit availability can be attenuated. This design at least maintains or even might promote the *competition between systemic and non-systemic institutions on the asset-side* which makes it difficult for systemically relevant institutions to pass the tax-burden onto borrowers. Even in the case where systemically relevant institutions pull out of the market, we do not expect major constraints on credit growth, as non-systemic institutions still remain in the market. Large-scale funding will further be realized, too, as most big projects are already funded in the form of syndicated loans.

Second, financial institutions have multiple "set screws" to deal with an increase in regulatory requirements related to the gross cost of funds. In particular, it can be shown that, under admittedly strong assumptions, the effect of higher capital requirements on loan rates will be cushioned substantially by the use of different adjustment mechanisms (Elliott, 2009). Based on similar calculations, one can also gauge the impact of a levy on lending costs. Our analysis is based on a fairly simple condition (equation 1), and calibrated to match current financial information for big German banks: Financial institutions will only provide a loan if the left hand side of the equation, the interest rate on loan plus other benefits to the bank from making the loan, is at least equal to the cost of funds, any expected credit losses and administrative expenses.

Equation 1

$$(L+O)*(1-t) \geq E*r_e+(D_1*r_1+D_2*(r_2+l)+C+A)*(1-t),$$

where

L =	effective interest rate on the loan, including the annualized effect of fees,
t =	marginal tax rate for the bank,
E =	proportion of equity backing the loan,
r_e=	required rate of return on the marginal equity,
D_1 =	proportion of deposits funding the loan,
r_1 =	effective marginal interest rate on D_1, including indirect costs of raising funds such as from running a branch network,
D_2 =	proportion of debt funding the loan,
r_2 =	effective marginal interest rate on D_2,
l =	levy,
C =	the credit spread, equal to the probability-weighted expected loss,
A =	administrative and other expenses related to the loan and
O =	other offsetting benefits to the bank of making the loan.

The expression augments the condition in Elliott, 2009, in two ways. First, since we propose that the levy assessment base should comprise all liabilities excluding deposits, we need to distinguish between different debt instruments. Thus, we differentiate between deposit D_1 and other type of debt D_2. We then can incorporate D_2*l into the equation, assuming that the cost for the levy will be *tax deductible*. Second, as debt will become – compared to deposit – more expensive from the perspective of the institution, we expect a substitution effect between deposits and other types of debt.

To calculate the effects of the levy, we use the following assumptions.

t = 30%	E = 3% & D = 97%	D_1 = 1/3D & D_2 = 2/3D	r_e = 15%
C = 0.5%	A = 1.5%	O = 1%	r_1 = 2% and r_2 = 6%

The figures are mainly based on the estimates in Elliott, 2009, and modified using rough averages from big private German banks between the years 2000 and 2007. For example, the required rate of return on the marginal unit of equity is not directly observable and hard to verify. Up until the crisis, a 25% ROE was considered as reasonable, at least for money centre banks. In the post-crisis period, we would view such a figure as an upper bound. Between 2000 and 2007, ROE for big private German banks was only around 10%. As this should provide a reasonable lower bound, we choose an intermediate value of r_e=15% for our calculations.

Before the crisis, the net charge-off rate for big private banks was at very low levels (0.2%). We expect that new loans being put in place during the critical economic situation will lead to net charge-offs above 0.2% but also far below the loss experience on existing loans. Specifically, we assume a value of 0.5% for C. Moreover, due to the close relationship between universal banks and industrial companies in Germany we assume a higher value for "other offsetting benefits to the bank of making the loan" than Elliott, 2009, assumed for US-banks, i.e. we assume O=1%.

The levy should in theory eliminate the extra profitability that results from being able to tap capital markets with a too-systemic-to-fail guarantee. Set optimally, the levy will lead to a reduction in the financial institutions' systemic relevance, which in the long-run will lead to an increase in r_2 since debt-holders would require a higher interest rate for the reduced implicit guarantee. In expected terms, however, debt-holders should expect no additional returns, as the payout in case of a failure would be below of what can be currently achieved through taxpayer support.

Faced with the new situation, the new regime provides incentives to lower the extent to which an institution is considered systemically relevant. However the reduction of systemic relevance is a long-lasting process. In the short-run, the financial institutions will not be able to adjust their systemic relevance ad-hoc and thus have to pass on the burden to their stakeholders. This, in turn, will be reflected in changes in the margins faced by shareholders, depositors, unsecured creditors, and clients of the bank. Moreover, the proportion to which an institution funds itself with unsecured debt should decrease, as this would reduce the tax base and thus the tax burden. Note that this is a desired effect, as the large share of wholesale funding in many institutions' business models has played a crucial role in the crisis.

To get a sense of the maximum impact of the levy, we first assume that only one margin adjusts. Put differently, we look at each variable individually and determine the extent to which it has adjusted to take into account the introduction of the levy (Table 1).

Table 1

Upper bounds of effects if there is only one margin of adjustment[1)]
(in percent)

Level of levy (in basis points)	0	30	50	70
Full pass-tough to loan rate ..	6,17	6,36	6,49	6,62
Full absorption by returns on equity	15,00	10,47	7,46	4,44
Full impact on deposit rate ...	2,00	1,40	1,00	0,60
Full impact on debt rate	6,00	5,70	5,50	5,30
Change in the proportion of deposits (debt) with unchanged rates of return	32,33 (64,67)	36,84 (60,16)	39,52 (57,48)	41,96 (55,04)

1) Own calculation.

The required increase in the loan rate, holding all else equal (scenario 1), would be 19 bp for a levy of 30 bp, 32 bp for a levy of 50 bp, and 45 bp for a levy of 70 bp. Even in this maximum impact scenario, the pass-through of the levy to the loan rate is somewhat cushioned by the fact that the levy is deductible from income taxes. On the other hand, the maximum impact on the return on equity would be significant if the levy was completely absorbed into profits (scenario 2). If banks were to fully absorb the impact of the levy of 70 bp into profits, their return on equity would drop to 4.44%. The last three simulations assume that the only adjustment is on the liability side: Banks would be able to keep returns on equity and loan rates constant if they could reduce their cost of funding by reducing deposit or debt rates (scenario 3 and 4). Alternatively, scenario 5 assumes that all banks do is to increase the proportion of deposit funding and decrease debt funding while holding returns on the two sources of funding constant. If the only adjustment margin was the proportion of debt funding, this would have to go up by almost 10% while the proportion of deposit funding would increase accordingly.

As mentioned above, these simulations are useful for describing the upper bounds of the possible impact of a levy. In reality a more likely outcome would be that more than one adjustment margin changes. Financial institutions have "multiple screws" to deal with an increase in regulatory requirements. The framework above allows us to compare different scenarios and to get a feel for the involved magnitudes. For example we could design an intermediate scenario by assuming small variations in different variables (see Table 2).

Table 2

Assumption for an intermediate scenario with several adjustment margins

(in percentage points)

	Levy rate (basis points)		
	30	50	70
r_e decrease	0,50	0,75	1,00
D_2 decrease	1,00	1,50	2,00
r_1 increase	0,05	0,075	0,10
r_2 decrease	0,10	0,15	0,20

By introducing the levy, uninsured debt will become more expensive relative to deposits; hence, banks will have an incentive to substitute other debt by cheaper means of financing (deposits). Thus, D_2 will decrease and D_1 will increase. The increased demand for deposits (D_1) is likely to result in a somewhat higher value for r_1. However, since deposits are usually covered by deposit insurance, the increase will be at a rather low level. Finally, for estimating the change in r_2, we also have to take into account that the decreasing demand for debt (D_2) has an opposing effect on r_2. Thus, we assume that, in short-run and before the lower probability of a bail-out is priced in, creditors are forced to drop their required returns.

As can be seen in Table 3, small adjustments in other variables would substantially reduce the pressure on loan rates going up. In our simple example, the introduction of a levy will lead to an increase in loan rates of 8 to 22 bp. This increase is much smaller than the estimated value for the U.S. in Elliott, 2009, where the introduction of additional capital requirements is analyzed. At this point, it is worth reiterating that this framework can only serve as an illustration of the possible impact of a levy, not as a forecast. This is due to the fact that we do not have the necessary information about the price elasticity financial institutions face on the different markets they operate on.

Table 3

Adjustment through multiple variables[1)]

(in percent)

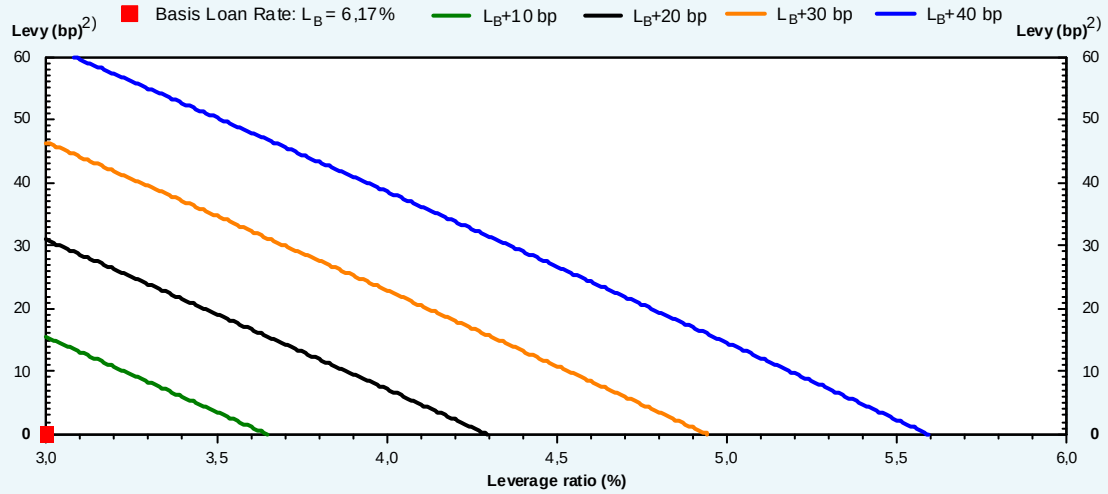
Level of levy (in basis points)	0	30	50	70
Loan rate	6,17	6,25	6,32	6,39
Return on equity	15,00	14,50	14,25	14,00
Return on deposit	2,00	2,05	2,08	2,10
Return on other debt	6,00	5,90	5,85	5,80
Proportion of deposits (debt) funding the loan	32,33 (64,67)	33,33 (63,67)	33,83 (63,17)	34,33 (62,67)

1) Own calculation.

Taking into account this limitation, Equation 1 can be used to compare the effects of a levy with the impact of a surcharge on capital. To keep the analysis as simple as possible, we assume that the surcharge is applied to a regulatory leverage ratio and not as currently envisioned to risk-based capital requirements. Chart 2 illustrates the relationship between an increase in the leverage ratio and a levy by displaying combinations of the two regulatory instruments that would have the same impact on the loan rate. Each line represents a combination of a specific leverage ratio and a levy for a constant loan rate. The loan rate in the origin (with a leverage ratio of 3% and a levy of zero) is 6.17%; the difference between the ISO-loan rates is always 10 bp. For example, the increase of loan rates that would result from a levy of 50bp is approximately equivalent to the increase that would follow from an increase in the regulatory leverage ratio from 3 to 5%. Both measures would lead to an increase in the loan rate of around 32 bp.

Chart 2

ISO-Loan Rates for Different combinations of Levy and Leverage Ratios[1)]



1) Own calculation.– 2) (bp) = basis points.

A priori, it is not clear how much each of the margins would adjust in response to a levy or a surcharge, but in principle, banks could mobilize many adjustment margins. As shown above, the additional cost could in part be passed on to creditors of the bank, who might be forced to accept lower rates of return on unsecured debt. In theory, banks might also pass on a part of the burden to depositors. However, given that this cheap source of funding becomes even more attractive, banks might instead try to attract more deposits, which could have the opposite effect; i.e. an increase of the interest rate on deposits r_1. Banks might also adapt their business model in order to increase cross-selling opportunities from lending (O) or become more efficient by lowering administrative costs (A). Finally, they might have incentives to under-price risks by applying excessively low credit spreads (C).[4]

Nevertheless, concerns about the real effects of the new instruments remain. To avoid damage and to address these concerns, we would favor a *dynamic* framework, so that macroeconomic effects and potential disincentives of our instrument can be identified and immediately remedied by adjusting the tax level. This can be achieved by an appropriate frequency of re-assessments, monitoring and adjustment for which we propose a *quarterly basis*, which is also applied by FDIC

[4] For this reason, both a leverage ratio and a levy should be viewed as complements to risk weighted capital regulations.

insurance and typical CDS contracts (see Pennacchi, 2009). This may not only serve as an early warning system if risk scores are increasing, but can also indicate that the systemic risk charge is working if risk scores are diminishing. This frequency should also be sufficient to adequately monitor the institutions' financial burden, as well as further implications, such as the levy's impact on the asset-side, particularly on private sector lending. Additionally, it should be high enough to keep pace with structural changes in the financial system and financial innovation (see IMF et al., 2009).

The dynamic framework just described also allows for adjustments if the right incentives are not yet strong enough. If the quarterly assessment and monitoring reveals that the degree of systemic relevance of financial institutions is not reduced, the incentives can easily be adjusted by increasing the level of the levy.

B. Designing a Systemic Risk Fund

As a second pillar of our approach, we propose to install a Systemic Risk Fund – an institution which is endowed with *control rights* for the *early intervention* in and *resolution* of systemically relevant financial institutions. As the intervention and in particular the resolution of failing financial institutions requires financial resources, it is necessary that the Fund has as its disposal a *liquidity buffer for situations of systemic distress* which is based on *pre-funding* through systemically relevant institutions.

Naturally, there are fears that a fund creates moral hazard. Indeed, there are good reasons for these fears, as expectations about additional and explicit insurance guarantees might emerge: Building a fund which is pre-funded by financial institutions would then increase bailout expectations, and thus moral hazard. However, the particular design and institutional setting of the proposed Systemic Risk Fund attenuates these incentives. In fact, it could even be argued that moral hazard can be reduced by providing the resolution authority with a certain amount of firing power and maneuverability in reacting to balance sheet weaknesses at individual institutions.

Most importantly, and as a matter of fact, the existing implicit insurance scheme is so perverse that it is unlikely that a properly designed fund would aggravate it. Drawing on this argument, moral hazard could even be reduced if non-systemic banks were explicitly excluded from the list of systemically relevant institutions. Moreover, a central element of our proposal is setting up the Systemic Risk Fund as an independent authority which is endowed with control rights. While the degree of systemic relevance is supposed to be reduced by the levy, the purpose of the Systemic Risk Fund is to *allow the resolution of systemically relevant institutions*. This is the main difference between our Systemic Risk Fund and the Stability Fund proposed by the some private sector banks or existing national arrangements such as the German Financial Stabilization Fund (Sonderfonds Finanzmarktstabilisierung – SoFFin). While other funds are supposed to accumulate reserves in order to step in if financial institutions come into financial distress, our Systemic Risk Fund is not supposed to bail-out or rescue failing financial institutions. Rather, the Fund receives financial resources the purpose of which is to control and wind-down failing financial institutions.

The proposed design of the Systemic Risk Fund offers additional safeguards against moral hazard. First, intervention by the Fund would be tied to strong *conditionality* arrangements. In particular, the Fund would be equipped with control rights in the sense of early intervention and resolution powers. In this respect, the Fund's reserves should be thought of as an element that contributes to its *credibility*. *Funding is not for free but expensive*, as the regulatory intervention tools associated with Fund intervention would include and emphasize the creation of good bank/bad bank solutions. Second, additional moral hazard due to the Fund's reserves should at best be

internalized by appropriate taxes: Whenever certain debt instruments become under-priced because of an assumed guarantee by the Fund, this would lead to a built-up of systemic risks in the balance sheet and should thus be reflected in higher levies. To allow for these dynamic adjustments, we would assess tax incidence and effectiveness as well as the appropriate tax rate on a quarterly basis.

A final element of potential moral hazard is that, in a pool of ailing banks, each institution might have incentives to be the first one to fail, before the Fund's financial resources are exhausted. This argument is particularly relevant for supra-national arrangements, as individual countries might be tempted to exploit the fact that the burden of a local problem bank is now shared by the voters of other jurisdictions. We would argue that this incentive mechanism would only kick in when the resolution of the first institution with problems is characterized by forbearance. The objective of a fund, however, would exactly be to allow a strict implementation of resolution measures without having to fear the shockwaves that would usually result from such a policy. As the fund would allow the resolution authority to address contagion to counterparties, the threat of stringent intervention would become credible. In fact, and following Mishkin, 2006, we would argue that the problem of time inconsistency would be diminished substantially if the resolution authority had instruments at its disposal that would allow it to be tough on the first institution experiencing problems, while simultaneously avoiding failure of interconnected institutions.

Early intervention and resolution

In case of financial distress, the Systemic Risk Fund has the obligation for *early intervention* as well as *resolution powers*. The early intervention scheme could be based on the "prompt corrective action" schemes currently applied by the U.S. Federal Deposit Insurance Corporation, and complemented by a "special resolution regime" for systemically relevant institutions. The latter could be modeled upon the British Banking Act of 2009, which involves reorganization, breaking-up of institutions into good-bank and bad-bank parts, as well as liquidation of financial institutions. Under this framework, it is possible to take into account the special characteristics of systemically relevant financial institutions. A special characteristic of these entities is that the freezing of pending operations due to internationally established primacy of creditor protection can cause major disruptions. The freezing of cash flows is supposed to guarantee the creditors a maximum of payout from insolvency. However, this simultaneously could cause financial distress at one or several counterparty institutions and disperse the shock throughout the financial system. Therefore, it is necessary to finance part of an institution's operations during the resolution process. This can be ensured by equipping the Systemic Risk Fund with reserves which can be accumulated from the proceeds of the levy.

Cumulating and administering the reserves

In order to pre-fund the intervention and resolution measures in advance, the Systemic Risk Fund collects revenues and cumulates the reserves. As the levy pursues a regulation effect in the Pigouvian sense, the *levy is always applied* independent of the Fund's volume. If the *Systemic Risk Fund exceeds a certain volume threshold, the surplus is allocated to the government*, or on the international level, to the participating governments. This can be understood – and we follow this interpretation – as a compensation for the permanent residual risk carried by taxpayers. Alternatively, it can also be justified according to President Obama's proposal where the charges repay the accrued costs of the public sector.

As we suggest setting up separate Systemic Risk Funds on the national, European and global level (section III.C), this has some implications on the allocation of the Funds' surpluses. If the Fund is implemented on the national level, the allocation of the surplus from the Fund to the corresponding government does not pose any problems. However, some complications emerge if

the Fund is established on the international, e. g. European, level and financial institutions from various jurisdictions contribute to the Fund. In this case, a rule as to how the surplus is to be allocated to the governments has to be found. This can be associated with some kind of burden-sharing problem, however, in the opposite direction. We propose as a rule to distribute the surplus of a period according to the ratio of the contribution of financial institutions from a particular country.

Refunding the Fund if reserves melt down

Additionally, we exploit the *element of co-funding or limited funding*. If the Fund runs out of reserves, it will be *funded temporarily* with a loan from the government which has to be *repaid in the aftermath of the crisis*. For the collection of the loans, the same rule can be applied as for the allocation of the Fund's surpluses. This proposal is economically most reasonable as the governments which are asked to contribute financial resources are exactly the ones that profit from the allocation of the Fund's surpluses in tranquil times. Hence, a fixed rule according to this pattern might establish a first step in solving the burden-sharing problem which has appeared in the context of several cases. However, it has to be ensured that governments adhere to this arrangement even during times of crises, e.g. through international agreements which enact sanctions if one party breaches the contract. Memoranda of Understanding (MoUs) will not be sufficient because of limited enforcement capacity. Hence, a legally binding agreement is necessary to ensure an ex ante determined and ex post enforceable agreement (Goodhart and Schoenmaker, 2006).

One of the main obstacles to effective international (re-)solutions is the problem of *burden-sharing*. Typically, the argument is that a national government has to carry the burden caused by the failing financial institution in its jurisdiction. This argument is, however, flawed since cross border burden-sharing is already a fact of life. In the way currently implemented it mostly takes the form of blanket guarantees to debt- and shareholders. Since most of the liabilities and of the shares of global financial institutions are held by non-residents and in particular by financial institutions across the globe, any blanket bailout or guarantee involves a measure of cross border transfers. The size of the transfer remains in the dark, with rare exceptions such as the bailout of AIG (which benefited among others large European banks or the one of Bayern LB in the benefit of Austrian Bank with operations in Eastern Europe).

Given the cross-border interrelations on the asset, liability as well as equity side, it would not be incentive-compatible if the home country carried all burden in case of a financial institution's distress.[5] With our proposal, we can at least partly mitigate the burden-sharing problem. In particular, the European Systemic Risk Fund would receive contributions from all European governments: If the Fund runs out of reserves, all governments have to temporarily finance the Fund. Specifically, the European Systemic Risk Fund could issue European bonds while the annual servicing costs of the bonds would be financed by the national governments (for a similar approach see Goodhart and Schoenmaker, 2009). The governments' contributions would be made according to the same rule as is applied with respect to the surpluses of the Fund: the ratio of the contribution of financial institutions from a particular country. This scheme is fair as – on average – stakeholders in all European countries profit from an intervention in a pan-European active financial institution.

[5] See Goodhart and Schoenmaker, 2006, for evidence on cross-border exposure of individual banks in 2004. The authors investigate how the assets of the top 30 European banks are allocated between the home market, the rest of Europe, and the rest of the world. They find that on average the 30 examined banks have about 55 per cent of their assets in the home market while they have 25 (20) per cent in other European countries (the rest of the world).

The size of the Fund's reserves

Before answering the question of the volume of the Systemic Risk Fund, one should again highlight the purpose of the Fund. The Fund should enable the regulator in case of urgent problems to react quickly and to temporarily finance positions which might disperse serious shocks throughout the financial system. Thus, the Systemic Risk Fund does not have to cover all costs of a potential crisis. Simultaneously, each fund that accumulates reserves would in principle generate additional moral hazard and it would be hazardous to choose an inappropriately large Fund. In the light of these arguments, it is economically reasonable to set the volume at a level which is sufficient to cover necessary expenses, but not too large to create additional disincentives.

For regimes on the national level, one way to derive an upper bound for the Fund's size is to consider the cost of past systemic crises to taxpayers. The variation in these costs is large: Some of the less costly crises like the U.S. S&L ended up totaling fiscal costs of 3.7 percent of GDP. Some of the most "expensive" ones, like the Japanese banking crisis are estimated to have cost taxpayers up to 24 percent of GDP (see Laeven and Valencia, 2008). However, using past fiscal costs to estimate the necessary size of the Fund is a flawed approach because it implicitly assumes that the incidence and intensity of future crises is not reduced. The implicit assumption is that the systemic risk levy is not successful in reducing risk. Therefore, choosing the fund size according to the fiscal cost of past systemic crises would lead to an overestimation of the optimal fund size. Another approach is to consider the size of existing deposit insurance funds and use these as "best existing practice". These turn out to vary between about 1 to 5 percent of GDP, and tend to be at the lower bound in industrialized countries (see Acharya, 2009).

Taken together, these measures suggest that a fund target of 1 - 2 percent of GDP would provide a lower bound, a fund target of 5 to 10 percent of GDP the upper bound for a Systemic Risk Fund able to finance the functioning of bridge banks and potentially equity injections in fundamentally viable institutions. In the end, however, they can only provide rough yardsticks. Each Fund will have to separately assess the amount of funds it would need to stabilize the system while interventions in those institutions that have previously contributed take place. To this end, probably the best approach is to carefully study the experiences from the current crisis. Based on a complete picture on inter-institutional commitments, case studies would need to be prepared that attempt to answer hypothetical questions about the amount of funds that would have been needed to safely wind down institutions. Which funds would have been necessary if a bank that was bailed out would have been taken into receivership? What amount would have been necessary to split a specific institution into a good and a bad bank without causing major disruptions in the rest of the system?

C. National and international adaption

Globalization of financial services has contributed to a surging internalization of financial activities. Especially the European Community created a pan-European playing field with the establishment of the EU's single market. As financial operations have exceedingly reached across borders, we would identify three regional levels on which externalities are particularly severe: national, pan-European and global. According to this classification, we propose to install separate Systemic Risk Funds whereby *each Fund corresponds to one specific level of externality*. In particular, Systemic Risk Funds should be established on the national, European and global level which separately regulate institutions that operate nationally, pan-European and globally, respectively.

Naturally, other world regions outside Europe that come to the conclusion that national financial systems have developed regional linkages requiring explicit burden-sharing could also set up supranational arrangements. For Europe, however, finding a common solution is in our view a

particularly pressing issue (see Klueh and Weder di Mauro, 2010). If European governments do not find the strength to implement such a solution, harmonization of levies and funds would provide a minimum degree of consistency among national solutions. Harmonization would need to be complemented by arrangements that specify how the emerging network of national funds would work under conditions of stress, and how the network could serve as a nucleus for more elaborate burden-sharing arrangements.

With regard to one specific level, a comprehensive framework comprises the supervision, early intervention and resolution of systemically relevant financial institutions. Generally, we suggest sharing the tasks between two institutions: *one institution as the supervisor and the Systemic Risk Fund as the body that is in charge when institutions experience problems*. The supervisory institution collects data, calculates the tax rates, monitors the financial institutions and instructs the Fund to take regulatory action if a financial institution is about to experience problems or even fail. Typically, this assignment should be given to the central bank. By contrast, the Systemic Risk Fund collects the tax proceeds, and takes early intervention and resolution measures. Under specific circumstances, the Systemic Risk Fund should also be allowed to take regulatory action without being instructed by the supervisory institution. This double lance concept additionally contributes to avoid regulatory forbearance as both institutions can trigger the regulatory intervention process.

For the institutional setup as well as the division between national and international adaption, we propose to install a cascade model in accordance with the nature of the systemic externalities associated with different types of institutions: Non-systemic, systemic with a national range, systemic with a European range, and globally systemic.

Non-systemic institutions should be supervised by national authorities and can further be treated according to existing procedures. As a failure of one of these institutions would, on a stand-alone basis, not cause major disruptions in the rest of the financial system. Hence, there is *no need to put them under specific supervision and regulation*. Concerns about the built-up of risks in groups of banks during boom times that would give rise to the so-called too-many-to-fail problem would be dealt with the appropriate instruments, i.e. those targeted at the problem of pro-cyclicality.

Systemic institutions with *national range* should be treated according to our proposed framework implemented nationally. These institutions should be charged a levy according to the degree of their systemic relevance with respect to the rest of the national financial system. The proceeds of the levy are to be contributed into a *national* Systemic Risk Fund which is endowed with control powers to intervene in ailing and resolve failing institutions. Note that the deposits of private creditors could still be covered by national deposit insurance funds, while the systemic institutions *additionally* should be covered by the proposed stability framework.

Systemically relevant institutions which exercise cross-border operations on the *European level* should be regulated by a *European* Systemic Risk Fund. One option would be a division of labor in which the European Systemic Risk Fund again serves as the executive organ which administers the Fund's reserves and intervenes in problem institutions. The recently established European Systemic Risk Board (ESRB) and the European System of Financial Supervisors (ESFS) would share the tasks outlined above. Since the ESRB has competences in macro-prudential supervision and monitoring, it is a natural candidate as the institution to set the systemic risk levy and control the European Systemic Risk Fund. Such a design has the additional benefit of giving the ESRB an instrument for macro-prudential supervision. It would thus provide the existing paper tigers with teeth and strengthen the competences of the European institutions.

Ideally, for financial institutions that operate globally, a global regime along these lines would be established. This, however, is an unlikely outcome. A more realistic approach is to designate the IMF or the FSB to supervise and calculate the size of the levy for a pre-specified group of institutions. Such supra-national coordination would be necessary to ensure a level playing field and a consistent implementation of the levy. The proceeds of the levy would then be contributed to the national or regional Systemic Risk Fund. This Fund would then also be responsible for controlling the corresponding institution in case of failure.

IV. Summing up and comparing proposals

This paper proposes that a systemic risk levy combined with a Systemic Risk Fund for resolving failing financial initiations could provide powerful incentives to reduce excessive systemic risk taking and enable burden sharing of tail risks between the private and the public sector. This systemic risk levy is not meant a substitute for efforts underway in the realm of Basel III. Rather, it should be the systemic complement to capital regulations aimed at reducing risk at the level of the individual bank.

Compared to other approaches, a systemic risk levy has several advantages. The distinguishing features of our proposal can be highlighted by comparing it to the main alternatives in the current debate (see Appendix Table 4). The most important distinguishing feature among alternative proposals to charge the financial sector is their ultimate purpose. The purpose of some proposals is mainly the generation of fiscal revenues, as they merely aim at raising funds and finance past or future crises. A second class of proposals is more ambitious. It aims at preventing crisis by affecting the behavior of financial institutions and in particular by internalizing the externality of systemic risk taking. Examples of the former are the tax on financial activities (FAT) suggested in IMF, 2010, which could act as a substitute for a VAT. Similarly an insurance premium would primarily serve to finance the cost of future crisis rather than correcting behavior ex ante.

There are essentially only two types of proposals aimed at correcting perverse incentives by reducing the systemic risk externality: a systemic surcharge on capital requirements and a systemic risk levy. The surcharge on capital requirements is the instrument favored by supervisors and regulators, whose revealed preference is to work through the Basel process. One of the differences between the surcharge and the levy is the identity of the institution that controls the funds. The capital surcharge leaves the funds on the balance sheet of banks and thus partly under the control of management and shareholders. It creates an internal buffer which may, however, be prone to manipulation. By contrast, the proceeds that would emerge in the context of our proposal (a systemic risk levy combined with a Systemic Risk Fund) would have two recipients. A first tranche of funds is transferred to an independent public resolution authority; the rest is transferred to the general budget and would thus be controlled by fiscal authorities and create an external buffer.

A further difference between the proposals is the design of the premium, charge, tax or levy. This is also the area in which major challenges arise. These challenges are somewhat less pronounced for non-corrective instruments, as a tax to collect revenue should simply be designed to induce few distortions, and an insurance premium should be calculated to be actuarially fair. The challenge facing the corrective instruments is to gauge the amount of systemic risk an individual institution emits to the system, and to translate measures of this contribution into a charge that effectively internalizes the related externality. In this respect, it is important to all corrective instruments, and in particular the surcharge and the levy, to overcome this same obstacle.

Based on estimates of the value of explicit state guarantees, we suggest that the funding advantage that too-systemic-to-fail institutions enjoy may be large. Estimates for the U.S. suggest

that the funding premium may be in the order of 50 bp. A systemic risk levy of this order is substantially higher than envisaged in current proposals and may give rise to two types of concerns: One concern is that a high levy may substantially reduce banks profits and the other is that it may lead to a sharp contraction in credit to the real economy. Frequently, these fears are backed by using a very mechanistic approach to gauging the impact of a levy, e.g. by simply applying the levy to the base and subtracting the resulting amount from profits. Alternatively, the reduction in capital is leveraged up into a reduction in credit. These types of "back-of-the-envelope-calculations", however, are flawed in several ways. First, they focus on quantities only and ignore price changes. Second, they pretend that the entire tax burden falls on one adjustment margin, though in reality a number of margins are at the disposal of financial institutions. Using a fairly simple model of a typical lending decision, we show that the impact of a levy on loan rates is substantially cushioned if we assume that banks take a part of the costs into profits, share another part with debt-holders and finally change the composition of their liabilities in ways that appear desirable against the backdrop of the lessons from the crisis.

It is worth noting that, a priori, the determinants of tax incidence, i.e. which group of stakeholders (shareholders, debt-holders, depositors, borrowers or management) will end up carrying the burden of higher costs, are largely the same for higher capital requirements on the one, levies on the other hand. The burden sharing among those groups will depend on the price elasticity on the markets for debt, equity and credit as well as on the business model and market position of a specific firm.

However, one crucial advantage of the levy over the surcharge lies in the perimeter of institutions that can be covered. The capital surcharge applies to banks only and therefore could create strong incentives for risk migration. Most importantly, systemic risks could be transferred from banks to less regulated parts of the financial sector. This greatly reduces the appeal of a capital surcharge as a corrective instrument, since the perimeter of the charge is fixed to a particular type of financial institution. Consequently, the internalization of systemic risk is bound to remain rather partial. By contrast, a systemic risk levy could be designed as an effective macro-prudential tool because it can be applied to the universe of financial institutions that are systemically relevant or could potentially become so in the future. An important prerequisite for this function is that the systemic risk levy would be under the control to a macro-prudential authority charged with identifying and mitigating systemic risks as they emerge.

Overall, we conclude that a properly designed systemic risk levy combined with a resolution fund could correct biased incentives effectively and provide for risk mitigation and (cross-border) crisis management. At the same time, we would like to point out that we view our proposal as a point of departure for future discussions, and not as something that is set in stone. In particular, implementing our proposal would require extensive calibration work and sensitivity analysis by supervisory authorities endowed with micro-prudential data. By offering the concrete elements of a design without such calculations, we hope to contribute to the ongoing debate on a setup which in our view contains the crucial elements to redefine the relationship between the state and financial institutions.

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Appendix

Table 4

Comparing alternative proposals to charge the financial sector

	Tax on bonuses, on financial activity, or on transactions	**Insurance Premium**	**Systemic Surcharge on Capital**	**Systemic Risk Levy + Systemic Risk Resolution Fund**
Purpose of the tax / levy / charge	Not corrective: Collect revenues to pay for the cost of past crisis	Not corrective: Insurance for crisis (akin to deposit insurance schemes)	Corrective: Internalize systemic risk	Corrective: Internalize systemic risk
Use of proceeds	General revenue	Build-up of insurance reserves (possible need backstop from government in the event of crisis)	Increase financial institutions' capital buffer (probable need for backstop from government in the event of crisis)	– Build-up of reserves for funding of resolutions – General revenue / compensation for backstop of government
Control over funds	Government	Government and / or industry through insurance agency (mutualisation)	Individual financial institutions (no mutualisation)	– Independent resolution authority – Government
Type of rate	– Temporary – Discretionary	– Permanent – Actuarially fair	– Permanent – Rate set to internalize systemic risk	– Permanent – Rate set to internalize systemic risk
Perimeter	Fixed perimeter: All financial institutions, or only the ones that profited in the last crisis	Fixed perimeter: All contributing financial institutions	Only Banks	Flexible perimeter: All systemically relevant financial institutions have a positive rate of the levy
Challenges	– Determine optimal least distortive tax – Tax incidence	If not combined with resolution regime the insurance increases moral hazard and incentive to take systemic risk	– Determination of systemic risk contribution / level of surcharge – Incidence of surcharge	– Determination of systemic risk contribution / rate of levy – Incidence of levy
Advantages	Pay for cost of past crisis	Pay for cost of future crisis	For Banks only: Reduce the cost and incidence of banking crisis	For the entire system: – Reduce the cost and incidence of future systemic crisis (macro prudential instrument) – Contribute to covering the cost of (smaller) future crisis