Financial Systemic Risk: Taxation or Regulation?

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Abstract

In this paper we describe systemic financial risk as a pollution issue. Free riding leads to excess risk production. This problem may be solved, at least partially, either with financial regulation or taxation. From a normative viewpoint taxation is superior in many respects. However, reality shows that financial regulation is more frequently adopted. In this paper we make a positive, politico-economic argument. If the majority chooses a tax, then it is likely to be too low. If it chooses regulation it will possibly be too harsh. Moreover, a majority of low polluting portfolio owners may strategically use regulation in order to charge the minority a larger share of the externality reduction.

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1 Introduction

The dilemma between regulation and taxation of financial activities has come under closer scrutiny as a result of the recent crisis. The main reason is that both regulation and taxation represent policy tools for curbing system risk, a peculiar case of externality resulting from contagion effects. In a perfect Pigouvian world taxation and regulation would be equivalent policy tools: both policies can achieve the first best outcome if well calibrated to deal with the externality. In the real world, dominated by uncertainty and asymmetric information, policymakers usually choose financial regulation to produce progressive effects in investors' risk taking (Claessens et al., 2010), while taxation is used to produce proportional effects, using flat tax schemes (Goodhart, 2010). Thus, from a normative viewpoint, the choice between regulation and taxation is made by looking at the shape of the externality and the distribution of costs. In this paper we adopt a positive approach, based on a political economy argument first proposed for a general pollution problem by Alesina and Passarelli (2010). Suppose that regulation has a stronger impact on highly risk polluting portfolios, while a tax is levied also on low-polluting portfolios and that the choice between regulation and taxation is made by voting. A majority of low-polluting portfolio owners may have a strategic incentive to choose regulation in order to charge the minority a larger share of the externality reduction burden. This may lead to a suboptimal instrument choice. This also explains why regulation is so frequent in financial markets, whereas taxation is rarely employed to cope with systemic risk problems.

J. M. Keynes (1936) was one of first proponents of a systemic risk tax. He identified security contracts as a source of financial instability. Thus he proposed to tax only those kinds of contracts. Subsequently many others took the same view (among them, Stiglitz, 1989). We claim that attention should be focused on the overall financial playing field, rather than on the banking industry only. The default of any specific financial contract may originate negative and amplifying effects not only on the lender's and/or the borrower's portfolios, but also on other interconnected operators' claims. The possible failure of a specific portfolio can produce a generalized fear of counter-party credit risk, with potential domino effects that spread over the markets. An externality problem arises because these potential effects are not completely internalized by the contracting parties. In principle, any financial contract can be characterized by its level of toxicity in terms of system risk externality (SRE). In other words, any single financial portfolio produces a certain amount of systemic risk pollution, even an extremely small one. Therefore, curbing systemic risk represents a general interest policy task and any citizen's portfolio choice is potentially affected by that policy.

Our attention here is mainly focused on the "political distortion" that occurs when the choice of policy instrument is made by voting. As in the political analysis of income taxation (Meltzer and Richard, 1981), the distortion depends on the position of the median voter relative to the average.[1] Taxes and rules however are different in the way they allocate the sacrifices of the externality reduction. In the case of regulation, most sacrifices are made by top risk producers. Thus, even when the median voter produces an amount of risk that is slightly above the average, he chooses a regulation level that is too restrictive. By contrast, with a tax low risk producers bear a consistent amount of costs. Thus a low median is induced to prefer taxes that are too low. The two instruments are quite different in the political distortion: regulation is very likely to be too restrictive; taxation is likely to be too low.

This argument is based on the assumption that, independently of the toxicity measure adopted, regulation has a more than proportional impact on more toxic instruments; i.e. it forces people to progressive toxicity reductions. For example, a full prohibition rule (such as, "all instruments whose toxicity level is above a given level are banned") has a dramatically progressive impact and it would resemble an extremely convex tax schedule (such as: "a 100% toxicity tax is levied above a given level"). By its nature, taxation tends to be less progressive, if not regressive.

Our assumption that regulation is more progressive than taxation is straightforward if regulation consists in full prohibition of toxic instruments. Apart from this extreme case, the assumption can be justified if one considers that usually lending institutions meet regulation on operational risk by drastic cuts in their most toxic activities. Vice versa, with a tax they may decide to keep some high risk activities if they make high profits from them. Moreover, the idea that regulation is more progressive may be justified also by a measurement problem. In principle, the base of either taxation or regulation should be a non-distorted toxicity measure. However, measuring toxicity may be quite costly, if not virtually impossible. Rules and taxes are applied to differently distorted measures of toxicity. In general, rules affect directly the supply of toxic instrument; this may cause progressive effects. Taxes are usually levied on non linear measures of toxicity, with a regressive effect. For example, a fixed tax on financial transactions is independent of actual risk production, and hence is regressive in SRE.

Realistically, the measurement problem seems to be more severe with

[1] For an excellent survey of politicy choices in several economic contexts, see Persson and Tabellini (2000).

taxation than with regulation. This possibly explains why both the political debate and the academic debate have paid relatively little attention to taxation. A basic assumption of SRE taxation is that it is possible to evaluate the marginal systemic externality of each financial firm (Acharya et al, 2009; Adrian and Brunnermeier, 2009). In the presence of a measurement bias taxation results to be highly suboptimal. Regulation is less subject to a measurement problem. Rules can be more detailed and easier to implement than taxation. Soft information is easier to use in regulation than in taxation (Claessens et al, 2010).

The measurement bias may also explain why so far concrete proposals on financial taxation have concerned taxes that are different from a proper SRE tax; i.e., levies on banks on an ex post basis that are based on funding or profits, or banking bonuses (Claessens et al, 2010). In general, financial activity taxation does not follow the SRE principle. There are however specific areas in which SRE principles have been applied, such as securities, currency, insurance premia, real estate transaction and capital levies. In the past decade several G20 countries have imposed different forms of financial transaction tax, although the current trend is a reduction in their application.[2]

Of course, taxation is not necessarily a substitute for regulation. In practice regulation is the primary instrument to reduce systemic risk, while corrective taxation plays a complementary role (Claessens et al, 2010). Taxation of the financial industry can also address goals that are different from externality reductions, such as the implementation of general taxation design (Lockwood, 2010); ensuring that banks meet the direct financial costs of possible bailouts; the implementation of bankruptcy schemes (Claessens et al, 2010) and macroeconomic policies in managing aggregate demand (Tobin, 1978).

This paper is related to a large body of literature that has recently studied policy tools to reduce financial systemic risk. Major attention has been devoted to banks' liquidity management, which seems to be a core factor of contagion. In fact, the crisis of the wholesale market has determined the rapid withdrawing of short-term debt, with the consequential shocks propagation across the system (Gorton, 2009; Brunnermeier, 2009; Allen, Babus and Carletti, 2010). In Perotti and Suarez (2011) the externality problem specifically resides in the wedge between private and social value of short-term banks' funding. Based on a price vs quantity argument (Weitzman, 1974), the authors claim that when the main source of bank heterogeneity is credit ability a flat rate tax on short-term funding is efficient because it allows good banks to continue lending. When heterogeneity concerns solvency or

[2] See Matheson 2010 for a complete survey.

risk-taking, quantity instruments, such as net funding or capital ratios, are preferable. Acharya and Öncü (2010) are in favor of a Repo Authority which takes over repo positions during systemic events. Gorton (2009) proposes to stop discounted price sales of large collateral by a blanket state guarantee. Farhi and Tirole (2010) look at bail-out expectations, which imply an endogenous loss of public control over money supply. This claims for measures to reduce the private creation of liquidity risk. Most of this literature adopts a normative viewpoint, in which the basic question is: "what is the best thing to do?". To the best of our knowledge, none of the existing work has addressed positive, political economy issues. This paper is novel in this respect. We try to answer a different question: "what is the most likely thing to happen?".

We argue here that regulation is more likely to be preferred to taxation in a democracy, in which citizens/voters are heterogeneous in their portfolio toxicity. One might object that a lobbying model *a' la Stigler* is possibly more appropriate to address politico-economic issues in financial markets. In this case, however, one would need to explain why banks would lobby for regulation rather than for taxation. Moreover, the idea that financial policies are specific interest policies is questionable. We rather think that any policy intervention in financial market is in principle a general interest policy. Any citizen is a potential portfolio owner. Thus anyone perceives the private consequences of any policy measure that may affect, directly or indirectly, the relative cost of his alternative portfolios and the relative benefits from systemic risk reduction.

This reminder of this paper is organized as follows. Section 2 presents a general model with externality production. Section 3 studies the effects of regulation and how people vote on it. Section 4 does the same for a tax. Section 5 addresses the issue of instrument choice. Section 6 concludes.

2 The model

Consider a continuum of investors/voters, and denote with i a generic investor. Each investors/voter makes a portfolio choice. Assume that a certain amount of systemic risk is associated to the financial instruments in any possible portfolio. Call t_i, or "type i", the risk produced when i chooses his most preferred portfolio. Let $t_i \in [0, 1]$. In a sense t_i is a measure of the "polluting" activity of investor i when his portfolio choice is not constrained whatsoever. We say that i is a "low" type when the risk of his most preferred portfolio is low, and vice versa. A low type is an investor who unilaterally chooses a portfolio with a small amount of "toxic" instruments. We will also say that i is a low-polluting investor. Vice versa, high t_i means that i prefers polluting instruments. Call b_i the amount of systemic risk associated to i's *actual* portfolio choice, with $b_i \in [0, 1]$.

Let $F(t)$ be the distribution of types in $[0, 1]$. This function describes how systemic risk is produced across population when investors choose their most preferred portfolios. For example, a rightward slanted distribution means that there are relatively few big risk producers, whereas the majority of investors prefer low amount of toxic instruments in their portfolios. Assume for simplicity that the population has unit measure: $F(1) = 1$. By definition, an investor maximizes his utility when his actual portfolio choice is his type: $b_i = t_i$. Choosing a portfolio with a different amount of systemic risk. i.e. $b_i \neq t_i$, entails a disutility, that we describe here with a cost function that is increasing and quadratic in the distance between b_i and t_i:[3]

$$c(b_i, t_i) = (|b_i - t_i|)^2 \tag{1}$$

Let ε be the externality, or the *social* cost, of the systemic risk produced by i's actual portfolio choice, b_i. Assume that the externality function is linear in systemic risk:[4]

$$\varepsilon(b_i) = -b_i$$

The idea is that if an investor produces an amount of systemic risk that is lower than his type ($b_i < t_i$), he generates a *social* benefit that spreads over the population, but he bears a *private* sacrifice given by (1). Let $G(b) : [0, 1] \to [0, 1]$ be the risk distribution associated to investor's actual portfolio choices. investor i's utility function is:

$$U_i = -\int_0^1 bdG(b) - (|b_i - t_i|)^2 \tag{2}$$

Since any individual is infinitesimal in the population the private benefit that he obtains from his own externality reduction is infinitesimal too. Hence nobody has an incentive to reduce unilaterally his portfolio's systemic risk below his type. Therefore, $b_i = t_i$ for all i, or $G(b) = F(t)$. In equilibrium, i's utility is:

$$U_i = -\int_0^1 tdF(t)$$

[3] A fundamental assumption is that the cost function is convex. Assuming that it is quadratic greatly simplifies calculus. Below we discuss how our results are affected by different degree of cost convexity.

[4] Also linearity of ε is a simplifying assumption. Below we show how things change if one removes it.

A free riding problem eventually emerges as a result of the discrepancy between private and social benefits from externality reductions. Investors make portfolio choices with too much systemic risk production. There is scope for government intervention; either regulation or taxation.

3 SRE regulation

By financial regulation we denote a policy that tends directly to prevent financial institutions from issuing instruments having too much systemic risk. The supply of large SRE instruments is strongly limited, therefore investors with those kind of instruments in their portfolios will have to make substantial changes. Arguably, this kind of policy has a quite strong impact on "highly polluting" portfolios while it only moderately affects the low polluting ones.

We can formalize this idea in our model by assuming that a rule forces investors to more than proportional reductions in systemic risk production. In other words, for any t_i, actual risk production, b_i, has to lower more than proportionally. Call ρ the policy parameter that measures the regulation level (with $0 \leq \rho \leq 1$). Once ρ is enforced individual i must choose a portfolio with b_i such that:

$$b_i(t_i, \rho) = (1 - \rho \cdot t_i) \cdot t_i.$$

For example, suppose that $\rho = 0.5$; for a low type with $t_l = 0.2$ actual risk production is 10% lower: $b_l = 0.18$. For a high type with $t_h = 0.8$ actual risk production is 40% lower: $b_h = 0.48$. Thus, for any level of the regulation parameter, risk production decreases more than proportionally for larger t_i.

The decision regarding the level of the regulation parameter is made by voting. The timing is the following: at time 1, given the distribution of types $F(t)$, individuals compute their preferences regarding ρ; at time 2, they select a Condorcet winner in pair-wise voting; at time 3, they choose their portfolios and their pollution levels, b_i.

The "policy" preferences of an individual i are:

$$U_i(\rho) = -\int_0^1 t - \rho \cdot t^2 dF(t) - \rho^2 t_i^4$$

We can compute i's most preferred rule, which is the solution of the following FOC:

$$\int_0^1 t^2 dF(t) = 2\rho t_i^4 \tag{3}$$

Convexity of the cost function takes care of the SOC. The most preferred rule is set where the private benefit due to a marginal increase in the rule parameter (the left-hand side of (3)), equals the marginal private cost of complying with the rule (the right-hand side). All U_i's are single peaked. This rules out strategic voting and allows for the existence of a Condorcet winner which is unique under the simple majority rule (Black, 1948). More precisely, call ρ_i^* investor i's most preferred rule, or the bliss point:

$$\rho_i^* = \frac{\int_0^1 t^2 dF(t)}{2t_i^4} \tag{4}$$

Observe that bliss points are negatively related to types: heterogeneity in policy preferences is due to differences in types. An investor with highly polluting portfolio (high t_i) wants a low rule, and vice versa. The reason is simple. Private benefits are the same for all, but for any rule a higher type bears larger private costs. Since costs are convex individual's utility is maximized with a lower rule. The median voter theorem applies: under the bare majority, the voting outcome is the bliss point of the median type, m:

$$\rho_m^* = \frac{\int_0^1 t^2 dF(t)}{2t_m^4} \tag{5}$$

Let us look at the efficiency of this policy outcome. Assume a benthamite social welfare function, $W(\rho)$, that is given by the sum of individual utilities:

$$W(\rho) = -\int_0^1 t - \rho \cdot t^2 dF(t) - \rho^2 \int_0^1 t^4 dF(t) \tag{6}$$

The socially optimal rule, ρ^*, maximizes $W(\rho)$; therefore:

$$\rho^* = \frac{\int_0^1 t^2 dF(t)}{2\int_0^1 t^4 dF(t)} \tag{7}$$

The difference between ρ_m^* and ρ^*can be viewed as a "political distortion" due to voting. We say that the rule adopted by the majority is too restrictive if $\rho_m^* > \rho^*$. By comparing (5) with (7) we see that this occurs if $t_m^4 < \int_0^1 t^4 dF(t)$. Let us see what this condition means. Observe that t^4 is a convex transformation of t. By Jensen's inequality, $\int_0^1 t^4 dF(t) > \bar{t}^4$, where $\bar{t}$ is the average type. Suppose that $t_m < \bar{t}$, then the condition for a too restrictive rule is satisfied: $t_m^4 < \bar{t}^4 < \int_0^1 t^4 dF(t)$. Then a median lower than the average is a *sufficient* condition for the emergence of a too restrictive rule. Restrictiveness can also occur if the median is slightly above the average. It is easy to see that with more convex costs, the rule is too restrictive even if the median is consistently above the average. This result is not affected by the assumption of linear externalities.

The main idea is that when financial regulation is decided through voting, a too restrictive policy is rather easy to emerge. Even if the median voter pollutes more than the average, he opportunistically chooses a too restrictive rule in order to force the minority of top polluters to substantial portfolio changes. The reason is that regulation impacts mostly on top polluting investors, forcing them to large adjustments in their portfolio choices. The median voter does not consider the cost incurred by top polluters. He rather looks at regulation as a way to charge them the main burden of the externality reduction.

Thus voting on financial regulation is likely to yield socially too restrictive rules, as it happens in the model above. Voting outcome inefficiency is larger when costs are more convex and when the median is in a relatively low position with respect to the highest types.

4 SRE taxation

An SRE tax aims to increase the private cost of systemic risk production. The problem with this instrument is that risk is not usually not easy to measure. Thus the tax is often levied on distorted SRE measures, as for example the monetary amount of financial transactions. investors who make the same amount of financial transactions pay the same amount of tax, independently of actual systemic risk produced. We will see below that taxing a biased measures of the externality is not only socially inefficient, but it also affects the "political" distortion.

4.1 Tax on systemic risk

Let us start by considering the policy benchmark. Suppose that the Social Planner is able to detect the true systemic risk in any portfolio; i.e. the actual externality level produced by any single investor. A basic result in optimal taxation theory applies here: welfare is maximized if, for any agent, the after-tax private marginal cost equals the social marginal externality. Since in our model the marginal externality is independent of t_i, the optimal tax must ensure that marginal costs are the same for all investors. Assume that preferences are quasi-linear in money. The optimality condition is satisfied by a proportional tax with lump sum refunds of proceeds. To show this, call τ the per-unit tax of pollution. Given τ, any investor i optimizes his portfolio by choosing a risk level, $b_i(t_i, \tau)$, such that the marginal cost of decreasing risk equals the tax (or the price) per unit of risk: $c'(t_i - b_i) = \tau$. Thus:

$$b_i = t_i - \tau/2 \tag{8}$$

This means that given τ all investors reduce the systemic risk in their portfolios by the same amount, $\tau/2$.[5] Total externality becomes $-\bar{b} = -(\bar{t} - \tau/2)$. Socially optimal tax, τ^*, must ensure that total marginal cost equals total marginal externality, provided that individual risk choice satisfies (8):

$$\int_0^1 [\varepsilon_b' \mid b_i = t_i - \tau/2]\, dF(t) = \int_0^1 [c_b' \mid b_i = t_i - \tau/2]\, dF(t) \tag{9}$$

Observe that both sides of (9) are independent of i; namely, the left-hand side is -1 and the right-hand side is $-\tau$. Therefore:

$$\tau^* = 1 \tag{10}$$

This is a *first best*, that is achieved thanks to the government's ability to detect and tax actual systemic risk production.[6] The policy runs as follows. The government sells (i.e. taxes) for one dollar any unit of systemic risk ($\tau^* = 1$). Individual tax burden is proportional to the risk produced: $\tau^* \cdot b_i = b_i$. All investors bear the same marginal cost. Proceeds are lump sum redistributed. Per capita refund amounts to $\bar{b}$, where $\bar{b}$ is the after-tax average behavior.[7]

4.2 Tax on transactions

As pointed out earlier, the problem with a tax is that in reality it is levied on distorted measures of systemic risk. Here we consider a tax on financial transactions. We will study the distortion that this may cause and we will discuss how our results can be generalized of other forms of taxation.

In order to study a transaction tax we have to specify how the tax is related to the risk produced. Arguably, the systemic risk in a portfolio is due

[5] Here we are assuming without loss of generality that the after-tax optimal b_i is interior for all i.

[6] It can be shown that the optimal tax decreases in the degree of cost convexity. For example, with $c = (t_i - b_i)^\alpha$, whe have that

$$\tau^* = \left(\alpha(\alpha - 1)^{\alpha - 1}\right)^{\frac{1}{3 - 2\alpha}}$$

The reason is that with more convex costs, pollution reduction is socially more costly, thus the optimal tax must allow for more pollution; i.e. the tax rate must be lower.changes when degree of convexity the optimal

[7] Observe that, thanks to quasi-linear preferences, this tax schedule solves the Mirrlees problem. Thus, the schedule would be optimal even if the types were not observable. The government does not need to know anything about the cost incurred by any single agent.

As for the assumption of linear externalities. No big changes occur if one removes it. The Social Planner we can establish a nice non-linear tax schedule, such that the (variable) marginal externality produced by any agent equals the marginal tax rate.

to two factors: first, the number of toxic instruments; second, the portfolio size, i.e. the number of transactions made by the investor. With a proportional transaction tax, however, an investor pays only according to the second factor. Somehow a proportional transaction tax does not bear on the full amount of the externality produced. Thus we can realistically assume that a tax that is proportional to financial transactions is *de facto* regressive with respect to the externality produced. Let us formalize this idea. Denote by μ the transaction tax rate.

Assume a simple linear relation between the tax rate and the systemic risk produced: $\left(\mu - \frac{1}{\beta} b_i\right)$. Parameter β is a measure of the amount of systemic risk that is actually taxed through the transaction tax μ. High values of β imply that transactions are a good proxy of risk, thus with a tax levied on transactions the amount of, say, tax-free risk is rather limited. In a sense, β inversely captures the distortion due to the measurement bias. The amount of taxes paid by investor i on a portfolio that produces b_i units of risk is $\left(\mu - \frac{1}{\beta} b_i\right) \cdot b_i$. Individual optimal risk choice implies that the marginal cost from reducing risk equals the marginal tax: $c'(t_i - b_i) = \mu - \frac{2}{\beta} b_i$. Thus, each investor's after-tax risk production is:

$$b_i = \frac{\beta}{\beta - 1} (t_i - \mu/2) \tag{11}$$

Observe that, due to regressivity, large polluters reduce their risk production by less than small polluters. Then, the latter's marginal cost is larger.[8]

The tax chosen by the Government maximizes social welfare, subject to individual optimization constraint in (11). The FOC is:

$$\int_0^1 \left[\varepsilon_b' \mid b_i = \frac{\beta}{\beta - 1} (t_i - \mu/2)\right] dF(t) = \int_0^1 \left[c_b' \mid b_i = \frac{\beta}{\beta - 1} (t_i - \mu/2)\right] dF(t) \tag{12}$$

The Government's most preferred transaction tax, call it μ°, solves (12):

$$\mu^\circ = \left(1 - \frac{1}{\beta}\right) + \frac{2}{\beta}\bar{t} \tag{13}$$

This tax rate is a *second best*. Taxing transactions forces the government to adopt a tax that is *de facto* regressive in the externality, whereas the first best instrument would be a proportional tax. Departures from the first best occur because the government taxes a distorted measure of risk. The difference between first and second best decreases in β, the measurement

[8] Without loss of generality, assume that $t_i > \mu/2$. This ensures that $b_i < t_i$ for any i.

bias. If the ability to tax externalities through transactions is low (low β) then μ° is substantially lower than τ^*. In a sense this means that, when by μ only a low amount of externality is taxed, then it is better to have a low μ. Vice versa, as the measurement bias tends to zero the socially optimal transaction tax approaches the first best (i.e. $\lim_{\beta\to\infty} \mu^{\circ} = \tau^*$). Finally observe that the second term in the left-hand side of (13) is increasing in $\bar{t}$. This means that with a regressive tax, the optimal rate must be higher when the average type is larger, because on average the marginal cost decreases.

In synthesis, when the Social Planner a tax on financial transactions, it chooses a too low level. The reason is because a distorted measure of risk is adopted. Top risk polluters do not pay enough taxes; their private marginal cost is too low, compared to marginal externalities, and vice versa low risk polluters pay too much.

4.3 Political distortions

This Section studies the political distortion that may occur when the decision about taxes is made by voting. First, consider the case in which a proportional tax is levied on risk production directly. Thus there is no measurement bias.

4.3.1 Tax on risk

In this situation the Social Planner chooses the first best tax rate, $\tau^* = 1$. Below we show that, not surprisingly, the majority chooses a possibly different tax rate. Recall that tax proceeds are lump-sum redistributed out of a balanced Government budget. Any individual receives a refund that is equal to the average tax burden, $\tau \cdot \bar{b}$. Thus, investor i's indirect utility is:

$$U_i(\tau) = -\int_0^1 b(t)dF(t) - (t_i - b_i(t_i))^2 - \tau \cdot (b_i(t_i) - \bar{b}) \qquad (14)$$

Recall also that, for given τ, any individual reduces the amount of risk in his portfolio by $\tau/2$, as in (8). Note that (14)is concave in τ. Thus, maximizing (14) subject to (8) yields i's most preferred tax rate, τ_i^*:

$$\tau_i^* = 1 + 2(\bar{t} - t_i)$$

Higher types want lower tax rates. They pay larger amounts of taxes because their after-tax risk production is higher. Since bliss points are inverse-monotone in types, the majority chooses the median's bliss point:

$$\tau_m^* = 1 + 2(\bar{t} - t_m) \qquad (15)$$

The difference between τ_m^* and τ^* is a measure of the political distortion due to majority decision:

$$\tau_m^* - \tau^* = 2(\bar{t} - t_m) \tag{16}$$

If the median type is below (above) the average, the majority chooses a too high (low) tax rate. The distortion occurs because the amount of taxes paid by, say, a low median is lower than the average. A low median has an incentive to fix a high rate in order to have others pay for a larger share of the pollution reduction cost. No political distortion occurs only if the median's risk production equals the average.

When the Government is able to tax systemic risk the political distortion is only determined by the difference between median and average types. This result on externality taxation is similar to a well known result in the public finance literature on income taxation (Roberts, 1977; Meltzer and Richard, 1981).

4.3.2 Tax on transactions

Consider now the political distortion when a tax, μ, is levied on financial transactions. A measurement bias occurs: systemic risk is not entirely taxed. Individual policy preference is the same as (14). With a transaction tax individuals' after-tax risk production is given by (11). Taking this choice as a constraint in utility maximization, we get the following FOC:

$$\frac{\partial U_i(\mu)}{\partial \mu} = \frac{1}{2} + \frac{t_i}{\beta - 1} - \frac{\beta}{\beta - 1}\frac{\mu}{2} + (\bar{t} - t_i) = 0$$

The SOC is satisfied, thus i's most preferred transaction tax is:

$$\mu_i^* = \left(1 - \frac{1}{\beta}\right) + \frac{2}{\beta}t_i + 2(1 - \frac{1}{\beta})(\bar{t} - t_i)$$

Bliss points are decreasing in t_i. Then the transaction tax chosen by the majority is the one preferred by the median type:

$$\mu_m^* = \left(1 - \frac{1}{\beta}\right) + \frac{2}{\beta}t_m + 2(1 - \frac{1}{\beta})(\bar{t} - t_m) \tag{17}$$

The difference between μ_m^* and μ° in (13) gives an idea of where the political distortion comes from:

$$\mu_m^* - \mu^\circ = -\frac{4}{\beta}(\bar{t} - t_m) + 2(\bar{t} - t_m) \tag{18}$$

Political distortion is given by the sum of the two terms in the right-hand side of (18). This first term is positively related to the relative position of the median. The reason is that, due to regressivity, a high median wants too high a tax rate because his marginal cost decreases. The second term is the "usual" political distortion, as in (16), and it works in the opposite direction: a high median wants a low tax rate since he pays a large amount of taxes.

Interestingly, the net political distortion depends on parameter β. Suppose $t_m < \bar{t}$. If $\beta < 2$ the tax is too low. This means that if the median is lower than the average the "usual" political distortion occurs only if the ability to tax systemic risk through a transaction tax is sufficiently high (β larger than 2). If this is not the case, a low median chooses a too low tax because regressivity, rather than a low position, plays a major role.

Let us compare the political distortion in the case of a transaction tax with that of a rule. Consider the most interesting case: transactions are a poor measure of risk, $\beta < 2$. Suppose the median is lower than the average. A rule is always too restrictive: a low median uses the rule as a tool to charge a high polluting portfolio the largest share of total cost, but this causes social welfare loss. By contrast, a tax is too low: due to tax regressivity a low median must pay large amounts of tax and thus prefers too low a tax level.

This relationship between political distortions and median's position is continuous. Thus, if the median is moderately above the average, the rule is too restrictive and a tax is too permissive. With a very high median both a rule and a tax are too restrictive.

Summing up, with both instruments majority voting produces a political distortion. This may cause large inefficiency losses. However, the distortion is considerably different when voting concerns a tax instead of a rule, especially if there is a problem of measurement bias. Too restrictive rules are more likely to emerge than too restrictive taxes. The reason is that rules are a progressive mechanism, whereas taxes on transactions are regressive. Thus, on the one hand a relatively low median voter, who is not necessarily below the average, prefers restrictive rules in order to force higher types to large risk reductions; on the other hand, he prefers a low tax rate because otherwise he would have to pay high taxes.

5 The instrument choice

Suppose now that the majority determines not only the level of the policy, but also which instrument to adopt. We can realistically assume that voting takes place sequentially: first, the majority selects the instrument; then it chooses its level.[9] Voters know that, whatever the instrument, the level that will pass at the second stage is the one preferred by the median. Any voter compares his own utility in both cases, and chooses his most preferred instrument. At the first stage, the majority behaves as a Stackelberg leader: it selects the instrument and it lets a possibly different majority choose the level at the second stage. There is no scope for strategic vote.

When does the majority choose a rule at the first stage? A low polluting investor has to make small adjustments with a rule, whereas with a tax he has to pay a relatively large amount, due to regressivity. Thus he prefers a rule. A top polluting type has reversed preferences: a tax is better than a rule because with a tax the burden of systemic risk reduction is borne mostly by low polluting investors. A likely situation is that if the number of low polluters is sufficiently large, then a majority on the rule will form. Observe that we do not require that the median is below the average in this case. If the rule is strongly progressive then also moderately high types will prefer it. Vice versa, a regressive tax is preferred by high polluting investors. If regressivity is stronger more moderate types prefer the tax. Thus a majority on a tax will form if it is strongly regressive with respect to the rule and the population of low polluters is relatively small.

Let us consider the normative characteristics of these positive results. In our model the social cost of systemic risk is linear. Thus, the Social Planner is not interested in whom produces the externality, it is rather interested in choosing an instrument that shares costs evenly. A rule is strongly progressive: the cost is concentrated on high risk investors. Vice versa, a tax levied on a biased risk measure may be regressive; thus the cost is concentrated on low polluters. The socially optimal instrument is a tax if regressivity is not too high; i.e. if the measurement bias is not too strong.

Consider however, that when the measurement bias causes strong regressivity or when the distribution is slanted towards top polluting portfolios a majority of voters prefers the rule. In this case a double political distortion occurs. First, the majority selects the wrong instrument: regulation instead of a taxation. Second, the majority of low polluters chooses a too restrictive level.

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[9] In general, with bi-dimensional policy issues the existence of a Condorcet winner cannot be taken for granted. However, with sequencial voting in which the first issue is binary this problem does not arise.

Consider, however, that with bi-dimensional sequential voting the outcome is sensitive to the voting sequence. In our situation we do not have such a problem. An inverse sequence in which the majority decides the instrument after having decided the level of the policy is quite innatural. For an exaustive analysis of sequencial bi-dimensional voting, see De Donder, Le Breton and Peluso (2010).

6 Conclusion

The main point in this paper is that when policies to reduce financial systemic risk are made by voting, the political aspects of the decision are quite relevant and may cause significant distortions. These distortions are substantially different when taxation rather than regulation is under discussion.

We approached systemic risk contagion as an externality issue and we considered it as a general interest policy. In a sense, everybody is interested in reducing systemic risk and, as a consequence of the policy, all investors must readjust their own portfolio or bear a cost. If regulation is adopted, most costs and adjustments are supported by high risk producers; with taxation, sacrifices are more evenly distributed across population. Political distortions hinge on the distribution of sacrifices for the externality reduction. A majority of small portfolio owners with low risk production will tend to choose regulation in order to concentrate sacrifices on high risk producers. Even a median that is above the average might prefer regulation. provided it has a sufficiently progressive effect on risk adjustments.

We showed that regulation may be highly inefficient. In particular, majorities tend to choose too restrictive rules. Loosely speaking, if "risk is due to everybody" (as in the case where externalities are linearly related to risk), and the cost of complying with the rules grows at a fast rate, concentrating risk reduction on top risk producers is not socially optimal. However, if the majority is made by low risk producers, the decision will be harsh regulation.

With a tax, the political distortion is quite different. Systemic risk is reduced by taxing distorted measures of risk, such as transactions, intermediaries' profits or their turnover. We argued that this is likely to yield a regressive effect: small risk producers pay proportionally more than large risk producers. As a consequence a majority of small risk producers has less incentive to choose a tax; if this will be the case, it chooses too low a tax level. This political economy argument is possibly helpful to understand reality in which taxes on risky financial instruments are usually rare and low, whereas financial regulation is much more frequent.

Of course there might be many other circumstances, not considered in this paper, that explain the frequency and efficiency of policies. For example, taxes can be better calibrated to financial activity, and produce more gradual externality reductions. From a normative viewpoint, taxation is preferable when the contributions to system risk is more evenly distributed across financial instruments and investors. Vice versa, regulation is more effective when there are information concerns. If risk production is private information a rule that limits specific financial activities is more effective than a tax on those activities.

Financial risk externalities may clearly be an international issue. In these circumstances common decisions rely on the existence of institutions that ensure a sufficient degree of coordination among parties. Incentives and enforceability issues may severely limit the set of available policy options and distort common decisions. Finally, as already mentioned, financial intermediaries may find that engaging in lobbying activities is profitable in order to distort the political decision in a favorable direction.

These are relevant aspects of the policy making of systemic financial risk. They are not alternative, but rather complementary, to the points made in this paper and they may eventually suggest extensions of our approach.

References

[1] Acharya, Viral and Sabri Öncü (2010): "The Repurchase Agreement (Repo) Market" in A. Viral, T. Cooley, M. Richardson, and I. Walters, eds., *Regulating Wall Street: The Dodd-Frank Act and the New Architecture of Global Finance*, Wiley.

[2] Acharya, Viral, Lasse Pedersen, Thomas Philippon and Matthew Richardson (2009): "Regulating Systemic Risk", in V. Acharya and M. Richardson M. (eds.), *Restoring Financial Stability: How to Repair a Failed System*, Wiley.

[3] Adrian, Tobias and Markus Brunnermeier (2009): "CoVar", Staff Report, *Federal Reserve Bank of New York*, n. 348.

[4] Alesina, Alberto and Francesco Passarelli (2010): "Regulation versus Taxation", *NBER Working Papers*, n. 16413.

[5] Allen, Franklin, Anna Babus and Elena Carletti (2010): "Financial Connections and Systemic Risk", mimeo, Wharton.

[6] Brunnermeier, Markus (2009): "Deciphering the Liquidity and Credit Crunch 2007-08", Journal of Economic Perspectives 23(1), pp. 77-100.

[7] Claessens, Stijn, Michael Keen and Ceyla Pazarbasioglu (2010): *The Financial Sector Taxation*, IMF, September. Claessens, Keen, and Pazarbasioglu

[8] De Donder , Philippe, Michel Le Breton and Eugenio Peluso (2010): "Majority Voting in Multidimensional Policy Spaces: Kramer-Shepsle versus Stackelberg", *IDEI Working Papers,* 593.

[9] Farhi, Emmanuel and Jean Tirole (2010): "Collective Moral Hazard, Maturity Mismatch and Systemic Bailouts" ,forthcoming, *American Economic Review.*

[10] Goodhart, Charles A. (2010): The New *Emerging Architectures of Financial Regulation*, mimeo.

[11] Gorton, Gary (2009): "Slapped in the Face by the Invisible Hand: Banking and the Panic of 2007", mimeo, Yale.

[12] Hanson, Samuel G., Anil K. Kashyap and Jeremy C. Stein (2011): "A Macroprudential Approach to Financial Regulation", *Journal of Economic Perspectives*, forthcoming.

[13] Keynes, John M. (1936): *General Theory of Employment, Interest Rates and Money*, Harcourt Brace & World, New York.

[14] Lockwood, Ben (2010): "How Should Financial Intermediation Services be Taxed?", *Working Paper Series, Cesifo*, n. 3226.

[15] Matheson, Thornton (2010): "Taxing Financial Transactions: Issues and Evidence", in S. Claessens , M. Keen M. and C. Pazarbasioglu (eds.), *The Financial Sector Taxation*, IMF, September.

[16] Meltzer, Allan H. and Scott F. Richard (1981): "A Rational Theory of the Size of Government", *Journal of Political Economy*, vol. 89(5), pp. 914-927.

[17] Perotti, Enrico and Javier Suarez (2011): "A Pigovian Approach to Liquidity Regulation", *CEPR Discussion Paper*, No. 8271

[18] Persson, Torsten and Guido Tabellini (2000): *Political Economics: Explaining Economic Policy,* Cambridge MA, The MIT Press.

[19] Stiglitz, Joseph (1989): "Using Tax Policy to Curb Speculative Short Term Trading", *Journal of Financial Services Research*, Vol.3, n.2-3, 101-115.

[20] Tobin, James (1978): "A Proposal for International Monetary Reform", *Eastern Economic Journal*, Vol.4, n.3-4, 153-159.

[21] Weitzman, Martin L. (1974): "Prices vs. Quantities", *Review of Economic Studies*, 41(4), pp. 477-491.