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*Structuring Deposit Insurance in
Europe: Some Considerations and a
Regulatory Game*

by
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Structuring Deposit Insurance in Europe: Some Considerations and a Regulatory Game ¹

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Abstract: The protection of savings and the creation of insurance schemes is becoming a hot topic for the European Union Regulator: incoming Directives seem to state a sort of "financial guarantee scheme model" valid not only for deposit insurance but also for investor compensation schemes in case of failure of investment firms. We describe the ongoing process, focusing on the recently approved deposit-guarantee scheme Directive which will compel the Member States to redraw their internal regulation; then, using a very simple game, we study the effects on the equilibria of different kinds of institutional regulations. The normative results, especially from this last analysis, are not easy to state: however, using also some results of Di Noia (1994a and 1994b), we end up with some suggestions on the way of regulating the single DIAs in the EU Member States.

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1. Introduction

The progressive evolution and globalization of capital markets and instruments and the various crises of intermediaries in these years have transformed the way of thinking about the protection of savings, which is no more considered exhausted by supervisory and prudential controls and capital adequacy requirements. The experience of many countries shows, in fact, that, beyond the regulating and control authorities that supply “indirect protection”¹ to savings, there exist instruments

¹We mean by “indirect protection”, *latu sensu*, the set of the various regulations that supervisory authorities use to try to reduce the possibility of insolvency of the intermediaries; *stricto*

of so called “direct protection” like insurance funds or, in general, schemes that guarantee in some ways against the failure of the intermediaries: these schemes operate not only for banks (for example the FDIC) but also for intermediaries in capital markets (say the Securities Investor Protection Corporation which protects customers of securities broker-dealers), pension funds or insurance companies. The opportunity of the introduction of such schemes does not necessarily depend on the failure of regulation or inability of supervisory authority or distrust of savers towards the functioning of financial markets but, on the contrary, on the different risks intrinsic in the nature of every kind of intermediation. It is obvious that the guarantee of the absolute stability of the intermediary could be obtained only with a very strict control that would influence so much the managerial choices to annihilate them. But, in this trade off between stability, competition, efficiency of markets and intermediaries and protection of savers, the creation of guarantee schemes can result in a very useful complement, contributing to reinforce financial stability, too. The importance of the various kind of schemes is different given the characteristic of the intermediary, its activities and the risks involved, the nature of the fund (public or private; compulsory or voluntary), the coverage and the way of financing. Then, different regulation have different effects.

For example, the institutional framework for a deposit insurance agency (DIA) is determinant for pursuing efficiently the aim for which it has been created. Different regulation, both of the structure of the agency and of the ways it acts, have different effects on the aims which a DIA generally pursues (Guttentag and Herring (1987)): to avoid or at least reduce the probability and gravity of bank runs; to protect small depositors; to equalize the competitive position of small banks (which generally have small depositors as customers) with respect to big banks (assumed to be safer due to the “too big to fail principle”).

It seems very interesting to study this problem because the process of harmonization of the legislations of the countries belonging to the European Union will soon involve banking deposit insurance, too, compelling all States to restructure their agencies (if any) or to create it (if none).

After having described the ongoing process set up by the EU legislator, we will analyze the implications of the Directive and the possible scenario; then, we will use a very simplified framework *a la* “Diamond- Dybvig”, to study the effect of various ways of intervention of a DIA on the equilibria of a “bank run” game to check, albeit very abstractly, if something useful can come out from the theory

sensu, the set of regulations that disciplines the structural, functional and behavioral profile of financial intermediaries (Ruta (1970)).

and what may be some consequences of the regulating options of the European policy makers.

The normative results, especially from this last analysis, are not easy to state because, following Fratianni (1994), deposit insurance, bank regulation and bank supervision are not independent activities, while present regulatory theory does not give clear cut recommendations due to the complexity of welfare analysis (Vives (1991)): however, using also some of our results in Di Noia (1994a and 1994b), we end up with some suggestions on the way of regulating the single DIAs in the EU Member States.

2. The institutional framework in Europe

In 1986 the European Commission had approved a formal Recommendation (n. 87/63) trying to persuade the Member States of the importance of the creations of systems of deposit guarantee since, at that time, only some countries² had a deposit insurance scheme while others³ were about to set it and the remaining ones⁴ had not even approached the problem. There was no quantitative or percentage limit on the coverage but this document already stated some relevant theoretical points:

- deposit insurance is seen as protection for the weak depositor i.e. for those who do not have instruments to adequately evaluate financial policies of the bank which they lend money to;

- joining the insurance system must be compulsory for all the banks, including the branches of foreign banks;

- there is no discrimination between private and public system given the different structures of the banking systems in the countries.

The Recommendation, though not a compulsory document for the member states, has been slowly implemented: by December 31st 1993, 11 countries out of 12 have their guarantee system⁵ but, in spite of the Recommendation, the

²Belgium, Germany, Spain, France, Holland and UK.

³Italy, Ireland and Portugal.

⁴Denmark, Greece and Luxembourg.

⁵In spite of that, "the most striking feature of deposit insurance in Europe is that it remains largely unknown to the public. The explanation relies probably on the fact that it is common knowledge in Europe that banks in trouble will be bailed out by the government and taxpayers, and not depositors, will foot the bill" (Vives (1991)).

situation is still heterogeneous, as the following table shows⁶.

Deposit guarantee schemes of commercial banks in EU and other countries					
	Compulsory /voluntary membership	Public/ private origin	Ex-ante/ ex-post funding	Annual fee (as a % of deposits)	maximum compensation in US\$ 1.32\$=1ECU
Bel	<i>comp.</i>	<i>priv.</i>	<i>ante</i>	0.02	15,500
Den	<i>comp.</i>	<i>pub.</i>	<i>ante</i>	0.2	37,000
France	<i>comp.</i>	<i>priv.</i>	<i>post</i>	<i>post/reg.</i>	76,100
Ger	<i>vol.</i>	<i>priv.</i>	<i>ante</i>	max 0.06	∞
Ireland	<i>comp.</i>	<i>pub.</i>	<i>ante</i>	0.2	17,100
Italy	<i>vol.</i>	<i>priv.</i>	<i>post</i>	<i>post/reg.</i>	685,000
Lux	<i>comp.</i>	<i>priv.</i>	<i>post</i>	<i>post/prop.</i>	15,500
Hol	<i>comp.</i>	<i>pub.</i>	<i>post</i>	<i>post/prop.</i>	22,600
Por	<i>comp.</i>	<i>pub.</i>	<i>ante</i>	<i>n.a.</i>	16,176
U.K.	<i>comp.</i>	<i>pub.</i>	<i>mix</i>	max 0.3	28,500
Spain	<i>vol.</i>	<i>pub.</i>	<i>ante</i>	0.15	15,400
Canada	<i>comp.</i>	<i>pub.</i>	<i>ante</i>	0.2	52,300
Japan	<i>comp.</i>	<i>pub.</i>	<i>ante</i>	0.132	69,800
Suisse	<i>vol.</i>	<i>priv.</i>	<i>post</i>	<i>post/mix</i>	23,200
USA	<i>comp.</i>	<i>pub.</i>	<i>ante</i>	max 0.31	100,000

Source: Federation Bancaire (1993)

As it is visible, Greece has not a DIA yet; the coverage in Germany is more or less infinite, being up to 1/3 of bank's own fund per depositor; the way of funding the DIA is different (ex ante or upon request), proportional or regressive like in France or (slightly) in Italy, with eventual intervention of the Central Bank (as

⁶We also inserted major countries outside EU. For USA, we just refer to commercial banks which are part of the FED system and joining FDIC.

For Switzerland, the commitment to payments in the event of calls is mixed because there is one basic contribution amounting to SFR 250 per SFR 1 million in profits before tax with a maximum of SFR 200,000. Banks with profits before tax of less than 2 million are exempt from the basic contribution. Then there is one variable contribution calculated as a percentage of the bank's customer savings and deposit accounts covered by the system as compared with the total of savings and deposit accounts of all the banks adhering to the scheme. If the amount to be covered following the bankruptcy of a bank is less than SFR 10 million, the basic contribution is reduced so that it does not exceed 30% of the total amount to be recovered (Federation Bancaire (1993)).

in Spain, where it provides a contribution of 0.075% of total bank deposits); the maximum coverage has a big range; the origin of the DIA is public or private.

This situation convinced the EU Commission of the need to propose a Directive, which is a compulsory document to be implemented in the single countries' legislation. The first "preliminary draft directive on the coordination of laws, regulations and administrative provisions relating to deposit guarantees schemes" dates October 1991; the official proposal of directive is of April 14th, 1992 (OJ C n. 163/1992) and the modified proposal is of June 7th 1993 (OJ C n. 178/1993); on September 13th 1993 the EU's finance ministers approved the common position and, finally, on May 30th 1994 the directive was released (n. 19/1994).

2.1. The proposal for a Directive on investor compensation schemes

In the meanwhile, the Commission has presented a proposal for a directive on "investor compensation schemes" (September 22nd, 1993, COM(93) 381) as a necessary supplement to the Investment Services directive⁷ (93/22/EEC) completely symmetric to the deposit guarantee directive, as it is later described. The need for this proposal, according to the regulator's explanatory memorandum, is that, even if the failure of an investment firm should be a relatively exceptional event, given the supervision and prudential rules, it can sometimes occur especially because "no rules can prevent fraud" (p. 4). The objective of this proposal is to insure investor protection and thus encourage the small investors in particular to invest in securities. Many countries have already an investor compensation schemes⁸, but the regulations and scope are very different: as it is clear from the following tables (taken from the explanatory memorandum of the proposal), the coverage is much different in the amount and in the type of customer; the firms covered are often just the member of the Stock exchange; the way of financing is quite different; the intervention is not always compulsory. That is why the harmonization of the systems seem necessary: "in order to avoid causing confusion in the minds of investors and to give them equal confidence when dealing with non-domestic investment firms operating via branches or through the cross-frontier provision of services as when they deal with domestically incorporated investment firms, it seems reasonable and indeed necessary to provide for some

⁷Which establishes a common definition of investment firms and, by virtue of mutual recognition, that investment firms authorized in their home Country may carry on any or all the services covered by the Directive for which they have received authorization throughout the European Union by establishing branches or under the freedom to provide services.

⁸Actually, USA has something similar, the SIPC.

I N V E S T O R C O M P E N S A T I O N S C H E M E S I N T H E E E C

Country	Title, Constitution & Management	Membership	Financing/ contributions	Type of client covered	Coverage	Level of cover	Operation/intervention
FRANCE Investment firms	Fonds de garantie. Terms of operation fixed by the Conseil des Bourses de valeur pursuant to Art. 6 of Law n° 88.70 of 22.1.88.	Compulsory for all sociétés de bourse.	Fixed by CBV.	Holders of a nominative account with a société de bourse.	Cash and securities, including common fund and SICAV units, but not precious metals.	Missing cash : max. FF 500000 per client (=ECU 76.000) Missing securities : max. FF 2.500.000 (=ECU 379.500) subject to overall ceiling of FF 200 million per failure. Press suggests 99% of accounts covered by above amounts.	Failure has to be established and published by the Société des Bourses Françaises. Clients have 3 months to present their claims.
GERMANY The banks are by far the largest suppliers of ISD investment services. The Freimakler and Kursmakler, for example, do not deal directly with the public.	Deposit Protection Fund of the Federal Association of German Banks.	Banks. Voluntary, subject to certain criteria being fulfilled.	Contribution on admission. Annual contribution of 0.3 per mille of deposits from non- banks.	All non-bank depositors.	Sustained deposit losses*. Not defined, but covers all liabilities incurred by banks.	30% of bank's equity capital per client.	At discretion of Fund Committee. Law ensures investors' securities holdings cannot be touched in event of insolvency.
LUXEMBOURG	Stockbrokers guarantee fund - Caisse de Garantie des Agents de Change.	Voluntary. Membership limited to stockbrokers and members of the Stock Exchange or non-bank financial institutions whose principal activity is securities dealing.	Initial contribution of LP 500.000. Annual contribution based on customer deposits held. Deposits of 0-50 MLF = LP 30000 50-500 MLF = LP 50000 >500 MLF = LP100000	All customers of the agents de change.		Max. LP 250.000 per client (=ECU 6.200). Limit of 20% of the assets of the guarantee fund as at 31.12 of year preceding the failure.	
PORTUGAL	No fund exists at present. A fund is planned, but no details available.						

<u>Country</u>	<u>Title, Constitution & Management</u>	<u>Membership</u>	<u>Financing/ contributions</u>	<u>Type of client covered</u>	<u>Coverage</u>	<u>Level of cover</u>	<u>Operation/intervention</u>
NETHERLANDS	No fund compensates investors directly. Two schemes exist : 1. Compensation scheme (omslagfonds) of de vereniging voor de Effectenhandel (VvdE). Run by a Foundation. 2. Guarantee Fund of Central Bank (DNB)	Company members of the VvdE. Compulsory for all credit institutions.	Levy on all members based on revenue 2/3 from banks and brokers 1/3 from the "hoekman" Collective guarantee system. Total amount payable apportioned in proportion to scale of business. One-off contribution base on capital or number of agents de change. Annual contribution based on turnover.	Compensation not paid direct to investors ; covers deficits of member in event of default. Private persons, associations or foundations not legal entities.	N/A Cash accounts or deposited securities.	N/A Max. FL 40000 per creditor (=ECU 18.200).	At discretion of the Foundation Board; onexchange business only.
BELGIUM	The law of 4.12.90 created the Caisse d'intervention des sociétés de bourse. The royal Decree of 2.1.91 established a 'fonds d'intervention' within the Caisse. Run by a Conseil d'administration.	Compulsory for all sociétés de bourse de droit belge.	One-off contribution base on capital or number of agents de change. Annual contribution based on turnover.			FB 2.5 million per creditor (=ECU 62.200). FB 0.5 million for cash deposits (=ECU 12.400). Max. of FB 200 million per failure and FB 250 million per year.	A société de bourse must have failed ; faillite or concordat judiciaire. Preventive intervention also possible.
SPAIN	New rules concerning investor compensation are said to be under review.						
DENMARK	There is no compensation scheme in Denmark.						
UNITED KINGDOM	Investors compensation scheme established by SIB in 1988 under section 54 of the FSA. Run by a separate management company. Investors Compensation Scheme Limited.	Compulsory for members of the participating SROs and firms directly regulated by SIB.	By retrospective levy on scheme participants. Compensation costs levied in first instance on members of SRO (or SIB) where default occurred with provision for cross-contribution as appropriate.	Private clients and small businesses.	Losses must relate to UK investment business.	First £ 30000 100% cover next £ 20000 90% cover i.e. max. £ 48000 per claim (=ECU 61.100) Annual max. of £ 100 million.	Board must declare a firm in default before claims can be considered ; ICN needs to have evidence of the firm's inability to pay claims. This normally, but not necessarily, means that liquidation or bankruptcy proceedings will have begun.
IRELAND	Stock Exchange Compensation Fund.	Members of the exchange.	Contributions called when necessary. Fund partially insured.	Basically private clients only, although non-professional investor corporate clients might recover (the system is discretionary).	Cash and securities.	Max. £ 48000 per client. same basis as UK. Overall limit of £ 4.5 million. (Amounts in £ sterling).	Fund is discretionary. Operated by the Council of the ISE, under ISE Regulations.

minimum investor compensation arrangements throughout the EU covering the case where an investment firm fails and is unable to return to investors the money or securities belonging to them”⁹.

Briefly, it states that in each Member State an investor compensation scheme (or schemes) is established and officially recognized and all the investment firms must join the system. The scheme must provide cover to investors in case “the investment firm is unable or likely to be unable to meet its obligation resulting from investors claims”. There is, in principle, a home country system protection as the scheme must cover also the foreign branches of an investment firm authorized in its countries¹⁰. The minimum coverage is 20,000 ECU but a certain coinsurance can be imposed as the repayment must be only $\geq 90\%$: compensation is to be calculated and paid per investor rather than on a per account basis and money and instrument in any currency should be covered (art. 6). Note that the instruments covered are the ones described in Section B of the Investment Service Directive and thus they comprehend also futures, options, swaps and f.r.a.. As usual some categories may be excluded from the compensation, like, not only directors and managers, but also other investment firms, credit institutions, financial institutions, insurance undertakings, pension funds.

The very interesting point is that this proposal is relevant also for banks, as they not only deal with deposits but also trade securities on behalf of their customers and may hold clients’ securities on a temporary or long term basis but such securities do not appear on the bank’s balance sheet. That is why banks are requested to join the investor compensation scheme. Besides it may be difficult to distinguish between ordinary bank deposits and money that is intended for the purchase of securities or is derived from their sale: Member States should be allowed to decide for themselves whether such claims fall under the investor compensation Directive or the deposit-guarantee Directive (art. 2).

This point has very important potential dangerous consequences. With the approval and implementation of the Second Banking Coordination Directive and of the Investment Services Directive all the obstacles to the creation of true universal banks (including the direct access in the Stock Exchanges) are eliminated but with possible increased systemic instability: on one side crises originating from the traditional banking activities may reflect in the access to the safety net studied exclusively for the capital market intermediation (i.e. investor compen-

⁹Explanatory memorandum, p. 5.

¹⁰There is an exception in that the foreign branch of a firm whose home country offers a coverage less than the host country can join this last system to supplement its coverage (art. 4).

sation schemes); on the other side, crises originating from not banking sectors may have to be solved with the use of instrument arranged not for that purpose (deposit insurance, lender of last resort, public intervention to bail out bank in difficulties).

2.2. Features of the deposit-guarantee scheme Directive and economic theory

2.2.1. Aims of the Directive

The structure of the directive and especially of the introductory recitals allows us to understand which part of economic literature had guided the European legislator in regulating deposit guarantee schemes.

Even this directive, like all the preceding ones regarding banking, wants to promote “the harmonious development of the activities of credit institutions throughout the Community (...) through the elimination of all restrictions on the right of establishment and the freedom to provide services, while increasing the stability of the banking system and the protection for savers”¹¹.

The Directive has two main aims¹²: on the one hand, to protect, in case of the crisis of a credit institution, the depositors and, in particular, those who lack sufficient financial knowledge to distinguish solvent banks from those who are not; on the other hand, to avoid runs not only on banks in difficulty but also on other banks in relatively sound condition due to unfounded rumors and, in this way, to ensure the stability of the banking system as a whole.

Pursuing these two aims is a priority for the European policy maker regardless of any consideration of costs and financing of the guarantee scheme: in fact “the cost to credit institutions of participating in a guarantee scheme bears no relation to the cost that would result from a massive withdrawal of bank deposits not only from a credit institution in difficulties but also from healthy institutions following a loss of depositor confidence in the soundness of the banking system”¹³. What does it mean at a theoretical level?

First of all¹⁴, if a bank run happens, it might cause a generalized run to all

¹¹1st recital of the Common Position (all the following reminders refer to it).

¹²Stated in the Opinion of the Economic and Social Committee in OJ C 332, 16.12.1992, p. 13, and in explanatory memorandum of the Proposal (COM(92) 188, 6/4/1992).

¹³4th recital.

¹⁴To have a complete review of the literature, see, for example, FDIC (1983 and 1989), Fratianni and Huang (1993) and Fratianni (1994).

Country	Title, Constitution & Management	Membership	Financing/ contributions	Type of client covered	Coverage	Level of cover	Operation/intervention
GREECE	Compensation fund for Brokers' transactions set up by Law 3078/54.	Compulsory for all stockbrokers and stockbroking companies.	Contribution paid by all new members.	Client individuals and institutions.	Transactions effected during a stock exchange session.	Creditors of a failed broker receive his share of the Fund, plus a further 20% of remaining fund if necessary. If a number of brokers fail simultaneously up to 80% of fund can be distributed.	Administrative Board of Fund appears to have discretion re fund intervention.
ITALY	A special fund covers incorporated stockbroking firms engaging in off-exchange business and underwriting. Fondo Nazionale di Garanzia set up by Art. 15 of the SIMS Law of 2.1.1991. Detailed rules laid down in Decree of the Treasury Minister of 30.9.1991.	Compulsory for all intermediaries covered by SIMS laws.	Extra 15% of share capital exceeding DR 700.000. Fixed contribution of (initially) Lit 1 million plus variable contribution based on volume of business.	All clients, except intermediaries authorized to deal for their own account or on behalf of third parties.	Cash claims and claims for the return of securities, provided they are recognized by the bodies responsible for the winding-up procedure.	Limit of 25% of each client's claim. Fund may not pay out more than 40% of its assets for any one failure.	Failure/insolvency of an intermediary.

the banks of the system (i.e. a bank panic), as depositors may think that the cost of intervening on the bank in difficulty can not be borne by the insurance agency (if public) or by the banks joining the interbank agreement. This is even more probable if the resources are only callable upon request, thus paid out only *ex post* and not *ex ante*, for credibility problems. Besides, a panic by definition spreads all over just at the sight of people queuing up at a bank or simply due to sunspots (Cass-Shell (1983)): actually, it is perfectly rational to run even on a healthy bank if others are withdrawing their deposits, because, due to the hurry of liquidating the assets to pay back depositors, the bank is likely to bear many losses.

Then, more important for the EU Commission, a run can degenerate in panic simply due to another information problem: when rumors (even unjustified) are spread, depositors, not having perfect information about the assets of their banks and so being doubtful, immediately withdraw. As this happens for all depositors of all banks, it comes out a panic: it is the nature of banks itself, with this special kind of liabilities what causes instability. The famous case of the crisis of Continental Illinois can show perfectly this point: there is not a run on the bank but a run on the whole banking system. As it is visible from the graph, taken from Herring (1994), the spread between CD's and T-bills widened suddenly during the period May-June 1984, because many people withdrew their deposits from many banks¹⁵ buying "safer" T-bills.

2.2.2. The cost of a run

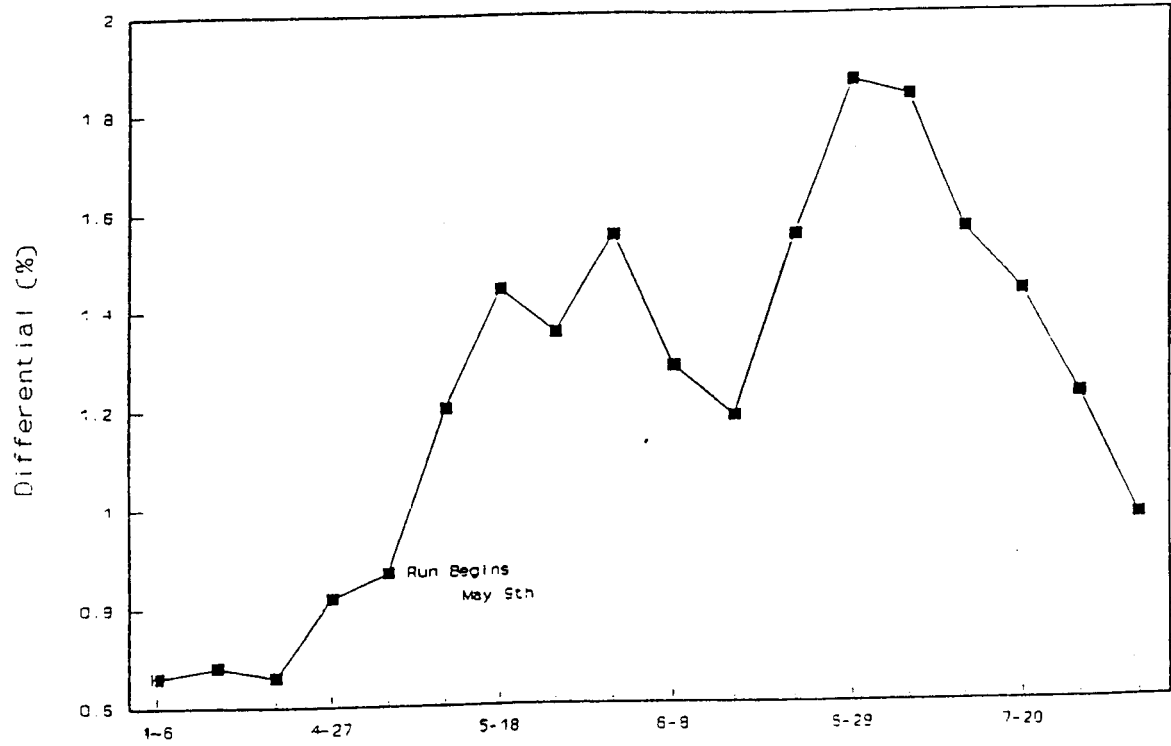
Which is "the cost that would result from a massive withdrawal of bank deposits"? And the cost of a guarantee scheme?

According to Diamond-Dybvig (1983) (DD in the following), during this situation "there is a disruption of the monetary system and a reduction in production". It is certainly true that a panic causes a contraction of money supply, but only if deposits are transformed into currency and not deposited in another bank (which is more frequent during a bank run). The withdrawal of deposits obliges the bank to recall loans so that firms may have difficulties even in finding currencies for current expenses; the examination of the real sector activity during a panic shows that it reduces substantially (Chari (1989)), even if the post-war experience should

¹⁵If the run had been only on Continental, it would not have affected the whole market in this way. This is also one of the few reasons why banks, in spite of the increasing competition, want to rescue other banks in difficulty, instead of let them fail, by having deposit insurance even governed by interbank agreements and, in any case, with premia paid by banks.

CD-TBill Differential

During run on Continental Illinois



convince us that the elimination of panics does not mean the elimination of economic cycles. In this context, the task of monetary Authorities should be to insert liquidity in the system to compensate the quantity of money destroyed: otherwise, as Friedman-Schwartz (1963) explains, a great depression can result. Bernanke (1983) analyzes how bank runs and broad failures could reduce the efficiency of financial sector in pursuing its intermediation function because the real cost of intermediation between lenders and borrowers increases and verifies empirically the existence of a correlation between the higher cost of intermediation and the decline of aggregate output.

But the real social cost of a run (and *a fortiori* of a panic) is the destruction of information, because, as time elapses, the bank, due to its loan relationship with firms, acquires an informative heritage which is destroyed by a failure caused by a run and difficult to build again. As Matutes and Vives (1994) summarize, this social cost (external and not internalized by the bank) consists of the loss of informational capital (built up with monitoring borrowers throughout years), destruction of long-term relationship of borrowers of the bank (who have to find other lines of credit to continue their business) illiquidity costs of deposit holders (with a wealth effect which could induce a fall in aggregate demand), disruption in the payment system (interrupting the clearing process, inducing perhaps a failure in interbank settlements), and contagion effects (the failure of a bank carries bad news for another bank with a similar portfolio and can trigger its failure): the social cost seem so big that any kind of devices to avoid it seem appropriate.

2.2.3. The solutions of the Directive

The directive requires, in principle, every credit institution, authorized in a Member State under Article 3 of Directive 77/780 (the so called First Banking Coordination Directive), to join a deposit-guarantee scheme¹⁶; if no such scheme is

¹⁶Unless it already belongs “to a system which Protects the credit institution itself and in particular ensures its liquidity and solvency, thus guaranteeing protection for depositors at least equivalent to that provided by a deposit guarantee scheme”, and with some conditions (art. 3). It is not clear the logic of this article which cannot refer to an implicit guarantee of the government, because this alternative system” must not consist of a guarantee granted to a credit institution by a Member State itself or by any of its local or regional authorities”. It cannot be a prefiguration of a competitive system of many (possibly private) insurance firms because this alternative system “must be in existence and have been officially recognized when this Directive is adopted”.

Could it be that the regulator refers to a permanent lender of last resort committed to intervene?

present, each Member State “shall ensure that within its territory one or more deposit guarantee schemes are introduced and officially recognized” (art. 3), by 7/1/1995. The minimum deposit guarantee is set¹⁷ at 20,000 ECU per depositor¹⁸, but Member States can introduce a partial coinsurance to leave some market discipline: in fact, the percentage guaranteed must be $\geq 90\%$ of aggregate deposits until the amount to be paid under the guarantee reaches 20,000 ECU¹⁹. Actually, “the only unaggregated data readily available to the (EU) Commission relate to the average size of deposits held at Community savings banks. The average for such deposits is about ECU 2,500, which reflects a weighted average of ECU 30,000 for time deposits, ECU 2,600 for current accounts and ECU 2,150 for savings account” (explanatory memorandum, p.5)²⁰. But without direct empirical evidence on the size and distribution of accounts, the 20,000 ECU has been chosen as a reasonable average among the existent schemes²¹. Schemes that have higher coverage can, of course, keep it.

The scheme is obviously surrogated to the rights of depositors in liquidation proceedings for an amount equal to their payments (art. 11).

As usual, interbank deposits are not covered²² while certain types of depositors, due to their financial expertise or closeness to the bank, may be excluded (annex I of the Directive), like financial institutions, insurance undertakings, governments and other central and local authorities, collective investment undertakings, pension funds, bank’s managers, their relatives, and people with non nominative deposits; finally all deposits in currencies other than those of Member States and ecus, debt securities, and deposits for which the depositor has, on an individual

¹⁷Even if until 12/31/1999, Member States in which, when this Directive is adopted, deposits are not covered up to 20.000 ECU, may limit the guarantee to 15.000 ECU (art. 7).

¹⁸And not per depositor, like in Italy up till now.

¹⁹It is interesting to notice that the reason why the possibility of partial coinsurance has been introduced is “in order to take account of the anxieties, in particular of economists and financial experts who would like part of the risks to be borne by depositors” (expl. memo, p. 15).

²⁰This figure has been criticized from the Economic and Social Committee (OJ C 332, 12/16/1992, p.13), who defined them not very convincing and statistically incorrect (p.16): first of all, the figures keep changing such that at the end of 1990 they were 26,500 for time deposits, 3,000 for current accounts and 2,200 for savings account. Moreover, they were average figures of the Union of the Saving Banks in the EU for 12 countries and 201.4 millions of saving accounts, 55.5 millions of current accounts and 2.9 millions of time deposits. So any average of that would be biased; in any case, the greater amount fixed considering the average coverage of the existing schemes seem correct.

²¹Excluding the two “outliers”, Germany and Italy, as you can see from the previous table.

²²“Own funds” and deposits arising out of “money laundering” are excluded, either (art. 2).

basis, obtained rates and financial concessions which have helped to aggravate the financial situation of the bank may not be covered, either. The list is limitative in the sense that Member States cannot exclude anyone else not listed there²³.

One of the most delicate and important points of the proposal was the setting of the promptest possible payout of the guarantee provided by the scheme. The final solution, stated in art. 10, is that, in principle, the scheme must pay the claims by depositors within three months of the date on which the competent authorities declared it “unavailable”²⁴, but there are some exceptions which may sensibly lengthen it.

The coordination among DIAs of different countries is in principle easy, following the home country rule: foreign branches of national banks are covered by their home country DIA, with two very relevant exceptions. In fact, “whereas the retention in the Community of schemes providing cover for deposits which is higher than the harmonized minimum way, within the same territory, lead to disparities in compensation and unequal conditions of competition between national institutions and branches of institutions from other Member States”²⁵, then, in order to counteract those disadvantages, those branches, whose home country scheme

²³Actually, a great discretionality is given by the 3rd paragraph of art. 7 stating that the 20,000 ECU limit “shall not preclude the retention or adoption of provisions which offer a higher or more comprehensive cover for deposits. In particular, deposit-guarantee schemes may, on social considerations, cover certain kinds of deposits in full”.

²⁴Art. 1 defines an “unavailable deposit” as “a deposit that is due and payable but has not been paid by a credit institution under the legal and contractual conditions applicable thereto, where either:

(i) the relevant competent authorities have determined that in their view the credit institution concerned appears to be unable for the time being, for reasons which are directly related to its financial circumstances, to repay the deposit and to have no current prospect of being able to do so.

The competent authorities shall decide whether to make this determination, as soon as possible and not beyond 21 days after first becoming satisfied that a credit institution has failed to repay a deposit which is due and payable.

Or

(ii) a judicial authority has made a ruling for reasons which are directly related to the credit institution’s financial circumstances which has the effect of suspending depositors’ ability to make claims against it, should that occur before the aforementioned determination has been made”. Thus, the timing of this decision can be very long without any maximum limit for the authority. This statement is much worse for depositors than the original Proposal which stated a sufficient condition for unavailability as the suspension of payments for ten consecutive days, with no need of a declaration or a decision of a judicial or administrative authority (art. 1 of the Proposal).

²⁵13th recital.

coverage is less than what the host system offers, may join voluntarily the host country DIA in order to supplement the guarantee which its depositors already enjoy by virtue of its membership of its home Member State scheme (art. 4). Besides, “whereas market disturbances could be caused by branches of credit institutions which offer level of cover higher than those offered by credit institutions authorized in their host Member States; whereas it is not appropriate that the level or scope of cover offered by guarantee schemes should become an instrument of competition”²⁶, then, until 31/12/1999, neither the level or the scope, including the percentage, of cover provided by home country DIA shall exceed the maximum level or scope of cover offered by the corresponding guarantee scheme within the territory of the host Member State (art. 4).

These solutions represent an obvious political mediation between different positions. In spite of the annex II which states some guiding principles, the first exception seem dangerous given that with the home country control rule, the host country agency has incomplete information about the foreign branch; having to choose between two extremes, we think that it would have been better to use the home country rule also for the supplementary guarantee, setting the premia equal to what the banks normally pay in the host country.

In order for the guarantee scheme to achieve its goal, a complete information about who, when and what is insured is important: that is why art. 9 strictly regulate the point, imposing a readable and comprehensible information to all consumers. What seems interesting is the invitation to Member States to set rules limiting the use in advertising of some relevant information, regarding the bank and the guarantee scheme, which may affect the stability of the banking system or depositor confidence²⁷.

The Directive allows the Member States to decide the methods of financing DIAs, even if the cost of financing such schemes must be borne, in principle, by credit institutions themselves but, on the other hand, the financing capacity of such schemes must be in proportion to their liabilities, “whereas this must not, however, jeopardize the stability of the Member State concerned” (23rd recital). It does not tackle the problem of the legal status of the guarantee scheme, too, due to the diversity of arrangements in the States, as the private schemes “are just as effective as the schemes managed by or with the assistance of public authorities”

²⁶14th recital.

²⁷Think of the case where a bank invites people to withdraw funds from another bank, making publicly know that its premia to the scheme are not the same (like in USA it could be 23 cents versus 31 cents per 100\$) belonging to different supervisory groups.

(expl. memo, p.7).

Of course, as in every EU Directive, the treatment is different for branches of banks from non Member States. Member States have to check if they have a cover equivalent to the 20.000 ECU: “failing that, Member States may, subject to Article 9(1) of Directive 77/780/EEC, stipulate that branches established by a credit institution which has its head office outwith the Community must join deposit-guarantee schemes in operation within their territories” (art .6).

2.2.4. The possible scenarios

It is not easy now to evaluate the consequences in economic terms of the innovations that will happen due to the Directive because, as already stated, it has recently been approved and the EU countries will have to implement it in their legislation.

The fundamental principle to oblige all the countries to have a deposit insurance scheme is not in discussion.

What puzzles is the solution, above described, for the coordination of the different schemes. Even if the European legislator wanted to avoid competition among different insurance schemes, the device thought does not seem either clear, or well-done or even necessary.

In fact, whatever happens with the treatment of branches abroad (of domestic banks) and of domestic branch of foreign banks, a certain degree of competition among insurance systems can in any case arise. In part this has already happened because, with the complete liberalization of capital movements, every citizen not only can open a deposit account in a foreign currency in his national territory but especially can open it abroad without restrictions²⁸: the cost of transactions, psychological factors and habits have kept low this interchange of deposits of small and unsophisticated depositors, while professional investors with great sums of money (less sensible to the above factors) did not have to wait liberalization to spread their capital all over Europe.

Among the important psychological factors, there is the uncertainty of depositors on the soundness of the bank but this is going to sharply decrease with the directive even for deposits over the minimal amount insured, as the single countries can have guarantee systems which insure greater amounts.

Finally, apart from the specific legal solution to implement the directive in

²⁸Even if for example, in Italy, there are still “psychological” limitations caused by the compulsory notification to the Authorities of every transaction above 20 million lire.

each country, it will be possible for depositors to choose among banks that join different deposit insurance schemes.

So what seems realistic, is to forecast that the demand deposit function in Europe could be influenced by the coefficient of insurance protection on the deposit²⁹: *ceteris paribus*, a depositor will open his account where is higher the limit of coverage of his deposit and, given the limit, where the percentage covered is higher³⁰. It may happen, due to the usual moral hazard problem, that riskier banks may offer higher rates of interest on deposits, getting them as soon as they are under the limit of insurance. The two obvious solutions to that are risk based premia whose marginal cost should be higher than the marginal revenue from having more deposits to invest (even at a higher rate) and especially coinsurance exploiting completely the possibility of setting the repayment at something $\geq 90\%$ of the 20,000 ECU (perhaps it could be left the 100% till 10,000 ECU).

In this case, the national policy makers of the different countries could be tempted to raise their rate of coverage to attract in the national banks³¹ deposits from abroad: namely, the national policy maker may want to maximize the amount of deposits in his system, if he considers this variable an instrumental objective to economic growth. In order to check which could be the effect of this behavior, we thought in Di Noia (1994a) to analytically implement this considerations in a simple model of the credit market which reflects the Italian institutional framework (Arcelli (1991)), so to make some exercises of comparative statics to approximately simulate this consequences: we showed that the Member States that “were fearing that high-insurance countries would be more competitive in attracting deposits than low-insurance countries” (Fратиanni (1994)) may have nothing to worry about, so that their lobbying for this feature of the Directive was wrong. In fact, given some conditions on the elasticities on supply and demand of deposits, an increase in the rate of coverage may, perhaps unexpectedly, cause an aggregate decrease of the deposits in the system³².

²⁹Given our preceding considerations, at this step it is still not interesting to look for some econometric estimation of the incidence of this factor: in fact, not only the directive has just been approved, but especially the very different systems are not all compelled to reimburse depositors and in any case the liberalization of capital movements is too recent to dispose of meaningful time series.

³⁰Otherwise - it is the same - we could think as explanatory variable the coverage differential among banks.

³¹Or even in the national branches of foreign banks, given that they reinvest in his nation.

³²While there is a decrease in the rate of interest paid on them: this is quite normal because it is plausible to think that depositors may accept to earn less interest if a greater protection is

What seems reasonable to forecast (and/or to advise) is setting two different level of the insurance (Fратиanni (1993)): each scheme should offer only the minimal guarantee of 20,000 ECU on a compulsory basis so to avoid some, even if not all of the above mentioned coordination problems; this part could be even based on flat premia or, better, on risk based premia following the mixed model of FDCIA. Then on a voluntary basis and very tough standard to join the scheme, it could be offered an optional coverage, even without limit, on risk based premia which probably would attract more depositors but should be more easily translated on them: this solution would allow countries whose tradition is to offer more protection, to keep the system without drastic changes which could undermine stability.

3. An “institutional” game

Now, we want to address the topic of making a simple exercise to show how different institutional arrangements of a DIA can change the equilibria of a game, assuming that an eventual policy maker’s aim is to avoid that a bank run is a pure Nash equilibrium³³, thinking in this way to keep financial stability³⁴. Our result, in this framework, is that not necessarily the introduction of a DIA eliminates the run as a Nash equilibrium but only in some institutional arrangements.

It is widely known that banks can be seen as producers of a transformation service of illiquid assets into short term liquid liabilities, providing liquidity insurance to risk averse consumers facing private liquidity risk (DD). “The optimal deposit contract involves a fixed payment to early withdrawers and has a good equilibrium which realizes optimal risk sharing but also has a bad equilibrium in which all depositors panic, withdraw their funds and the bank collapses” (Vives (1991)).

The model we are using for this exercise is very simple, as it just wants to

³³A main criticism can be done to these assumption: why ever should a policy maker care of Nash equilibria? Actually, “the fact that Nash equilibria pass the test of being consistent predictions does not make them good predictions, and in situations it seems rash to think that a precise prediction is available” because it depends in reality on more information (Fudenberg and Tirole (1991)). Nevertheless, we simply mean that “a Nash equilibrium, and only a Nash equilibrium, can have the property that the players can predict it, predict that their opponents predict it, and so on” (*ibidem*) and so no player has incentive to deviate: that is why, ex-ante, is a very reasonable outcome. Another criticism could be that a policy maker may not know what is a Nash equilibrium: but we cannot find a solution to this.

³⁴Keeping stability in financial markets is, for Solow (1982), a kind of public good.

tackle the different institutional arrangements of a DIA. Its description is the following:

$i=\{1,2\}$ are the players³⁵;

$S_i=\{W, NW\}$ is the strategy space for player i : Withdraw deposits or Not Withdraw, with $s_i \in S_i$;

(s_1, s_2) is, so, a combination of strategies, one for each player;

u_i is the payoff function of player i : $u_i(s_1, s_2)$ is the payoff of player i if the players chose the strategies (s_1, s_2) . We will use directly as payoffs the amount of money but it is of course implicit that they come out from Von Neumann-Morgestern utility function.

The story behind the game is a simplified textbook version of the usual DD³⁶, slightly modified to take into account more realistic features (like reserve requirements) and the new institutional aspects introduced by the directive (like the fact that the DIA has to intervene not at the end of a very long process but as soon as the deposits become “unavailable”).

Two investors have each supplied inelastically a deposit D in the bank³⁷. The bank has invested these deposits in a long-term project so that, if the bank is forced to liquidate its investment before the project matures, only a lower sum can be recovered which I assume is zero³⁸. The only cash available is $2r$ which represents the compulsory reserves, where $r = \alpha D$ (around 20% in reality)³⁹. If the banks allows the investment to reach maturity, however, the project will pay out a total of $2R$, where $R > D$.

In the usual story, there are two dates at which the investors can make withdrawals from the bank⁴⁰. Date 1 is before the bank’s investment matures and

³⁵This assumption does not change the result: it can be shown that the more realistic assumption of $i=\{1,2, \dots, N\}$ depositors does not add or delete any pure equilibria of the basic game. What change is simply that it could be possible a situation where few enough depositors withdraw and the schemes makes all participant better off, but this is not an individually rational strategy, which is to withdraw if it is the strategy others are playing.

³⁶Like in Gibbons (1992), for example.

³⁷We do not deal with the optimality of the deposit contract and why, so, the agent should choose this type of contract, given our different purposes.

³⁸Imperfect marketability is a fundamental characteristic of most bank loans.

³⁹We prefer to interpret like this instead of thinking of the liquidation value of the asset but it is the same. Actually, given our purpose, we do not consider explicitly the other side of DD: in fact, in all their game the value that depositors get back depend on the technology where the bank invested in; for example, the liquidating value equal to the former deposit “has nothing directly to do with the zero rate of interest on deposits” (p. 409).

⁴⁰Why should the depositor withdraw? Because he likes it (he is of the type that, in DD,

date 2 is after; there are also people of two types, uncertain when to consume. In this game, we merge these two complete different facts in just the strategy space; there is no time 2 because not withdrawing can be interpreted either as withdrawing at the end of the game (when the interest on deposit matures) or simply withdrawing in period 1 but, as we absorbed the game in one stage, it is possible to interpret the strategy (NW) when the other withdraws as a sequential service constraint working: (NW) could simply mean that this depositor arrived late because the bank had already served the other, running out of assets (the reserves in our case). There are some possible different outcomes:

1) if both investors make withdrawals, then each receives r (which, of course, is less than their deposited D)⁴¹ and the game ends;

2) if only one investors makes a withdrawal then that investor receives the $2r$ (where ⁴² $2r < D$, even if, later, I consider the other case) from the cashier, while nothing remains for the other, and the game ends;

3) finally, if neither investor makes a withdrawal at date 1 then the project matures and the investors make withdrawals decision at date 2; in our game, this just means that they receive R each, which is the pure Nash equilibrium in the second game⁴³.

dies at period 1), or he is just afraid of the other withdrawing (panic run) or, finally, he has information about bad returns of the bank (fundamental or information-based run as in Jacklin and Bhattacharya (1988), for example). We may include all these different uncertainty in a probability distribution but for our purposes this is useless.

⁴¹They arrive together at the bank and a proportional rationing rule works: they split equally the $2r$ of reserves, which is the only cash the bank has ready.

⁴²In Gibbons' example (1992) $2r > D$ but according to me is difficult to think of a bank that has cash greater than half of the deposits.

⁴³According to Gibbons (1992), if both investors make withdrawals at date 2 then each receives R and the game ends. If only one investor makes a withdrawal at date 2 then that investor receives $2R - D$, the other receives D , and the game ends. Finally if neither investor makes a withdrawal at date 2 then the bank returns R to each investor and the game ends.

Using Gibbons' informal representation and his slightly different values for the first period, at date 1 we have

$$\left[\begin{array}{c|cc} 1 \backslash 2 & W & NW \\ \hline W & r, r & D, 2r - D \\ NW & 2r - D, D & nextstage \end{array} \right]$$

and at date 2

$$\left[\begin{array}{c|cc} 1 \backslash 2 & W & NW \\ \hline W & R, R & 2R - D, D \\ NW & D, 2R - D & R, R \end{array} \right]$$

Roughly, it is like representing a mere liquidity shock (i.e. an unexpected need for cash that exhaust a bank's liquidity position⁴⁴) so that the bank has rapidly to sell its assets suffering a probable loss. A solution for the bank could be to raise the interest rates to attract more funds but, as Guttentag and Herring (1987) point out, the bank is likely to have limited scope for doing it because potential lenders tend to ration a bank that signals a willingness to pay more than the customary for a bank in its category.

Another solution could be a liquidity intervention of other banks, but we assume that it is more and more unlikely to happen in these times of increasing competition among banks, agreeing with Macchiati (1990)⁴⁵, as it is even implicit in DD where there is really only one bank.

It could simply be observed that DIA could give liquidity without purchasing the bank, but the commitment to supply infinite liquidity to all banks is more the duty of the lender of last resort (in general the Central Bank), which, by definition is discretionary: following Kindleberger (1978), the lender of last resort must exist but its intervention must be doubtful and its help must be uncertain, even in the timing of it, so to induce caution in speculators, banks, local administrations and nations. On the contrary, Guttentag and Herring's (1983) major policy recommendation is that central banks should be more explicit about their commitment

so that working backwards the unique Nash equilibrium at date 2, is that both investors withdraw.

Since there is no discounting we can get a one period version of the two period game with two pure strategy Nash equilibria: (1) both investors withdraw, leading to a payoff of (r,r); (2) both investors do not withdraw, leading to a payoff of (R,R).

$$\left[\begin{array}{ccc} 1 \backslash 2 & \mathbf{W} & \mathbf{NW} \\ \mathbf{W} & r, r & D, 2r - D \\ \mathbf{NW} & 2r - D, D & R, R \end{array} \right]$$

Thus the original two period bank-runs game has two subgame perfect outcomes: (1) both investors withdraw at date 1, yielding payoffs of (r,r); (2) both investors do not withdraw at date 1 but do withdraw at date 2, yielding payoffs of (R,R) at date 2.

⁴⁴Actually, this may be due not only to bank runs but also to the commitments to lend to commercial customers (like stand-by credit) which may result in unexpected surges in loan demand, whose failure, though in many case not illegal, may damage bank reputation (Guttentag and Herring (1987)).

⁴⁵Actually he refers to the interbank agreement for deposit insurance saying that: "it seems correct to cast some doubts on the fact that, in a system with growing competition, there should be a spirit of cooperation among different banks".

On the other side, other banks would be very willing to intervene if they fear a run on all the system causing effects on interest rates like, as already shown, in the Continental Illinois case.

to provide lender of last resort assistance.

A more radical approach could be to decentralize the currency supply to avoid the information and incentive problems that can cause a run. In fact, as Selgin and White (1994) summarize in a very interesting article, in a free banking system where banks issue notes (and possibly coins) without statutory reserve requirements, they can then “accommodate changes in the public’s desired currency-deposit ratio simply by changing the mix of their note and deposit liabilities. In the simplest case, where bank notes alone are normally employed as currency and the desired reserve ratio for notes and deposits are the same, no change would be required in the overall quantity of money or bank credit” while, in general, “the public’s attempts to draw currency from its deposit accounts cause reserve drains from banks, which forces them to contract their balance sheets” (p. 1722).

Let’s look at this point at the possible alternatives.

3.1. Absence of an insurance fund

This is our simplified version of DD game with (W,W) and (NW, NW) pure Nash equilibrium⁴⁶ which are, also, Pareto-ranked even if this does not tell which is the more likely (they are both strict).

$$\begin{bmatrix} 1 \backslash 2 & \mathbf{W} & \mathbf{NW} \\ \mathbf{W} & r, r & 2r, 0 \\ \mathbf{NW} & 0, 2r & R, R \end{bmatrix}$$

The payoffs may be slightly modified if $r > D/2$, because in the case $2r > D$ and $u_1(NW, W) = 2r - D > 0$ but this would not change the equilibria, as soon as $u_1(W, W) > u_1(NW, W)$.

The depositor withdrawing before the other gets all the reserves; if they go together to the bank they share them. In both cases they cannot get back even their initial amount so that, according to the Directive, their deposit is “unavailable” and a DIA should intervene⁴⁷.

⁴⁶DD do not consider any mixed strategy equilibrium because, as they state, “is not economically meaningful” (p. 409).

⁴⁷We give a numerical example to be clearer. Imagine that $D=100$, $R=120$ (think of an interest rate on the deposit), $r=20$ (which seems a plausible rate of reserve).

$$\begin{bmatrix} 1 \backslash 2 & \mathbf{W} & \mathbf{NW} \\ \mathbf{W} & 20, 20 & 40, 0 \\ \mathbf{NW} & 0, 40 & 20, 120 \end{bmatrix}$$

Is it true that the mere existence of a DIA should avoid the bank run? According to us this is true only given some institutional conditions.

3.2. Intervention of a Deposit Insurance Agency (DIA)

What we want to show is how different institutional arrangements modify the game and which one is more suitable to avoid the bank run. It is obvious that if run can be made a strictly dominated strategy, then there is nothing to worry any more; and even if withdrawing is a weakly dominated strategy and/or the run is a weak Nash equilibrium this could be a fair result. There are some conditions in the generic case which we have to analyze. Remember that $0 < \alpha < 1$ and $\beta > 1$; the eventual DIA has to intervene if the deposit is "unavailable": this happens everywhere but (NW,NW) because $2\alpha D < 2D$ and $x < D$ (even if, in case $\frac{1}{2} < \alpha < 1$, then $y = D$, because if you run before the other you get the whole original deposit).

$$\begin{bmatrix} 1 \setminus 2 & W & NW \\ W & \alpha D, \alpha D & y, x \\ NW & x, y & \beta D, \beta D \end{bmatrix}$$

Depending on the values, we can get that the optimal strategy for the regulator should be simply to set $x=y=(r+\varepsilon)$ to make W strictly dominated, respecting *par condicio creditorum* ($x=y$) and so giving identical claimants the same amount of money. Note that if $x=y=r$ for any non degenerate probability (if any player believes that the other will not withdraw with probability $p>0$) then W will never be played⁴⁸.

In this sense, the agency should not pay back the whole amount of the deposit but simply a fraction ($\alpha D + \varepsilon$): paradoxically, the smaller is the amount of the reserve (and/or the amount of money that the bank can recover from the investment in the technology) the better is for the DIA which has to pay out less money. So, it would seem optimal from the point of view of the agency to set (if the agency is connected with the Central bank or is publicly financed) the reserve requirement to 0 and/or to have the bank investing in highly illiquid assets so

The two pure Nash are (W,W) and (NW,NW).

⁴⁸In this sense, contrary to DD's statement in a previous footnote, the belief I am talking about is simply the probability with which the two players play the mixed strategy Nash equilibrium, as it is common, under another interpretation, to consider "a mixed strategy equilibrium as a profile β of beliefs, in which β_i is the common belief of all the other players about player i 's actions" (Osborne and Rubinstein (1994)).

that in case of difficulty it cannot recover anything back and the cost for the DIA is minimum. To summarize, just to avoid the run the regulator does not need repayment beyond a certain level.

Even if from the point of view of avoiding the run, this peculiar option seemed optimal it is obvious that the other aim of a DIA, the protection of small savers, would not be tackled: that is why the repayment should be a fair amount with respect to the deposit. There are many possible cases that can arise (and many others not tackled in this note) and we will give directly the numerical example to be clearer.

3.2.1. Partial repayment of deposits

The DIA always pays back a fixed percentage or absolute amount of the money (as it is in the Directive) (included the liquidity reserves), or this may be interpreted as a DIA with limited resources, respecting *par condicio creditorum* (otherwise we can interpret it like a maximum amount of resources at DIA's disposal of 60), so that the depositor who withdraw anticipating the other one receives 40 from reserves and 10 from DIA which pays 50 to the other one. Even in this case two Pareto-ranked Nash equilibrium arise, yet not strict.

$$\begin{bmatrix} 1 \backslash 2 & W & NW \\ W & 50, 50 & 50, 50 \\ NW & 50, 50 & 120, 120 \end{bmatrix}$$

Nothing changes if DIA pays pro-rata (still assuming that DIA has 60 or partially pays back): in fact (W,W) doesn't change; with asymmetric actions, on the contrary, who withdraws has a further credit of 60 while the other one should claim 100. The first one then receives $\frac{60}{(60+100)} = 37,5\%$ of the 60 owned by the DIA (namely 22,5 plus the 40 that he had already withdrawn) while the guy who didn't run gets the 62,5% ($= \frac{100}{160}$), namely 37,5 and the normal form of the game should be

$$\begin{bmatrix} 1 \backslash 2 & W & NW \\ W & 50, 50 & 62.5, 37.5 \\ NW & 37.5, 62.5 & 120, 120 \end{bmatrix}$$

the situation remains unchanged, even if the run is again a strict Nash.

3.2.2. Unlimited coverage

In this case, if the bank failed, DIA would reimburse wholly and **immediately** all depositors the nominal value of their deposit (without the interest rate, because it would have matured only if depositors had left the money till next period). Obviously reserves are used before the resources of DIA, but the *par condicio creditorum* imposes not to create disparities among depositors: so in (NW, W), who withdrew receives 40 of reserves + 60 from DIA while the other depositors receives his all 100 from DIA.

$$\begin{array}{c|cc} 1 \backslash 2 & W & NW \\ \hline W & 100, 100 & 100, 100 \\ NW & 100, 100 & 120, 120 \end{array}$$

It is straightforward to see that the two Nash are still the same: the introduction of a DIA which, in case of “unavailable deposits” or bank failures, compels itself to reimburse totally all depositors does not eliminate the risk of bank runs⁴⁹. As already explained, this outcome does not depend on the quantity of the repayment but simply by the equal payoff in $u_1(W, W)$ and $u_1(NW, W)$.

3.2.3. DIA’s purchase of the bank

The situation changes radically in this case. Now, the bank run is no more a Nash equilibrium of the game: the only Nash is (NW, NW) and especially this is a **dominant strategy equilibrium** as every player strictly prefers to play NW compared to W, whatever the other one plays.

$$\begin{array}{c|cc} 1 \backslash 2 & W & NW \\ \hline W & 100, 100 & 100, 120 \\ NW & 120, 100 & 120, 120 \end{array}$$

The interpretation of this matrix is that DIA purchases⁵⁰ the bank, which is

⁴⁹Moreover, if DIA had paid back even the interest on deposits in any contingent state, the run would have remained a Nash equilibrium but the game would have been a trivial form like this:

$$\begin{array}{c|cc} 1 \backslash 2 & W & NW \\ \hline W & 120, 120 & 120, 120 \\ NW & 120, 120 & 120, 120 \end{array}$$

⁵⁰Even, possibly, for free if there are no other bank that want to buy it.

not able to respect his contractual obligations, and has liquidity \geq to standing deposits: in this way the depositor who withdraws can do it and gets the interest according to the deposit contract: 0 if W; 20 if NW.

In fact, DIA, after taking over the bank, is not compelled to sell the asset because has sufficient resources to tackle withdrawals.

This normal form game could be really interpreted in many other ways, like liquidity supply from other banks or by Central Bank (and the lender of last resort) but we have already explained that, in this framework, we do not want to consider a discretionary intervention because from the point of view of depositors they must be certain of the payoffs (i.e. how much they are paid back in order to avoid the run). Besides, as Guttentag and Herring (1987) clearly confirm, “central banks are strongly averse to making guarantees explicit *ex ante* because they wish to avoid weakening market discipline and they do not want to commit themselves to a course of action which they subsequently might prefer not to take; (...) but the implicit guarantees offered large banks under the policy of ambiguity result in only minimal *ex ante* discipline, while experience suggests that the freedom of action that central bankers seem to prize so greatly is largely illusory” (p. 171)⁵¹.

Moreover, DIA’s purchase of the bank could be an incentive to limit the moral hazard of the management as shareholders, fearing the eventual loss of control, could more easily substitute them⁵². Again, this support our view that is better for the DIA to take control of the bank (becoming its shareholder).

DIA should evaluate if the bank is just facing a liquidity crisis, giving help, if it is so; while, if the crisis is due to mismanagement or even fraud, DIA should purchase the bank: in this way, the discretionality, not of the intervention but of the kind of intervention, of the DIA would increase a lot. But our interpretation of the matrix, in a sense, simply recognizes the importance of the bank run as a useful way for authorities who were unable to avoid imprudent operations of the

⁵¹This point is confirmed by the clumsy actions of the Bank of England in the last years. Despite the awkward attempt to keep secret the their intervention, it is now common knowledge that in 1991 the Bank intervened to avoid the failure of three little banks (National Mortgage Bank, City Merchants Bank and East Anglia Bank), whose failure would have unlikely threatened the stability of the system. The Bank of England “persuaded” other banks to give loans to the small banks in danger and to pretend that these loans were normal lines of credit. However these loans were fully guaranteed by the Bank of England: “they were in fact loans of the Bank” (Financial Times, 10/19/1993). Bank of England is likely to have losses due to these interventions of 115 millions Pounds (*ibidem*).

⁵²On the other side, moral hazard is, nearly by definition, a characteristic of shareholders due to their limited liability (White (1989)), which let them take on risks that they, otherwise, would have avoided.

bank to bail it out, taking control of it and eventually replacing the management and the shareholders. It is implicit in our solution that, as soon the deposit become “unavailable” (in the meaning of the Directive) a DIA with available funds has the option of simply supplying liquidity or directly buying the bank, using this sort of “bank run discipline”⁵³. That is why, like in USA for the FDIC, the European DIAs, even if they come from interbank agreement, should have a sure way (stated in the rules, not discretionary) of accessing extraordinary lines of credit from the Treasury or the Central Banks or issuing bonds (perhaps government guaranteed in order to have a higher rating) to face any kind of situation.

The solution is the same in case of limited resources of DIA (which, again, may be seen as buyer or just a lender), which supplies funds just for the only depositor withdrawing (if both withdraw, we come back to the previous case), but we must assume that

$$Reserves_{DIA} + CompulsoryReserves \geq Deposits;$$

In this way the bank keeps existing without selling their assets and the depositor who does not make a withdrawal will have in the next period the principal plus the interest, as it is easy to see from this normal form of the game

$$\begin{bmatrix} 1 \backslash 2 & W & NW \\ W & 50, 50 & 100, 120 \\ NW & 120, 100 & 120, 120 \end{bmatrix}$$

Even in this case (NW, NW) is a dominant strategy equilibrium.

3.2.4. Partial penalization of withdrawing depositors

Another similar result is obtained if the policy maker exploited, but only **in part**, the possibility offered by the paragraph 4 of art. 7 according to which Member States may limit the guarantee provided to a percentage $\geq 90\%$ of aggregate deposit until the amount to be paid under the guarantee reaches the amount of 20.000 ECU.

Why in part? We have already seen above that partial repayment of depositors leaves the run a Nash equilibrium. What we propose is to use the possibility

⁵³We do not take into account the issue of who is exerting discipline: normally it is easier to think that not depositors but holders of subordinated debts (who cannot run) are a preferable means of focusing market discipline (Guttentag and Herring (1987)).

offered by the Directive to “penalize” only those who have withdrawn, once the bank has failed⁵⁴.

$$\begin{bmatrix} 1 \backslash 2 & W & NW \\ W & 90, 90 & 90, 100 \\ NW & 100, 90 & 120, 120 \end{bmatrix}$$

The run is no more a Nash equilibrium (W is strictly dominated). It does not matter if DIA reimburses totally (i.e. 120) people who did not withdrew. What is important is that they can get more by keeping the deposit in the bank.

$$\begin{bmatrix} 1 \backslash 2 & W & NW \\ W & 90, 90 & 90, 120 \\ NW & 120, 90 & 120, 120 \end{bmatrix}$$

3.2.5. Insurance intervention of DIA with types of depositors not repaid

According to the regulation of deposit insurance funds in major countries, some class of depositors (shareholders, other banks, etc.) and general creditors (with claims not coming from deposits) are not reimbursed. In this case the payoff matrix becomes the one just above: in the usual three cases of failure the player 2, not insured, receives only half of or all the reserves if withdrawing or nothing if he does not withdraw (because the other one, quicker, got all of it).

$$\begin{bmatrix} 1 \backslash 2 & W & NW \\ W & 100, 20 & 100, 0 \\ NW & 100, 40 & 120, 120 \end{bmatrix}$$

The bank run is again a pure Nash equilibrium of the game⁵⁵. This is an easy intuition thinking that interbank deposits, generally very consistent, are not insured: nowadays “the risk of bank run derives much more from the interbank market and from big banks acting on it than from the fears of small depositors” (Revell (1985)). Then the exclusion of certain categories from the repayment or the uncertainty as to who is insured and who is not⁵⁶ causes an incentive to

⁵⁴This sort of punishment ex post is somewhat similar to some suggestion in Baltensperger and Dermine (1990).

⁵⁵Note that this is independent of the ROB: even if the payoff for $i = 2$ in the case of failure were zero, the run is a Nash.

⁵⁶For example, the Italian Interbank Deposit Protection Fund can make intervention only after the authorization of Bank of Italy, on a voluntary basis, and can refuse the coverage to

withdraw not only of the not insured but also of the category that should not fear, undermining the stability of the intermediary.

3.3. Summary

In the end what we find with this simple game is how the outcome can be different due to various institutional framework.

Going backwards we verified that it is dangerous to exclude types of depositors from the insurance; it seems more efficient to supply an amount of funds sufficient to avoid the failure of a bank. In the case of depositors equally insured (namely with symmetric payoffs), the only way to avoid that the run is a Nash equilibrium is, with a public policy approach, to modify the outcome so that W is strictly dominated. This could be even obtained, in theory, without a DIA, with different rules for banking failures punishing the “unfaithful” depositor who made a withdrawal before time, but this could violate the *par condicio creditorum*; otherwise, we could interpret this game thinking of an asset which can be sold before the expiration (like a CD or a time deposit) with a sort of penalization in case of an anticipated sale; finally the optimal solution can imply the existence of a DIA not supplying liquidity or making a purchase but just legally authorized to penalize who made the earlier withdrawal, implementing partially art. 7 of the Directive.

But all these consideration are valid only if the DIA exist and the depositor know for sure that DIA is compelled to act⁵⁷: only in that case the payoff matrix without bank run is valid. Otherwise, if uncertainty prevails (assuming, like in DD, that is meaningless to speak of mixed strategies), the depositors, “discounting” the fact that DIA could not intervene, can make the run in equilibrium⁵⁸.

It is evident that we avoided to try to fit in the example considerations about the DIA’s financing and cost of intervention. Banally, we could say that the repayment to depositor in case of (NW) is net of the premium paid by the bank to

“persons who in the discretionary and final judgment of the Executive Committee are in any way not deemed to be deserving of the benefits of the Fund, having helped cause the insolvency or benefited by it” (art. 27 of the Statutes).

⁵⁷This has not been an obvious point in some systems. In fact, while quite all of the literature on deposit insurance coming from USA implicitly assumes that if a DIA exist then it is compelled to intervene, this has not been true in some European countries, like in Italy as a previous note briefly explained.

⁵⁸In this simple framework with just one bank, we have also to assume $Reserves_{DIA} \geq \frac{Dep_i + Reserves}{2}$ otherwise the DIA lacks credibility. In this way, it is the mere availability of funds that avoids the run, so that even a kind of contribution *ex post* by banks to the DIA could be correct.

the DIA. In presence of a public funded DIA, is not totally relevant to examine the problem because, when doing concrete policy choices, maximizing social welfare allow us not to consider the matter of funding DIA (on taxpayers or depositors) which implies only redistributive problems: if there were no other advantages in rescue a bank, the net effect would be zero and some criticism could be accepted. But, *ceteris paribus*, it is very well known, beyond the eventual damage to depositor, that a bank failure may have a very large social cost.

This is, of course, quite a rough way of representing reality but it can be shown that playing, eventually, the repeated game, both finite and infinite, does not change the basic results. In fact, in the basic game an implicit cooperative strategy may avoid the run (*a fortiori* if it infinite) while in the following descriptions, unless the players behave irrationally, if the run is not even a Nash, it will not be played.

It remains, nearly on purpose, untackled the problem of the cost of a potential intervention of the DIA not allowing the bank to fail: the traditional critics, already quoted, about the cost for taxpayers of these acts, is deceitful. As Merton e Bodie (1993) explain “in discussions of deposit insurance, it is common practice to use the cost to the (...) taxpayer of bailing out the depositors of failed depository institutions as the measure of the problem. The true cost to our society, however, is the misallocation of investment and the unintended redistribution of income and wealth caused by the current system”.

On the other side Di Noia (1994a) shows that in some cases the solutions proposed by the Directive, with respect to the coordination of different countries' DIAs may be a bit dangerous and also not completely right because it is possible that the EU legislator's fear of competition in grade of coverage could be non existent.

4. Conclusions

Our simple analysis show that it will be very difficult the implementation of the new rules in the single countries legislation: it is helpful neither the literature on the pros and cons of having a DIA, as now EU States will be to have it nor some of the literature about the costs of a DIA, thinking that, for example, Italian taxpayers could bear in part the risk of rescuing a Portuguese bank, whose branch could join the Italian DIA with higher cover.

It seem logic to suggest that every DIA will set a compulsory cover for just the minimum of 20.000 ECU, possibly only for 90% (as it is allowed in art. 7). Interest

rates on deposits should not be paid, according to the simple game showed, to discourage people to withdraw. Besides, the probability of a run on checking account would drastically decrease “by linking checking services to equity claims (such as money-market mutual funds accounts) rather than debt claims (such as demand deposits). There is no point in running on a mutual fund, because there is no greater expected payoff from closing one account ahead of others. Any fall in the value of a mutual fund’s assets is shared immediately by all account holders (Selgin and White (1994))⁵⁹. A double regime of insurance is strongly advisable, together with a revision of the Directive with respect to the coordination problem.

The credibility of a DIA can be established only with exceptional new sources of funds beyond the premia⁶⁰ like borrowing money from Treasuries or Central Banks or issuing government-guaranteed bonds on the market (or selling them to the DIAs-member banks). An optional coverage above the 20.000 ECU could be offered but, in order to avoid a dangerous mingle, by a different agency.

Thinking of a more radical approach, Merton and Bodie (1993) “conclude that an efficient solution is for commercial lending to be financed by standard instruments such as debt, preferred stock, and equity, and that deposit insurance be limited to institutions or accounts that collateralize deposits with US Treasury bills or their equivalent”; they underline that this proposal is somewhat different from the “narrow-bank” proposal of Kareken (1986) which “allows bonds of any maturity to be used for collateral, and does not permit depositories to engage in other financial activities” (p. 5)⁶¹.

I think that an intermediate approach could be undertaken: according to me, a sort of “**narrow-narrow banking**” could be imposed in Europe. There are two aspects in my proposal, somewhat similar to Merton and Bodie (1993)⁶² and adapted to the new European framework.

On one side, the banks should invest the 100% of the difference between the

⁵⁹On the contrary, if the value of bank’s assets falls below the unchanged face value of demand deposits, the quickest depositors can withdraw the whole amount of their claim, getting a greater utility than the latest.

⁶⁰Which in any case, should be somewhat risk (capital) based, following the model of FDICIA.

⁶¹As it is widely known, Friedman (1960) had the original idea to require interest-earning obligations of the U.S. government as 100% reserves against bank demand deposits in order to achieve a more effective control of money supply. In the wake of this proposal there are other similar like Litan (1987), Tobin (1985) and Pierce (1991).

⁶²However, they admit certainly to be “not the first to arrive at (this) solution” but they echo the view of their “good friend, Stanley Fisher, M.I.T., that in matters of public policy, he would rather be right than original” (p. 24).

total amount of deposit insured (a maximum of 20.000 ECU per each depositor's account) and the total compulsory reserves⁶³ in safe assets⁶⁴ deposited possibly in the Central bank; this would serve as a formal or informal collateral for the insurance agency in case of bankruptcy, as a sort of application of the absolute priority rule⁶⁵. In this way, banking activity is not so restricted as in the standard "narrow banking" proposal, given that the sum invested in safe assets should allow them in engaging in different financial activities: in fact, not only the safe amount should not be so much given the way to calculate it⁶⁶ but especially the liability side of banks' balance is no more relying only on deposit.

On the other side, they should pay the premia, even flat, for deposit insurance only on that part, unless, of course they want a supplementary coverage. Someone could argue that in this case there is no need of an insurance scheme given the robust collateral for depositor and we agree in part; but the excessive length of the bureaucratic process to get back the money make the agency useful to anticipate the money to depositor, trying to recover it afterwards. This could be, in principle, even a department of the Treasury or of the Central Bank but the eventual conflict of interest arising suggest an independent agency as the best solution. In this case depositors would receive interest rates on deposits as the collateral get interest and the compulsory reserves too.

The problems of coordinating different countries' DIAs are so big that they could be solved in various ways: either with a strict coordination of fiscal and monetary policies as proposed by Santomero and Trester (1994); or with the creation of a European DIA agency, perhaps acting as a body of the European Monetary Institute (which will develop in the European Central Bank)⁶⁷. This European DIA could have different features: it could insure all European banks; it could ensure only banks having branches abroad, while small banks should join national systems; it could be a Fund of the national countries insurance Funds; it could be

⁶³Which are in general deposited c/o the Central Bank.

⁶⁴It is not clear if a Government bond is a safe asset, though. I would not suggest to Belgian and Italian bank to invest in their Government bonds: in fact, there, the yields on Government bonds is much higher than corporate bonds, respectively 0.85% and 1.79% (the Economist, October 15th), while in all the other major countries is the other way round.

⁶⁵This is a fundamental common principle of the law of bankruptcy, according to which secured creditors are entitled to receive the full value of their collateral (up to the amount of their claim) before any unsecured claims are paid (see Bebchuck and Fried (1994) who, actually, criticize a.p.r.).

⁶⁶It might be even zero if the reserve requirements are greater than the insured amounts, which is possible, for example, if the average amount on each deposit is very high.

⁶⁷Or it could be a private DIA managed by the European Banking Federation.

a reinsurance fund; finally, it could be something like a regional agency for Europe of an international deposit insurance Corporation, modifying the proposal from Grubel (1973). Otherwise, this “mega DIA” may also converge in a European compensation scheme which, according to this new “financial guarantee scheme model” of the European legislator, could have the purpose also of intervene in case of unavailability of funds from investment firms, given the symmetry of the two mentioned Directive⁶⁸.

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⁶⁸It is still the clumsy Bank of England to show that there is no actual difference between rescuing a bank or another kind of financial intermediary: in 1991 the Bank, despite boasting declaration of unwillingness to bail out anyone, avoided the failure of a small intermediary (Union Discount) which operated as dealer in Treasury bonds (Financial Times 10/19/1993).

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