NBER WORKING PAPER SERIES

EVIDENCE OF DIFFERENCES IN THE EFFECTIVENESS OF SAFETY-NET MANAGEMENT IN EUROPEAN UNION COUNTRIES

Santiago Carbo-Valverde
Edward J. Kane
Francisco Rodriguez-Fernandez

Working Paper 13782
http://www.nber.org/papers/w13782

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
February 2008

Research support by the Fundación de las Cajas de Ahorros (Funcas) is acknowledged and appreciated. The authors are grateful to Robert A. Eisenbeis , Ignatio Hermando, Armen Hovakimian, Charles Goodhart, James Moser, James Thomson, and two anonymous referees for valuable comments on earlier drafts. The views expressed herein are those of the author(s) and do not necessarily reflect the views of the National Bureau of Economic Research.

Evidence of Differences in the Effectiveness of Safety-Net Management in European Union Countries
Santiago Carbo-Valverde, Edward J. Kane, and Francisco Rodriguez-Fernandez
NBER Working Paper No. 13782
February 2008
JEL No. F02

ABSTRACT

EU financial safety nets are social contracts that assign uncertain benefits and burdens to taxpayers in different member countries. To help national officials to assess their taxpayers' exposures to loss from partner countries, this paper develops a way to estimate how well markets and regulators in 14 of the EU-15 countries have controlled deposit-institution risk-shifting in recent years. Our method traverses two steps. The first step estimates leverage, return volatility, and safety-net benefits for individual EU financial institutions. For stockholder-owned banks, input data feature 1993-2004 data on stock-market capitalization. Parallel accounting values are used to calculate enterprise value (albeit less precisely) for mutual savings institutions. The second step uses the output from the first step as input into regression models of safety-net benefits and interprets the results. Parameters of the second-step models express differences in the magnitude of safety-net subsidies and in the ability of financial markets and regulators in member countries to restrain the flow of safety-net subsidies to commercial banks and savings institutions. We conclude by showing that banks from high-subsidy and low-restraint countries have initiated and received the lion's share of cross-border M&A activity. The efficiency, stabilization, and distributional effects of allowing banks to and from differently subsidized environments to expand their operations in partner countries pose policy issues that the EU ought to address.

Santiago Carbo-Valverde
Departamento de Teoría e Historia Económica
Facultad de CCEE y Empresariales
Universidad de Granada
s/n E-18071, Granada, Spain
scarbo@ugr.es

Edward J. Kane
Department of Finance
Boston College
Chestnut Hill, MA 02467
and NBER
edward.kane@bc.edu

Francisco Rodriguez-Fernandez
Departamento de Teoría e Historia Económica
Facultad de CCEE y Empresariales
Universidad de Granada
s/n E-18071, Granada, Spain
franrod@ugr.es

January 17, 2008

EVIDENCE OF DIFFERENCES IN THE EFFECTIVENESS OF SAFETY-NET MANAGEMENT IN EUROPEAN UNION COUNTRIES

In individual countries, banking insolvencies trace to difficulties in constraining the extent and character of risk-taking and risk-shifting by banks. Risk-shifting occurs when particular bank stakeholders are not adequately compensated for the risks to which they are exposed.

EU directives and Basel agreements divide cross-country accountability for preventing and resolving bank insolvencies in an economically arbitrary way. If a multinational European bank were to fail, the EU's 1994 Directive on Deposit-Guarantee Schemes makes host countries responsible for paying off at least the domestic depositors of any banking offices the failed organization might have operated in their jurisdiction[1].

Although the host country is charged with supervising banking entities that operate within its borders, Basel arrangements make home-country officials responsible for supervising the accounts of the consolidated multinational organization to which a host-country subsidiary would report. This gives regulators in both countries authority to influence loss exposures and insolvency resolution at host-country banks. Losses large enough to ruin a host-country subsidiary might be dumped on it by a wily offshore parent or a slippery host-country subsidiary might avoid ruin by hiding its losses in assets it manages to transfer to the home country at an inflated value. Unfair though it might be, cross-country differences in bankruptcy procedures and in the effectiveness of market and regulatory discipline exerted in different jurisdictions could

[1] See Huzinga (2005) for an extensive revision of this Directive and the remaining differences across the EU countries.

force taxpayers of a home or host country to shoulder the bill for negligent acts of safety-net officials, auditors, or creditors in a partner country (Eisenbeis, 2004 and 2006; Eisenbeis and Kaufman, 2006).

This paper develops a way for EU regulators to assess their taxpayers' exposures to loss from partner countries. Our method estimates how well, on average, markets and regulators in individual countries manage to control deposit-institution risk-shifting during a specified time period. Sections I and II explain that our procedure combines two steps. We first construct time series for leverage, return volatility, and safety-net benefits at individual EU financial institutions. For stockholder-owned banks, our calculations use 1993-2004 data on stock-market capitalization. In generating these data for mutual institutions, we draw on less frequently reported accounting values to construct (albeit less precisely) these same three time series.

Section III takes the second step, feeding the first-step estimates as input into regression models of ex ante safety-net benefits and interpreting the results. We show that parameters of the second-step models express differences in the magnitude of safety-net subsidies and in the ability of financial markets and regulators in member countries to restrain the flow of safety-net subsidies to commercial banks and savings institutions. The final section shows that our estimates help to predict cross-border merger activity among banks. It argues that it is poor policy for the EU to allow banks to merge into and out of differently subsidized and differently controlled environments without explicitly considering the efficiency, stabilization, and distributional effects that such mergers might unleash.

I. Risk-Shifting Opportunities Provided by the Safety Nets

It is instructive to conceive of a country's financial safety net as an evolving and purposively incomplete contract whose counterparties are major sectors of that country's economy. This contract has two dimensions. First, it allocates de facto responsibility for controlling bank risk-taking and recapitalizing insolvent institutions to specific regulators and bank stakeholders. Second, to alleviate customer losses in economically and politically arduous circumstances, it authorizes government officials to assign to taxpayers some of the costs of resolving bank insolvencies that supervisory pressure and market discipline fail to prevent.

Financial safety nets expand risk-shifting opportunities by reducing incentives for depositors and other private counterparties to monitor and police risk taking by banks. The costs and benefits a country receives from its safety net depend on how much market discipline the net displaces and how successfully safety-net managers substitute explicit and implicit insurance premiums and takeover threats for the credit-market discipline they displace.

All EU safety nets include depositor guarantees. By exerting lobby pressure, a country's banking industry can and (we find) do keep these guarantees from being fully priced. The result is that an increase in a bank's overall risk exposure can almost always increase the value of the safety-net benefits it receives. This creates an incentive to search out and to exploit weaknesses in risk-control arrangements. At the same time, takeover threats exerted by safety-net managers make it uneconomic to maximize the value of current-period benefits. The result is that bankers support their risk-taking partly – but only partly – with off-balance sheet risk capital that they extract strategically via the safety net from taxpayers and less-adventurous banks (Kane, 1995; Honohan and Klingebiel, 2002).

Merton (1974) models the equity of a firm as a call option on the firm's assets whose exercise price is the book value of creditor claims (B). When B exceeds the value of bank assets, creditors absorb the difference. Safety-net support allows creditors to put some or all of their losses to safety-net managers. This reduces the net default risk that markets for equity and debt must price (Vallilou and Xing, 2004).

The per-period flow of safety-net benefits that bank stockholders enjoy can be defined as a "fair" insurance premium (IPP) expressed per euro of a bank's deposits. Merton (1977, 1978) shows that the IPP increases both with a bank's leverage and with the volatility of its returns. In Merton's one-period model, leverage is measured as the ratio of the market value (D) of deposits and other debt to the market value of a bank's assets (V). Volatility is defined as the standard deviation of the return on bank assets (σ_V). Our first-round estimates replace D with its book value (B) and our second-round models parsimoniously linearize the IPP as:

$$IPP = \gamma_0 + \gamma_1\sigma_V + \gamma_2(B/V) + \varepsilon_1.^2 \qquad (1)$$

This formulation implies that, other things equal, the value of safety-net benefits increases in both σ_V and B/V. By themselves, the positive partial derivatives $\gamma_1 = \partial IPP/\partial\sigma_V$ and $\gamma_2 = \partial IPP/\partial(B/V)$ in (1) tell us how much incremental value bank stockholders might extract from the safety net by increasing the associated form of risk-taking.

The benchmark single-equation model (1) does not explicitly recognize that debt and deposit-insurance contracts convey covenant-like monitoring and loss-control powers to creditors and safety-net managers that empower them to restrain risk-shifting directly (Kane, 1995). To analyze the risk-shifting process at individual countries and banks, we estimate a version of the two-equation model pioneered by Duan, Moreau, and Sealey (1992). To address whether and how well safety-net covenants constrain bank-risk-shifting incentives, Duan et al. introduce into the Merton model a structural equation for the debt-to-asset ratio, B/V:

[2] Because the implicit Taylor-series expansion occurs around positive IPP mean values in each country, the zero lower bound on IPP is not a worrisome source of bias.

$$B/V = \alpha_0 + \alpha_1\sigma_V + \varepsilon_2. \tag{2}$$

Equation (2) is a locus of potential market-equilibrium points that expresses a tradeoff between the pursuit of current safety-net benefits and the bank's exposure to takeover by creditors or insurers. Substituting (2) into (1) produces the following (partially) reduced-form equation:

$$IPP = \beta_0 + \beta_1\sigma_V + \varepsilon_3, \tag{3}$$

where $\varepsilon_3 = \varepsilon_1 + \gamma_2\varepsilon_2$. Even though it is convenient to estimate (2) and (3) separately, an underlying recursive structure links the two equations:

$$\alpha_1 \equiv \frac{d(B/V)}{d\sigma_V}, \tag{4}$$

$$\beta_1 \equiv \frac{\partial IPP}{\partial\sigma_V} + \frac{\partial IPP}{\partial(B/V)}\alpha_1 = \gamma_1 + \gamma_2\alpha_1. \tag{5}$$

In portraying volatility as an exogenous variable, the model assumes that σ_V represents a value-maximizing decision made in response to a vector of unobserved bank-specific profit generators. The underlying intuition is that of a dynamic rational-expectations game: each bank sets its leverage and asset volatility jointly, with the understanding that creditors and safety-net managers monitor these values and restrain leverage by raising funding costs and standing ready to take over the franchise in the event of insolvency. In turn, creditors and regulators expect banks to react ex ante and ex post to the discipline they provide. Equation (2) expresses the hypothesis that, in equilibrium, outside monitoring constrains banks to choose points that lie on a locus of mutually acceptable leverage and volatility pairs.

Given the external discipline a bank faces, the sign of β_1 in equations (3) and (5) indicates whether a bank's covenanted contracting environment allows increases in asset volatility to increase the multiperiod value of its safety-net guarantees. In principle, the total derivative β_1 incorporates the value of the opportunity to operate the bank in future periods (Ritchken, Thomson, and DeGennaro, 1993). If β_1 is nonpositive, risk-shifting incentives in a given country are fully neutralized.

To constrain risk-taking at all, outside limitations on leverage must be risk-sensitive enough to overcome the "inside" value of leverage to bank stockholders so as to establish a negatively sloped locus of acceptable B/V and σ_V values. However, a negative α_1 only implies that risk-sensitive capital regulation and complementary takeover and market discipline partially constrain realizable safety-net benefits. As an input into β_1 in equation (5), the size of α_1 tells us whether at the margin outside discipline is potent enough to persuade the bank not to increase return volatility when outside capital requirements increase. To neutralize risk-shifting incentives at the margin, outside pressure must induce a decline in B/V large enough to offset the current-period increase in IPP a higher σ_V would otherwise generate.

Thus, for market and regulatory pressure consistently to discipline -- and potentially to neutralize -- incremental risk-shifting incentives, two conditions must be met:

Capital must increase with volatility: $\alpha_1 < 0$,

Guarantee value must not rise with volatility: $\beta_1 \leq 0$.

Although the values of assets, guarantees, and volatility are imbedded in a bank's stock price, none of these variables is directly observable. However, Marcus and Shaked (1984) show that we can use option-based numerical expressions for the value of deposit insurance to track these variables synthetically. Because finance theory tends to focus on unobservable values, running regressions on synthetic data sets is a common practice in finance. This two-step approach tests substantive hypotheses about asset valuation jointly with the subsidiary hypothesis that the synthetic observations are reliable estimates of the true variables.

Every model makes deliberate and hard-to-defend simplifications. In interpreting our parsimonious regression experiments, we cannot rule out the possibility that omitted variables, measurement error, and simultaneous-equation bias distort the outcomes in unknown ways. Murphy and Topel (1985) show that standard errors of substantive parameters are often underestimated in two-step tests. These considerations suggest that we should interpret t-values conservatively and subject our results to robustness checks.

The first step in the Marcus-Shaked procedure is to generate tracking values for V and σ_V by numerical methods. These values are then used to estimate IPP as the value of a put option on bank assets. The procedure begins by solving the call-option formula for equity, E.[3] The last step uses Îto's lemma to link σ_V to E, V and σ_E (the instantaneous standard deviation of equity returns) by means of equation (6):

$$\sigma_V = \sigma_E(E/V)/(\partial E/\partial V). \qquad (6)$$

The procedure follows Merton (1977) in portraying deposit insurance as a single-period European put option on the bank's assets. Merton treats bank equity as the sum of a dividend-unprotected European call option and the present value of the dividends distributed before the option's expiration date. The bank's debt is assumed to mature in one year, which is also the assumed exercise date for the insurer. The model expresses the value of a bank's equity, *E*, and the value of the fair deposit insurance premium, *IPP*, as:

$$E = V[1-(1-\delta)^T] + V(1-\delta)^T N(x_1) - BN(x_2), \qquad (7)$$

$$IPP = N(-x_2) - (1-\delta)^T N(-x_1)V/B. \qquad (8)$$

[3] To establish whether inferences are robust to differences in how forbearance is modeled, it is useful to conduct regressions using proxies for V, σ_V, and IPP derived from different models of deposit-insurance option value. Hovakimian and Kane (2000) provide a detailed discussion of three such models.

In (7) and (8), δ is the fraction of bank assets distributed at each interim dividend date to stockholders, T is the number of interim dividend payments, $N(x_i)$ states the probability that the variate value x is $\leq x_i$, given that x is distributed with zero mean and unit variance.[4]

Ronn and Verma (1986) adapt Merton's model to account for the likelihood that safety-net managers would forbear from exercising their right to call the put when their claim is only slightly in the money. When forbearance occurs, the value of the short position in the put can turn negative. The RV model scales down the effective exercise price of the put for all banks and all dates by a factor of $\rho = 0.97$. The data we employ to estimate equations (2) and (3) set T equal to one year:

$$E = V[1-(1-\delta)^T] + V(1-\delta)^T N(x_3) - \rho B N(x_4), \quad (9)$$

$$IPP = N(-x_4) - (1-\delta)^T N(-x_3) V/B. \quad (10)$$

Although we will experiment with other specifications eventually, for fixed samples, the policy implications of regression experiments using U.S. data have proven relatively insensitive to variation in ρ[5]. Moreover, Pennacchi (1987a and b) shows that, by counterfactually presuming prompt and complete insolvency resolution, single-period models of IPP tend to understate the economic value that government guarantees convey to bank stockholders. In exploring differences in risk-shifting opportunities and authorities' ability to constrain them, this bias increases the power of regression tests based on a minimal-forbearance model.

II. Input Data

Tables 1 through 3 summarize the synthetic datasets on IPP, B/V, and σ_V over which we conduct regression experiments. Our goal is to compare the quality of safety-net management not

---

[4] $x_1 = [\ln((1-\delta)^T V/B)+\sigma_V^2 T/2]/(\sigma_V\sqrt{T})$, $x_2 = x_1 - \sigma_V\sqrt{T}$, $x_3 = [\ln((1-\delta)^T V/\rho B)+\sigma_V^2 T/2]/(\sigma_V\sqrt{T})$, $x_4 = x_3 - \sigma_V\sqrt{T}$.

[5] Of course, parameter estimates are sensitive to differences in the years and countries covered in any experiment.

only across countries, but also between commercial banks and savings institutions in each country.

Because commercial banks are stockholder-owned, regression inputs can be calculated from data on bank stock prices recorded on Bankscope. However, savings banks and credit cooperative banks are mutual institutions. This has three important consequences. First, values for E, B/V and σ_V must be calculated entirely from book values. Given that balance-sheet data are reported less frequently than stock prices, variation in returns is bound to be understated for mutual institutions. Second, at mutuals, risk-taking incentives are blunted because owners and managers cannot divide potential gains from risk-shifting by writing easily enforceable side contracts. Third, mutual institutions do not pay dividends. Assuming that market-determined interest rates are paid on loans and deposits, we treat the reported value of "distributed profits" (contributions to social works and social funds) as a rough counterpart. In interpreting statistical tests, we must recognize that the reliability of coefficient estimates in IPP equations for mutuals is weakened by these difficulties. The Appendix shows the main sources of information employed to estimate IPP, B/V, and σ_V values separately for commercial banks and for savings and cooperative banks. To provide proxies for market-value data for mutual institutions, we experiment with two alternatives: the first employs book values for E, B/V, and σ_V; the second generates synthetic market-value data by using the model and parameters estimated for commercial banks. Our procedures are summarized in the Appendix.

Table 1 shows the size of sample cells for both types of institutions in each of the EU-15 countries. For all but four countries (Austria, Sweden, Italy, and Germany) the number of observations for commercial banks exceeds that for mutual institutions. For several countries, data on mutual institutions are scant and may not be fully representative of overall industry experience. Gaps in data availability persuade us to delete Greece from the study and limitations on sample size lower the power of statistical tests for comparisons involving a few other countries.

Table 2 presents estimates of the mean values found for our three input variables at commercial banks in each country. B/V ranges from a low of 83 percent in Spain to a high of 94 percent in Luxembourg. The mean volatility of returns varies from a low of 1.30 percent in Italy to a high of 3.22 percent in the United Kingdom. Most importantly, the mean value of safety-net benefits vary from 13 basis points per Euro in Luxembourg to 28 basis points in Denmark.

For mutual institutions, Table 3 reports safety-net premiums and return volatility in two ways. Model I applies the RV procedure directly to the accounting values these firms report. Model II instead runs the accounting data for mutuals through the equations used to generate IPP and σ_V for each country's commercial banks. In most cases, the second procedure greatly lowers the values of safety-net benefits and volatility at mutual firms. One might interpret this as evidence that, on average in most EU countries, more outside discipline is exerted on commercial banks than on savings institutions.

III. Regression Results

However high or low the mean value of safety-net benefits might be in a given country, the policy problem is to control risk-shifting at the margin. In effect, managers of risky banks engage regulators and creditors in an endless dynamic game. As creditors and regulators develop ways to counter a bank's ability to burden them, bankers devise new strategies for concealing or understating their exposure to loss. The dialectical nature of this game makes it advisable to estimate equation (2) and (3) in first-difference form.

Individual-Country Estimates. Using a fixed-effects specification for individual institutions chartered in each country, Tables 4 and 5 estimate leverage and fair-premium equations for commercial banks and savings institutions separately.

For commercial banks, α_1 is significantly negative at better than one percent, except in Austria, Netherlands, Sweden, and Italy. In the ten other countries, capital discipline significantly restrains risk. However, β_1 still proves positive for all countries, ranging from 0.001 in Austria and in France to 0.045 in Sweden. At one-percent significance, only for Austria, Finland and France can we reject the hypothesis that safety-net subsidies exist. Incremental safety-net control is weakest in Sweden, Ireland, Netherlands, and Denmark.

With the exception of Sweden, the values of α_1 and β_1 found for mutual institutions in Table 5 using Model I do not differ much from those reported for banks in Table 4. When Model II is used to adjust accounting data, α_1 typically becomes more negative, but β_1 usually becomes more positive. However, when we use accounting data to fit the model to commercial banks, results do not differ significantly from those reported in Table 4. This suggests that, by itself, disciplining accounting capital might prove a more reliable way to control risk-shifting at commercial banks than at savings institutions.

Still, judging by our baseline Model I estimates, it appears that capital discipline importantly influences risk-taking at savings institutions. Except in Netherlands and Italy, α_1 proves significantly negative at one percent, but at that level of significance, the hypothesis of incremental safety-net subsidies (i.e., positive β_1) is rejected only for Finland and France. The good news is that the magnitude of estimated safety-net benefits at savings institutions is relatively small, exceeding 7 basis points only for Denmark, Luxembourg, Netherlands, Sweden, and Italy.

Partitioning Countries by IPP and β_1 Values. Our policy focus is how the costs of resolving financial-institution distress might seep unrecognized across borders. Figure 1 divides the 14 counties into three classes based on observable clusters in the mean value of their IPP for banks. Countries whose IPP is 15 basis points or less are coded as "low." Countries whose IPP are 20 basis points or higher are coded as "high" IPP. The other five countries (Austria, Finland, Ireland, Netherlands, and Sweden) are coded as "medium."

The policy issue is whether adverse economic shocks could force taxpayers and regulators in low-β_1 countries to pay for weaknesses in market and regulatory oversight exerted on institutions by high-β_1 countries. To explore this issue, in Figure 2 we use the β_1 estimates reported in Tables 4 and 5 to partition the commercial-bank and savings-bank samples into three clusters: $\beta_1 \leq .05$; $.05 < \beta_1 < .012$; $\beta_1 \geq .012$.

Both for banks and for supervisory officials, incentives for risk-shifting intensify as an institution slides into financial distress (Marcus, 1984; Kane, 1989). To protect taxpayers in home and host countries, markets and officials in high-β_1 countries must have the authority to subject troubled banks to significantly stronger disciplines. To investigate this question, we experiment with two dummy variables. What we call the "low-capital dummy" equals 1 for institutions that fall in the less capitalized (i.e., more levered) half of the aggregate sample in the preceding period and equals zero otherwise. As a robustness check, we employ an alternative "high-premium dummy" that equals one for institutions whose fair premium exceeded the median value recorded in the previous period.

In Tables 6 and 7, each dummy is interacted with $\Delta\sigma_V$. In the columns reporting on these experiments, the total effect of $\Delta\sigma_V$ on the leverage ratio and fair premium is the sum of the two coefficients shown.

Very different pictures emerge for banks and for savings institutions. In the IPP equations for banks in the higher-β_1 subsamples, the value of access to safety-net subsidies falls for distressed banks and the decline is significant in three of the four cells. On the other hand, in the IPP equations for savings institutions, discipline strengthens for troubled institutions (though only at 5 percent significance) in low-β_1 countries, but falls sharply in high-β_1 jurisdictions. This is true even though leverage restrictions tighten significantly when distress emerges.

These results support the hypothesis that, in EU countries, it has been difficult for commercial banks and easy for savings institutions to expand their access to safety-net subsidies when they fall into distress. Still, because few savings institutions are large enough to command too-big-to-fail benefits or to engage in substantial cross-border activity, their risk-shifting capacity seems unlikely to create important loss exposures for regulators and taxpayers in partner countries. The greater concern should attach to large commercial banks operating in home or host countries whose safety-net management is not yet up to speed.

Evidence of Learning by Doing. Table 8 reports on the age of individual-country deposit-insurance schemes. Hovakimian, Kane, and Laeven (2003) find that in the early years of operating a deposit-insurance system, officials are apt to do a poor job of replacing the depositor discipline they displace. Tables 9 and 10 investigate this issue for our EU-14, partitioned by the effectiveness of safety-net management.

Both for commercial banks and for savings institutions, the tables indicate that countries whose safety-net management is highly effective established tight control from the outset. The statistical significance of the system's age in the other two subsamples indicates that safety-net managers in other countries did tend to improve their control as their systems aged.

IV. Robustness Issues

Potentially observable sources of variation might explain at least some cross-country differences. This section investigates four possibilities.

1. Effects from Differences in Character of Deposit-Insurance Coverage and Management. Tables 11 and 12 depict several ways that deposit-insurance schemes in the EU-15 differ in structure. Although one might suppose that differences in the design features imbedded in different deposit-insurance schemes could explain the bulk of cross-country differences in loss control, the evidence suggests that differences in regulatory culture and environment are more important. For example, narrow coverage does not translate directly into either low β_1 or low IPP. Denmark, Finland, and Sweden cover the fewest categories of deposit, but our regressions classify none of them as a low-IPP country and only one of them (Finland) as a low-β_1 country. Also, slope coefficients differ negligibly and insignificantly between countries whose schemes do and do not cover deposits that are denominated in foreign currencies or held by very large companies.

Table 13 does indicate (and covariance tests confirm) that schemes that are chartered either as private or public organizations control risk with similar effectiveness, and better than schemes in which private and public officials share control. The same table finds that schemes that separately guarantee the deposits of commercial banks and savings institutions are negligibly more effective than joint-liability arrangements.

2. Effects From Differences in Country Size. One might also expect safety-net subsidies to vary with the tax capacity of individual countries. We study this issue indirectly by asking whether risk-shifting behavior varies with aggregate income. Table 14 partitions sample countries into three classes: those with GDP below 100 million euros, those with GDP between 100 and 350 million euros; and those with GDP over 350 million euros. GDP data cover 2004 and come from Eurostat. Covariance tests find no differences in capital discipline by country size. The lowest p-value is 0.17 for differences in slopes between the medium and lowest GDP size classes. However, safety-net subsidies are higher in the smallest countries and the differences prove significant for all pairs by covariance tests. The p-values range between 0.01 and 0.03 and indicate that undesirable distributional effects are more intense in smaller countries. This may be because their governments lack the capacity either to finance or to execute preventive supervision as effectively.

3. Effects from Government Ownership. The risk-shifting process passes losses directly to taxpayers in state-owned institutions. This leads us to investigate whether incentives at publicly-owned banks might differ from those at private institutions. Banks are defined as publicly-owned if a public (national, regional or local) authority holds at least 50 percent of its capital. The differences are shown in Table 15. Safety-net subsidies do prove significantly lower for public banks, but only at the 2-percent level. However, the data reject the hypothesis that capital discipline varies between privately-owned and publicly-owned banks (the p-value for the covariance test is 0.22).

4. Effects from Special Governmental Support of Major Banks. Since differences across EU countries in risk-shifting incentives are more likely to affect multinational banks, we compare risk-shifting behavior at country-champion banks with that for other sample banks. Country-champion banks are defined as those whose total assets fall in the first size decile of EU banks. These banks are listed in the Appendix. Table 16 shows that country-champion banks do extract higher incremental safety-net benefits. The p-value of the relevant covariance test is 0.01. At the same time, α_1 estimates show that country-champion banks receive stronger capital discipline on average and this difference proves statistically significant at 2 percent.

V. Policy implications for EU Merger Policies

Contestability theories of market structure stress the importance of entry and exit costs. Incentives exist for national governments to protect domestic institutions from entry by foreign competitors and to resist the exit of important domestic enterprises by bailing them out when they become insolvent. The strength and predictability of these incentives let bank stakeholders estimate fair insurance premiums for commercial banks and savings institutions in each country. In countries like the Netherlands where three large institutions dominate banking markets and foreign competition was until recently discouraged, too-big-to-fail benefits can be substantial.

Although the mean value of the safety-net benefits reported in Tables 2 and 3 range only between 13 and 32 basis points, these estimates are biased downward by using a model that assumes counterfactually that safety-net enhancements expire after only one year. Although our findings are subject to simultaneous-equations bias from treating changes in volatility as exogenous, our estimates of the rate at which benefits increase with increments in volatility (β_1) avoid early-expiration bias. The magnitude of this coefficient ranges from 10 to 450 basis points for commercial banks and from 40 to 760 basis points for savings institutions.

Some high-β_1 countries (e.g., Sweden) have suffered sectoral crises, but several (e.g., Netherlands) have not. In any case, it is particularly dangerous for the EU either to permit banks such as Nordea to move their headquarters from low-β_1 to high-β_1 locales or to allow banks from high-IPP and high-β_1 countries to exploit the single-license framework to expand their footings in low-β_1 countries.

Consistent with the hypothesis of cross-country risk-shifting, table 17 indicates that capital and IPP discipline is less effective at offshore subsidiary banks than at parent institutions and that multinational organizations experience significantly less aggregate restraint from both home and host regulators than purely domestic banks do. Table 18 shows that, vis-à-vis estimated safety-net benefits, acquisition activity appears to move both uphill and downhill. Banks from high-IPP and high-β_1 countries have both initiated and received the lion's share of cross-border merger and acquisition activity. From a global perspective, entry of banks from or into high-premium or low-control home countries can generate undesirable efficiency, distributional, and stabilization effects. Sooner or later, EU authorities will have to confront the coordination challenges that these effects raise.

REFERENCES

Demirgüç-Kunt, A., and E.J. Kane, 2002. "Deposit Insurance Around the World: Where Does it Work? Journal of Economic Perspectives, 16, 175-195.

Duan, J-C., A.F. Moreau, and C.W. Sealey, 1992. "Fixed-Rate Deposit Insurance and Risk Shifting Behavior of Banks," Journal of Banking and Finance, 16, 715-742.

Eisenbeis, R.A., 2004. "Agency Problems and Goal Conflicts," Atlanta: FRB of Atlanta Working Paper No. 2004-24 (October).

_____________, 2006. "Home Country Versus Cross-Border Negative Externalities in Large Banking Organization Failures and How to Avoid Them," Atlanta: FRB of Atlanta Working Paper No. 2006-18 (October).

Eisenbeis, R.A., and G.G. Kaufman, 2006. "Cross-Border Banking: Challenges for Deposit Insurance and Financial Stability in the European Union," Atlanta: FRB of Atlanta Working Paper No. 2006-15 (October).

Honohan, P., and D. Klingebiel, 2002. "The Fiscal Cost Implications of an Accommodating Approach to Banking Crises." Journal of Banking and Finance, forthcoming.

Hovakimian, A., and E.J. Kane, 2000. "Effectiveness of Capital Regulation at U.S. Commercial Banks, 1985-1994," Journal of Finance, 55, 451-469.

Hovakimian, A., E.J. Kane, and L. Laeven, 2003. "How Country and Safety-Net Characteristics Affect Bank Risk-Shifting," Journal of Financial Services Research, 23, 177-204.

Huizinga, H., 2005, "The EU Deposit Insurance Directive: does one size fit all?", CEPR Discussion Papers 5277, CEPR.

Kane, E.J., 1989."Changing Incentives Facing Financial-Institution Regulators," Journal of Financial Services Research, 2, 263-272.

______________, 1995. “Three Paradigms for the Role of Capitalization Requirements in Insured Financial Institutions,” Journal of Banking and Finance, 19, 431-454.

Marcus, A.J., 1984. “Deregulation and Bank Financial Policy,” Journal of Banking and Finance, 8, 557-565.

Marcus, A.J., and I. Shaked, 1984. “The Valuation of FDIC Deposit Insurance Using Option-Pricing Estimates,” Journal of Money, Credit, and Banking, 16, 446-460.

Merton, R.C., 1974. “On the Pricing of Corporate Debt: The Risk Structure of Interest Rates,” Journal of Finance, 29, 449-470.

______________, 1977. “An Analytic Derivation of the Cost of Deposit Insurance and Loan Guarantees,” Journal of Banking and Finance, 1, 3-11.

______________, 1978. “On the Cost of Deposit Insurance When There Are Surveillance Costs,” Journal of Business, 51, 439-452.

Murphy, K.M., and R.H. Topel, 1985. “Estimation and Inference in Two-Step Econometric Models,” Journal of Business and Economic Statistics, 3, 370-379.

Pennacchi, G.G., 1987a, “A Rexamination of the Over- (or Under-) Pricing of Deposit Insurance,” Journal of Money, Credit, and Banking, 19, 340-360.

______________, 1987b, “Alternative Forms of Deposit Insurance: Pricing and Bank Incentive Issues,” Journal of Banking and Finance, 11, 291-312.

Ritchken, P., J.B. Thomson, and R.P. DeGennaro, 1993.“On Flexibility, Capital Structure, and Investment Decisions for the Insured Bank,” Journal of Banking and Finance, 17, 1133-1146.

Ronn, E.I., and A.K. Verma, 1986. “Pricing Risk-Adjusted Deposit Insurance: An Option-Based Model,” Journal of Finance, 41, 871-895.

Vassalou, M., and Y. Xing, 2004. “Default Risk and Equity Returns,” Journal of Finance, 49, 831-868.

APPENDIX

Four focal variables appear in our analysis:

- B, total debt: computed as the difference between the book values of total assets and common equity.
- E, the market value of a bank’s equity: computed as the end-of-period stock-market capitalization.
- σ_E, standard deviation of the return on equity: computed as the standard deviation of: (1) deleveraged quarterly holding-period returns on stock for commercial banks and (2) reported quarterly return on equity reported by mutual institutions.
- δ, fraction of bank assets distributed yearly as dividends to stockholders.

These variables are taken directly from the Bankscope database, provided by Bureau Van Dijk.

Since a market value for equity cannot be observed for (non-quoted) savings & cooperative banks, we experiment for these institutions with two different models of IPP, B/V and σ_V values.

- **Model I**: This is our baseline model. It employs market or market-like values wherever possible. Since savings and cooperative banks do not pay dividends, we represent “distributed profits” as a “social dividend” that is intended to capture community claims that are exerted on these institutions. The “social dividend” consists primarily of contributions to social works and social funds.

- **Model II**: Accounting values for IPP and σ_V are understated because book values that are reported annually cannot capture intrayear variation in B/V and σ_V. Model II estimates IPP, B/V, and σ_V by means of equations fitted to data for commercial banks. The procedure has two steps. The first step estimates equations for commercial banks in each country. In the second step, the accounting data for a country's savings & cooperative banks are fed as input data through the numerical equations that generated IPP and σ_V for that country's commercial banks. The following example employs real data to illustrate how V and σ_V are obtained from model II using a randomly chosen savings bank *i* from Germany that we will call SB_i:

  Step 1: Fitted model for the average commercial bank in Germany in 2000:

  $\sigma_V = \sigma_E(E/V)/(\partial E/\partial V) = (0.091)(0.243)/(1{,}474) = 0.015$

  $E = V[1-(1-\delta)^T] + V(1-\delta)^T N(x_3) - \rho B N(x_4) = V[1-(1-0.23)^1] + V(1-0.23)^1 N(x_3) - 0.97(18523)N(x_4);$

  $E=1636;$

  $V = 6732$;

  Step 2: Fitted model for SB_i in 2000:

  The σ_E, $(\partial E/\partial V)$, δ, T and ρ parameters and the probabilities for normal densities estimated for commercial banks are used to compute "market" values of σ_V and V for savings bank SB_i:

  $\sigma_V = \sigma_E(E/V)/(\partial E/\partial V) = (0.091)(0.198)/(1{,}474) = 0.012$

  $E = V[1-(1-\delta)^T] + V(1-\delta)^T N(x_3) - \rho B N(x_4) = V[1-(1-0.023)^1] + V(1-0.023)^1 N(x_3) - 0.97(15268)N(x_4)$; $V = 5327$

LIST OF COUNTRY CHAMPION BANKS:

Abbey National Plc; Bank of Scotland; Barclays Bank Plc; British Arab Commercial Bank Limited; Co-operative Bank Plc; Daiwa Securities Trust and Banking; HSBC Bank plc; Merrill Lynch International Bank Limited; Royal Bank of Scotland plc; Singer & Friedlander Ltd; Standard Chartered Plc; ABN Amro Holding NV; Fortis Bank Nederland (Holding) N.V.; Friesland Bank; Baden-Wuerttembergische Bank AG; Bankhaus Reuschel; Berenberg; Banca Antonveneta-Banca Antoniana Popolare Veneta SpA; Banca Carige SpA; Banca delle Marche SpA; Banca di Credito Cooperativo di Roma; Banca Fideuram SpA;Banca Monte Parma SpA; Banca Nazionale del Lavoro SpA – BNL Banca per il Leasing– Italease; Banca Popolare dell'Adriatico S.p.A.; Banca popolare dell'Etruria e del Lazio Spa; Banca Popolare di Ancona SpA; Banca Popolare di Bari Scarl; Banca Popolare di Intra; Banca Popolare di Puglia e Basilicata; Banca Popolare di Sondrio SCarl; Banca Popolare FriulAdria SpA; Banca Toscana SpA; Banco Desio - Banco di Desio e della Brianza SpA; Banco di Sardegna SpA; Bank Fuer Trient und Bozen-Banca di Trento e Bolzano SpA; Capitalia SpA; Cassa di risparmio di Alessandria SpA; Cassa di Risparmio di Prato SpA (Cariprato); Cassa di risparmio di Rimini SpA (Carim); Cassa di risparmio di San Miniato SpA; Cassa di Risparmio di Savona SpA; Cassa di Banco Espirito Santo; Banco Internacional de Crédito; Banco Totta & Açores; Banco Internacional do Funcha (Banif);Caixa Economica Montepio Peral Caixa Geral de Depositos; Credito Predial Portugues; Bank J. Van Breda en Co NV; Banque Degroof NV-Banqu Degroof SA; Bank-Joh. Berenberg; Berliner Volksbank eG; Berlin-Hannoverschen; CBC Banque S.A.; ING-ING Belgium SA/NV; ACCBank Plc; Crédit Industriel et Commercial (CIC); Crédit Industriel de Normandie-Banque (CIN); Crédit Industriel de l'Ouest-Banque (CIO); Banque Hervet S.A.;Crédit Agricole Indosuez; Fortis Banque France SA; Banque Scalbert Dupont (BSD); Crédit Lyonnais; Société Générale; Crédit Agricole CA; Banque Populaire de la Côte d'Azur; Caisse Centrale de Crédit Coopératif; BRED Banque Populaire; Crédit Coopératif; Banque Populaire Provençale et Corse; Danske Bank A/S; Nordea Bank Danmark Group A/S; Depfa Bank Plc; Allied Irish Banks plc; Dexia Banque Internationale à Luxembourg SA - Dexia BIL; Deutsche Bank Luxembourg SA; Skandinaviska Enskilda Banken AB; Euro Invest Bank AG; Partner Bank AG; Wiener Privatbank Immobilieninvestment AG; Foereningssparbanken (Swedbank); Hypothekenbank AG; BHW-Bank AG; CommTrust Wertpapierhandelsbank AG; Deutsche Apotheker- und Arztebank eG; Deutsche Bausparkasse BADENIA AG; Deutsche Hypothekenbank (Actien-Gesellschaft); Deutsche Schiffsbank AG; Die Sparkasse Bremen; Dresdner Bank AG; DVB Bank AG; Eurohypo AG; Hypothekenbank in Essen; Kasseler Sparkasse; KD-Bank eG - die Bank fuer Kirche und Diakonie; Kreissparkasse Bautzen; LIGA Bank eG; M.M. Warburg & CO Hypothekenbank eG; Norddeutsche Landesbank Girozentrale NORD/LB; kgaa; SEB AG; Südwestbank AG; Vereins-und Westbank AG; Volksbank Kommanditgesellschaft auf Aktien; Merck Finck & Co Privatbankiers; Nordea Bank Finland Plc ; Merita Bank Plc; Norisbank AG; Oldenburgische Landesbank – OLB; Sal oppenheim jr. & Cie; Pastor; Banco Simeón; Barclays Bank, BBK; Caja de Ahorros de la Inmaculada de Aragón; Caja Murcia; Caixa Sabadell; Caja Vital; Caja Navarra; Unicaja; Ibercaja; Pforzheim eG; WW Bank GmbH; Westdeutsche Immobilienbank; Weserbank AG; Rabobank Group-Rabobank Nederland; Cassa di risparmio in Bologna SpA (Carisbo); Credito Artigiano; Credito Bergamasco; Credit Valtellinese SCarl; Interbanca SpA; Suedtiroler Volksbank-Banca Popolare dell'Alto Adile; Veneto Banca Scparl; Santander Central Hispano Group-Banco Santander Central Hispano; Banco Bilbao Vizcaya Argentaria SA; Caja de Ahorros y Pensiones de Barcelona; LA CAIXA; Banco Central Hispanoamericano – BCH; Caja Madrid-Caja de Ahorros y Monte de Piedad de Madrid; Banco Español de Crédito SA; BANESTO; Banco Popular Espanol SA; Caja de Ahorros de Valencia Castellon y Alicante BANCAJA; Caixa d'Estalvis de Catalunya-Caja de Ahorros de Cataluña; Caja de Ahorros del Mediterraneo CAM; Banco de Sabadell SA; Banco Exterior de España SA; Bankinter SA; Caja de Ahorros de Galicia - Caixa Galicia; Caja de Ahorros del Mediterraneo CAM; Banco de Andalucía; Banco de Castilla; Banco de

Galicia; Banco Guipuzcoano; Banco Svenska Handelsbanken; Westfälische Hypothekenbank AG- Die WestHyp; Wiesbadener Volksbank eG;

Figure 1

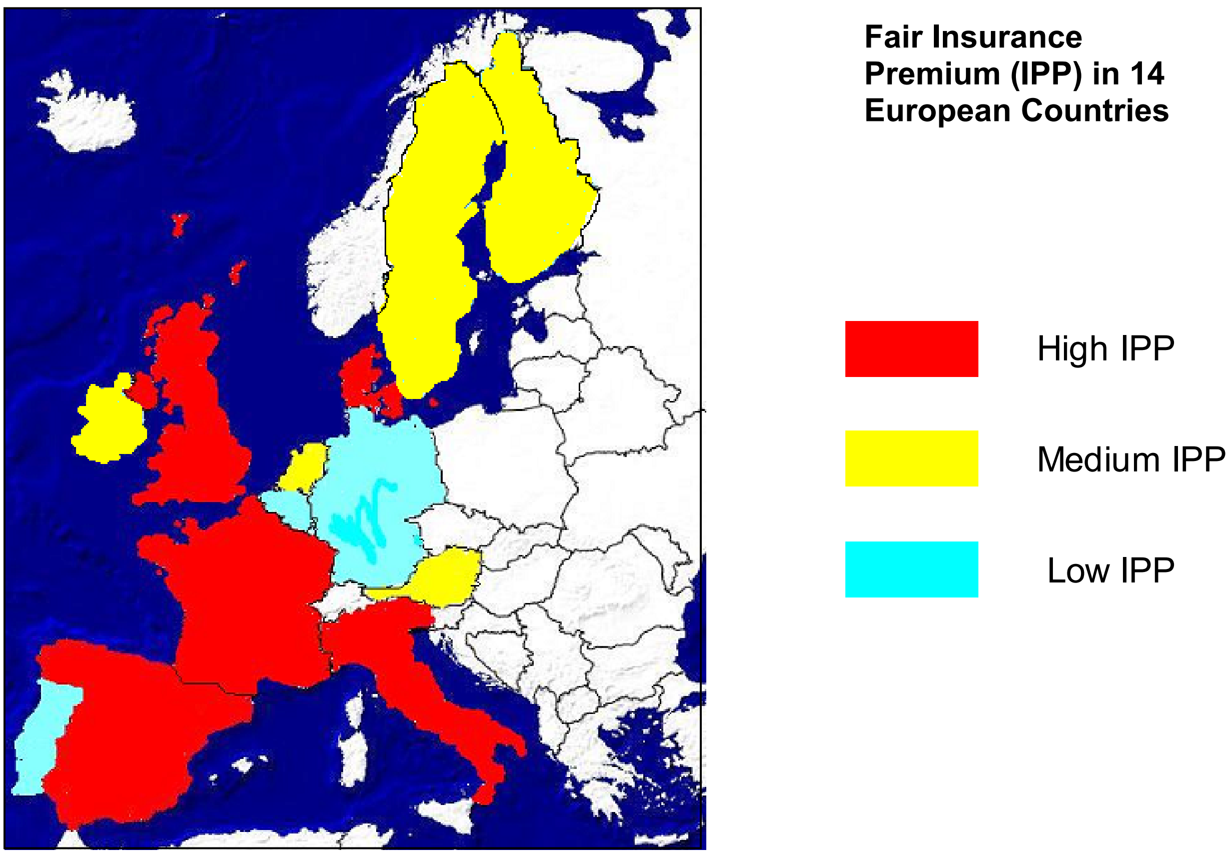
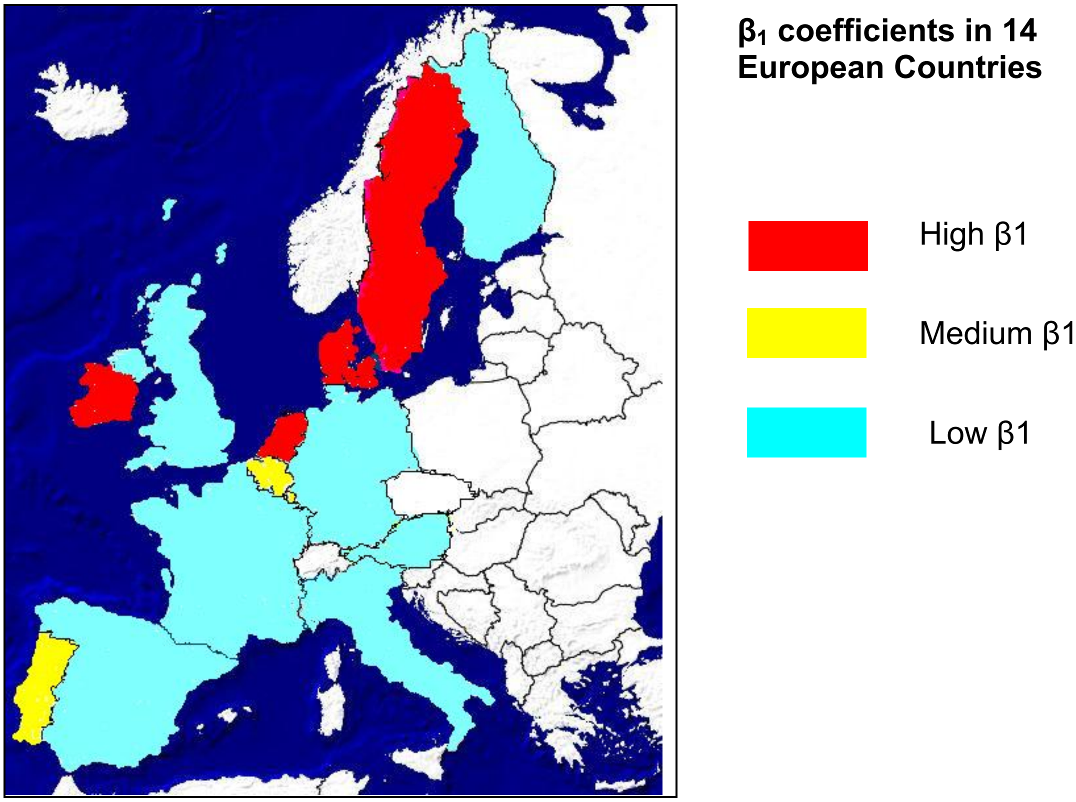


Figure 2



β_1 coefficients in 14 European Countries

TABLE 1
SAMPLE SIZE (NUMBER OF OBSERVATIONS)
DISAGGREGATED BY COUNTRY AND INSTITUTIONAL TYPE

	ALL	*COMMERCIAL BANKS*	*SAVINGS AND COOPERATIVE BANKS*
Austria	*1589*	*555*	*1034*
Belgium	*1848*	*1308*	*540*
Denmark	*1002*	*669*	*333*
Finland	*146*	*118*	*28*
Luxembourg	*1058*	*1024*	*34*
Netherlands	*551*	*517*	*34*
Portugal	*374*	*317*	*57*
Sweden	*501*	*160*	*341*
Greece	*290*	*281*	*9*
Ireland	*353*	*340*	*13*
United Kingdom	*1809*	*1757*	*52*
Spain	*1961*	*1095*	*866*
France	*2626*	*2045*	*581*
Italy	*3963*	*819*	*3144*
Germany	*14068*	*2099*	*11969*
TOTAL	***32139***	***13104***	***19035***

TABLE 2
MEAN LEVERAGE RATIOS (B/V), MEAN FAIR PREMIUM (IPP), AND STANDARD DEVIATION OF RETURN ON ASSETS (σ_V)
FOR COMMERICAL BANKS IN EU-15 COUNTRIES

Value of fair premiums generated by the procedure of Ronn and Verma (JF, 1986)

	Model I		
Country	**B/V (%)**	**IPP (%)**	**σ_V (%)**
Austria	*87.654*	*0.158*	*1.366*
Belgium	*92.571*	*0.149*	*1.828*
Denmark	*88.579*	*0.280*	*2.937*
Finland	*92.266*	*0.192*	*2.329*
Luxembourg	*93.912*	*0.130*	*1.576*
Netherlands	*88.838*	*0.152*	*1.876*
Portugal	*89.176*	*0.150*	*1.747*
Sweden	*91.904*	*0.176*	*1.732*
Greece	-	-	-
Ireland	*88.286*	*0.152*	*1.837*
United Kingdom	*85.454*	*0.219*	*3.222*
Spain	*83.135*	*0.215*	*1.484*
France	*88.021*	*0.212*	*1.427*
Italy	*88.509*	*0.201*	*1.302*
Germany	*87.561*	*0.146*	*1.621*

All estimated parameters are significant at the 1% level

TABLE 3
MEAN LEVERAGE RATIOS (B/V), MEAN FAIR PREMIUM (IPP), AND STANDARD DEVIATION OF RETURN ON ASSETS (σ_V) FOR SAVINGS BANKS AND COOPERATIVE BANKS IN EU-15 COUNTRIES

Value of fair premiums generated by the procedure of Ronn and Verma (JF, 1986)

	Model I			Model II	
Country	**B/V (%)**	**IPP (%)**	**σ_V (%)**	**IPP (%)**	**σ_V (%)**
Austria	*92.769*	*0.094*	*1.326*	*0.055*	*0.618*
Belgium	*88.161*	*0.184*	*3.561*	*0.096*	*0.982*
Denmark	*83.437*	*0.296*	*2.848*	*0.186*	*2.026*
Finland	*92.427*	*0.232*	*1.516*	*0.155*	*1.924*
Luxembourg	*95.026*	*0.034*	*0.855*	*0.125*	*1.532*
Netherlands	*93.919*	*0.087*	*1.207*	*0.140*	*1.747*
Portugal	*93.893*	*0.190*	*1.612*	*0.127*	*1.514*
Sweden	*86.416*	*0.258*	*2.389*	*0.056*	*0.702*
Greece	-	-	-	-	-
Ireland	*92.898*	*0.321*	*2.709*	*0.145*	*1.757*
United Kingdom	*90.824*	*0.203*	*1.943*	*0.212*	*3.109*
Spain	*92.803*	*0.244*	*2.197*	*0.118*	*0.924*
France	*94.290*	*0.133*	*1.442*	*0.164*	*1.159*
Italy	*87.339*	*0.241*	*2.087*	*0.041*	*0.442*
Germany	*94.883*	*0.100*	*1.130*	*0.021*	*0.427*

All estimated parameters are significant at the 1% level

TABLE 4
SINGLE-EQUATION ESTIMATES OF THE EFFECTIVENESS OF SAFETY-NET CONTROLS FOR COMMERCIAL BANKS IN FOURTEEN EU COUNTRIES

Panel data fixed-effects regressions relating changes in a bank's leverage, ($\Delta B/V$), and changes in its fair deposit insurance premium, ΔIPP, to the riskiness of its assets, $\Delta\sigma_V$. B is the face value of bank's debt, including deposits. V is the market value of bank assets. The second and third columns report the value of α_1 and β_1, respectively.

Country	$\Delta(B/V)$	ΔIPP
Austria		
$\Delta\sigma_V$	0.000 (0.24)	0.001* (2.25)
Observations	555	555
R^2	0.030	0.046
Belgium		
$\Delta\sigma_V$	-0.004** (-4.33)	0.009** (7.07)
Observations	1308	1308
R^2	0.048	0.183
Denmark		
$\Delta\sigma_V$	-0.005** (-7.39)	0.022** (12.69)
Observations	669	669
R^2	0.791	0.588
Finland		
$\Delta\sigma_V$	-0.011** (-21.87)	0.003 (1.79)
Observations	118	118
R^2	0.887	0.571
Luxembourg		
$\Delta\sigma_V$	-0.004** (-7.69)	0.012** (11.71)
Observations	1058	1024
R^2	0.308	0.188
Netherlands		
$\Delta\sigma_V$	-0.003 (-1.67)	0.024** (11.02)
Observations	517	517
R^2	0.589	0.370
Portugal		
$\Delta\sigma_V$	-0.006** (-5.31)	0.007** (4.59)
Observations	317	317
R^2	0.492	0.308
Sweden		
$\Delta\sigma_V$	-0.004 (-1.75)	0.045** (6.16)
Observations	160	160
R^2	0.801	0.735

Table 4 cont.

Ireland		
$\Delta\sigma_V$	-0.025** (-7.00)	0.029** (10.58)
Observations	340	340
R^2	0.256	0.361
United Kingdom		
$\Delta\sigma_V$	-0.003** (-5.99)	0.004** (9.09)
Observations	1757	1757
R^2	0.089	0.140
Spain		
$\Delta\sigma_V$	-0.006** (-7.48)	0.002** (3.18)
Observations	1095	1095
R^2	0.061	0.024
France		
$\Delta\sigma_V$	-0.004** (-13.37)	0.001 (1.92)
Observations	2045	2045
R^2	0.269	0.313
Italy		
$\Delta\sigma_V$	-0.002* (2.55)	0.005** (3.04)
Observations	819	819
R^2	0.911	0.596
Germany		
$\Delta\sigma_V$	-0.003** (-7.38)	0.002** (2.73)
Observations	2099	2099
R^2	0.750	0.679
* Statistically significant at 5% level ** Statistically significant at 1% level		

TABLE 5
SINGLE-EQUATION ESTIMATES OF THE EFFECTIVENESS OF SAFETY-NET CONTROLS AT SAVINGS AND COOPERATIVE BANKS

Panel data fixed-effects regressions relating changes in a bank's leverage, ($\Delta B/V$), and changes in its fair deposit insurance premium, ΔIPP, to the changes in the riskiness of its assets, $\Delta\sigma_V$. *B* is the face value of bank's debt, including deposits. *V* is the market value of bank assets. The second and third columns report the value of α_1 and β_1, respectively.

	Model I		Model II	
Austria				
	$\Delta(B/V)$	ΔIPP	$\Delta(B/V)$	ΔIPP
$\Delta\sigma_V$	-0.002** (-6.50)	0.002** (5.99)	-0.006** (-26.05)	0.004** (7.62)
Observations	1034	1034	1034	1034
R^2	0.127	0.114	0.432	0.103
Belgium				
$\Delta\sigma_V$	-0.010** (-16.29)	0.007** (9.70)	-0.013** (-14.82)	0.006** (6.91)
Observations	540	540	540	540
R^2	0.311	0.197	0.506	0.235
Denmark				
$\Delta\sigma_V$	-0.005** (-8.25)	0.023** (14.74)	0.008** (-3.85)	0.037** (8.43)
Observations	333	333	333	333
R^2	0.791	0.628	0.545	0.743
Finland				
$\Delta\sigma_V$	-0.011** (-22.11)	0.003 (1.86)	-0.003** (15.48)	-0.006 (-1.49)
Observations	28	28	28	28
R^2	0.890	0.642	0.999	0.995
Luxembourg				
$\Delta\sigma_V$	-0.004** (-7.69)	0.012** (11.71)	-0.050** (-3.43)	0.016 (8.72)
Observations	34	34	34	34
R^2	0.319	0.206	0.999	0.995
Netherlands				
$\Delta\sigma_V$	-0.003 (-1.67)	0.024** (11.02)	-0.035** (-2.81)	0.029** (13.06)
Observations	34	34	34	34
R^2	0.592	0.396	0.689	0.984
Portugal				
$\Delta\sigma_V$	-0.006** (-5.43)	0.007** (4.70)	-0.008 (0.55)	0.056** (15.98)
Observations	57	57	57	57
R^2	0.507	0.394	0.958	0.999
Sweden				
$\Delta\sigma_V$	-0.010** (7.84)	0.052** (15.49)	-0.014** (-8.62)	0.057** (15.18)
Observations	341	341	341	341
R^2	0.883	0.752	0.886	0.730

Table 5 cont.

Ireland				
$\Delta\sigma_V$	-0.025** (-7.00)	0.029** (10.58)	-0.031** (-6.30)	0.035** (7.72)
Observations	13	13	13	13
R^2	0.259	0.385	0.662	0.805
United Kingdom				
$\Delta\sigma_V$	-0.003** (-6.00)	0.004** (9.11)	-0.018** (-9.07)	0.034** (4.35)
Observations	52	52	52	52
R^2	0.090	0.157	0.999	0.962
Spain				
$\Delta\sigma_V$	-0.006** (-10.12)	0.003** (5.31)	-0.069** (-28.99)	0.027** (6.43)
Observations	866	866	866	866
R^2	0.132	0.078	0.552	0.865
France				
$\Delta\sigma_V$	-0.004** (-14.12)	0.001* (2.07)	-0.013** (-6.63)	0.041** (6.94)
Observations	581	581	581	581
R^2	0.294	0.441	0.918	0.987
Italy				
$\Delta\sigma_V$	-0.001** (-2.89)	0.017** (18.32)	-0.005** (-9.65)	0.035** (26.75)
Observations	3144	3144	3144	3144
R^2	0.753	0.472	0.319	0.470
Germany				
$\Delta\sigma_V$	-0.003** (-24.51)	0.007** (19.26)	-0.007** (-35.73)	0.076** (7.37)
Observations	11969	11699	11969	11969
R^2	0.781	0.580	0.656	0.720
* Statistically significant at 5% level ** Statistically significant at 1% level				

TABLE 6
TESTING THE INCENTIVE-INTENSIFICATION HYPOTHESIS FOR COMMERCIAL BANKS, IN COUNTRIES PARTITIONED BY EFFECTIVENESS OF SAFETY-NET MANAGEMENT

Panel data fixed-effects estimations regressions relating changes in a bank's leverage, $\Delta(B/V)$, and changes in the bank's fair deposit insurance premium, ΔIPP, to the changes in the riskiness of their assets, $\Delta\sigma_V$. B is the face value of bank's debt, including deposits. V is the market value of bank's assets.

	TEST USING A LOW-CAPITAL DUMMY		TEST USING A HIGH-PREMIUM DUMMY	
	$\beta_1 \leq 0.005$		$\beta_1 \leq 0.005$	
High Effectiveness	$\Delta(B/V)$	ΔIPP	$\Delta(B/V)$	ΔIPP
$\Delta\sigma_V$	0.001 (0.97)	-0.003** (-7.92)	0.001 (0.53)	-0.005** (5.90)
$\Delta\sigma_V$ X *low-capital dummy*	-0.003 (0.85)	-0.003* (-2.36)	-	-
$\Delta\sigma_V$ X *high-premium dummy*	-	-	-0.000 (-0.14)	0.002* (2.48)
Observations	4244	4244	4244	4244
R^2	0.194	0.535	0.194	0.527
	$0.005<\beta_1<0.012$		$0.005<\beta_1<0.012$	
Intermediate Effectiveness	$\Delta(B/V)$	ΔIPP	$\Delta(B/V)$	ΔIPP
$\Delta\sigma_V$	-0.013** (59.97)	0.011** (43.13)	-0.010** (-37.04)	0.011** (35.42)
$\Delta\sigma_V$ X *low-capital dummy*	-0.003** (8.96)	-0.001* (-2.00)	-	-
$\Delta\sigma_V$ X *high-premium dummy*	-	-	-0.001** (-4.72)	-0.002** (-5.55)
Observations	812	812	812	812
R^2	0.452	0.518	0.439	0.514
	$\beta_1 \geq 0.012$		$\beta_1 \geq 0.012$	
Lesser Effectiveness	$\Delta(B/V)$	ΔIPP	$\Delta(B/V)$	ΔIPP
$\Delta\sigma_V$	-0.012** (-35.92)	0.019** (28.38)	-0.011** (-20.05)	0.014** (7.38)
$\Delta\sigma_V$ X *low-capital dummy*	0.003** (6.61)	-0.022** (-4.04)	-	-
$\Delta\sigma_V$ X *high-premium dummy*	-	-	0.000 (0.19)	-0.006** (-9.69)
Observations	1355	1355	1355	1355
R^2	0.380	0.397	0.368	0.409

* Statistically significant at 5% level
** Statistically significant at 1% level

TABLE 7
TESTING THE INCENTIVE-INTENSIFICATION HYPOTHESIS FOR SAVINGS AND COOPERATIVE BANKS, IN COUNTRIES PARTITIONED BY EFFECTIVENESS OF SAFETY-NET MANAGEMENT

Panel data fixed-effects estimations regressions relating changes in a bank's leverage, $\Delta(B/V)$, and changes in its fair deposit insurance premium, ΔIPP, to the changes in the riskiness of their assets, $\Delta\sigma_V$. *B* is the face value of bank's debt, including deposits. *V* is the market value of bank's assets.

	TEST USING A LOW-CAPITAL DUMMY		TEST USING A HIGH-PREMIUM DUMMY	
	$\beta_1 \leq 0.005$		$\beta_1 \leq 0.005$	
High Effectiveness	$\Delta(B/V)$	ΔIPP	$\Delta(B/V)$	ΔIPP
$\Delta\sigma_V$	-0.004* (-2.12)	-0.030** (5.85)	-0.006** (-3.22)	0.029** (5.59)
$\Delta\sigma_V$ X *low-capital dummy*	0.004 (0.73)	-0.034** (2.34)	-	-
$\Delta\sigma_V$ X *high-premium dummy*	-	-	0.009*** (3.45)	-0.020* (2.63)
Observations	1280	1280	1280	1280
R^2	0.831	0.890	0.394	0.894
	$0.005<\beta_1<0.012$		$0.005<\beta_1<0.012$	
Intermediate Effectiveness	$\Delta(B/V)$	ΔIPP	$\Delta(B/V)$	ΔIPP
$\Delta\sigma_V$	-0.019** (-25.25)	0.015** (12.07)	-0.007** (-20.04)	0.012** (6.87)
$\Delta\sigma_V$ X *low-capital dummy*	-0.004** (17.48)	0.074 (1.75)	-	-
$\Delta\sigma_V$ X *high-premium dummy*	-	-	-0.003** (-7.33)	0.021** (4.35)
Observations	1280	1280	1280	1280
R^2	0.789	0.898	0.584	0.707
	$\beta_1 \geq 0.012$		$\beta_1 \geq 0.012$	
Lesser Effectiveness	$\Delta(B/V)$	ΔIPP	$\Delta(B/V)$	ΔIPP
$\Delta\sigma_V$	-0.012** (-59.52)	0.030** (49.41)	-0.008 (-56.48)	0.019** (29.40)
$\Delta\sigma_V$ X *low-capital dummy*	-0.005** (12.66)	0.030** (27.93)	-	-
$\Delta\sigma_V$ X *high-premium dummy*	-	-	-0.004** (-12.51)	0.024** (29.11)
Observations	1949	1949	1949	1949
R^2	0.705	0.678	0.683	0.624

* Statistically significant at 5% level
** Statistically significant at 1% level

TABLE 8
ADOPTION OF DEPOSIT INSURANCE SYSTEMS IN EU-15 COUNTRIES

Country	*Year that Legislature Enacted Explicit Deposit Insurance*
Austria	*1979*
Belgium	*1974*
Denmark	*1988*
Finland	*1969*
Luxembourg	*1989*
Netherlands	*1979*
Portugal	*1992*
Sweden	*1996*
Greece	*1993*
Ireland	*1989*
United Kingdom	*1982*
Spain	*1977*
France	*1980*
Italy	*1987*
Germany	*1966*

TABLE 9
HOW THE AGE OF A COUNTRY'S DEPOSIT-INSURANCE SYSTEM AFFECTS COMMERCIAL BANKS, IN COUNTRIES PARTITIONED BY EFFECTIVENESS OF SAFETY-NET MANAGEMENT

Panel data fixed-effects estimations regressions relating changes in a bank's leverage, $\Delta(B/V)$, and changes in its fair deposit insurance premium, ΔIPP, to the changes in the riskiness of their assets, $\Delta\sigma_V$. B is the face value of bank's debt, including deposits. V is the market value of bank's assets. The second and third columns report the value of α_1 and β_1, respectively.

$\beta_1 \leq 0.005$		
High Effectiveness	$\Delta(B/V)$	ΔIPP
$\Delta\sigma_V$	0.000 (0.66)	0.004** (11.29)
Age of deposit insurance	-0.012 (-0.52)	0.008 (0.58)
Observations	8488	8488
R^2	0.237	0.611
$0.005 < \beta_1 < 0.012$		
Intermediate Effectiveness	$\Delta(B/V)$	ΔIPP
$\Delta\sigma_V$	-0.001*** (-7.68)	0.004** (11.34)
Age of deposit insurance	-0.012 (-0.51)	-0.007** (5.50)
Observations	1625	1625
R^2	0.237	0.611
$\beta_1 \geq 0.012$		
Lesser Effectiveness	$\Delta(B/V)$	ΔIPP
$\Delta\sigma_V$	-0.006** (-32.65)	0.010** (40.08)
Age of deposit insurance	-0.006** (-3.50)	-0.002** (-20.92)
Observations	2710	2710
R^2	0.379	0.456

* Statistically significant at 5% level
** Statistically significant at 1% level

TABLE 10
HOW THE AGE OF A COUNTRY'S DEPOSIT INSURANCE SYSTEM AFFECTS RISK-SHIFTING AT SAVINGS AND COOPERATIVE BANKS, IN COUNTRIES PARTITIONED BY EFFECTIVENESS OF SAFETY-NET MANAGEMENT

Panel data fixed-effects estimations regressions relating changes in a bank's leverage, $\Delta(B/V)$, and changes in its fair deposit insurance premium, ΔIPP, to the changes in the riskiness of their assets, $\Delta\sigma_V$. *B* is the face value of bank's debt, including deposits. *V* is the market value of bank's assets.

$\beta_1 \leq 0.005$		
High Effectiveness	Δ**(B/V)**	Δ**IPP**
$\Delta\sigma_V$	-0.005 (-0.70)	0.005** (11.87)
Age of deposit insurance	-0.012 (0.57)	0.004 (0.32)
Observations	2561	2561
R^2	0.266	0.698
$0.005 < \beta_1 < 0.012$		
Intermediate Effectiveness	Δ**(B/V)**	Δ**IPP**
$\Delta\sigma_V$	-0.005** (-2.73)	0.010** (6.91)
Age of deposit insurance	-0.012 (-0.56)	-0.002** (-4.51)
Observations	12566	12566
R^2	0.265	0.417
$\beta_1 \geq 0.012$		
Lesser Effectiveness	Δ**(B/V)**	Δ**IPP**
$\Delta\sigma_V$	-0.006** (-56.37)	0.011** (59.91)
Age of deposit insurance	-0.005* (-4.71)	-0.006** (3.42)
Observations	3899	3899
R^2	0.453	0.572

* Statistically significant at 5% level
** Statistically significant at 1% level

TABLE 11
DIFFERENCES IN DEPOSIT-INSURANCE COVERAGE IN EU-15 COUNTRIES

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Austria	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Belgium	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Denmark							X		X	X		X		
Finland	X													
Luxembourg	X	X	X	X	X	X	X	X	X		X	X		X
Netherlands	X	X	X	X	X	X	X	X	X	X	X	X		X
Portugal	X	X	X	X	X	X	X	X	X	X	X	X		
Sweden	X					X				X				
Greece	X	X	X		X		X	X	X			X		
Ireland	X	X	X	X	X	X	X	X	X	X	X	X		X
United Kingdom	X	X	X	X	X	X	X	X	X	X	X	X		X
Spain	X	X	X	X	X	X	X	X	X	X	X	X		
France	X	X	X	X	X	X	X	X	X	X	X	X	X	
Italy	X	X	X	X	X	X	X	X	X	X	X	X		
Germany	X	X	X	X	X	X	X	X	X	X	X	X	X	X

1. Deposits by financial institutions as defined in Article 1 (6) of Directive 89/646/EEC.
2. Deposits by insurance undertakings.
3. Deposits by government and central administrative authorities.
4. Deposits by provincial, regional, local and municipal authorities.
5. Deposits by collective investment undertakings.
6. Deposits by pension and retirement funds.
7. Deposits by a credit institution's own directors, managers, members personally liable, holders of at least 5 % of the credit institution's capital, persons responsible for carrying out the statutory audits of the credit institution's accounting documents and depositors of similar status in other companies in the same group.
8. Deposits by close relatives and third parties acting on behalf of the depositors referred to in 7.
9. Deposits by other companies in the same group.
10. Non-nominative deposits.
11. Deposits for which the depositor has, on an individual basis, obtained from the same credit institution rates and financial concessions which have helped to aggravate its financial situation.
12. Debt securities issued by the same institution and liabilities arising out of own acceptances and promissory notes.
13. Deposits in currencies other than those of the Member States.
14. Deposits by companies which are of such a size that they are not permitted to draw up abridged balance sheets pursuant to Article 11 of the Fourth Council Directive (78/660/EEC) of 25 July 1978 based on Article 54 (3) (g) of the Treaty on the annual accounts of certain types of companies

TABLE 12
DIFFERENCES IN DEPOSIT-INSURANCE MANAGEMENT AND SYSTEM SIZE IN EU-15 COUNTRIES

	Public (PB), Private (PR) or Mixed (MX) deposit guarantee scheme	*Joint (JT) or Separate (SP) liability scheme for commercial and mutual institutions*	*Total amount of deposits (th. €)*	*Total amount of eligible deposits (th. €)*	*Total amount of covered deposits (th. €)*
Austria	*PR*	*JT*	*241,000,000*	*180,000,000*	*116,000,000*
Belgium	*PU*	*JT*	*443,016,000*	*200,641,000*	*103,972,413*
Denmark	*PR*	*JT*	*1,803,863,000*	*1,188,935,000*	*616,107,577*
Finland	*PR*	*JT*	*75,326,000*	*72,273,000*	*35,359,000*
Luxembourg	*PR*	*JT*	*516,754,552*	*86,013,863*	*13,118,600*
Netherlands	*MX*	*JT*	*447,757,000*	*406,507,000*	*210,652,427*
Portugal	*PU*	*SP*	*156,349,940*	*118,853,250*	*61,943,201*
Sweden	*PU*	*JT*	*153,315,744*	*147,101,781*	*54,320,112*
Greece	*MX*	*JT*	*154,732,608*	*104,124,554*	*53,957,472*
Ireland	*PU*	*JT*	*206,434,700*	*128,751,429*	*66,719,149*
United Kingdom	*PR*	*JT*	*1,555,918,020*	*1,061,543,833*	*845,598,688*
Spain	*PU*	*SP*	*694,856,820*	*573,865,000*	*296,260,000*
France	*PR*	*JT*	*1,015,849,000*	*884,809,396*	*704,816,553*
Italy	*PR*	*SP*	*1,579,939,298*	*526,610,551*	*402,068,170*
Germany	*PR*	*SP*	*1,803,863,000*	*1,188,935,000*	*616,107,577*

Source: European Commission ("Estimating the effects of changing the funding mechanisms of EU Deposit Guarantee Schemes", feb. 2007) and own elaboration

TABLE 13
ESTIMATES OF THE EFFECTIVENESS OF SAFETY-NET CONTROLS FOR COMMERCIAL BANKS IN FOURTEEN EU COUNTRIES: PUBLIC, PRIVATE, MIXED, JOINT-LIABILITY AND SEPARATE-LIABILITY SCHEMES

Panel data fixed-effects regressions relating changes in a bank's leverage, ($\Delta B/V$), and changes in its fair deposit insurance premium, ΔIPP, to the riskiness of its assets, $\Delta\sigma_V$. B is the face value of bank's debt, including deposits. V is the market value of bank assets. The second and third columns report the value of α_1 and β_1, respectively.

Public deposit guarantee scheme		
	Δ(B/V)	**ΔIPP**
$\Delta\sigma_V$	-0.007** (3.93)	0.005** (6.06)
Observations	5037	5037
R^2	0.382	0.326
Private deposit guarantee scheme		
	Δ(B/V)	**ΔIPP**
$\Delta\sigma_V$	-0.008** (-4.06)	0.006** (6.42)
Observations	26261	26261
R^2	0.402	0.504
Mixed deposit guarantee scheme		
	Δ(B/V)	**ΔIPP**
$\Delta\sigma_V$	-0.003 (-1.67)	0.024** (11.02)
Observations	517	517
R^2	0.589	0.370
Joint-liability deposit guarantee scheme		
	Δ(B/V)	**ΔIPP**
$\Delta\sigma_V$	-0.008** (-7.16)	0.004** (17.27)
Observations	11483	11483
R^2	0.393	0.447
Separate-liability deposit guarantee scheme		
	Δ(B/V)	**ΔIPP**
$\Delta\sigma_V$	-0.007** (-9.11)	0.002* (2.21)
Observations	20366	20366
R^2	0.461	0.226

* Statistically significant at 5% level
** Statistically significant at 1% level

Definitions: Schemes are designated as public, private, or mixed according to how the controlling organization is chartered.

Joint liability indicates that a single organization insures both banks and mutual institutions.

TABLE 14
HOW THE SIZE OF THE ECONOMY
AFFECTS RISK-SHIFTING AT EU-15 BANKS

Panel data fixed-effects regressions relating changes in a bank's leverage, $\Delta(B/V)$, and changes in its fair deposit insurance premium, ΔIPP, to the changes in the riskiness of their assets, $\Delta\sigma_V$. *B* is the face value of bank's debt, including deposits. *V* is the market value of bank's assets.

GDP (millions of euro)		
GDP≤100.000		
	$\Delta(B/V)$	**ΔIPP**
$\Delta\sigma_V$	-0.004* (-2.24)	0.021** (12.92)
Observations	3474	3474
R^2	0.234	0.579
100.000<GDP<350.000		
	$\Delta(B/V)$	**ΔIPP**
$\Delta\sigma_V$	-0.005** (-2.95)	0.011** (13.33)
Observations	4322	4322
R^2	0.392	0.601
GDP≥350.000		
	$\Delta(B/V)$	**ΔIPP**
$\Delta\sigma_V$	-0.006** (-9.82)	0.004** (21.61)
Observations	11230	11230
R^2	0.218	0.544

* Statistically significant at 5% level
** Statistically significant at 1% level

TABLE 15
RISK-SHIFTING AT PUBLICLY-OWNED VS. PRIVATELY-OWNED BANKS

Panel data fixed-effects regressions relating changes in a bank's leverage, $\Delta(B/V)$, and changes in its fair deposit insurance premium, ΔIPP, to the changes in the riskiness of their assets, $\Delta\sigma_V$. *B* is the face value of bank's debt, including deposits. *V* is the market value of bank's assets.

Publicly-owned		
	$\Delta(B/V)$	**ΔIPP**
$\Delta\sigma_V$	-0.006** (-2.99)	0.004** (16.96)
Observations	1736	1736
R^2	0.250	0.547
Privately-owned		
	$\Delta(B/V)$	**ΔIPP**
$\Delta\sigma_V$	-0.005** (-7.99)	0.009** (27.88)
Observations	17290	17290
R^2	0.318	0.671

* Statistically significant at 5% level
** Statistically significant at 1% level

TABLE 16
RISK-SHIFTING AT COUNTRY CHAMPION BANKS VS. ALL OTHER BANKS

Panel data fixed-effects regressions relating changes in a bank's leverage, $\Delta(B/V)$, and changes in its fair deposit insurance premium, ΔIPP, to the changes in the riskiness of their assets, $\Delta\sigma_V$. B is the face value of bank's debt, including deposits. V is the market value of bank's assets.

Country champion banks		
	$\Delta(B/V)$	**ΔIPP**
$\Delta\sigma_V$	-0.008** (-6.98)	0.012** (12.28)
Observations	1602	1602
R^2	0.227	0.496
All other banks		
	$\Delta(B/V)$	**ΔIPP**
$\Delta\sigma_V$	-0.004** (-3.91)	0.007** (11.65)
Observations	17.424	17.424
R^2	0.274	0.580

* Statistically significant at 5% level
** Statistically significant at 1% level

TABLE 17
ESTIMATES OF THE EFFECTIVENESS OF SAFETY-NET CONTROLS FOR COMMERCIAL BANKS IN FOURTEEN EU COUNTRIES: FOREIGN SUBSIDIARIES, PARENT BANKS AND PURELY DOMESTIC BANKS

Panel data fixed-effects regressions relating changes in a bank's leverage, ($\Delta B/V$), and changes in its fair deposit insurance premium, ΔIPP, to the riskiness of its assets, $\Delta\sigma_V$. B is the face value of bank's debt, including deposits. V is the market value of bank assets. The second and third columns report the value of α_1 and β_1, respectively.

Foreign subsidiaries		
	Δ(B/V)	***ΔIPP***
$\Delta\sigma_V$	-0.011** (4.54)	0.009** (7.04)
Observations	1156	1156
R^2	0.362	0.540
Parent banks		
	Δ(B/V)	***ΔIPP***
$\Delta\sigma_V$	-0.008** (-3.27)	0.006** (6.96)
Observations	3327	3327
R^2	0.402	0.527
Purely domestic banks		
	Δ(B/V)	***ΔIPP***
$\Delta\sigma_V$	-0.003** (-11.04)	0.003** (16.25)
Observations	27656	27656
R^2	0.379	0.456

* Statistically significant at 5% level
** Statistically significant at 1% level

TABLE 18
ESTIMATED TRANSITION PROBABILITIES FOR CROSS-BORDER MERGER AND ACQUISITION ACTIVITY WITHIN AND ACROSS FAIR INSURANCE PREMIUM AND β_1 CLASSES DURING 1993-2004

FROM/TO	High IPP	Medium IPP	Low IPP
High IPP	29.41	11.76	2.94
Medium IPP	17.65	8.82	5.88
Low IPP	14.71	5.88	2.94

FROM/TO	High β_1	Medium β_1	Low β_1
High β_1	20.59	2.94	2.94
Medium β_1	2.94	2.94	5.88
Low β_1	29.41	14.71	17.65

Source: Thomson Financial and European Central Bank for Merger and Acquisitions data.