THE EFFECTS OF NATIONAL DISCRETIONS ON BANKS

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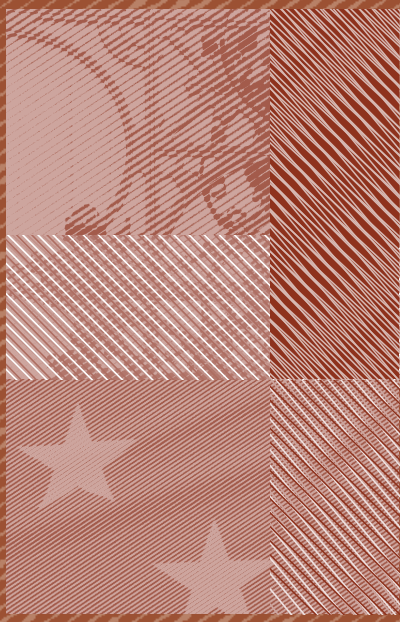

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Abstract

The EU's transposition of Basel II into European law has been done through the Capital Requirements Directive (CRD). Although the Directive establishes, in general, uniform rules to set capital requirements across European countries, there are some areas where the Directive allows some heterogeneity. In particular, countries are asked to choose among different possibilities when transposing the Directive, which are called national discretions (ND). The main objective of our research is to use such observed heterogeneity to gather empirical evidence on the effects on European banks of more or less stringency and more or less risk sensitivity in capital requirements. Following the approach in Barth et al. (2004, 2006, 2008) we build index numbers for groups of national discretions and applying Altunbas et al. (2007) approach, we provide evidence on their effect on banks' risk, capital, efficiency and cost. We show that more stringency and more risk sensitivity in regulation not always result in a trade off between efficiency and solvency: the impact depends on the area of national discretion on which such characteristics apply.

Keywords: Prudential regulation; capital requirements; bank capital; risk; efficiency.

JEL classification: E61, G21, G28.

1 Introduction

The EU's transposition of Basel II into European law was done through the Capital Requirements Directive (CRD). Although the Directive establishes, in general, uniform rules to set capital requirements across European countries, there were some areas where the Directive allowed some heterogeneity. In particular, countries were asked to choose among different possibilities when transposing the Directive, which are called options and national discretions. Countries made use of this possibility and we observe that different choices were made, so that these options and national discretions (ND) were exercised. It can be expected that these different choices reflect different regulatory preferences and, therefore, if regulation is effective it can also be expected that these choices lead to different bank results.

The theoretical academic literature produces highly mixed predictions regarding the effects of capital regulation on asset risk and overall safety and soundness for the banking system as a whole, so that it mainly remains an empirical issue. However, regulators' expectation is that tighter capital requirements, if effective, should lead to higher capital and lower risk taking. The idea is that if banks hold sufficient capital, they internalize the adverse consequences of gambling and thus will choose to invest prudently. On the other hand, such tightness could lead to higher inefficiency, which could show in lower profits or higher costs, although evidence has been also gathered on the opposite effect [Berger (1995)]. Moreover, a more risk sensitive capital framework, if effective, should result in lower risk and/or higher capital, with costs in terms of efficiency as well.

A fair amount of empirical work has already been done on the impact of banking regulation on banking system stability, while there is very little systematic empirical evidence on how regulation affects risk taking, capital and efficiency banking industry. This paper tries to address this gap. The large cross-country database on bank regulation and supervision that has been gathered in different waves by the IMF has allowed the analysis of the effects of the regulatory and supervisory arrangements on the development of the financial sector and on the stability and efficiency of the banking system [Barth et al. (2004, 2006 and 2008) Demirgüç-Kunt et al. (2004)]. Through the construction of regulatory indices, the works of Barth et al. found that more stringency in capital regulations does not seem to have a statistically significant effect on banking-system fragility, neither on bank development, nor on efficiency or costs.

The objective of our paper is to test whether this lack of effect holds when we consider more disaggregated information in relation to capital requirements, that is, at the level where many regulatory decisions are taken. In particular, we make use of the heterogeneity provided by the choice of national discretions in CRD to gather empirical evidence on the impact on European banks of more or less stringency and more or less risk sensitivity in capital requirements. We focus on the potential effects that these options and discretions may have on the risk, capital, costs and efficiency of individual banks.

By carrying out this analysis, we provide evidence on whether there is a trade-off between solvency and efficiency caused by more stringency or by more risk sensitivity in capital requirements. To do so, we assume that the choice of National Discretions made by Member States reflects not only the regulator's most preferred option, but also the regulation closest to the one that they already had in place before CRD was adopted.

In this sense, we are not aiming at testing the impact of the introduction of national discretions, but their role in banking results and activity. The analysis also allows us to provide an estimate of the impact of different choices as far as risk sensitivity and stringency in capital requirements is concerned and in particular in relation to the initial proposal made by the Committee of European Banking Supervisors (CEBS) in October 2008.

We follow the approach in Barth et al. (2004, 2006 and 2008), and construct indices of national discretions in bank capital regulation for all 27 EU countries and we test for their relevance on bank's risk, capital and efficiency. We study the impact for the whole sample of banks, including commercial, saving and cooperative banks.

The organisation of the paper is as follows. Section 2 reviews the literature concerning the effects of capital regulation on bank's risk, capital and efficiency. Section 3 describes the data and specifically the construction of the National Discretion indices while Section 4 focuses on the methodological framework. Section 5 presents the results and Section 6 records the simulations. Finally, section 7 summarizes and concludes. Annex 1 contains a description of the National Discretions, while Annex 2 provides the estimation for the efficiency variable and Annex 3 records the detaled tables with the estimation results for the capital, risk, cost and efficiency equations.

2 Literature review

Although there is extensive theoretical literature on bank capital, it is much scanter the one that takes into account the presence of financial regulation [see Van Hoose (2007) and Santos (2001) for a survey of theories of bank behaviour under capital regulation]. And this happens in spite of the fact that banking is undoubtedly one of the most regulated industries in the world, and the rules on bank capital are one of the most prominent aspects of such regulation.

Given that the regulatory requirement depends on the amount of loans granted, a link between bank capital and lending is established. There is a widespread agreement in the available theoretical literature that the immediate effects of constraining capital standards are likely to be a reduction in total lending and accompanying increases in market loan rates and substitution away from lending to holding alternative assets.[1]

This literature produces highly mixed predictions, however, regarding the effects of prudential regulation on banks' risk-taking profile and on overall safety and soundness for the banking system as a whole [Dewatripont and Tirole (1994)]. In particular, theoretical contributions do not agree on the impact of more risk sensitive capital requirements on portfolio choices and on efficiency. Although the effects of capital adequacy requirements are usually to decrease risk taking, the reverse is also possible [Kim and Santomero (1988), Rochet (1992), Besanko and Kanatas (1996)].[2]

The impact of capital requirements on bank capital and credit risk depends on the extent to which such requirements are binding. Some of the empirical research carried out to determine whether this is the case seems to support the view that regulatory capital has an impact on the capital held by banks [Ediz et al. (1998), Alfon et al. (2004), Francis and Osborne (2009a)]. In fact, the claim that, since most banks already hold capital quite well in excess of the regulatory minimum, any change in it will not have any effect on banks' capital is not supported by the results for the UK in the works of Alfon et al. (2004) and Francis and Osborne (2009a and 2009b), the ones in Van Roy (2008) with data for six G-10 countries (Canada, France, Italy, Japan, the United Kingdom, and the United States) or the findings in Rime (2001) for Switzerland. As for risk-based capital ratios, they have been shown to lead to significant increases in capital ratios [Jacques et Nigro (1997)] in relation to a non risk-sensitivity baseline. However, Ashcraft (2001) finds little evidence that capital regulation during the 1980s materially influenced bank capital ratios. In the same vein, Barrios and Blanco (2003) find that for Spanish banks, a market-based model better fits the data, indicating that the banks they considered were not at all constrained by capital regulation during the period of study.

Empirical evidence is provided for the irrelevance of stringency in capital regulation for bank development and stability [Barth et al. (2004, 2006 and 2008)], while more stringent capital regulations are negatively linked with nonperforming loans [Barth et al. (2008)].

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1. Jackson et al (1999) reach the same conclusion as far as empirical evidence is concerned.

2. For example, using the mean-variance framework, Kahane (1977), Koehn and Santomero (1980) and Kim and Santomero (1988) have shown that increased regulatory capital standards may have the unintended effect of causing utility-maximizing banks to increase portfolio risk. The results in Furlong and Keeley (1989) and Keeley and Furlong (1990) suggest that increased capital standards will not cause banks to increase portfolio risk, because an increase in capital reduces the value of the deposit insurance put option.

However, the evidence on the impact of capital adequacy requirements on financial stability has been usually obtained under an event-based approach, which identifies crisis only when they are severe enough to trigger market events. In contrast, crises successfully contained by corrective policies are neglected, so that estimation suffers from selection bias [von Hagen and Ho (2007)]. Using a Markov-switching regression model to deal with this bias, the results in Tchana Tchana (2008) show that capital adequacy requirements improve stability and reduce the expected duration of banking crises.

The possible distortions arising from regulatory capital pressure has been analysed in some papers. Editz et al. 1998 find no evidence that an increase in the minimum bank-specific capital ratio prevalent in the UK causes a bank to shift into less risky asset risk buckets. A similar result is obtained in Rime (2001), where it is shown that regulatory pressure does not affect the level of risk in Swiss banks. On the other hand, González (2002) provides evidence that banks in countries with stricter regulation have a lower charter value, which increases their incentives to follow risky policies, a similar result to the one found by Shrieves and Dahl (1992). The evidence gathered on the impact of risk sensitivity capital requirements on risk taking points at a negative relationship with data on the introduction of Basel I [Thakor (1996)], which is also supported by the work of Jacques and Nigro (1997).

As for the effects of regulation on performance and costs, the results in Demirgüç-Kunt et al. (2004), indicate that tighter regulations on bank entry and on bank activities boost the cost of financial intermediation. In contrast, Berger (1995) finds that there is positive Granger- causation from capital to bank earnings, through lower interest rates paid on uninsured purchased funds, while Barth et al. (2006 and 2008) results dos not capture any effect, so that capital regulation does not impact on efficiency.

Therefore, the gathered empirical evidence produces rather mixed results as far as the effects of capital regulation on bank's behaviour.

3 Data

Four main different sources of data are used for the empirical analysis. We first exploit the data on how each Member State (MS) has exercised each national discretion, which is obtained from the Committee of European Banking Supervisors (CEBS) website[3] and which we detail below. We also use aggregate country data describing several characteristics and reflecting the structure and operation of the national banking system for 2007, which are obtained from the European Central Bank (we use the data contained in both the 2007 European Banking Structures Report and the 2007 Banking Sector Stability Report). We also use the Barth, Caprio, Levine (2008) database to capture institutional features of the regulatory and supervisory framework. And finally, individual bank data for 2007 (and other years when needed to construct the variable) are obtained from the BankScope database, which is provided by Fitch-IBCA. Data are for all financial institutions (commercial banks, saving banks and cooperatives) with accounting data for 2007 from consolidated accounts if available, and from unconsolidated accounts otherwise.

Our final data set consists of 2108 financial institutions from 27 countries for year 2007, which comprises 267 commercial banks, 379 saving banks and 1458 cooperatives.

3.1 Construction of National Discretion indices

MS have a choice of more than 150 national discretions and options in the Capital Requirements Directive, which may be applied on the basis of national circumstances and which cover a rather wide scope of areas within the Directive.[4]

To carry out the empirical analysis, we picked up 53 of these national discretions for which we could clearly identify whether its adoption implied more or less stringency in regulation or more or less risk sensitive than the benchmark given by the Directive.[5] We include a description of each ND in Annex I.

For each country, the CEBS' data reflects whether the discretion has been exercised or not (YES/NO answer) by each one of the EU countries. Thus, most of the national discretions can be specified as simple zero/one variables. In general, we assign a value of 1 when the answer reflects a more stringent regulatory treatment or when it implies a more risk sensitive approach[6] than the benchmark provided by the Directive. We group the responses provided by the MS into aggregate indexes that we define below.

We first group national discretions in two main categories, depending on whether they affect the stringency or the risk sensitivity of regulation. This aggregation allows us to analyse the impact of overall stringency (ST) and overall risk sensitivity (RS) on bank's risk, capital and efficiency.

Alternatively, we group ND in a more disaggregated form, defined in relation to the regulatory areas that they cover. Following CEBS, we distinguish the areas of own funds (OF),

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3. http://www.c-ebs.org/Publications/Consultation-Papers/All-consultations/CP11-CP20/CP18.aspx.

4. See Annex 1 for a short description of the National Discretions included in the empirical part.

5. There are 11 transitional discretions that could also be classified, but because of their temporary nature have not been included in the analysis.

6. More risk sensitivity does not necessarily imply a greater stringency in terms of capital requirements, as this will depend on the financial institutions' risk profile.

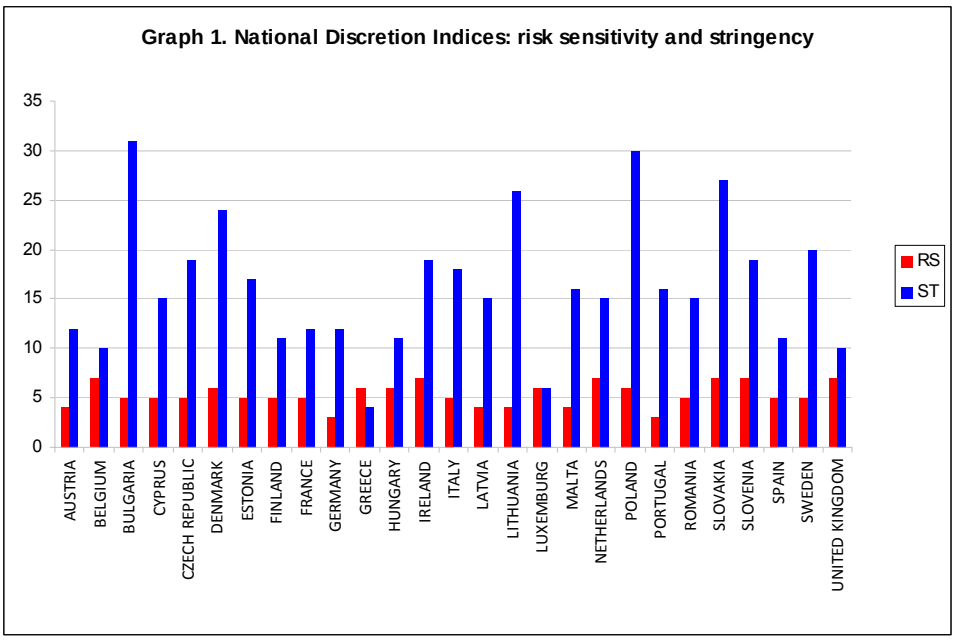
scope of application (S), credit risk under the standard approach (CRSA), credit risk under the Internal Ratings-Based approach (IRB),[7] Counterparty risk (CRD) and Operational Risk (OR).[8] CRSA, IRB and CRD are, in fact, split in two: one covering stringency (XX_ST), and the other risk sensitivity (XX_RS). The actual number of national discretions included in each group is different and spans from as few as one in CRD_RS or two in CRD_ST to as much as 14 in CRSA_ST, as the last line in Table 1 records. The aggregate index ST is obtained from the sum of all the indices that cannot be split plus the ST part of those that can. The aggregate index RS is obtained as the sum of those that have been classified as RS.

Following Barth et al. (2004), we use two methods to construct the indices for regulatory stringency and risk sensitivity that incorporate the answers to several of the ND. First, we simply add the individual zero/one answers, so that a higher value of the index implies higher stringency in the regulation of the area or higher risk sensitivity, if risk is the issue. The drawback of this method is that it gives equal weight to each of the components in constructing the index. The second method involves calculating the first principal component of the underlying ND, to obtain a principal component with mean zero and standard deviation one. The advantage over the simple aggregation is that no equal weights to the different ND are assumed. The disadvantage is that it does not allow assessing the impact of a change in a specific ND used for the construction of the index.

Using the equiponderated aggregation we observe (Graph 1) that no MS has chosen a combination of National Discretions that implies either most stringency (value of 41) or most risk sensitivity (value of 10). On the other hand, none has either chosen an overall combination of most lenient treatment or least risk sensitivity and only five of the twenty-seven MS present a stringency index whose value is over half the maximum and eleven whose value for risk sensitivity is above half the maximum value. We observe that MS that have joined the EU in recent years, with a few exceptions, tend to have chosen more stringent and more risk sensitive national discretions than former members.

7. To measure its credit risk for regulatory purposes, the bank can use three approaches: the standardized approach, the foundation internal ratings based approach (IRB), and the advanced IRB approach: (i) the standardized approach uses only a predetermined risk weight for different types of loans; (ii) the model underlying the internal ratings based approach is the one-factor Gaussian copula model of time to default

8. The equiponderated indices for each country are recorded in Table A1 in Annex 1.



For the rest of the paper, following the approach in the works of Barth et al. (2004, 2006 and 2008), we only report the results obtained with the principal components index.

The simple correlation between the different indices in the different countries is in general low (Table 1), reflecting that the choice made by MS in relation to the ND is rather diverse. Moreover, the area of counterparty risk (CRD) tends to show a negative correlation with the rest of areas, which may result from some sort of substitutability between areas. The highest values for the correlations (above 50%) can be found between the areas of Own Funds and Scope, Operational Risk and Scope, and Operational Risk and the Standard Approach indices.

Table 1
CORRELATIONS AMONG ND INDICES

	OF	S	CRSA_ST	CRSA_RS	CRD_ST	CRD_RS	IRB_ST	IRB_RS	OR
OF	1								
S	0.576	1							
CRSA_ST	0.310	0.409	1						
CRSA_RS	0.007	-0.313	-0.007	1					
CRD_ST	-0.115	-0.348	-0.309	0.238	1				
CRD_RS	-0.420	-0.341	-0.455	0.143	0.522	1			
IRB_ST	0.485	0.443	0.444	-0.198	-0.080	-0.467	1		
IRB_RS	0.302	0.159	0.158	-0.107	0.242	-0.090	0.279	1	
OR	0.155	0.501	0.527	-0.168	-0.170	0.015	0.416	0.240	1
# ND	4	7	14	4	2	1	12	6	3

4 Methodological framework

All Member States should have transposed the new Directive by the end of 2007, and, therefore, banks should have been operating under the new regulatory framework by that year.[9] Based on the assumption that regulation is very persistent in time [Barth et al. (2006)], so that it takes time for a country to change dramatically its regulatory system, we can also assume that countries exercised, for each national discretion, the option more similar to the regulation in force before 2007. National Discretions can, thus, be regarded as reflecting current practices in the countries that apply them, as their existence in the Directive is justified on the grounds that they try to accommodate different regulatory approaches. In that sense, the analysis we carry out is not about the impact of the new regulation but of the regulation itself.

The empirical analysis proposes testing whether bank risk, efficiency, costs and capital are affected by the characteristics of these national discretions, taking into account other features of the functioning of the countries. In particular, the following regression model is estimated to capture the impact of National Discretions on bank's risk, capital and efficiency:

$$Y_{jn} = \alpha + \beta\, ND_n + \gamma\, COUNTRY_n + \lambda\, CONTROL_{jn} + \varepsilon_{jn} \qquad [1]$$

Where *n* indexes country n, and *j* indexes bank j.

Moreover, Y_{jn} is either $RISK_{jn}$, the observed value of the measure of risk chosen for the jth bank operating in country n, or $CAPITAL_{jn}$, the amount of capital that a bank holds, or $INEFFICIENCY_{jn}$, the observed value of the measure of inefficiency for the jth bank in country n; ND_n is the vector of National Discretions; $COUNTRY_n$ is a vector of country specific variables, $CONTROL_{jn}$ is the vector of control variables that are bank specific and that differ depending on the variable that is being explained; α, β, γ, λ are the regression coefficients and ε_{jn} is the disturbance term. Our focus of attention will be the sign and statistical significance of the β coefficients. If β has a statistically significant negative sign in the risk equation and/or a positive sign in the capital equation, we can say that the corresponding ND has a positive impact on solvency. Moreover, if β has a statistically significant positive sign in the inefficiency equation, we can say that the corresponding ND has a negative impact on efficiency.

Following Altunbas et al. (2007) we specify a system of equations and estimate these using Zellner's Seemingly Unrelated Regression (SUR) approach. This allows for considering the possibility of correlated errors between the equations as we are using the same accounting data in all of them, while controlling for relevant variables, whether country or bank-specific.

4.1 The dependent variables

We proxy INEFFICIENCY with two variables:

9. The only exceptions were Malta, Spain and Greece, which transposed the directive a year later.

AC_{jn}: Average costs obtained as the ratio of total costs (overhead costs + interest expenses) divided by total assets.

$INEFT_{jn}$: cost inefficiency measure. It is obtained as the distance of a firm's observed operating costs to the minimum or "best practice" efficient cost frontier. It is derived from the estimation of a stochastic cost frontier using a translog specification, whose details can be found in Annex 2.

As for RISK, we proxy it with:

$LOLPTA_{jn}$: Loan loss provisions over total assets.[10] It is derived from accounting information so that it has the limitations inherent to such kind of data, of being backward looking. Higher levels of provisions are suggestive of greater banking risk.

And for CAPITAL we use:

ETA_{jn}: the ratio of book value of equity to total assets, where equity includes preferred shares and common equity.

4.2 The control variables

As it is crucial to use a variety of control variables and sensitivity checks to mitigate problems while interpreting the findings, we propose including the following:

Bank size. As a measure of size we use the natural log of total assets for bank j in country n ($SIZE_{jn}$). As pointed out by McAllister and McManus (1993), larger banks have better risk diversification opportunities and thus lower cost of funding than smaller ones. On the other hand, the "too-big-to-fail" argument suggests that larger banks would benefit from an implicit guarantee that, other things equal, decreases their cost of funding and allows them to invest in riskier assets. Previous empirical evidence on this issue produced ambiguous results. We also include bank size squared ($SIZE2_{jn}$) to capture any non linearity in the relationship.

Fee income. As a measure of banks' different product mixes we include the variable $FEES_{jn}$ that equals non-interest-operating income divided by total assets. Since banks engage in different non-lending activities, these other activities may influence the pricing of loan products due to cross-subsidization of bank products. Thus, we include fee income to control cross-bank differences in the products offered by banks.

Bank liquidity. The bank liquidity is proxied with the ratio of liquid assets to costumer and short term deposits for bank j in country n ($LIQUID_{jn}$). We could expect that banks with a high level of liquid assets will receive lower interest income than banks with less liquid assets. Moreover, although it need not reflect a more efficient asset allocation, liquidity could affect efficiency.

Bank loans. We use the change in total net loans to total assets as the measure of bank's lending activity ($TNLTA_{jn}$). Loans might be more profitable than other types of assets such as securities. Loans might be more costly to produce than other types of assets.

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10. A similar measure (with reserves) is used by Altunbas et al. (2007).

Moreover, we can expect that the more loans a bank makes to the retail or the corporate sector, the higher the risk tolerance of bank managers.

Shadow banking. We include a proxy for shadow banking as we can expect that its size can affect the capacity of the regulatory framework to impact the banks performance and results. We proxy it with the ratio of off balance sheet items divided by off balance sheet items + total assets, as it reflects the weight of off-balance sheet items in a bank ($OFFBALR_{jn}$).

Return on assets. In the capital equation we also include a proxy of bank profits ($ROAA_{jn}$), which is the computed return on average assets that is available in the Bankscope dataset.

4.3 The country variables

We control for the following country variables:

COIRC : Cost-to-income ratio (% of total income) to control for banking efficiency

OEPOAC: Total expenses (% of total assets), which should account for production costs in the banking system.

GDP: The national GDP growth rate, which should account for the impact of the economic cycle on bank performance.

HERFINDAHL. It is the Herfindahl index that should cover for the competitiveness of the national markets.

DIP: It is the index Deposit Insurer Power from Barth et al. (2004 and 2008). It ranges from 1 to 3 with higher values indicating more power.

4.4 The National Discretions variables

The National Discretions variables are included in the regression and their relevance tested for different specifications. In particular, for the ND grouped depending on their stringency and risk sensitivity, we run a regression with the aggregate index and a regression for each one of the different areas of regulation. We could expect that more stringency, which would be associated with higher values for the indices, would result in lower risk and higher capital, as a proxy for higher solvency while negatively affecting efficiency and increasing costs.

It could be argued that the choice by a country of more stringency or more risk sensitivity in regulation results from the efficiency and solvency of their banking system. The possibility of such inverse causation needs therefore to be addressed.

Because of lack of a time series, we test for it with the calculation of the simple correlations between each one of the ND indices for risk sensitivity or stringency and the variables that we are analysing (risk, capital, efficiency and costs). We also carry out the estimation of a univariate regression where each one of the indices is explained only by each one of the variables, at the country level. As the results in Table 2 show, the correlations are very low (part A) and the coefficients are only statistically significant for the variable of

capital in the case of stringency and the ND on scope and for the variable of efficiency in the case of the ND on scope if AC is used (part B).[11]

Table 2
DEPENDENCY BETWEEN ND VARIABLES AND BANKS' RISK, CAPITAL , EFFICIENCY AND COSTS

A. Simple correlations [(1)]

	ST	RS	OF	S	CRSA_ST	CRSA_RS	CRD_ST	CRD_RS	IRB_ST	IRB_RS	OR
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
LOLPTA	-0.029	0.274	0.192	0.139	-0.190	-0.178	0.070	0.106	-0.227	0.195	-0.029
ETA	0.368	0.302	0.166	0.474	0.232	-0.206	-0.112	-0.046	0.218	0.293	0.391
INEFT	-0.123	-0.293	-0.198	-0.130	-0.075	-0.042	0.115	-0.069	0.055	-0.321	-0.037
AC	-0.125	-0.002	-0.197	-0.327	0.082	0.167	0.282	0.126	0.114	0.107	-0.147

B. Univariate regressions of ND on Banks' Risk, Capital, Efficiency and Costs [(2)]

	ST	RS	OF	S	CRSA_ST	CRSA_RS	CRD_ST	CRD_RS	IRB_ST	IRB_RS	OR
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
LOLPTA	-0.008	0.179	0.105	0.636	-0.071	-0.157	0.040	0.079	-0.104	0.135	-0.028
ETA	0.912*	1.780	0.822	1.959**	0.787	-1.632	-0.579	-0.307	0.900	1.823	3.425
INEFT	-0.183	-1.043	-0.591	-0.323	-0.154	-0.200	0.358	-0.278	0.138	-1.204	-0.197
AC	-1.288	-0.048	4.037	-5.597*	1.150	5.509	6.047	3.514	1.956	2.773	-5.328

(**) Statistically significant at 5% level of confidence, (*)Statistically significant at 10% level of confidence

(1) Simple correlation by country

(2) Coefficient β in the regression of ND= α+β*Y, where y is either banks' risk, capital, efficiency or cost averaged by country

We interpret both the low correlations and the lack of statistical significance as a sign of no causation, so that banks' risk, capital and efficiency do not determine the level of stringency and risk sensitivity chosen by MS.

We apply a filter to detect and remove outliers for the control variables (roughly corresponding to the 1st and 99th percentiles of the distribution of the respective variable, distinguishing among banks, saving and cooperatives).

11. The main differences in relation to the equiponderated indices arise in relation to the OR area, where the sign differs. In particular, under the simple index the relation is positive with LOLPTA and INEFT. It is also the case that LOLPTA is statistically significant for CRSA, and RS for AC.

5 Results

5.1 Aggregate results

The information in Table 3 presents the qualitative results obtained through the estimation of the system of equations in [1], when we have included in the specification, both jointly and individually the two aggregate ND indices that distinguish between risk sensitivity (RS) and stringency (ST). The Table summarises whether more solvency is obtained, through either higher capital or lower risk or both and whether higher inefficiency or higher costs or both accompany more stringency and more risk sensitivity. It also reflects whether these results show evidence of a trade-off between solvency and efficiency.

We find no evidence of a trade-off for overall stringency while we do for overall risk sensitivity. In particular, we find evidence that more stringency results in higher solvency, but cannot find evidence that it is also associated with higher inefficiency. On the other hand, overall higher risk sensitivity in capital requirements is associated with higher solvency but also with higher inefficiency, thus resulting in a trade-off between solvency and efficiency.

Table 3
TRADE-OFF BETWEEN SOLVENCY AND EFFICIENCY IN CAPITAL REQUIREMENTS. INDIVIDUAL AND JOINT RESULTS OF AGGREGATE STRINGENCY AND RISK

	SOLVENCY	INEFFICIENCY	TRADE-OFF
Individual Impact			
Stringency	**Y**	**N**	**N**
Risk Sensitivity	**Y**	**Y**	**Y**
Joint Impact			
Stringency	**Y**	**N**	**N**
Risk Sensitivity	**Y**	**Y**	**Y**

Table 4 provides the more detailed qualitative results that support the relations that have just been summarised. In particular, Table 4 records the statistical significance and the sign of the coefficient for the ND indices (β coefficients in [1]) on each of the estimated two sets of equations; that is, the set that includes INEF as the inefficiency measure (first line recorded in the Table) and the one that includes AC, instead (second line). Under Risk we show the results obtained for the estimation of β in the risk equation (LOLPTA as the dependent variable); under Capital we record the results for β in the capital equation (ETA) and under Inefficiency the results obtained for this coefficient in the efficiency and cost equation (INEF and AC), respectively. The detailed quantitative results for the joint estimate can be found in Annex 3.

The results show that, in general, the overall stringency and the overall risk sensitivity inherent in the choice of national discretions have an impact on risk, on capital and on

efficiency. We find that both stringency and risk sensitivity in regulation have the desired positive effect on solvency: the more stringent the choice of discretions is and the more their risk sensitivity, the lower the risk that firms show, as recorded by a negative statistically significant coefficient for the ND indices in the risk equation. Moreover, we also find evidence that more risk sensitivity is associated with higher capital, as the positive statistically significant coefficient in the capital equation reflects.

Table 4
IMPACT OF STRINGENCY AND RISK SENSITIVITY IN CAPITAL REQUIREMENTS ON RISK, CAPITAL, EFFICIENCY AND COSTS

	RISK	CAPITAL	INEFFICIENCY	
			TECH	COST
Individual Impact				
Stringency	-**	.	.	
	-**	.		-**
Risk Sensitivity	**-****	**+****	**+****	
	-**	+**		.
Joint Impact				
Stringency	-**	.	.	
	-**	.		-**
Risk Sensitivity	-**	+**	+**	
	-**	+**		+*

(**) Statistically significant at 5% level of confidence, (*)Statistically significant at 10% level of confidence

As for the undesired effects on efficiency, we find that while higher inefficiency also results from higher risk sensitivity, higher stringency is associated with lower costs, a result that is be consistent with Berger's findings.

Therefore, more general regulatory stringency in capital requirements seems to result in a positive effect on financial stability as it is associated with lower risk. Moreover, more stringency results in lower costs, a finding that could be explained by markets' positively valuing stringency and thus generating lower funding costs.

We also find that risk sensitivity in the choice of ND for capital requirements has a positive impact on stability, both through its positive impact on capital and through its negative one on risk. But this benefit is counterbalanced by its negative impact on efficiency and on higher costs, so that for risk sensitivity we observe a trade-off between solvency and efficiency.

5.2 Disaggregated results by areas of discretion

The aggregate indices can be regarded as reflecting the general approach to capital regulation that the supervisors have. We could think that there may be some heterogeneity in the effects that the different areas of discretion can have on solvency and efficiency, not only because their incidence may be heterogeneous, but also because their impact may differ. It could be the case that in spite of the fact that regulators have chosen the more stringent option, there are but few institutions under their jurisdiction that are directly affected by the measure. On the other hand, areas such as own funds may have a more widespread

incidence, than other areas where the relationship with capital or risk may be more indirect. Moreover, it could be the case that the isolated effects of a specific area of capital regulation differ from the rest because of its interaction with other regulatory aspects.

The analysis of the impact of each one of the different areas of national discretion is carried out using two approaches. Under the first one, we only include one ND index at a time in the specification, so that we try to capture its impact independently from the rest of the measures, so as to obtain the individual effect. In fact, such approach is the one that underlines the way policy makers usually carry out the analysis of the effects of each measure. In general, when a policy decision needs to be reached, it is usually the case that only the effects that could be expected from the specific proposal that the policymakers are analysing are considered, as if the decisions were taken in isolation with respect to the rest of the measures. In general, the task forces or working groups that are being created to discuss policy decisions look at each area of regulation in isolation.

Under the second approach, we try to overcome the limitations of the isolated approach by jointly including in the specification to be estimated all the different areas of national discretion and then testing for their individual relevance. This approach allows us to capture the interactions that could exist among them.

We first present the summary results obtained from the individual estimates in relation to the existence of a trade-off between efficiency and stability in the choice of ND (Table 5), before analysing the detailed individual results (Table 6) that give rise to the summary that is recorded in the previous Table. We finalise this section presenting this same results when the joint estimates are considered (Tables 7 and 8).

5.2.1 INDIVIDUAL EFFECTS BY AREAS OF DISCRETION

As recorded in Table 5, we find evidence that for all areas of ND, except the risk sensitivity component of the Counterparty Risk, the regulators' expected positive relationship between solvency and stringency or risk sensitivity holds. However, we cannot unambiguously establish the sign of this relationship in the areas of own funds and the stringency component of Counterparty Risk.

As for the effect on efficiency of having more stringency in particular areas of ND, we observe mixed results. In particular, we obtain that in three areas of ND (Scope, the stringency component of the Standard Approach and the risk component of the Counterparty Risk) we cannot find evidence of more inefficiency for having been chosen. All in all, we only find evidence of a trade-off between efficiency and solvency in the areas of Operational Risk, both components of IRB and the risk component of the Standard Approach.

Table 5
TRADE-OFF BETWEEN SOLVENCY AND EFFICIENCY IN CAPITAL REQUIREMENTS. INDIVIDUAL RESULTS

	SOLVENCY	INEFFICIENCY	TRADE-OFF
Specific Stringency:			
Own Funds	**Y (?)**	**Y (?)**	**N**
Scope	**Y**	**N**	**N**
Standard	**Y**	**N**	**N**
Internal Models	**Y**	**Y (?)**	**Y**
Counterparty	**Y (?)**	**Y**	**N**
Operational	**Y**	**Y**	**Y**
Specific Risk			
Standard	**Y**	**Y**	**Y**
Internal Models	**Y**	**Y**	**Y**
Counterparty	**N**	**N**	**N**

The detailed results in Table 6 show that in all the areas of ND where we have found evidence of a positive relationship between stringency and solvency, this is so by either a positive impact on capital (Own Funds, IRB and Counterparty Risk) and/or a negative on risk (Scope, Standard Approach, IRB and Operational). However, in the areas of Own Funds and Counterparty Risk we also obtain a positive impact on risk, under the specification that uses technical inefficiency, thus raising some ambiguity as far as the final relationship is concerned, as it will depend on the relative impact on capital and risk of stringency in these areas. As for the impact of having more risk sensitivity capital regulation, we find that it increases stability when it is channelled through the ND of both the Standard and the IRB approach, through its positive impact on capital (Standard and IRB) and negative on risk (IRB). However, it has the undesired effect of raising risk when it is channelled through the Counterparty Risk.

The effects on efficiency are more mixed up. As for stringency, we obtain contradictory results for the areas of Own Funds and IRB, depending on which variable is chosen to capture inefficiencies: we get a positive relationship with technical inefficiency, but a negative one with cost. Only in the areas of the Stringency component of Counterparty Risk and operational Risk the evidence points clearly at a positive impact on inefficiency. Moreover, in the areas of Scope and the stringency component of the Standard Approach we cannot find a positive relationship with inefficiency: in the latter case, because there is no statistically significant relationship and in the area of Scope as more stringency is associated with lower costs.

Finally, more risk sensitivity in the areas of the Standard Approach and the IRB approach result in higher inefficiency, a result that does not hold in the area of Counterparty Risk.

Table 6
IMPACT OF STRINGENCY AND RISK SENSITIVITY IN AREAS OF NATIONAL DISCRETION ON RISK, CAPITAL, EFFICIENCY AND COSTS. INDIVIDUAL RESULTS

ND Index	RISK	CAPITAL	INEFFICIENCY	
			TECH	COST
Specific Stringency:				
Own Funds	+*	+**	+**	
	.	+**		-**
Scope	-**	.	.	
	-**	.		-**
Standard	-**	.	.	
	-**	-**		.
Internal Models	-**	+**	+**	
	-**	+**		-**
Counterparty	+*	+**	+**	
	+	+**		+
Operational	-**	.	.	
	-**	.		+**
Specific Risk				
Standard	.	+**	+**	
	.	+**		+**
Internal Models	-**	+**	+**	
	-**	+**		.
Counterparty	.	.	-*	
	+**	.		-**

(**) Statistically significant at 5% level of confidence, (*)Statistically significant at 10% level of confidence

5.2.2 JOINT EFFECTS BY AREAS OF DISCRETION

The analysis carried out so far considers the effect of each one of the different areas of capital standards regulation in isolation, as if the other measures were not in place. It can provide us a guide to what we can expect if only this regulatory area is implemented. In order to take into account the possibility that decisions are jointly made in different areas and that some interaction takes place, we estimate the set of equations in (1) including as explanatory variables all the ND indices.[12]

The comparison of the results summarised in Table 7 and detailed in Table 8 with the ones just presented in Tables 3 and 4 shows that as far as the areas of risk sensitivity are concerned, the same relationships that we have captured hold under the joint analysis. That is, more risk sensitivity in capital requirements results in a trade-off between solvency and efficiency except in the area of counterparty risk.

On the other hand, in the ND areas that reflect stringency, the results we obtained when we considered the effects in isolation do not always hold when the joint analysis is carried out. In particular, we observe a trade-off between solvency and efficiency in the areas of Scope and the Standard Approach that we had not been observed when the effects were analysed in isolation, while we do not observe such a trade-off for IRB and Operational Risk.

12. See Table A.4 in Appendix 3.

When we consider the joint effects of all ND we still obtain in most cases that stringency is positively associated with solvency, the exceptions being Own Funds and Operational Risk. On the other hand, the effects on efficiency under the joint analysis seem to provide different results from the ones obtained under the individual analysis. Under the joint approach, we find that more stringency in the areas of Scope, the Standard Approach and Counterparty risk are associated with higher inefficiency, a relationship we only got under the individual analysis for the latter. On the other hand, we do not observe such relationship in the areas of Own Funds, IRB and Operational Risk, when we did, under the individual analysis.

Table 7
TRADE-OFF BETWEEN SOLVENCY AND EFFICIENCY IN CAPITAL REQUIREMENTS. JOINT RESULTS

	SOLVENCY	INEFFICIENCY	TRADE-OFF
Specific Stringency:			
Own Funds	**N**	**N**	**N**
Scope	**Y**	**Y**	**Y**
Standard	**Y**	**Y**	**Y**
Internal Models	**Y**	**N**	**N**
Counterparty	**Y (?)**	**Y (?)**	**N**
Operational	**N**	**N**	**N**
Specific Risk			
Standard	**Y**	**Y**	**Y**
Internal Models	**Y**	**Y**	**Y**
Counterparty	**N**	**N**	**N**

The more detailed results recorded in Table 8 show that we obtain that more stringency in Own funds and in Operational Risk does not result in higher solvency, as either capital is lower (Own Funds) or risk is higher (Own Funds and Operational Risk). For the rest of the areas, the positive relation between stringency and solvency shows through higher capital, when under the individual approach it was mainly showing in lower risk. In the case of the Standard Approach it is reinforced by its negative relation to risk.

We also find that in the areas where stringency is the issue, there is a negative relationship with inefficiency only in the areas of Scope and the Standard Approach. For these areas be observe that higher stringency is associated with higher technical inefficiency, a result that we did not get under the isolated analysis. In the area of the Standard Approach it also shows in higher costs. There is no other area were we observe a positive relationship between stringency and costs, as either it is not statistically significant (Scope) or it is negative (Own Funds, IRB, Counterparty Risk and Operational Risk).

Table 8
IMPACT OF STRINGENCY AND RISK SENSITIVITY IN AREAS OF NATIONAL DISCRETION ON RISK, CAPITAL, EFFICIENCY AND COSTS. JOINT RESULTS

ND Index	RISK	CAPITAL	INEFFICIENCY	
			TECH	COST
Specific Stringency:				
Own Funds	.	-**	-*	
	+**	.		-**
Scope	.	+**	+**	
	.	+**		.
Standard	-*	+**	+**	
	-**	.		+**
Internal Models	.	+**	.	
	.	.		-**
Counterparty	+**	+**	+**	
	.	+**		-*
Operational	.	-**	-**	
	.	-**		-**
Specific Risk				
Standard	.	+**	.	
	.	+**		+**
Internal Models	-**	.	.	
	-**	.		+**
Counterparty	.	.	-*	
	.	.		-**

(**) Statistically significant at 5% level of confidence, (*)Statistically significant at 10% level of confidence

6 Simulation of different choices

We use the results that we have obtained in order to quantify the effect that different choices of stringency and risk sensitivity in capital regulation would have implied on risk, capital and efficiency, under a *ceteris paribus* assumption. In particular, we propose analysing the impact on these factors of choosing for all MS the most stringent possible combination of National Discretions (ST_MAX), the least stringent one (ST_MIN), the most risk sensitive one (RS_MAX) and the least sensitive one (RS_MIN). With the analysis that we have carried out we cannot estimate the impact of changing the rules chosen in each country, but we can simulate the implicit effect under the estimates we have obtained.

We also present the results obtained under the option chosen by CEBS in its October 2008 advice (ST_CEBS). In particular, CEBS proposed to keep as an option or national discretion 28% of the 152 provisions covered in its analysis.[13] It must be reminded that the choice made by CEBS implied changes only in ND that we have gathered under the stringency index, but it did not propose changing the treatment given to any of the discretions that we have grouped under the risk sensitivity index, so that the impact that we can capture for CEBS choice is channelled only through the effects of more or less stringency on risk, capital and costs.

We present in Table 9 the quantitative results that we obtain from the estimation of the model that had *AC* as the efficiency measure and when the equiponderated indices were used[14] (Table A5 in Appendix 3). We apply the coefficients that we have estimated to the difference between the observed index and the corresponding index that we would obtain if the choice of ND had been each one of the combinations above mentioned. When the coefficient is not statistically significant, we assume the effect to be nil. The values on the Table reflect the changes in the mean risk, capital and cost variable that each choice would imply in each country.

13. In particular, following the Call for Advice CEBS classified the options and national discretions into three categories: i) options and discretions that might be subject to mutual recognition; ii) possible legitimate options and discretions; and iii) options and discretions which should be deleted. We can only take into consideration ii) and iii). On April 2009 the Commission requested further technical advice on several national discretions, which was delivered in June. Further work is expected within the next future.

14. We cannot use the Principal Component Indices in this part as we want to estimate the differential impact. See Table A5 in Appendix 3.

TABLE 9

SIMULATION OF IMPACT ON AVERAGE RISK , CAPITAL AND COSTS OF DIFFERENT PROPOSALS ON THE LEVEL OF STRINGENCY AND RIST SENSITIVITY BY COUNTRY (1)

	RISK					CAPITAL		COSTS				
	ST_CEBS	ST_MAX	ST_MIN	RS_MAX	RS_MIN	RS_MAX	RS_MIN	ST_CEBS	ST_MAX	ST_MIN	RS_MAX	RS_MIN
country	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
AUSTRIA	0.067	-0.974	0.403	-0.926	0.618	0.474	-0.316	0.018	-0.260	0.108	0.508	-0.339
BELGIUM	-1.753	-54.349	17.532	-24.173	56.404	0.309	-0.721	-0.008	-0.245	0.079	0.224	-0.523
BULGARIA	-0.160	-0.441	1.203	-0.921	0.921	0.370	-0.370	-0.039	-0.107	0.291	0.458	-0.458
CYPRUS	0.000	-0.517	0.298	-0.457	0.457	0.513	-0.513	0.000	-0.159	0.092	0.290	-0.290
CZECH REP	0.000	-0.690	0.596	-0.720	0.720	0.350	-0.350	0.000	-0.250	0.215	0.535	-0.535
DENMARK	-4.153	-17.649	24.916	-19.086	28.629	0.230	-0.344	-0.036	-0.153	0.215	0.339	-0.509
ESTONIA	-0.008	-0.181	0.128	-0.173	0.173	0.248	-0.248	-0.007	-0.162	0.115	0.319	-0.319
FINLAND	-0.842	-25.259	9.262	-19.349	19.349	0.616	-0.616	-0.009	-0.271	0.099	0.427	-0.427
FRANCE	0.000	-1.396	0.578	-1.106	1.106	0.292	-0.292	0.000	-0.229	0.095	0.372	-0.372
GERMANY	0.029	-0.831	0.344	-0.922	0.395	0.751	-0.322	0.009	-0.251	0.104	0.573	-0.246
GREECE	0.069	-1.270	0.137	-0.631	0.947	0.383	-0.575	0.019	-0.354	0.038	0.361	-0.541
HUNGARY	0.022	-0.657	0.241	-0.402	0.604	0.181	-0.272	0.005	-0.138	0.051	0.174	-0.261
IRELAND	-0.295	-6.487	5.603	-4.066	9.487	0.162	-0.378	-0.007	-0.154	0.133	0.198	-0.463
ITALY	0.000	-0.907	0.710	-0.906	0.906	0.330	-0.330	0.000	-0.224	0.175	0.459	-0.459
LATVIA	0.000	-2.446	1.411	-2.594	1.729	0.294	-0.196	0.000	-0.209	0.120	0.455	-0.303
LITHUANIA	-0.131	-0.656	1.137	-1.206	0.804	0.464	-0.310	-0.027	-0.133	0.230	0.501	-0.334
LUXEMBOURG	0.036	-1.289	0.179	-0.659	0.988	0.497	-0.746	0.007	-0.255	0.035	0.267	-0.401
MALTA	0.000	-3.973	2.543	-4.382	2.921	0.449	-0.299	0.000	-0.259	0.166	0.588	-0.392
NETHERLANDS	0.000	-7.327	4.227	-3.885	9.066	0.235	-0.549	0.000	-0.018	0.010	0.019	-0.045
POLAND	-0.733	-2.199	5.313	-3.368	5.053	0.289	-0.434	-0.030	-0.090	0.216	0.282	-0.423
PORTUGAL	0.000	-0.809	0.518	-1.041	0.446	0.552	-0.236	0.000	-0.213	0.136	0.563	-0.241
ROMANIA	0.017	-0.445	0.257	-0.394	0.394	0.363	-0.363	0.006	-0.143	0.083	0.260	-0.260
SLOVAKIA	-0.024	-0.359	0.622	-0.330	0.770	0.182	-0.426	-0.010	-0.149	0.259	0.282	-0.658
SLOVENIA	-0.024	-0.537	0.464	-0.449	0.673	0.295	-0.442	-0.011	-0.232	0.200	0.398	-0.597
SPAIN	0.033	-1.038	0.335	-0.770	0.770	0.506	-0.506	0.012	-0.367	0.118	0.558	-0.558
SWEDEN	-0.242	-2.666	2.302	-2.784	2.784	0.260	-0.260	-0.021	-0.235	0.203	0.505	-0.505
UNITED KING	0.000	-0.938	0.303	-0.417	0.974	0.220	-0.513	0.000	-0.180	0.058	0.165	-0.385

(1) obtained from the results of the estimation presented in col. 1 in Tables A3 to A5. Under CEBS, MAX_ST, MIN_ST it is recorded the change in the variables under the CEBS, the maximum and minimum stringency option, respectively. Under MAX_RS and MIN_RS it is recorded the change in the variables under the maximum and minimum risk sensitivity option, respectively.

The results presented in Table 9 show that the CEBS option does have rather large effects on the risk ratio in most countries [col. (1)], especially if we compare them with the effects on average costs [col. (8)]. We might get both rises and declines in risk depending on whether the country reduces its stringency under the option proposed by CEBS (a rise in risk) or increases it (a decline in risk). In fact, the largest impacts are obtained in reductions in risk, implying that CEBS proposal implies larger movements towards more stringency, rather than making countries less stringent. From our calculations, the risk ratio could increase at most 6% in some countries while the reductions could reach as far as nearly 5 times the initial ratio. On the other hand, from our calculations the impact of CEBS proposal on costs also shows both signs [col. (8)], which depend on the country. It is the case that if the adoption of the CEBS proposal implies an increase in stringency in a given country, we can expect to see reductions in costs. By the same token, for those countries where stringency will be reduced, we can expect to observe increases in cost. Our estimates show that we can expect increases of at most 1% and declines of at most 2% on average costs, resulting from CEBS option.[15] Finally, because of lack of statistical significance of the coefficient, we assume that we cannot observe any effect on capital.

The choice of maximum (minimum) stringency would result in much higher effects on the average country risk and costs in absolute terms than the ones we would obtain under the CEBS option, but they would always have the same negative (positive) sign in all countries.

In absolute terms, moving towards maximum stringency would result in higher changes in risk than moving towards minimum stringency in most countries, the exceptions being Bulgaria, Denmark, Lithuania, Poland and Slovakia. The contrary would be the case when comparing maximum and minimum risk sensitivity, as the move towards the minimum would imply the largest changes in most countries, with the exceptions of Austria, Germany and Poland. We also find that changing to maximum stringency has in absolute values higher impact than changing towards minimum risk sensitivity in most countries.

15. We need to establish the equivalence between a unit of risk over total assets and one unit of costs over total assets in order to determine whether CEBS option, or any policy option produces a net benefit.

The effects in absolute values on the capital ratio of choosing a maximum risk sensitivity capital framework are lower than the ones we would obtain from moving towards a minimum risk sensitivity regulation in terms of ND. That is, in most countries, the choice of the least risk sensitive combination of ND would result in declines in capital that would be much larger than the corresponding increases that would be produced if the choice of maximum risk sensitivity would be taken.

Finally, the increase in costs resulting from the minimum stringency option would be in absolute values lower than the decline in average costs as a result of a maximum stringency choice in most countries. As with risk, the contrary would happen when the choice is made between maximum and minimum risk sensitivity, as in this case, the decline in costs from choosing minimum risk sensitivity would be larger than the increase if the contrary option were chosen.

7 Summary and conclusions

This paper carries out an empirical analysis of the effects on financial institutions of the choice of more or less stringency and more or less risk sensitivity in capital requirements, using the so-called national discretions and options (ND) that figure out in the Capital Requirements Directive. In particular, after controlling for individual firm characteristics, and country specific aspects, we test for systematic impact of different groups of National Discretions on the risk, capital, efficiency and costs of banks using individual data for financial institutions operating in 2007 in the 27 European Union countries, by means of the estimation by SURE of a system of equations. To do so, we have built for each country, different indices that group together the ND, and whose value is positively associated with stringency or risk sensitivity. The first group is composed of two aggregate indices that reflect either the stringency or the risk sensitivity in the choice of discretions, and which are assumed to reflect overall stringency and overall risk sensitivity in capital regulation. The second group is composed of nine indices that group together discretions that deal with a specific area of capital requirements regulation and whose value is also positively associated with stringency or risk sensitivity. Such disaggregation allows us to test whether different areas of regulation have different impact on financial institutions.

Our results show that more stringency and more risk sensitivity in capital requirements usually have the desired impact on solvency. That is, in general, more stringency or more risk sensitivity in regulation results in financial institutions having either lower risk and /or higher capital. Such relationship is obtained both when the overall stringency and risk sensitivity and the specific areas of the regulatory capital framework are considered. However, in the case of ND dealing with Own Funds and Counterparty Risk, we also find evidence that more stringency could be associated with more risk taking, as well. The fact that we cannot take into account the quality of capital may be one of the factors explaining this result.

We also found that, in general there is no trade off between stringency and efficiency. The areas of Operational Risk and IRB may be the exception, when taken in isolation, while the areas of Scope and the Standard Approach show that relationship when the effects of all the ND are jointly analysed. In all these cases we gathered evidence of a positive relationship with inefficiency. The ambiguity as regards the effect on solvency in the areas of Own Funds and Counterparty Risk does not allow us to conclude that for these areas there is a trade-off.

In the case of more risk sensitivity in capital standards we find evidence of a trade-off, so that by choosing more risk sensitivity ND we can expect higher solvency, but also higher inefficiencies and/or costs. The exception is again in the area of Counterparty Risk where we not only could not find a positive impact on solvency, but also found a positive impact on efficiency.

This study also provides empirical evidence of the limitations inherent in an isolated analysis of the impact of different measures, which are, in fact, jointly adopted. While in the areas of risk sensitivity the overall effects under the joint consideration do not differ from the ones obtained under the individual approach, different results are obtained in some of the areas of stringency. In particular, we obtain the same positive impact on

solvency through higher capital or lower risk in all areas of ND except in Own Funds and Operational Risk. In the case of Own Funds, we already observed higher risk under the individual approach, but not for Operational Risk. The effects on efficiency are the ones that vary most between the two approaches. While we observed a trade-off in IRB and Operational Risk under the individual approach, under the joint consideration the trade-off is captured for the areas of Scope and the Standard Approach.

From the estimated coefficients, we have computed the expected effects of different levels of stringency and risk sensitivity in capital requirements that could be channelled through the choice of National Discretions. Our results show that in absolute terms, moving towards maximum stringency would result in higher changes in risk than moving towards minimum stringency in most countries, while the contrary would be the case when comparing maximum and minimum risk sensitivity, as the move towards the minimum would imply the largest changes in most countries. The effects in absolute values on the capital ratio or on the cost ratio of choosing highest risk sensitivity are lower than the ones we would obtain from moving towards a minimum risk sensitivity regulation in terms of ND. Finally, the increase in costs resulting from the minimum stringency option would be lower in absolute values in most countries than the decline in average costs as a result of a maximum stringency choice.

These results have some relevant policy implications. On the one hand, we can conclude that even small variations in capital standards policy, such as the ones embedded in ND, have effects on firms. However, whenever a measure is taken jointly with other measures, the whole package needs to be taken into consideration when analysing the effects. While individual considerations may show the desired effects, when they are jointly taken, they may generate counterbalancing reactions that may result in no benefits or excessively high costs. In particular, we found that more stringency in the areas of Own Funds and Counterparty Risk may have the undesired effects of raising risk and reducing capital (OF). Finally, there is always a need to consider the trade-off between efficiency and solvency that we have shown that may arise whenever risk sensitivity is increased in the regulatory framework or when we increase stringency in specific areas of the capital requirements.

ANNEX 1. Description of national discretion indices

We present in this Annex a description of what each individual and National Discretion group involves. Those individual ND that are preceded by (*) have been included as a component of the aggregate risk sensitivity index. We also state whether we consider that the adoption of the ND by the MS implies more stringency/more risk sensitivity (Y=1) or less stringency/less risk sensitivity (Y=0). We assign a value of 1 if the choice made by the MS implies either more stringency or more risk sensitivity.

OF: Own funds

Our own funds index is formed, mainly, with discretions that allow flexibility to Member States (MS) in the inclusion of items to be counted or deducted from own funds. Increasing the number of items that can be considered as own funds allows for larger values in the numerator of the solvency ratio, and thus in the solvency ratio of the regulated entity as well. Higher values imply higher stringency (less items allowed to be counted as or more items to be deducted from own funds). In particular, the discretions are defined as:

a) MS may permit the inclusion of interim profits before a formal decision has been taken on the accounts, subject to conditions (Y=0).

b) Shares in another credit institution, financial institution, insurance or reinsurance undertaking may not be deducted if held temporarily for the purposes of a financial assistance operation designed to reorganise and save the entity (Y=0).

c) As an alternative to deductions of participations and capital instruments held in other financial institutions, credit institutions may be allowed to apply, with the necessary changes, any of the methodologies set out in Annex 1 to the Conglomerates Directive (Y=0).

d) For the purposes of the calculation of their stand alone requirements, institutions may not be required to deduct holdings and participations in institutions included in the scope of their consolidation (Y=0).

S: Scope of application

The scope of application index groups together those discretions that allow for a reduction in the regulatory burden on banking groups, by partially waiving the prudential requirements on a solo basis. It also includes a couple of discretions dealing with the limits to holdings in insurance companies (activities restrictions). In particular:

a) MS may grant individual institutions which are subsidiaries within a group, subject to the fulfilment of certain conditions, an exemption from individual requirements. The same applies where the parent company is a financial holding company. (Y=0).

b) MS may grant individual institutions which are the parent company within a group, subject to the fulfilment of certain conditions, an exemption from individual requirements. (Y=0).

c) MS may allow, on a case-by-case basis, for the purpose of the calculation of the individual requirements of the parent institution, and subject to certain conditions, the incorporation of subsidiaries whose material exposures or liabilities are to that parent credit institution (Y=0).

d) The Competent Authorities (CA) may decide to exempt, fully or partially, a credit institution from Pillar III requirements provided such institution is included within a group complying with comparable disclosures on a consolidated basis in a third country. (Y=0).

e) MS may decide that, if certain conditions are met, some subsidiaries need not be included in consolidation. (Y=0).

f) MS may exempt insurance sector undertakings from the general limits established for qualifying holdings. (Y=0).

g) MS may decide not to apply limits on qualifying holdings, provided excess is deducted from own funds. (Y=0).

CRSA: Credit risk Standard Approach

The credit risk standard approach index contains discretions affecting the computation of capital requirements for credit risk for those entities following the Standard Approach. The index mainly contains discretions affecting the risk weights of certain exposures and the items defining the range of collateral allowed by each Member State. A lower risk weight or more items accepted as collateral, reduces the denominator of the solvency ratio, thus increasing the solvency ratio of the regulated entity.

a) (*) MS may choose between two alternative methods for risk-weighting exposures to credit institutions: (a) on the basis of the risk-weight of the corresponding central government and (b) on the basis of the credit assessment of the institution itself (if option b) is chosen Y=1)

b) If certain conditions are met, the CA may assign a 0% risk-weight on exposures not forming part of "own funds" of a credit institution to its parent undertaking, its subsidiary, a subsidiary of its parent undertaking or an undertaking linked by a relationship within the meaning of Article 12(1) of Directive 83/349/EEC, provided that the following conditions on article 80.7 of the CRD are met. (Y=0).

c) If certain conditions are met, the CA may assign a 0% risk weight on exposures not forming part of "own funds" to counterparties which are members of the same institutional protection scheme as the lending institution. (Y=0).

d) (*) In order to use unsolicited ratings, credit institutions must get permission from the CA. To make this possible, that alternative should be incorporated to legislation (implicit discretion). (Y=1).

e) A CA may allow short term exposures to MS' institutions denominated and funded in the national currency a risk weight that is one category less favourable than the preferential risk weight applicable on exposures to EU central governments. (Y=0).

f) Where an exposure to an institution is in the form of minimum reserves required by the ECB or by the central bank of a Member State to be held by a credit institution, Member States may permit the assignment of the risk weight that would be assigned to exposures to the central bank of the Member State in question provided that certain conditions are met. (Y=0).

g) A risk weight of 100% may be assigned on past due exposures which are fully secured by non eligible collateral when value adjustments reach 15% of the exposure gross of the value adjustments, if strict operational criteria exist to ensure the good quality of collateral. (Y=0).

h) The applicable risk weight on past due exposures secured by mortgages on residential property net of value adjustments may be reduced to 50%, if value adjustments are no less than 20% of the exposure amount gross of the value adjustments. (Y=0).

i) The CA have the discretion to assign a risk weight of 150% on exposures associated with particularly high risks. (Y=1).

j) The risk weight on non past due exposures receiving a 150% risk weight may be reduced to (a) 100% if value adjustments exist which are no less than 20% of the gross exposure and (b) 50% if value adjustments are no less than 50% of the gross exposure. (Y=0).

k) The CA may recognise loans secured by commercial real estate as eligible collateral for covered bonds where the required loan to value ratio of 60% is exceeded up to a maximum level of 70%, if certain defined criteria and conditions are met. (Y=0).

l) MS may allow a risk weight of 10% for exposures to institutions specialising in the interbank and public debt markets in their home MS, if such institutions are subject to close supervision and the exposures are adequately secured. (Y=0).

m) The CA may allow the domestic currency rating of an obligor to be used for its foreign currency exposures provided such exposures arise from institutions' participation in a loan extended by a Multilateral Development Bank whose preferred creditor status is recognised in the market. (Y=0).

n) The CA may recognise as eligible collateral physical items of a type other than real estate collateral, if satisfied as to certain conditions. (Y=0).

o) Credit institutions must take all steps necessary to fulfil local requirements in respect of the enforceability of security interest. There shall be a framework which allows the lender to have a first priority claim over the collateral subject to national discretion to allow such claims to be subject to the claims of preferential creditors provided for in legislative or implementing provisions (Y=0).

p) (*) When debt securities have a credit assessment from a recognised ECAI equivalent to investment grade or better, the CA may allow credit institutions to calculate a volatility estimate for each category of security. (Y=0).

q) The CA may apply reduced risk weights to exposures or portions of exposures guaranteed by the central government or central bank, where the guarantee is

denominated in the domestic currency of the borrower and the exposure is funded in (Y=0).

r) In the case of securitisations subject to an early amortization provision of retail exposures which are uncommitted and unconditionally cancellable without prior notice and where the early amortization is triggered by a quantitative value in respect of something other than the three months average excess spread, the competent authorities may apply a treatment that simplifies computations for determining the conversion figure indicated. (Y=0).

CRB: Credit risk IRB

The discretions affecting the computation of capital requirements for those entities following the IRB approach can be divided into two categories. First, there are discretions that allow the national regulator to be more or less stringent in terms of capital requirements (IRB_ST), just as in the Standard Approach case discussed above. Second, there are other discretions that allow for more or less risk sensitivity when computing capital requirements (IRB_RS). In particular:

a) When IRB approach is used by an EU parent or financial holding company and its subsidiaries, MS may allow the minimum requirements to qualify for IRB to be met by parent and subsidiaries considered together. (Y=0).

b) The CA may authorise a credit institution to generally assign a 50% risk weight to SL-Category 1 and 70% to SL-Category 2 (regardless of maturity) if certain conditions are met. (Y=0).

c) The requirement that retail revolving exposures be unsecured [Annex VII, Part 1, Para. 13 b)] may be waived by the CA in respect of collateralised credit facilities linked to a wage account. (Y=0).

d) Exposures to ancillary banking services undertakings (equity) can be treated as non-credit obligation assets. (Y=0).

e) For the purposes of the recognition of unfunded credit protection in PD by institutions, the CA may extend the list of unfunded credit protection providers further than those included in Annex VIII, Part 1, Para. 26. (Y=0).

f) (*) The CA may require all institutions in their jurisdiction to use maturity (M) for each exposure in accordance with formulae instead of using values by default (0.5 years for repos and 2.5 for other exposures). (Y=1).

g) (*) The CA may allow maturity of exposures to European corporates with consolidated assets of less than EUR 500 million to be set at values by default, even if they apply the formulae option. (Y=0).

h) (*) The CA may allow maturity of exposures to European corporates that invest primarily in real estate with consolidated assets of less than EUR 1,000 million to be set at values by default, even if they apply the formulae option. (Y=0).

i) For the purposes of the calculation of dilution risk, the CA may extend the list of unfunded credit protection providers further than those included in Annex VIII, Part 1, Para. 26. (Y=0).

j) The CA may apply less stringency as regards the data needed for estimation and collected before the implementation of the directive, provided the credit institution makes appropriate adjustments. (Y=0).

k) The CA may authorise their credit institutions to recognise as eligible collateral shares in Finnish housing companies that are operating in accordance with the Finnish Housing Company Act of 1991 provided that certain conditions are met. (Y=0).

l) The CA may recognise as eligible collateral amounts receivable linked to a commercial transaction or transactions with an original maturity of less than or equal to one year. Eligible receivables do not include those associated with securitisations, sub-participations or credit derivatives or amounts owed by affiliated parties. (Y=0).

m) The CA may recognise as eligible collateral physical items of a type other than real estate collateral, if satisfied as to the following: (a) liquid markets for disposal of the collateral do exist in an expeditious and economically efficient manner, and (b) well-established, publicly available market prices for the collateral do exist. The institution must be able to demonstrate that there is no evidence that the net prices it receives when collateral is realised deviates significantly from these market prices. (Y=0).

n) The CA may recognise as eligible collateral physical items of a type other than real estate collateral, if satisfied as to certain conditions. (Y=0).

o) Credit institutions must take all steps necessary to fulfil local requirements in respect of the enforceability of security interest. There shall be a framework which allows the lender to have a first priority claim over the collateral subject to national discretion to allow such claims to be subject to the claims of preferential creditors provided for in legislative or implementing provisions. (Y=0).

p) (*) The CA may allow credit institutions to use empirical correlations within risk categories and across risk categories if they are satisfied that the credit institution's system for measuring correlations is sound and implemented with integrity. (Y=1).

q) (*) When debt securities have a credit assessment from a recognised ECAI equivalent to investment grade or better, the CA may allow credit institutions to calculate a volatility estimate for each category of security. (Y=0).

r) (*) The CA may permit credit institutions to apply for securitisations involving retail exposures the Supervisory Formula Method using simplifications for certain risk parameters. (Y=0).

CRD: Counterparty risk

The discretions that are grouped under this heading refer to the calculations of the exposure value of certain contracts, that either imply more risk sensitivity or more stringency.

a) For institutions complying with certain requirements in their trading activities in commodities, gold and other products, MS may allow percentages for the calculation of potential future value other than the general ones. (Y=0).

b) MS may set a value for coefficient Alpha (multiplier to calculate the exposure value of certain contracts) higher than 1.4. (Y=1).

c) (*) MS may allow institutions to calculate Alpha (multiplier to calculate the exposure value of certain contracts) internally, subject to a floor of 1.2. (Y=1).

OR: Operational Risk

These discretions cover mainly the approaches that firms may use to calculate their operational risk, or the indicator that they may use for the determination of capital requirements for this risk.

a) The CA may allow institutions to use a combination of approaches. (Y=0).

b) The CA may under certain conditions authorise institutions to use an alternative indicator to calculate its capital requirements. (Y=0).

c) The CA may allow the qualifying criteria set out to be met by the parent and its subsidiaries considered together. (Y=0).

Table A1: National Discretion Indices

	RS	ST	OF	S	CRSA_ST	CRSA_RS	IRB_ST	IRB_RS	CRD_ST	CRD_RS	OR
AUSTRIA	4	12	0	4	4	2	3	1	1	1	0
BELGIUM	8	7	0	1	7	2	0	4	2	1	0
BULGARIA	5	21	3	6	11	2	9	3	1	0	1
CYPRUS	6	11	1	2	5	1	4	4	2	0	1
CZECH REPUBLIC	6	14	2	6	6	2	3	2	2	1	0
DENMARK	6	20	0	6	10	2	4	3	2	1	2
ESTONIA	6	9	1	4	6	0	3	4	2	1	1
FINLAND	6	6	1	2	5	1	1	3	2	1	0
FRANCE	6	10	0	1	5	1	4	3	1	1	1
GERMANY	3	11	0	0	7	2	3	0	2	1	0
GREECE	7	0	0	0	3	2	0	3	1	1	0
HUNGARY	6	10	2	4	2	2	2	3	1	1	0
IRELAND	8	13	0	3	9	2	5	4	1	1	1
ITALY	6	16	1	5	4	1	6	3	1	1	1
LATVIA	5	9	0	3	7	1	4	3	1	0	0
LITHUANIA	5	19	2	4	11	1	7	3	1	0	1
LUXEMBOURG	7	5	0	1	4	1	1	4	0	1	0
MALTA	5	12	1	4	7	2	3	2	1	0	0
NETHERLANDS	8	10	0	1	8	2	5	4	1	1	0
POLAND	6	24	3	4	12	3	9	3	1	0	1
PORTUGAL	4	13	1	3	7	1	3	1	1	1	1
ROMANIA	6	9	3	4	4	2	3	2	1	1	0
SLOVAKIA	7	22	4	6	8	3	7	4	1	0	1
SLOVENIA	7	15	2	3	8	3	3	3	2	1	1
SPAIN	6	6	1	1	3	1	5	3	1	1	0
SWEDEN	6	16	2	3	10	1	4	3	1	1	0
UNITED KINGDOM	8	5	1	1	5	2	2	4	1	1	0
TOTAL	**10**	**41**	**4**	**7**	**14**	**4**	**12**	**6**	**2**	**1**	**3**

Source: Own calculations from CEBS.

ANNEX 2. Estimation of bank inefficiency

We follow most recent studies that derive bank's cost inefficiency from stochastic cost frontier estimates.

For the definition and measurement of output we follow the intermediation approach as in Maudos et al. (2002), considering balance-sheet items as good indicators of output. The following three outputs are used from Bankscope profit and loss account data:

Q_1 = loans

Q_2 = other earning assets

Q_3 = deposits and other short term funding

The prices of productive factors are proxied by:

P_1 = Cost of loanable funds, computed by dividing financial costs (interest paid) by their corresponding liabilities (deposit, money market funding and other funding).

P_2 = Cost of labour. It is proxied by overhead costs over total assets.

P_3 = Cost of physical capital, obtained as the ratio of other non-interest expenses, which proxies expenditure on plant and equipment over average assets.

We estimate a translog frontier cost function by types of firms, distinguishing among commercial, saving and cooperatives and include country dummy variables except for the specification corresponding to commercial banks.

In particular, the specification we estimate is the following:

$$\ln TC = \alpha_0 + \sum_{i=1}^{3} \beta_i \ln Q_i + \sum_{h=1}^{3} \gamma_h \ln P_h + 1/2[\sum_{i=1}^{3}\sum_{j=1}^{3} \varphi_{ij} \ln Q_i \ln Q_j + \sum_{h}^{3}\sum_{m}^{3} \delta_{hm} \ln P_h \ln P_m] +$$

$$+ \sum_{i=1}^{3}\sum_{m=1}^{3} \phi_{im} \ln Q_i \ln P_m + \ln v + \ln u$$

Where ln records natural logarithm and TC is total costs, proxied as the sum of overhead costs + interest expense. The restrictions of symmetry and linear homogeneity have been imposed on input prices.

We assume an exponential distribution to model the efficiency variable u.[16] The characteristics of such distribution are that the probability is highest near the zero values of u

16. The density function of an exponential distribution variable u_i is

$f(ui) = 1/\eta \exp(-u_i/\eta), \quad u_i >= 0$

where the mean and the standard deviation of u_i are both equal to $\eta > 0$.

which means that the probability of firms being close to full efficiency is the highest. It is appropriate for a competitive market such as the banking system in Europe. If firms are homogeneous it is expected that there will be fewer firms that are highly inefficient. On the other hand, if firms are heterogeneous, one might find some firms that are highly inefficient thereby meaning that the tail of the distribution is long. It would be indicated by a large value for the variance parameter. The results are presented in Table A.2.

TABLE A.2 ESTIMATION OF STOCHASTIC COST FUNCTION

	COMMERCIAL BANKS		SAVING BANKS (1)		COOPERATIVES (1)	
	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.
lq1	0.384	0.020	0.269	0.027	0.313	0.010
lq2	0.438	0.027	0.138	0.021	0.279	0.007
lq3	0.170	0.037	0.612	0.049	0.411	0.013
lnp1	0.687	0.025	0.659	0.015	0.621	0.009
lnp3	0.017	0.015	0.019	0.007	0.019	0.002
c_lnp1_p1	0.129	0.010	0.205	0.008	0.187	0.007
c_lnp3_p1	0.001	0.007	0.004	0.004	-0.011	0.004
c_lq1_p1	0.062	0.021	0.262	0.016	0.184	0.009
c_lq2_p1	0.016	0.023	0.136	0.009	0.087	0.007
c_lq3_p1	-0.115	0.035	-0.400	0.023	-0.283	0.014
c_lnp3_p3	0.006	0.003	0.006	0.001	0.002	0.001
c_lq1_p3	0.014	0.007	-0.012	0.006	-0.015	0.004
c_lq2_p3	0.016	0.008	-0.010	0.004	0.009	0.003
c_lq3_p3	-0.022	0.013	0.024	0.009	0.006	0.005
c_lq1_q1	0.049	0.004	0.161	0.010	0.142	0.006
c_lq2_q1	-0.174	0.017	-0.136	0.019	-0.132	0.009
c_lq3_q1	0.035	0.018	-0.181	0.041	-0.165	0.017
c_lq2_q2	0.036	0.004	0.052	0.006	0.088	0.002
c_lq3_q2	0.041	0.019	0.043	0.032	-0.048	0.011
c_lq3_q3	0.013	0.016	0.059	0.038	0.113	0.013
Observations	370		450		1698	

(1) Includes country dummies

ANNEX 3

Table A.3 Estimation of Risk, Capital and Efficiency Equations with aggregated ND indices

	1. ineft as the efficiency variable			2. ac as the efficiency variable		
	LOLPTA	ETA	INEFT	LOLPTA	ETA	AC
ETA	-0.009**		-0.178**	0.002		-0.070**
INEFT	-0.049**	-1.067**				
AC				0.023**	0.031	
LOLPTA		-1.084**	-1.359**		0.796**	0.237**
TNLTA	-0.004**	-0.113**	-0.023**	-0.003*	-0.108**	-0.021**
SIZE	0.065**	-0.721**	0.212**	0.047**	-1.435**	-0.065
SIZE2	-0.005**	-0.026	-0.036**	-0.003**	0.032*	-0.004
LIQUID	-0.002**	-0.035**	-0.020**	0.002**	0.142**	-0.010**
OFFBARL	0.008**	0.072**	-0.022**	0.012**	0.127**	0.003
FEES	-0.009*		-0.384**	-0.013*		0.768**
ROAA		2.266**			3.277**	
COIRC	0.000	0.045*	-0.003	0.001	0.049*	-0.009
OEPOAC	0.122**	-0.475	-0.543**	0.202**	0.655*	-0.144
GDP	0.026**	-0.438**	-0.198**	0.036**	-0.414**	-0.041
HERFINDAHL	-0.156**	0.038	-0.753**	-0.136**	1.283**	0.529**
DEPOSIT	-0.014	0.717**	0.350**	-0.023	0.689**	-0.022
RS	-0.099**	3.712**	0.799**	-0.140**	3.275**	0.234*
ST	-0.076**	-0.343	-0.146	-0.077**	-0.295	-0.200**
CONS	1.894**	52.167**	41.210**	-0.364**	10.585**	6.351**
Observations	2089	2089	2089	2108	2108	2108
R-2	0.138	0.477	0.374	0.164	0.446	0.613

* significant at 10%, ** significant at 5%

Table A.4 Estimation of Risk, Capital and Efficiency Equations with all areas of ND						
	ineft as the efficiency variable			**ac as the efficiency variable**		
	LOLPTA	ETA	INEFT	LOLPTA	ETA	AC
ETA	-0.009**		-0.190**	0.002		-0.062**
INEFT	-0.050**	-1.105**				
AC				0.037**	0.107*	
LOLPTA			-1.369**		0.758**	0.345**
TNLTA	-0.004**	-0.096**	-0.021**	-0.003	-0.087**	-0.019**
SIZE	0.032**	-0.606**	0.225**	0.042**	-1.326**	-0.036
SIZE2	-0.005**	-0.030*	-0.036**	-0.002*	0.029	-0.006
LIQUID	-0.002**	-0.029**	-0.019**	0.002**	0.019**	-0.012**
OFFBARL	0.008**	0.081**	-0.019**	0.013**	0.138**	-0.003
FEES	-0.008		-0.371**	-0.022**		0.751**
COIRC	0.003	0.114**	-0.000	0.005	0.166**	-0.011
OEPOAC	0.030	-1.473*	-0.383	-0.022	-1.378	1.636**
GDP	0.026	0.324	-0.075	0.048**	0.421	-0.316**
HERFINDAHL	-0.102	-1.837**	-1.248**	0.014	-0.458	-1.129**
ROAA		2.112**			3.151**	
DEPOSITS	0.040	0.647*	0.428**	0.027	0.473	-0.008
OF	0.082	-2.793**	-1.023**	0.203**	-1.821	-1.507**
S	0.036	2.648**	0.763**	0.002	2.348**	0.161
CRSA_ST	-0.074*	1.194**	0.479**	-0.141**	0.586	0.541**
CRD_ST	0.169**	4.140**	1.715**	0.106	2.385**	-0.398*
IRB_ST	-0.005	1.715**	0.451	0.059	1.431	-1.718**
OR	-0.083	-4.723**	-1.579**	-0.003	-4.040**	-0.720**
CRSA_RS	-0.045	2.336**	0.322	-0.091	2.648**	1.094**
CRD_RS	-0.109	-1.542	-1.041*	0.001	-0.387	-1.403**
IRB_RS	-0.227**	0.334	-0.329	-0.299**	1.160	1.983**
_CONS	2.037**	44.708**	40.385	-0.391	-1.201	6.854**
Observations	2089	2089	2089	2108	2108	2108
R-2	0.145	0.493	0.378	0.171	0.464	0.647

* significant at 10%, ** significant at 5%

Table A.5 Estimation of Risk, Capital and Efficiency Equations with aggregated ND indices (no Principal Components)

	1. ineft as the efficiency variable			2. ac as the efficiency variable		
	LOLPTA	ETA	INEFT	LOLPTA	ETA	AC
ETA	-0.009**		-0.171**	0.002		-0.072**
INEFT	-0.050**	-1.049**				
AC				0.029**	0.002	
LOLPTA		-1.101**	-1.389**		0.834**	0.289**
TNLTA	-0.004**	-0.102**	-0.020**	-0.003*	-0.097**	-0.018**
SIZE	0.058**	-0.735**	0.200*	0.040*	-1.411**	-0.037
SIZE2	-0.005**	-0.021	-0.033**	-0.002	0.032*	-0.007
LIQUID	-0.002**	-0.034**	-0.020**	0.002**	0.014**	-0.010**
OFFBARL	0.008**	0.074**	-0.023**	0.012**	0.128**	0.004
FEES	-0.008*		-0.383**	-0.017**		0.764**
ROAA		2.402**			3.396**	
COIRC	0.000	-0.019	-0.029**	0.001	0.015	0.018**
OEPOAC	0.120**	0.354	-0.289**	0.196**	1.273**	-0.257**
GDP	0.016	-0.701**	-0.318**	0.027**	-0.544**	0.086**
HERFINDAHL	-0.189**	-0.062	-0.712**	-0.165**	1.103*	0.145
DEPOSIT	-0.018	0.934**	0.444**	-0.030	0.722**	-0.196**
RS	-0.047**	0.525**	-0.054	-0.058**	0.777**	0.445**
ST	-0.011**	0.084*	0.354	-0.013**	0.036	-0.047**
CONS	2.289**	50.347**	42.275**	0.016	7.448**	3.198**
Observations	2089	2089	2089	2108	2108	2108
R-2	0.136	0.471	0.374	0.162	0.439	0.619

* significant at 10%, ** significant at 5%

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