In conclusion, the degree of central bank involvement in supervision may condition the policymaker in its decision to change the degree of supervisory concentration. The resulting effect is the noted inverse relationship with central bank fragmentation.

5. Financial Supervision Unification and Central Bank Fragmentation Effect

How do we empirically test the overall robustness of the fragmentation effect due to central bank involvement in supervision? In order to assess this relationship, we can estimate a model of the probability of different regime decisions as a function of this variable, checking for other structural economic and institutional variables.

In fact, supervision regimes can be viewed as resulting from a continuous, unobserved variable: the optimal degree of financial supervision unification, consistent with the policymaker utility. Each regime corresponds to a specific range of the optimal financial supervision unification, with higher discrete FAC Index values corresponding to a higher range of financial unification values. Since the FAC Index is a qualitative ordinal variable, the estimation of a model for such a dependent variable necessitates the use of a specific technique.

Our qualitative dependent variable can be classified into more than two categories, given that the FAC Index is a multinomial variable. But the FAC Index is also an ordinal variable, given that it reflects a ranking. Then the ordered model is an appropriate estimator, given the ordered nature of the policymaker alternative[34].

Let y be the policymaker ordered choices taking on the values (0, 1, 2, ... , 7). The ordered model for y, conditional on a set of K explanatory variables x, can be derived from a latent variable

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[34] See Maddala (1983), Greene (1997) and Wooldrige (2002) for the ordered models. See also Cramer (2003).

model. In order to test this relationship, let us assume that the unobserved continuous variable, the optimal degree of financial supervision unification y^*, is determined by:

$$y^* = \beta' x + \varepsilon \qquad (1)$$

where ε is a random disturbance uncorrelated with the regressors, and β is a 1 x K regressors' vector.

The latent variable y^* is unobserved. What is observed is the choice of each national policymaker to maintain or to reform the financial supervisory architecture: This choice is summarized in the value of the FAC Index, which represents the threshold value. For our dependent variable there are seven threshold values. Estimation proceeds by maximum likelihood, assuming that ε is normally distributed across country observations, and the mean and variance of ε are normalized to zero and one. This model can be estimated with an ordered Logit model or with an ordered Probit model[35].

Which economic model can be tested? Actually, to the best of our knowledge, there is no general theory on the determinants of the policymaker's decision on the degree of supervision unification.

First of all, given our previous descriptive results, the choice of the optimal level of financial supervision unification could depend on the role of the central bank in the supervision architecture. The crucial question is: does the degree of central bank presence (*institutional factor*) in financial supervision matter in defining the level of unification in that supervision? The expected sign of the relationship between central bank involvement and financial supervision consolidation is negative.

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[35] The logit model differs from the probit model only in the cumulative distribution function that is used to define choice probabilities. The maximum likelihood estimations were carried out by a packaged-ordered Probit and ordered Logit commands in STATA. To be complete we present both the Probit and the Logit results, given that, as usual, there is little basis for choosing between probit and logit models.

How to choose the control variables? As it is claimed before, no theory exists on the relationship between policymaking and financial supervision unification. Therefore we shall try to test the more general hypotheses:

a) First, the policymaker chooses to maintain or reform the degree of supervisory unification in response to the structure of the financial system. In the modern debate on financial structure, it is usual to confront the equity dominance model (or *market-based regime*) with the bank dominance model (or *bank-based regime*). Furthermore, recent literature pointed out the close relationship between the financial structure model and the corporate governance model, with particular attention to the political determinants.[36] Therefore, the control variables must capture the following effect: does the financial structure model (*financial factor*) matter in defining the policymaker's choices in the area of supervisory consolidation?

The expected sign of the relationship between the degree of supervision unification and the financial factor is undetermined (i.e. it can be either positive or negative). In section two we stressed the importance of the blurring process for banking and financial markets worldwide. The blurring process means potential changes in the nature and dimensions of intermediaries (*the financial conglomerates effect*). In a bank-based regime, if we think that the policymakers' choices depend on the features of their own regime, we can suppose a positive relationship between the kind of regime and the degree of financial supervision unification, exactly in face of the financial conglomerates effect. The rationale for the creation of a single financial supervisory authority is the blurring of confines between banks, insurers and financial service providers. The increasing importance of financial conglomerates requires the unification of supervisory functions.

At the same time, however, the blurring effect also means potential changes in the nature and dimensions of the financial markets (*the securitisation effect*). Therefore, in a market-based regime

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[36] Pagano and Volpin (2000), Perotti and Von Thadden (2003).

we can also expect a positive relationship between the kind of regime and the degree of financial supervision consolidation, this time in the face of the securitisation effect. Therefore the relationship between the financial factor and the degree of supervision concentration remains an empirical question.

b) Second, the political and institutional environment can determine the ability of the policymakers to implement their choices. Furthermore, we pointed out in a) that the financial structure itself could be influenced by political factors. Then the control variables must capture a possible second relevant effect: does the quality of public governance (*political factor*) matter in defining the policymaker's choices on the level of supervisory unification? The expected sign of the relationship between the degree of supervision unification and the political factor is also undetermined. In section two we noted that, whatever the financial regime of his country, a policymaker may choose a higher degree of supervision in order to improve the capacity to face the challenges of the blurring process. Then we can suppose a positive relationship between good governance indicators and supervision unification.

But a policymaker may prefer a single authority in order to increase the probability of capturing the financial supervisory structure. Therefore, at the same time we might expect a positive relationship between bad governance indicators and supervision unification. Again, the relationship between the political factor and the degree of supervision unification remains an empirical question.

c) But we must note that the relationship between the degree of supervision unification and the characteristics of the banking and financial markets, pointed out in a), might "obscure" the importance of other variables, which are themselves determinants in explaining the characteristics of the banking and financial markets[37]. Recently, the structure of the financial markets was

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[37]For example, in Demirguc-Kunt, Laeven and Levine (2003) regulation become insignificant in explaining banking performance when checking for institutional indicators.

explained with three different institutional approaches (*legal factors*)[38]: the legal-financial view, in the static and dynamic versions; the political-financial view; and the endowment view. Then we have to insert control variables related to the legal-financial view and the endowment view, while the political-financial view was already represented by the indicator of governance.

d) Then we asked ourselves whether the choices of policymakers to increase the degree of unification of supervisory powers might depend on the dimension in their respective countries (*economic size factor*).

e) Furthermore, as the above descriptive analyses pointed out, the concentration of powers seems more peculiar of developed countries, particularly in the European context. The *geographical factor* might also be important, in terms of location in Europe.

f) Finally, we could expect a positive relationship the OECD membership, as proxy of the levels of economic growth, on one hand, and financial supervision unification, on the other (*development factor*).

The general specification is represented by equation (2):

$$
\begin{aligned}
(FAC)_i = \ & \beta_0 + \beta_1 (CBFA)_i + \beta_2 (MvB)_i \\
& + \beta_3 (mcap)_i + \beta_4 (goodgov)_i + \beta_5 (gdp) + \beta_6 (OECD) \\
& + \beta_7 (Europe) + \beta_8 (CommonL) + \beta_9 (CivilL) + \beta_{10} (Latitude) + \varepsilon_t
\end{aligned}
$$

(2)

with country[39] $i = 1\ldots89$.

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[38] Different approaches have been proposed to explain the country choice between a bank-based model and a market-based model: the "legal approach" - La Porta, Lopez –de-Silanes, Shleifer and Vishny (1997) and (1998) - the "economic approach" - Rajan and Zingales (2000) - the "political economy approach" - Pagano and Volpin (2000) and Verdier (2001) Rosenbluth and Schaap (2001) Carney (2002) Perotti and von Thadden (2003).

[39] The country sample depends on the availability of institutional data. Given the 267 world countries (UN members are 180), our 89 countries represent 60 percent of world GDP and 82 percent of the world population.

Where the independent variables are the following[40]:

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1. CBFA Index is the index of involvement of the central bank in supervision, defined in section four;

2. MvB Index = Market vs Bank Index: binary variable for the private governance factor. It is a dummy that expresses the financial system of a given country, market-based versus bank-based [41];

3. mcap = Market capitalization/GDP: quantitative variable for the private governance factor. It shows a measure of the securities market size, relative to GDP[42];

4. goodgov = Good Governance: quantitative variable for the public governance factor. It shows the structural capacity of the government to formulate and implement sound policies. Furthermore the index can represent the control variable for the politics and finance view[43];

5. gdp = Gross Domestic Product: quantitative variable for the economic size factor[44];

6. OECD = binary variable for the economic factor. It is a dummy that signals whether a given country is a member of the OECD or not;

7. Europe = binary variable for the geographical factor. It is a dummy that signals whether a given country is European or not;

8-9. CommonL, CivilL = binary variables for the law factor. They are dummies that indicate the legal root of a given country, representing the control variables for the law and finance view[45];

10. **Latitude** = quantitative variable for the endowment view. The variable is calculated as the absolute value of the latitude of the country, scaled to take values between 0 and 1[46].

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[40] The correlation matrix for the variables is in Table 2.

[41] The index is calculated using different banking and financial variables: see Demigüç-Kunt and Levine (1999). For each variables we calculate the mean of four time values: 1996,1998, 2000, 2002.

[42] World Bank, 2003, *World Development Indicators*, Stock Markets 5.3. For each variable we calculate the mean of four time values: 1996, 1998, 2000, 2002. Note that the correlation index between the financial regime variable (MvB) and the market capitalization variable (mcap) is high, but their influence on the dependent variable is very low.

[43] The index is built using all the indicators proposed by Kaufmann et al. (2003). They define (public) governance as the exercise of authority through formal and informal traditions and institutions for the common good, thus encompassing: 1) the process of selecting, monitoring and replacing governments; 2) the capacity to formulate and implement sound policies and deliver public services; 3) the respect of citizens and the state for the institutions that govern economic and social interactions among them. Furthermore, for measurement and analysis purposes, these three dimensions of governance can be further unbundled to comprise two measurable concepts per each of the dimensions above for a total of six components: 1) voice and external accountability; 2) political stability and lack of violence; 3) government effectiveness; 4) lack of regulatory burden; 5) rule of law; 6) control of corruption. The authors present a set of estimates of these six dimensions of governance for four time periods: 1996,1998,2000,2002. For every country, therefore, we first calculate the mean of the four time values for each dimension of governance; then we build up an index of global good governance in the period 1996-2002, calculating the mean of the six different dimensions

[44] World Bank, 2003, *World Development Indicators*. For each variable we calculate the mean of four time values: 1996, 1998, 2000, 2002.

[45] Beck, Demirguc-Kunt and Levine (2001). The legal roots are five: Anglo-Saxon Law (=Common Law), French, German and Scandinavian Laws (=Civil Laws), Socialist Law (Others); we skip one root – choosing the Socialist Laws, as the least significant from an economic point of view – to avoid multicollinearity problems.

[46] La Porta, Lopez de Silanes, Schleifer, Vishny (1999). On the endowment view, also see Beck, Demirguc-Kunt and Levine (2001).

Tables 3 and 4 show the Logit and Probit estimates of Equation (1). In the multinomial ordered models the impact of a change in an explanatory variable on the estimated probabilities of the highest and lowest of the order classifications—in our case the Single Authority model and the "pure" Multi-supervisory model—is unequivocal: If β_j is positive, for example, an increase in the value of x_j increases the probability of having the Single Authority model, while it decreases the probability of having the "pure" Multi-supervisory model.

The results of the estimates show the robustness of the role of central bank involvement in explaining the degree of supervision unification. In fact, the probability of a single financial authority is always inversely and significantly related to the involvement of the central bank.[47]

Looking at the control variables, the probability that a country will move toward a Single Authority model is higher: 1) the smaller the overall size of the economy[48]; 2) when the jurisdiction adopts the Civil Law, particularly if the legal framework is characterized by German and Scandinavian roots[49]. Without considering the law features, the probability that a policymaker will establish a unified agency is higher the higher the goodness of public governance

To test the robustness of the results, we modify the dependent variable, eliminating the weights attributed to the banking and financial markets respect to the insurance sector[50]. Tables 5 and 6 report the Logit and Probit estimates. The central bank fragmentation effect is much stronger.

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[47]We contrast the qualitative statement of Nolle (2003), who claimed that there is no systematic pattern to the division between single and multiple supervisory regimes.

[48]If we consider the sample of the countries (14) with a Single Supervisor only, the UK seems to be the classic case of "outlier", i.e. the exception in the inverse relationship between the degree of financial supervision consolidation and the financial market dimension. In fact, if the same regressions are performed without the UK all the results are confirmed.

[49]We contrast the empirical results of Masciandaro (2005), who claimed that - given a smaller sample countries 68 – also the financial factor and the political factor are significant. Therefore the financial and political factors seem to be sample sensitive explanatory variables.

[50]We use an index (FAC Two) according to the following scale: 5 = Single authority for all three sectors (total number of supervisors = 1); 3 = Single authority for two sectors (total number of supervisors = 2); 1 = Independent specialized authority for each sector (total number of supervisors = 3).

Secondly we tested a more radical hyphotesis. We assumed that the policymaker does not select the supervision unification level but more simply decides between the two extreme models of supervision: single authority versus "pure" multi-supervisory authorities. The dependant variable becomes a binary variable[51], to be estimated with simple Logit and Probit. Tables 7 and 8 report the Logit and Probit estimates. The results confirm the robustness of the central bank fragmentation effect.

We then tested the robustness of the hypothesis that the institutional factor – i.e. the central bank fragmentation effect - could be considered an independent variable. We had to reject the hypothesis that central bank involvement is endogenous, i.e. that the policymaker jointly determines the financial supervision level and the central bank involvement, based on the same explicative model. We considered central bank involvement as a dependant variable. Tables 9 and 10 report the Logit and Probit estimates. Our conclusion is that the variables that could explain the degree of central bank involvement in financial supervision do not coincide with those that we use to analyse the degree of unification. In fact, if you perform Logit and Probit regressions using CBFA as a dependent variable and the same vector of independent variables, the results are inconsistent with the previous ones.

To test further the robustness of the institutional factor, we tried changing the index of central bank involvement, making it perfectly symmetrical with the index of financial supervision level[52]. Tables 11 and 12 report the Logit and Probit estimates. As expected, all the results are confirmed.

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[51]We use an index (FAC Binary) according to the following scale: 1 = Single authority for all three sectors; 0 = Otherwise.

[52]The different levels of central bank involvement can be measured using the identical scale of the FAU Index (labelled CBFA Two Index): 1= the central bank has responsibility in no sector; 3 = the central bank has responsibility in one sector; 5 = the central bank has responsibility in two sectors; 7 = the central bank has responsibility in all three sectors.

How should the results be interpreted? First of all, the analysis confirms the rule-driven path dependence hypothesis. The prior choice of the policymaker regarding "whom" to delegate supervisory policy seems to have consequences on the choice of "how many" institutions to delegate, according to an inverse relationship. The central bank fragmentation effect holds true: The more the central bank is involved in financial supervisory powers, the lower the degree of concentration of those powers is likely to be. The econometric analysis confirms the descriptive trade-off between supervision unification and central bank involvement. The institutional factor matters.

Secondly, the choice of the degree of supervisory unification is influenced by the dimension of the economic systems. More specifically, the lower the overall economic size, the more likely it seems that the probability of consolidation will increase, confirming the hypothesis of policymakers conditioned by the "small country" situation[53]. We confirm the size effect, using the population variable instead of the gross domestic product variable (Table 13). The small country effect captures the fact that with relatively few people the expertise in financial supervision is likely to be in short supply, and then this expertise might be more effectively utilized if it is concentrated with a single financial agency. The economic size factor matters.

Thirdly, the legal factor matters. This law effect is puzzling. The law and finance literature claims the existence of a strong relationship between market oriented financial systems and the British law jurisdictions. Here, we do not find that financial supervision unification is directly correlated with a market-based regime, while a link exist with the Civil Law root, in particular with the German and Scandinavian legal systems. This suggests a sort of "legal neighbour" effect. In order to test further the robustness of the legal neighbour effect, we use another country law

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[53]It has been noted that the small country effect holds, notwithstanding we do not include in our sample the eight very small countries (see note 17) that introduce the unified financial authorities.

classification[54] , with different German and Scandinavian law jurisdictions[55] (Table 14). The legal effect still holds.

Finally, the choice of policymakers to establish the concentration of supervisory powers could be facilitated by an institutional environment characterized by good governance. The relationship between good governance and the supervision concentration process could be explained, if we suppose that a policymaker who cares about soundness and efficiency would prefer the single financial authority as the optimal one in the face of the blurring challenges.

6. Conclusions

The objective of this paper was to analyse the role of central bank institutional position in influencing the recent tendency to unify the powers of financial supervision, highlighting the robustness of the central bank fragmentation effect.

The results seem particularly interesting for future research developments. It will be important to go in depth in the analysis of the determinants of the central bank fragmentation effect. In this paper the central bank fragmentation effect is an independent variable in explaining the supervision unification level.

The next step forward will be to consider the degree of central bank involvement as a dependent variable, in order to identify consistent proxies of the potential different causes (blurring

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[54]Pistor (2000) instead of La Porta et al. (1998).
[55]In La Porta et al (1999) the German and Scandinavian jurisdictions are: Austria, Denmark, Finland, Germany, Iceland, Japan, Korea, Norway, and Sweden. For historical reasons Pistor (2000) also includes: Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovak Republic.