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### **CENTRAL BANKS AND FINANCIAL SUPERVISION: NEW TENDENCIES**

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# CENTRAL BANKS AND FINANCIAL SUPERVISION: NEW TENDENCIES

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**Abstract:** The post-crisis political and theoretical developments have produced a profound reappraisal of central banks' mandate in achieving and maintaining financial stability. This evolution has had important consequences for the institutional architecture of financial supervision and for the role assigned to central banks within it. The paper aims to analyse the rationale of this evolution and to what extent it has characterised the reforms introduced by EU countries after the crisis. The empirical analysis confirms the wider mandate for financial stability given to EU central banks, mainly in those countries whose structural vulnerabilities arise from high degree of financialisation. The reforms associated to this process always result from political choices: in this respect, the different path towards the new architecture, which has characterised the UK and Germany can be taken as the two most interesting cases. They show the complex interactions between political pressure, resistance and ambitions of the various existing authorities, and the country's heritage, which characterise every stage of institutional reform, especially where significant supervisory failures have been found.

**Key words:** models of financial supervision; twin-peaks; central banks; financial reforms; Bank of England; Bundesbank; EU countries



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## 1. INTRODUCTION

The global crisis has been a turning-point in the theoretical debate and in the policy preferences for architecture of financial supervision<sup>1</sup> and the functions of central banks.

In the late 90s, the blurring of boundaries between different financial intermediaries and financial markets was the main reason for a large consensus in favour of integrating financial supervision in a single authority, separate from the central bank. Along with this development, the mandate of central banks has been restricted to monetary stability, and their political independence was strengthened. In those years, sharing responsibility for financial stability between the single regulator and the central bank was often considered the most efficient way to deal with increasing integration between banks, other intermediaries, and markets, and, at the same time, the one most consistent with the goal of safeguarding the independence of monetary policy. Central banks often refrained from making any opposition to this development, possibly because the traditional focus on banking oversight may have seemed difficult to reconcile with the widened perimeter of supervisory tasks.

In accordance with the prevailing belief that financial markets were naturally efficient and resilient, the pre-crisis consensus was that a low and stable inflation, together with “light touch” micro-prudential supervision, was also the best way to deliver financial stability.

Actually, the risks to financial stability arising from the pro-cyclical behaviour of the financial system and the necessary interactions between financial supervision and monetary policy had already been explored since the early 2000s in the analysis carried out by BIS researchers (Crockett, 2000; Borio and White, 2003). However, the traditional “mopping-up” approach – which said that monetary policy should not react to asset prices bubbles, except to the extent that they affect price stability, and should only intervene after the bubble had burst – had characterised the central banks’ policies (Fischer, 2014).

Experience of the latest crisis has confirmed structural vulnerabilities of liberalised and globalised financial systems, where price stability expectations have often contributed to the build-up of large financial imbalances and to increasing leverage, in overt or hidden

forms, in balance sheets of financial firms. At the same time, the growing role of non-bank financial institutions and the market-based finance have lowered the effectiveness of the traditional monetary policy transmission channels. This has helped to show that stable, low inflation is not enough to guarantee financial stability to economic systems (Kregel, 2008; Goodhart, 2009; Adrian and Shin, 2010; Kregel, 2014).

The political and theoretical developments, which arose after the global crisis, have produced a profound reappraisal of the central banks' contribution in achieving and maintaining financial stability. This evolution has had important consequences for the institutional architecture of financial supervision and for the role assigned to central banks within it.

At the same time, the key role played by central banks during the crisis in helping to stabilise financial systems with conventional and unconventional measures (G30, 2015) was probably a deciding factor in politically legitimising their greater involvement in financial supervision, whose prevailing micro-prudential approach was one of the main causes of the crisis itself.

The crucial role, which the central banks could claim in the new, macro-prudential supervision, partly by using basically the same tools used in micro-prudential supervision, and partly using specific instruments (CGFS, 2010), opened new perspectives into the traditional debate on relationships between central banks and financial supervision.

The policies for financial stability, which go from crisis prevention to crisis management, and which may involve not merely banks and the payment system, but also every sector in the financial system, blurred the limits of responsibility held by the central banks and their dealings with other regulators: especially with governments, on the one hand, and the authorities in charge of traditional micro-prudential supervision on the other. The effects which the changes made to institutional architecture of supervision (understood in its broader sense) had upon the independence and accountability of the central banks therefore gave rise to a debate which was inevitably conditioned by political implications (Quintyn and Taylor, 2004; Westrup, 2007; Buiters, 2012; Hellwig, 2015).

The present study is organised as follows. In the second section the main models for the architecture of financial regulation are presented, with some consideration about the relative advantages and hazards. In the third, I shall analyse discussions about the advantages and disadvantages of giving central banks the responsibility for supervision, also in the light of their role as macro-prudential regulators.<sup>2</sup> Evolution in models for supervisory architecture and the role given to central banks before and after the crisis in the EU have been there analysed for a selected group of countries. The aim is to find some associations with the degree of bankarisation, on the one hand, and fiscal costs of the crisis on the other. In the fourth section a comparison will be made between the reforms to institutional architecture proposed and/or made in the UK and Germany after the crisis. Finally, some conclusions are drawn.

## **2. THE ARCHITECTURE OF FINANCIAL REGULATION: THE MAIN MODELS**

According to Goodhart (2007), up to the mid-90s most writers and regulators themselves considered the institutional structure of financial regulation to be an area dominated by uncontrollable and completely fortuitous political factors. It was felt to have very little importance in economic analysis. “Institutional reform has also been tainted by the suspicion that it remains the last refuge of politicians who are keen to be seen “to do something’ in the wake of a financial crisis.” (Taylor, 2015, p. 11).

Changes to the financial systems’ morphology and experience of crises, however, have shown that, even though the models used to organise financial supervision are not sufficient to provide effective regulation,<sup>3</sup> they are still important: on the one hand, they should ensure that no part of the financial system can escape regulation, and, on the other, they should avoid that overlapping or conflicting mandates of different agencies might compromise proper regulation because of poor coordination between the various policies implemented (Wall and Eisembeis, 2000)<sup>4</sup>. In advanced financial systems, where the lines of demarcation between product and services have blurred, the regulatory framework must still guarantee the competitive neutrality, to avoid the risk that financial firms will engage in some form of supervisory arbitrage.<sup>5</sup>

Other profiles are important when assessing the alternatives: effective concentration of expertise; economies or diseconomies of scale in resource allocation and minimisation of costs for regulated firms (the problem of proportionality of regulatory burdens) (Llewellyn, 2000); risk of undue concentration of powers and relationships between the regulatory authorities and the political system (independence and accountability) (Quintyn and Taylor, 2007); relationships between supervisors and regulated firms and the problem of regulatory capture (rules versus discretion) (Boyer and Ponce, 2012). In the literature and in the minds of policymakers these various arguments may have greater or lesser importance in designing and implementing supervisory architecture (Taylor, 2009). The different role given to central banks in financial supervision shapes the institutional structure and the way it has developed (Masciandaro and Quintyn, 2015). However, no one institutional framework has proven unambiguously superior in achieving all the objectives of financial regulation.<sup>6</sup> This is not merely due to the difficulty in drawing up sufficiently robust measures for regulator performance (Goodhart, 2001; Goodhart, 2007), but also - and perhaps especially - because the ways in which supervision has been structured in a single country at a certain point in history reflect not only the characteristics of the financial system, but also specific institutional, economic, and political factors. For example, in many countries in the euro area, the increasing involvement of central banks in supervision has been brought about by their specialisation as “financial stability agencies” (Herring and Carmassi, 2008) because they no longer have full responsibility for monetary policy. However, there are many exceptions here too, as can be seen with the German Bundesbank (which we shall examine briefly towards the end of this study).

Four general approaches have been discussed and adopted in different countries in recent years (Di Giorgio and Di Noia, 2007; G30, 2008), even though no “pure” example of any model may actually exist, and hybrid models are prevalent (Lumpkin, 2002; Oreški and Pavcović, 2014). Let us now look briefly at the characteristics of each of them.

## **2.1 Institutional/sectoral model**

The legal status of a financial institution determines which regulator shall be responsible for it in both financial stability and business conduct terms. Under this model there are

several specialised agencies, responsible for different type of institutions and sectors of financial systems (for example, banks, insurance companies, the securities industry etc.), which may be subject to different rules according to different risks for financial stability and different types of protection, which must be given to savers and investors. For example, under this model, whereas the central bank has the oversight of banks, specialist supervisory agencies are responsible for different types of institutions.

When financial institutions are diversified and the scope of their activities include products and services which are functionally equivalent to the ones offered by other categories of financial firms, separating financial regulation by sector runs the risk of introducing competitive distortions, and thus increases the risk of regulatory arbitrages. The general trend towards functional de-specialisation of banks and the spread of universal banking has thus seen a progressive abandoning of this regulatory institutional framework, at least in its pure form.

## **2.2 Functional model<sup>7</sup>**

This model can be seen as an evolution of the institutional one, to keep account of the integration between business areas, previously carried out by separate classes of intermediaries, and the spread of financial products and services which, when conveniently brought together, replicate the functions of traditional products and services. The functional approach is based upon the idea that the functions performed in the financial system are more stable than the institutions, which perform them and that “institutional form follows function” (Merton and Bodie, 1998, p. 4). Under this approach, all institutions, regardless of its legal status, which perform a particular function or business activity must be subject to the same set of rules and be under the supervision of a common regulator. In contrast with the institutional approach, which considers the existing institutional structures as given with the task of ensuring their survival, the functional perspective takes the functions of financial sector as given and tries to find out which institutional structure can best perform them. According to Bodie and Merton (1998, p. 21), “[f]unctional regulation promises more consistent treatment for all providers of functionally-equivalent



products or services and thereby reduces the opportunities for rent-seeking and regulatory capture.”<sup>8</sup>

Under a purely functional approach, there are specialist agency for every business activity: for example, commercial banking (retail deposit-taking), life insurance, securities trading and underwriting, regardless of the service provider. A financial conglomerate, which performs all these three business activities, must therefore be subject to prudential and conduct-of-business regulation by the three specialist authorities. For multifunctional groups, this version of the functional approach has the defect of too much sharing of competencies around the different authorities. This model, in addition to multiplying compliance costs, is ineffective in crisis management: when a crisis comes, specific institutions are hit rather than functions. The possible solutions, which involve giving responsibilities to the “lead regulator” (the regulator in charge of the most important business sector) or to a college of specialist regulators, leave very broad areas of ambiguity and are not usually very effective in conflict resolution (Llewelyn, 2006).

The effective implementation of the functional model is mostly conditioned by criteria, which specify the functions of financial intermediates. The practical and theoretical difficulty in aggregating these functions according to the risks which each of them may cause to financial stability and to protection for savers explains why this model has hardly ever been used, at least in its pure form.

The functional model, theoretically speaking, can provide a viable solution for the problem of inconsistent treatment for intermediaries competing in the same market; moreover, it allows regulatory gaps to be covered and bring financial firms into regulation which would otherwise be excluded merely because their business is not covered by traditional institutional descriptions. This explains why it has been re-suggested in the literature as a possible solution to cope with the risk of migration towards shadow banking by businesses subject to the stricter prudential regulation, which came into force after the crisis.<sup>9</sup>

From the late 1990s onwards,<sup>10</sup> there has been an increasing trend towards the integration of financial regulatory authorities. This reflects the need to bring the institutional

regulatory structure in line with the characteristics of financial systems where innovation in products and institutions has tended to blur the traditional boundaries between sectors. Financial conglomeration, securitisation, and credit derivatives are the most significant examples of this process, which has thrown up new challenges to the traditional sectoral or functional supervisory architecture. In addition to efficiency in oversight and compliance, managing the issues of competitive neutrality and the regulatory playing field has become more and more complex (Llewellyn, 1999; Čihák and Podpiera, 2006; Herring and Carmassi, 2008).

The two main integrated models are those usually defined as single-regulator and integration by objectives, or twin-peaks. The first is particularly important for the analysis carried out in this study, since it often (but not always)<sup>11</sup> requires responsibility for micro-prudential regulation to be given to some authority outside the central bank. The central bank should maintain responsibility for overall financial stability and overseeing payment systems<sup>12</sup>.

### **2.3 Integrated model 1: the single regulator**

Under the single regulator model the same agency is responsible for both prudential supervision and conduct of business regulation of all financial sectors (banks, insurance and securities industry and markets). The most famous example is the Financial Services Authority (FSA) set up in the UK in 1999 and which operated until reforms were brought in after the crisis in 2012. According to Briault<sup>13</sup> (1999), the main advantages of the single-regulator model are:

- a) Economies of scale and scope brought about by a more efficient allocation of resources, the harmonisation of regulatory criteria, the unification of reporting requirements, and the removal of duplications, overlaps and inconsistencies across specialist regulators. These advantages ought to reduce the costs of regulation and the costs of compliance for regulated firms. Goodhart et al. (1998, p. 150 et. seq.), however, argue that the single regulator need not necessarily deliver these advantages, because specialist divisions necessarily exist within a single agency, and

this creates potential problems in communication, information sharing, coordination and consistency.

b) A more efficient and more effective resolution of conflicts between the different objectives of regulation is reached. This was actually one of the most controversial profile of the single regulator, right from when it was first established in the UK. The problems of possible conflicts or inconsistencies between different objectives, mainly between financial stability, on the one hand, and protection for investors on the other, have been stressed by many commentators (Hawkesby, 2000; Di Giorgio and Di Noia, 2007).

c) A single regulator allows the risk of unjustifiable differences in supervisory procedures and competitive inequalities imposed on regulated firms to be eliminated. Under this model, similar risks are more likely to be treated similarly, regardless of where they arise, thus avoiding regulatory arbitrages. However, while a certain degree of harmonisation is desirable, it is important to recognise the need to preserve appropriate differentiation between the particular characteristics of each financial industry, each one requiring specific regulation. The risk of the single regulator is that it tends to assert itself in a dominant culture, and thus impose a “one-size-fits-all” approach. In particular, if the single regulator is outside the central bank, the conduct of business objective may in practice dominate (Di Giorgio and Di Noia, 2001; de Luna Martínez and Rose, 2003; Turner, 2009; Schoenmaker and Kremers, 2015). At the same time, trying to minimise regulatory arbitrages may cause a moral hazard problem, because financial market participants may believe that all creditors of all institutions supervised by the single regulator (if it is the central bank) will receive the same protection. This might implicitly extend the central bank safety net from banks to other sectors in the financial system. This has been a powerful argument against the hypothesis whereby the central bank should become the single supervisor (Saapar and Soussa, 2000; Goodhart, 2001; Čihák and Podpiera, 2006).

d) The single regulator is more accountable, because it has no others regulatory bodies to which it can transfer blame for regulatory failure. This should provide the

regulator with a strong incentive to establish clear mandates and areas of responsibility. Concerns about accountability of the single regulator have been, however, raised by many commentators, because of all-embracing nature of their role, its concentrated powers and the large discretionary powers it enjoys as to how best to meet different objectives (Goodhart et al, 1998, p. 152 ss.; Ferran, 2003). The risk of regulatory capture of the single regulator has been particularly stressed by Boyer and Ponce (2012)<sup>14</sup>.

## **2.4 Integrated model 2: integration by objectives (twin-peaks)**

In a supervisory model integrated by objectives, separate agencies would be assigned responsibility for each objective of financial regulation: systemic stability, safety and soundness of financial firms, consumer protection and other rules for conduct of business. The most renowned model of integration by objectives is the twin-peaks approach proposed by Taylor (1995). Under this model there are only two separate agencies. The prudential peak is responsible for systemic stability, for supervision and crisis management of all potentially systemic institutions (banks and systemically relevant financial institutions) and overseeing systemically important payment and settlement systems. The conduct of business peak focuses on market misconduct and all issues related to information asymmetries between financial firms and clients and investors, throughout all sectors of financial system. The central bank, in the pure version of this model, should be the systemic risk regulator, as the micro and macro-prudential supervisor for at least the more systematically significant financial institutions (Nier, 2009).<sup>15</sup>

Synergies between crisis prevention (prudential regulation) and resolution arise from the fact that both of them have the goal to minimise the social costs of crises, in terms of financial instability or fiscal burdens, and both are supposed to deal with the common problems of moral hazards. However, such synergies must not blind us to the fact that resolution regimes for systemic financial institutions cannot operate without involving fiscal responsibility. Whether this means that responsibility for crisis resolution must be separate from the central bank and depend upon government is still very hotly debated.<sup>16</sup>

The twin-peaks model solves many of the problems caused by having a single regulator. Indeed, it reconciles integration objectives with the advantages of greater consistency and better efficiency. It is more consistent because it recognises the complementary nature of monetary, prudential and resolution policies; it is more efficient because, thanks to the independence of the authorities, it guarantees that the objectives of financial stability will not be sought at the expense of protection for consumers and investors, nor vice versa

Potential weaknesses of the twin-peaks model are related to potential risks and conflicts of interest arising from the crucial role assigned to central bank in financial supervision, that are analysed in some more details in the next section.

### **3. THE INVOLVEMENT OF THE CENTRAL BANK IN PRUDENTIAL SUPERVISION: THE PROS AND CONS**

Debate about the involvement of central banks in prudential supervision has developed alongside a cycle, which over the past few decades has characterised the institutional architecture of financial supervision. Since the mid-1990s, structural changes to financial systems and the prevailing idea that supervision and its architecture needed to adapt to these developments with a market-friendly approach, promoted a concentration of supervisory functions, previously broken down by sectors or by functions. In different countries, this has given rise to a separation between the central banking and supervision, mostly due to worries about too much power being concentrated in a politically independent authority, such as the central bank. According to Melecky and Podpiera (2012), between 1999 and 2010, the prevalence of central banks in prudential supervision has diminished, mainly among countries with high financial depth, and the number of countries which chose to integrate in a financial authority outside the central bank has been higher than those which have integrated supervision into the central bank.

After the crisis, this trend has reversed. This is partly explained by the supervisory failures, which contributed to the crisis, but it is mainly due to the “discovery” (better, the “re-discovery”) by policy makers and regulators of macro-prudential supervision and the synergies between this and traditional micro-prudential supervision (Dalla Pellegrina et al,

2013)<sup>17</sup>. Therefore, after the crisis many countries have opted for greater central bank involvement in financial supervision, with the UK and the US being the most significant examples. At the same time, however, the financial stability powers, which government has tried to appropriate for itself have increased in consideration of the important fiscal effects to which systemic crises can give rise.

At a theoretical level, the interactions between central banking and prudential supervision seem clear: the central bank is concerned about the safety and soundness of financial firms for the implications it may have on the payments system, on the transmission of monetary policy, and on the financial stability. Prudential supervisors, for their part, are concerned about the effects that central bank's policies may have on the liquidity, profitability, and solvency of financial firms. These interactions and the best institutional way of dealing with them have now become more complex after a global rethinking of supervisory functions, in the light of the conflicting interpretations of financial stability mandate given to central banks. Distinctions and possible overlaps and conflicts between micro-prudential and macro-prudential supervision complicated the institutional design, and made the role to be assigned to the central banks more ambiguous.

Macro-prudential mandates have been assigned either to the central bank (or a specific committee under the central bank), or to a board where the central bank, the supervisory authorities and the government are all represented. Even though in the governance of these new macro-prudential councils the central bank is always given an important role (at least in analysing overall macro-prudential risks), the implications for the various institutional solutions are very different (BIS, 2009; BIS 2011; Głuch et al, 2013)<sup>18</sup>.

Traditionally, arguments for combining or separating prudential supervision with central banking can be grouped into several main basic categories, as shown in Table 1.

The most common argument in favour of combination concerns the *information and expertise synergies*, which this solution may create. As lender of last resort (Goodhart and Schoenmaker, 1993 and 1995; Padoa-Schioppa, 2002), the central bank takes on a credit risk, which it, like every soundly managed institution, needs to monitor according to the

credit worthiness of its counterparties. According to Cecchetti (2008), separation between bank supervisors and the central bank does not permit the latter, as liquidity provider, to assess the impact of monetary policy on solvency and bank liquidity, and to internalise the trade-offs between contrasting objectives. “Internalization of the trade-offs means that central bank is best positioned to decide whether actions aimed at calming financial markets today forsake macroeconomic stabilization objectives tomorrow” (p. 31). Moreover, as demonstrated by Peek et al (1999), confidential bank supervisory information can help central bank in forecasting macroeconomic variables used to guide its monetary policy.

The *synergies between systemic risk perspectives* used by the central bank and banking supervision have traditionally been an important argument in favour of integration. The micro supervisor not always could be able to internalise the social costs of its policies. This has been seen, for example, in the pro-cyclical nature of capital requirements. As Osiński et al (2013) argue, many of the instruments used to control systemic risks (such as, for instance, risk-weights, Pillar-2 capital requirements, dynamic provisioning, leverage ratios, or large exposure limits) also have micro-prudential objectives. If the central bank, not in charge of micro-prudential supervision, is responsible for macro-prudential tools, without a formal hierarchical model to define which objective takes precedence over the other when using the same instrument, conflicts are inevitable. This is an argument in favour of integration.

The central bank's mandates for price and financial stability have traditionally raised the problem of *conflict of interests and objectives*, together with the related issue of *reputational risk*. Combining prudential supervision and monetary policy could lead the central bank to a monetary policy which is too loose, in order to avoid adverse effects upon bank profitability and solvency (Goodhart and Schoenmaker, 1993 and 1995; Goodhart, 2001). On the other hands, the central bank as supervisor might be led, even during an economic slowdown, to impose stricter prudential requirements upon financial institutions. This could generate a credit crunch and price deflation (Quintyn and Taylor, 2007; Di Giorgio and Di Noia, 2007; Hellwig 2014; Masciandaro and Quintyn, 2015).

The risk of *moral hazard and the regulatory capture*, when the supervisor is also the lender-of last resort and liquidity provider, is another argument frequently used against integration. Moral hazard is, actually, inevitable, given that it is impossible –especially during a period of crisis - to distinguish between banks which are short of liquidity and banks which are insolvent (Goodhart and Schoenmaker, 1995; Padoa-Schioppa, 2002). It is supposed to be one of the tasks of supervision to solve the problems of moral hazard, but if liquidity management and supervision are sitting in the same room, given the discretionary powers which the central bank can use in liquidity control, the risk of forbearance and regulatory capture could increase (Čihák and Podpiera, 2007; Boyer and Ponce, 2012). The risk of undermining the effectiveness of supervision will rise if the central bank uses the administrative powers it has been given as a supervisory authority to affect market behaviour (Hellwig, 2014). The “Chinese walls” between supervisory and monetary policy arms of central bank may however mitigate this problem (Beck and Gros, 2012).

In the debate about the *independence* of central banks, which has been accentuated especially in the light of the policies they have adopted during the crisis, many writers have pointed out that the moral hazard issue has not been caused only by banks alone, but also by governments. This is because of the close links they have with banks and because public bonds are usually used as collateral for central bank's liquidity operations, both conventional and unconventional. The potential fiscal effects of such interventions risk compromising the independence of central banks as monetary authorities (Cuckierman, 2011; Buiters, 2012; Hellwing, 2014). Actually, the independence issue seems quite ambiguous: while in the past it was used to support integrating supervisory functions in the central bank (Abrams and Taylor, 2000), it has recently become one of the strongest arguments against giving the ECB supervisory powers (Masciandaro D. and Passarelli F., 2014).

Finally, a widening of functions given to the central bank may lead to an excessive *concentration of powers*, which could hamper the checks and balances which support its accountability, and increase the risk of regulatory and industry capture (Arnone and Gambini, 2007)



Empirical analyses of the factors, which explain the reforms brought in after the crisis, under which central banks were given greater responsibility not just for macro- but also for micro-supervision, have not yet given convergent outcomes. For example, Masciandaro et al. (2011) have shown that the degree of involvement of the central banks in supervision has not had a significant impact upon crisis resilience in the various countries. Dalla Pellegrina et al. (2013) have examined whether central bank independence and the criteria used to set up monetary policy objectives have influenced the choices made by policy makers when giving the central banks supervisory authority. Strong political independence in monetary policy seems to represent a commitment to mitigate central bank discretion in injecting liquidity in order to help badly-supervised banks, thus resolving the problem of conflict of objectives between monetary policy and supervision. Meleky and Podpiera (2012) have shown that the number of financial crises, which a country has experienced, is a greater incentive for bringing together micro- and macro-supervision. However, at the same time they show that greater independence for central banks means less integration.

After the crisis, several European countries have introduced radical modifications in their supervisory architecture with a growing involvement of central banks. A more in depth analysis on the relationships between these changes and the relevance of financial stability problems arising from the size and vulnerabilities of financial systems can be useful to understand the rationale of these reforms.

Table 2 below shows the evolution between 2006 and 2015 in the institutional architecture of supervision in a selected group of European countries. Table 2 has been drawn up on the basis of two assumptions. First, the degree of financial deepening affects the supervisory financial architecture, i.e. the greater the degree of bankarisation is the more use will be made of integrated models (single regulator or twin-peaks). Second, the costs of the crisis have become an important factor in reforming the supervisory institutional architecture, with greater involvement of the central bank in the micro-prudential banking supervision. These hypotheses seem to be confirmed, overall, by the following:

a) Even if the integration trend (single regulator or twin-peaks) can be observed for many countries, those with a higher degree of bankarisation, in particular, France, Denmark, Ireland, the Netherlands, the UK, all have adopted integrated models.

b) The number of countries with central bank involved in micro-supervision has increased from 9 before the crisis to 15 after. After the crisis, several countries (Belgium, France, Italy, Portugal, the UK) have introduced a twin-peaks model, with central bank as micro- and macro-supervisor.

c) Countries where the fiscal costs of the crisis were significant (Belgium, France, Ireland, Hungary and the UK) have modified their supervisory architecture and/or given a more important micro-prudential role to their central bank.

#### **4. EXPERIENCES OF THE UK AND GERMANY AFTER THE CRISIS**

The UK and Germany are two interesting cases when assessing the effects of the crisis on political choices in reforming the supervisory architecture after 2008. They show the complex interactions between political pressure, resistance and ambitions in the various existing authorities, and the country's heritage, which characterise every stage on the path towards institutional reform of supervision, especially where significant supervisory failures have been found.

##### **4.1 The UK: from the single supervisor to the twin-peaks model.**

Before the crisis, the UK framework for financial services and financial stability was based on the so-called Tripartite Regime. The Financial Services Authority (FSA) was responsible for prudential and conduct of business regulation of all financial sectors; the Bank of England, operationally independent of government, had the task to ensure monetary and financial stability, with a surveillance function over potential threats to financial stability; the Treasury was responsible for the institutional structure of financial regulation and legislation and, in the event of a crisis, for authorising certain types of financial interventions and keeping Parliament informed. The arrangements for dealing with a possible crisis were set up in a Memorandum of Understanding, which required the Bank

of England and the FSA to alert the Treasury to cases with potential system-wide consequences.

The catalyst for change was the 2007 Northern Rock failure (House of Commons, 2008). During the parliamentary debate, the very workings of the Tripartite Regime were put under discussion, and the criticisms of the FSA's supervision were very severe. It was accused of having "systematically failed its duty as a regulator". Attempts by the FSA to keep its role as regulator with an ambitious Supervisory Enhancement Programme (Turner, 2009) were unsuccessful. Radical reform of the supervisory architecture was brought in by the new Tory government, which came to power in 2010, and became law in the Financial Services Act 2012. Under this reform, the Bank of England came back to the centre of financial regulation.

This reform took over from the Tripartite Regime with a twin-peaks model, and gave the Bank of England more formal powers over macro-prudential regulation through a newly established Financial Policy Committee (FPC). The task of the micro-prudential regulation for banks, insurance and major investment firms was given to the Prudential Regulatory Authority (PRA), created as a subsidiary of the Bank of England. For the conduct of business regulation, the Financial Conduct Authority (FCA) was set up, a separate institution from the central bank, and it was also assigned the responsibility for the micro-prudential regulation of financial services not supervised by the PRA, (e.g. asset management, hedge funds, many brokers and dealers and independent financial advisers). Major changes were also made to the governance of financial crisis management arrangements. The Bank of England has been designated as the resolution authority for central counterparties, and for banks and all financial firms supervised by the PRA. The Governor of the Bank of England has the specific duty to notify the government if there is a material risk to public funds. The Treasury (HMT) has powers of direction over the Bank in relation to provision of financial support to a financial firm or to the use of stabilisation powers, when necessary to resolve or to reduce a serious threat to financial stability.

One crucial problem with this reform was cooperation and coordination among the Bank of England's diverse functions: monetary stability, tasked to the Monetary Policy Committee

(MPC); financial stability, entrusted to the FPC, and micro-prudential regulation to the PRA. Indeed, minimising potential conflicts, reducing overlaps, and exploiting synergies are essential if an integrated regulatory and supervisory framework is to work properly. The solution was mainly found via information sharing mechanism. The most important of these is cross-committee memberships: the Governor chairs all three bodies, and there is further cross- membership of internal members.

Distinguishing the FPC and the PRA's powers and instruments has been another important profile of the reform. In addition to its powers to make recommendations to the other authorities, the FPC was also given the task of deciding which counter-cyclical capital buffers or sector capital buffers and leverage ratios were to be applied: these decisions were to be binding upon the PRA. However, the FPC cannot involve itself in matters relating to specific firms, which are the sole responsibility of the PRA (Fisher, 2014).

The reform process in the UK does not yet seem complete. Recently, in October 2015, the government introduced a new Bill into Parliament, to bring the PRA within the Bank of England. After de-subsidiarising the PRA, its functions will probably be transferred to a new Prudential Regulatory Committee at the Bank of England. The declared purpose of this proposal is to strengthen and simplify the Bank's internal governance and "allow it to benefit from having monetary policy, macro-prudential policy and micro-prudential policy under the aegis of one institution" (HM Treasury, 2015, p. 4).

#### **4.2 Germany: a missed reform**

The current Germany structure of financial supervision started in 2002, when a new integrated supervisor, the Federal Financial Supervisory Authority (BaFin) was created, reporting to the Ministry of Finance. BaFin replaced and took over the supervisory functions of the three previous federal authorities responsible, respectively, for banking, insurance, and securities trading. The banking supervision was entrusted to BaFin, which is the designated competent authority. BaFin, however, share this task with the Bundesbank. A Memorandum of Understanding sets out their respective roles in day-by-day supervision. According to the Memorandum, the Bundesbank was given most of the operational tasks. It

means performing on-site and off-site monitoring of banks under the guiding principles issued by BaFin, in agreement with the same Bundesbank. BaFin, however, has final powers of enforcement of these measures.

Quaglia (2008, p. 70) points out that, according to a gentlemen's agreement, the BaFin supervises mainly large banks (both private and public, as Landesbanks), whereas the Bundesbank mainly supervises local banks.

The German reform of 2002 had many similarities with the UK reform, which saw the setting up of the FSA as single regulator. There are some important differences, however: BaFin is not an independent authority, because it reports directly to the Minister of Finance, and it is supported by the Bundesbank in banking supervision, according to a "dual supervision" approach.

The reasons for the reform were mainly dictated, on the one hand, by changes to the structural characteristics in the German financial system and, in particular, by the increase in size of financial conglomerates (Allfinanz). On the other, there was the need to promote Frankfurt as a financial centre in competition with London. The pressures coming from financial industry were therefore given due consideration in going ahead with integrating supervision. Unlike the Bank of England, the Bundesbank at the time was strongly opposed to any reform, although unsuccessfully. This contradicted the traditional argument it had always supported in the years before the EMU, according to which the same body should not perform monetary policy and banking supervision. The ECB, called upon to give its opinion on the German reform, took the side of the Bundesbank, stressing that "the close involvement of national central banks in prudential supervision is a mandatory condition to allow the Eurosystem to contribute adequately to monitoring the risks to financial stability in the Euro Area" (ECB, 2001).

In 2009, with support from the new centre-right government, the Bundesbank pulled out again its old ambition for a more important role in financial supervision. Just like the FSA in the UK, BaFin was considered in Germany – rightly or wrongly – to be responsible for the banking upsets, which had struck the country in 2007/2008. According to the IMF (2008,

p.23), the significant subprime-related losses sustained by several medium banks, private and public (e.g. Sachsen Landesbank, Westlandebank, IKB, Hypo Real), had come about because neither the Bundesbank nor BaFin considered the “unusual nature of the banks’ off-balance-sheets activities and the liquidity commitments to their conduits” alarming, even though they ought to have been fully aware of this.

The “dual supervision” model had been shown to be unreliable because there was no efficient way for the authorities to coordinate: this weakened accountability and increased the risk of assessment error and delays in dealing with problem situations. However, perhaps even more important in providing a reason for the reform proposal were concerns about the Bundesbank’s role in the new authorities of the European System of Financial Supervision. Especially in the European Banking Authority the Bundesbank wanted to be adequately represented, but the fact that BaFin was the designated German authority for banking supervision relegated the Bundesbank to a secondary position on the EBA board, where it could sit, but without voting rights.

In the opinion of many, the new Bundesbank President, Axel Weber, was the architect of the proposal to bring in a twin-peaks model to Germany, making the Bundesbank the micro-prudential and macro-prudential supervisor and giving BaFin supervision for conduct of business (Engelen, 2010). Weber, actually, has said several times that “the Bundesbank stands ready to assume greater responsibility in supervision,” because “the independence of monetary policy and a more prominent role in the supervision of banks and insurance companies can be reconciled” (Weber, 2009, p.4 and 5; Weber, 2009b). In an attempt to deny the suspicious, raised by the new government’s reform project, Weber gave authorship for them to the political parties that had won the federal elections.

In the end, the proposed reform never went through. According to Hellwig (2014, p. 44) “the Bundesbank itself demurred when it realised that this task [financial supervision] might threaten its independence.” It is however likely that, among the various factors which came out during the political discussions, the pressures coming from major financial groups, strongly against any concentration of supervisory powers in the Bundesbank, have had a prominent role (Deutsche Bank Research, 2009).

## 5. CONCLUSIONS

Central banks, as bankers of banks, have always had a very important role in banking supervision. Changes to the structures in financial systems have led to a blurring of the traditional differences between sectors in financial systems. The very specificity of banks requiring a special supervisory regime, especially because of the interactions between their solvency, liquidity, and smooth-operation-of-payments system, has been partly allayed. With the wisdom of hindsight, this evolution should have implied that functions assigned to central banks in crisis prevention and management should have been extended over all intermediaries with systemic importance. The diminished importance of traditional commercial banking within financial systems contributed instead to call into question the central banks' role in prudential supervision.

In many ways, the crisis was a turning point in this development. The new role of the central banks in safeguarding financial stability, and the crucial importance of macro-prudential policies are the main reasons why the architecture of supervision needed to be revised, both theoretically and by policy makers.

There is today a broad consensus, on the one hand, that monetary stability and financial stability are two sides of the same coin and, on the other, that there are underlying synergies and interactions between micro- and macro-supervision. The most efficient institutional solutions are instead still disputed, because of the difficulties in specifying which models are most suitable for the economic and political reality of each individual country and because of inertia carried forward from the past. How supervision is conducted is surely more important than who is in charge of it, but there is often a very close association between these two profiles, which reflects a tradition of institutional expertise and sensitivity, which any reform will find it difficult to underestimate.

There is probably no perfect model for supervisory architecture; the balance between pros and cons in the involvement of central banks in prudential supervision remains ambiguous on a theoretical level. Financial supervisory reforms are always a political process, where the final word can only be given by summing up the interests of opposing sides.

Theoretical consistency, however, is the only yardstick we can use to judge any solution. In this perspective, the central banks – in view of the crucial role they are inevitably called upon to play in financial crisis management – cannot fail to step up to take responsibility for crisis prevention, of which prudential supervision is such a vital part. The worst reputational risks, which might stem from this, are probably a fair price to pay.

Once again, perhaps, British central banking has shown us the path to follow.



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<sup>1</sup> The term supervision is used to describe the regulation/supervision system, because the border between regulatory and supervisory tasks is blurred due the large rule-making powers formally or informally delegated to supervisory bodies.

<sup>2</sup> Developments in the architecture of financial regulation in the EU have been examined in a separate study as part of the FESSUD programme (Montanaro, 2015). Reference will only be made here to national experiences.

<sup>3</sup> According to Abrams and Taylor (2000), the institutional structure of supervision is a second order issue, in the sense that there should first be in place conditions for effective supervision, i.e. clear objectives, independence, accountability, adequate resources and enforcement powers.

<sup>4</sup> With reference to banking supervision, the Basel Committee (BCBS, 2012), Core Principle 1 states: “An effective system of banking supervision has clear responsibilities and objectives for each authority involved in the supervision of banks and banking groups. A suitable legal framework for banking supervision is in place to provide each responsible authority with the legal powers to authorise banks, conduct ongoing supervision, address compliance with laws and undertake timely corrective actions to address safety and soundness concerns”.

<sup>5</sup> Abrams and Taylor (2000), however, stress that complete regulatory neutrality should not be a primary objective of supervision, because the potential systemic costs associated with failure of financial institutions may be very different.

<sup>6</sup> The key policy goals of financial regulation include safety and soundness of financial institutions; mitigation of systemic risks arising from fragilities of the overall functioning of the financial system and from systemic financial institutions, markets and infrastructures; fairness and efficiency of markets and protection of investors and consumers. The first two refer to financial stability (micro- and macro-prudential supervision), and the latter two mainly to market integrity and conduct of business rules, generally considered together. Traditionally, systemic risks have tended to focus on banks and payment systems, usually subject to oversight by the central bank. Micro-prudential regulation involves all the categories of financial institutions. For banking, however, there has always been a special

supervisory framework, often entrusted to the central banks. This is both because banks are generally viewed as systematically sensitive, and because there are strong synergies between bank supervision and lending of last resort. The main goals of special banking supervision have traditionally been protection for savers and curbing the moral hazard caused by the fact that public safety net (lender of last resort and deposit insurance) protect not only small depositors, but also – and especially – the banks themselves, particularly those which are too-big-to fail. However, in the modern financial systems, where many financial intermediaries perform some of the traditional functions of banks, mainly risk and maturity transformation, a systemic approach to financial supervision cannot be limited to the banks alone. All institutions providing retail financial services are subject to conduct of business regulation. Market integrity and protection of investors and customers of brokers and dealers are, on the other hand, the primary objectives of securities regulation.

<sup>7</sup> The functional approach to regulation should not be confused with the so-called functional regulation of banks, developed in line with the original proposal of the “narrow bank”, which implies both that only pure monetary institutions should have access to the payment systems, and that the asset portfolio of narrow banks should be legally separate from the affiliate lending firms (Philipps, 1995). On this theoretical approach, which entails a separation between the banks’ functions of maturity transformation and liquidity supply, see also Kregel (2014).

<sup>8</sup> The UK’s model adopted after the Big Bang of the early 80s provides a classical example of this approach in its pure form: the scope of the banking activities was defined by reference of “deposit-taking” function; that of securities regulation, by reference of “investment business” etc. For the financial groups engaged in banking and securities activities, the Bank of England was responsible for supervising the banking activities and the functional regulator for supervising investment business, if conducted by a separately incorporated securities subsidiary. If, however, the bank itself conducted the bank’s securities business, the central bank was the “lead” regulator, responsible for overall safety and soundness oversight, and the functional regulator was in charge of solvency

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supervision of the subsidiary. The cooperation between the two supervisors came under “supervisory colleges” (Montanaro, 2016).

<sup>9</sup> One example of functional regulation is that suggested by Montanaro and Tonveronachi (2012): according to this proposal, all leveraged financial institutions, which perform risk and maturity transformation, should be subject to the same rules and the same supervisory measures. The same line has been taken by Acharya (2015), who argues that, in order to design a macro-prudential regulation able to deal with shadow banking and regulatory arbitrage, central banks should employ capital and liquidity requirements based on the features of underlying financial transactions rather than the specific institutional form of financial firms.

<sup>10</sup> A significant exception can be seen in the three Scandinavian countries (Norway, Sweden, and Denmark), where the integrated regulatory model was brought in many years ago, between the late 1980s (Norway and Denmark) and the early 1990s, after the crisis (Sweden). In all three countries, the central bank was never in charge of supervision: the single regulator therefore arose out of the integration of many previous bodies, and was only tasked with prudential functions. Rule-of-conduct regulation was entrusted to sector Ombudsmen. The integration of financial supervision was mainly justified by the expected economies of scale, which were especially important in these countries where the financial system, outside the banking and insurance sectors, was still relatively underdeveloped. In 1993, Finland, after the crisis, took a completely different approach from the other three Nordic countries: it replaced its Banking Inspectorate, which was an agency reporting to the Minister of Finance, with a Financial Services Authority, administratively linked to the central bank. The Finnish FSA is not a single financial regulator in the narrow sense, because it is only responsible for banking and securities regulation. Finland’s decision not to adopt a pure integrated approach was explained by two needs: to make supervision independent of political control, and to use the tried and tested capabilities of the central bank in crisis management (Abrams and Fleming, 1999).

<sup>11</sup> Unlike the British model of single supervisor (taken up in many other countries from the early 2000s onwards), the integrated model adopted in 2002 by Germany with the institution

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of BaFin implies an important involvement of the Bundesbank in operational aspects of banking supervision. This model, commonly known as “dual supervision,” has since been implemented in Austria.

<sup>12</sup> According to Nier (2009, p. 42), “the single integrated structure has not been adopted with macro-prudential objectives in mind. As a result, responsibility for macro-prudential policies is often not clearly assigned, and accountability for macro-financial outcomes is lacking”.

<sup>13</sup> Clive Briault served for many years at the FSA, as its Director of Prudential Standard Division.

<sup>14</sup> According to Taylor (2015, p. 20), experience with the British single regulator shows that the concerns about the excessive concentration of powers were actually misplaced. The “light touch” style of supervision which characterised the FSA’s regulatory philosophy meant that FSA never made full use of significant powers that it could have exercised, actually delegating many supervisory tasks to firms’ internal risk management systems within a framework of general principles.

<sup>15</sup> In the twin-peaks model adopted by the Netherland from 2002, the central bank serves as the prudential and systemic regulators of all financial firms, including banking, insurance, pension fund and securities. In Australia, though, the first country to adopt the twin-peaks approach, the prudential authority is separated from central bank and independent (Taylor, 1995).

<sup>16</sup> The European regulation for bank recovery and resolution is emblematic: even though Directive 2014/59/EU (BRRD) requires structural arrangements to be in place to ensure operational independence and to avoid conflicts between supervisory and resolution functions, most national central banks have also been given resolution authority (EBA, 2013).

<sup>17</sup> The main objective of macro-prudential policy is to mitigate the pro-cyclical effects of the financial sector and the risks linked to concentration and interconnectedness. Several studies seek to identify and classify macro-prudential instruments (CGFS, 2010; G30, 2010; Schoenmaker and Wiertz, 2011; Knot, 2014).

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<sup>18</sup> The institutional arrangements for macro-prudential supervision vary widely throughout various jurisdictions. In particular, there are significant differences between the European experience and the USA, due to different level of centralisation and different powers being awarded to the central banks. In the EU, the European Systemic Risk Board (ESRB), with representatives from central banks and supervisors plus one member of the European Commission, does not have direct authority over any policy instruments, but only the power to issue recommendation and risk warnings concerning systemic risks to competent authorities at both national and European level. These recommendations carry an “act or explain” obligation and could be made public only under certain circumstance. The leadership of ESRB is held *de facto* by the ECB: its President is the chair of the ESRB, and the ECB ensure analytical, statistical, administrative and logistical support.

Along with Single Supervisory Mechanism within the banking union, macro-prudential tasks of the ECB are significant. Even though the national regulators with responsibility for systemic risks oversight remain responsible for macro-prudential tasks, the ECB may autonomously decide to impose countercyclical capital buffers or, in general, more (but never less) stringent prudential requirements than the actions taken at the national level. The purpose is to prevent passiveness in the pursuit of macro-prudential policy by national authorities, as the deployment of these instruments is unpopular and tends to meet with the opposition from the industry (regulatory capture). The macro-prudential tasks conferred to the ECB may affect any credit institutions in a euro area country, and not only those classified as significant, directly supervised by the ECB. However, the non-banks financial firms are outside the mandate of the ECB as macro-prudential supervisor.

In the US the Dodd-Frank Act created a new centralised multiagency macro-prudential body, the Financial Services Oversight Council (FSOC). The FSOC, even though has not the rule-writing power of an enforcement authority, has powers to recommend and, in some cases, require actions by member agencies. In the FSOC the role of central bank is less prominent than in the European ESRB, because it is chaired by the Secretary of the Treasury, and the chairman of the Board of Governor is only one of ten voting members.

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Further, the main analytical support body is housed in the Treasury. The Federal Reserve, unlike the ECB, is the prudential supervisor for all systemically important firms (including non-banks), with the express powers to adjust prudential standards for macro-prudential objectives.

**TABLE 1 - ARGUMENTS FOR COMBINING OR SEPARATING PRUDENTIAL SUPERVISION WITH CENTRAL BANKING**

<b>Arguments for combining - pros</b>	<b>Arguments for separating - cons</b>
Information synergies and expertise	Conflicts of interest between supervision and monetary policy and reputational risk
Focus on systemic risk and overall financial stability	Moral hazard
Independence	Independence and regulatory capture
	Concentration of powers

**TABLE 2 - SUPERVISORY ARCHITECTURES AND THE ROLE OF CENTRAL BANKS IN SOME SELECTED EU COUNTRIES (2006-2015)**

Country	Bank total Assets/GDP (ratio)	2008 Financial crisis fiscal cost/GDP (%)	Supervisory model		Involvement of central bank in micro-prudential supervision		Macro-prudential authority
	2014	2011	2006	2015	2006	2015	2015
Austria	2.6	4.9	SS + CB	SS + CB	Yes	Yes	BG
Belgium	2,7	6.0	SS	TP	No	Yes	CB
Czech Republic	1.2	-	SS	CB	No	Yes	CB
Denmark	4.2	3.1	SS	SS	No	No	BCB
Estonia	1.1	-	SS	SS	No	No	CB
Finland	2.8	-	IO	SS + CB	Yes	Yes	SS
France	3.8	1.0	IO	TP	No	Yes	BG
Germany	2.8	1.8	SS+CB	SS+CB	Yes	Yes	BG
Greece	2.0	27.3	S	IO	Yes	Yes	CB
Hungary	1.00	2.7	SS	CB	No	Yes	CB
Ireland	5.6	40.7	SS	CB	No	Yes	CB
Italy	2.3	0.3	IO	TP	Yes	Yes	BCB
Latvia	1.2	5.6	SS	SS	No	No	CB
The Netherlands	3.3	12.7	TP	TP	Yes	Yes	BCB
Norway	1.4	-	SS	SS	No	No	G
Portugal	2.6	-	IO	TP	Yes	Yes	CB
Slovak Republik	0.8	-	SS	CB	Yes	Yes	CB
Spain	2.7	3.8	S	S	Yes	Yes	BCB
Sweden	2.8	0.7	SS	SS	No	No	SS
United Kingdom	4.7	8.8	SS	TP	No	Yes	CB

Abbreviations used in the Table:

Micro-prudential Framework: CB = Central Bank; IO = integration by objectives (this model is generally adopted in some hybrid form: in the Table a country's model is classified integrated by objectives when a single regulator is responsible for prudential/conduct of business supervision for at least two sectors of the financial system); TP = twin-peaks; S= sectorial; SS = single supervisor (autonomous from CB). For all Euro-area countries the primary responsibility of banking supervision has been transferred since 2014 to ECB, inside the SSM of the Banking Union. In the Table, however, reference is made only to



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national authorities. Macro-prudential framework: BCB = board chaired by central bank; BS = board chaired by supervisor; BG = board chaired by government; BC = central bank or a specific committee inside the central bank; G = government.

Sources: Supervisory models: ECB (2010); G30 (2008); Schoenmaker (2011); Oreški and Pavković (2014), ESRB (2014); Knot (2014) and online official information. Data: Bank total assets/GDP: ECB Statistical Warehouse; Fiscal cost of banking crisis/GDP: Laeven and Valencia, 2012.

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## **THE ABSTRACT OF THE PROJECT IS:**

The research programme will integrate diverse levels, methods and disciplinary traditions with the aim of developing a comprehensive policy agenda for changing the role of the financial system to help achieve a future which is sustainable in environmental, social and economic terms. The programme involves an integrated and balanced consortium involving partners from 14 countries that has unsurpassed experience of deploying diverse perspectives both within economics and across disciplines inclusive of economics. The programme is distinctively pluralistic, and aims to forge alliances across the social sciences, so as to understand how finance can better serve economic, social and environmental needs. The central issues addressed are the ways in which the growth and performance of economies in the last 30 years have been dependent on the characteristics of the processes of financialisation; how has financialisation impacted on the achievement of specific economic, social, and environmental objectives?; the nature of the relationship between financialisation and the sustainability of the financial system, economic development and the environment?; the lessons to be drawn from the crisis about the nature and impacts of financialisation? ; what are the requisites of a financial system able to support a process of sustainable development, broadly conceived?

## THE PARTNERS IN THE CONSORTIUM ARE:

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1 (Coordinator)	University of Leeds	UK
2	University of Siena	Italy
3	School of Oriental and African Studies	UK
4	Fondation Nationale des Sciences Politiques	France
5	Pour la Solidarite, Brussels	Belgium
6	Poznan University of Economics	Poland
7	Tallin University of Technology	Estonia
8	Berlin School of Economics and Law	Germany
9	Centre for Social Studies, University of Coimbra	Portugal
10	University of Pannonia, Veszprem	Hungary
11	National and Kapodistrian University of Athens	Greece
12	Middle East Technical University, Ankara	Turkey
13	Lund University	Sweden
14	University of Witwatersrand	South Africa
15	University of the Basque Country, Bilbao	Spain

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