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Mohamed Aldegwy and Matthias Thiemann

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Aldegwy, Mohamed[*] and Thiemann, Matthias[**]±

Abstract

Since the outbreak of the financial crisis, the macro-prudential policy paradigm has gained increasing prominence (Bank of England, 2009; Bernanke, 2011). The dynamics of this shift in the economic discourse, and the reasons this shift has not taken place prior to the crisis have not been addressed systemically. This paper investigates the evolution of the economic discourse on systemic risk and banking regulation to better understand these changes and their timing. Further, we use our sample to inquire whether, and if so, why the economic regulatory studies failed to recommend a reliable banking regulation prior to the crisis.. By following a discourse analysis, we establish that the economic discourse on banking regulation has not been suitable for providing the knowledge basis required for a dynamically reliable banking regulation, and we identify the underlying reasons for such failure. These reasons include the obsession of economic discourse with optimization and particular forms of formalism, particularly, partial equilibrium analysis. Further, the economic discourse on banking regulation excludes historical and practitioners' discourses and ignores weak signals. We point out that post-crisis, these epistemological failures of the economic discourse on banking regulation were not sufficiently recognized and that recent attempts to conceptualize systemic risk as a negative externality and to thus price it point to the persistence of formalism, equilibrium thinking and optimization, with their attending dangers.

Keywords: Sociology of Finance, Optimal Regulation, Dynamic and Reliable Regulation, Banking Regulation, Financial Crisis

[*] Doctoral Candidate in Law and Economics of Money and Finance, Goethe University, Frankfurt. Research Assistant at Goethe University, House of Finance (Germany).
[**] Juniorprofessor of Sociology of Finance, Goethe University, Frankfurt.
± The authors have equally contributed to the paper.

1. Introduction

The financial crisis of 2007-2009 has brought about an intensive discussion about its origins and how to avoid a similar crisis in the future (Gorton, 2010). Some economists have argued that the financial crisis could be traced back to the failure of regulators (Engelen et al., 2012, Lord Turner, 2011). In their line of argument, they perceive regulators to have ignored much of the teachings of the economic discourse regarding, inter alia, market failures and thus exaggerated the self-correction capacity of markets (Lord Turner, 2011). Some economists went further to contend that the financial crisis reflects a deeper problem indicating the failure of economics as a discipline (hereinafter referred to as the economic discourse) (Colander et al., 2009). This line of thought implies that the failure of regulators was not only due to ignoring some of the teachings of economic discourse, but also due to following its teachings. In particular, as Julia Black has recently argued (2013), regulators' ways of seeing and knowing financial markets was predetermined by a neoclassical framework, which simply assumed most of the actual regulatory problems away.

We conceptualize regulation as the outcome of the regulatory process taking place in the law-making sphere (policy sphere), with the latter being particularly influenced by the economic discourse due to the technocratization of the regulatory process (see Dorn, 2014). From this perspective, the failure of regulators could be a result of the failure of the economic discourse or a failure in communicating this discourse from its production sphere (mainly, the academic sphere) to the policy sphere. Alternatively, the failure may be a result of the failure of the political process due to political capture or ideological positions of the regulators. Earlier studies have focused on the policy sphere alone (Baker, 2013, Seabrooke and Tsingou 2009), ignoring the sphere of knowledge production. In this paper, to give these studies a better grounding, we investigate the sphere of economic discourse, i.e., the place where the cognitive models with which regulators were seeking to optimize regulation originate (Black 2013). We test whether this discourse has failed in developing reliable financial regulation pre-crisis that takes system-wide developments into account.

Since the outbreak of the financial crisis, a new macro-prudential policy paradigm that focuses on the evolution of systemic risks has gained increasing prominence (Bank of England, 2009; Bernanke, 2011).. Before the crisis, financial regulators in developed countries had adopted a

micro-prudential policy paradigm, the underlying rationale being that "for the financial system to be sound it is necessary and sufficient that each individual institution is sound." (Borio, 2009). As individual banks may take on excessive risk due to market failures, the micro-prudential approach aims to achieve the financial stability of individual financial institutions through the control of their risk taking (ibid). In contrast, the macro-prudential approach attempts to maintain the financial stability of the financial system as a whole by controlling systemic risks (Hanson et al., 2011), thus focusing on the sources of system-wide risks.

Despite the importance of this shift from micro to macro-prudential banking regulation, the dynamics of this shift in the economic discourse, and the reasons this shift has not taken place prior to the crisis have not been addressed systemically. This paper thus investigates the evolution of the economic discourse on systemic risk and banking regulation to better understand the changes in the economic discourse on banking regulation post-crisis, and why they have not taken place prior to the crisis.. By investigating the dynamics of the observed shift from micro to macro-prudential, we simultaneously inquire whether, and if so, why the pre-crisis economic discourse on banking regulation has failed to recommend a reliable or truly optimal banking regulation. By using a discourse analysis of economic research on banking regulation and systemic risk, we investigate two interrelated research questions:

First: we investigate whether, and if so why, the shift to macroprudential regulation has not taken place prior to the financial crisis in the academic sphere. Since economic research represents a significant input into policy-making, particularly, due to technocratization of economic policy making, we hypothesize that investigating the evolution of economic research on banking regulation and systemic risk in the academic sphere could partially explain the dynamics of evolution of prudential regulation in policy making sphere.. Then, in section (5) we use our discourse analysis to shed light on a broader question: does mainstream economics meet the epistemological requirements of the knowledge basis for reliable banking regulatory design.

Second, given our understanding of the evolution of prudential banking regulation, the reasons that impeded the shift from micro- to macro-prudential regulation, and the reasons that impede economics from developing reliable banking regulation, we use both our discourse analysis and some insights of Kuhn (1970) and Lakatos (1978) to investigate whether the shift to

macro-prudential regulation reflects a deeper restructuring of the neoclassical financial perspective so that this perspective would overcome its failure and would be able to develop reliable banking regulation in the future We show that the shift from micro- to macro-prudential regulation has not been accompanied with a significant shift in the neoclassical financial paradigm that still retains optimization, formalism and equilibrium modeling. These are the reasons that caused the failure of economics to develop reliable banking regulation prior to the crisis; neoclassical financial economics seems therefore to be locked into regulatory pseudo-optimization.

The structure of this paper is as follows. Section (2) demonstrates the discourse analysis method we adopted in this paper, describes our dataset and its selection criteria. Section (3) outlines the major findings of the discourse analysis of our data. Section (4) illustrates the reasons that impeded the shift from micro to macro-prudential regulation prior to the crisis. Section (5) illustrates that, given the findings of our discourse analysis, economics is not suited to develop reliable or truly optimal banking regulation.. Given the conclusions of sections (4 and 5), Section (6) argues that the shift to macro-prudential regulation does not reflect a fundamental changes in the mainstream economic research on banking regulation; the latter still retains formalism, equilibrium thinking and optimization and thus it seems that it would remain stuck in regulatory pseudo-optimization.. Section (7) concludes.

2. Method and Data Description

We analyze the evolution of economic thinking about banking regulation and systemic risk in a longitudinal perspective through content and citation network analysis of the economic discourse on banking regulation for the period from 1985 to 2014. We consider the top cited scholarly works (such as journal articles and books) on banking regulation to be a good representative of the most influential and well-established ideas in the economic discourse on banking regulation in the years following their publication during which these top cited articles have attracted most of their citations.

By relying on the number of citations each scholarly work on banking regulation received, we were able to construct a sample of 30 scholarly works (most of them are journal articles) covering the period of 1985 to 2014. Using the date of publications of these scholarly works, we divided the sample into six periods (1985-1990, 1990-1995, 1995-2000, 2000-2005, 2005-

2010, 2010-2014).[1] The number of citations is a good proxy of the established ideas in the economic discourse unless some of the scholarly works are highly cited because their advocated ideas are rejected. In the banking regulation sample (s. below), we could safely say that the sample has no selection bias since the top cited works share the same ideas. Further, some of the literature reviews have reached our top cited works and these reviews also reiterate the same ideas of the other top cited articles prior to the crisis. The only outlier prior to the crisis are the articles of Borio (2003) and Jimenez, Saurina, (2005), and these articles have received most of their citations post crisis when almost all financial economists have become macro-prudentialists and thus these article were cited also positively. Table 2.1 below shows our final refined sample on banking regulation discourse. Table 2.2 shows the number of citations the scholarly works of the banking regulation sample received.

Table 2.1: Banking Regulation Sample

Scholarly works using the historical approach are highlighted in green, those using practitioners' discourse are highlighted in red, and those using informal theoretical analysis are highlighted in black. Finally, scholarly works using quantitative/formal methods, whether theoretical or empirical are highlighted in blue.

1985-1990	1990-1995	1995-2000	2000-2005	2005-2010	2010-2014
Kim, Santomero, Risk in Banking and Capital Regulation 1988	Dewatripont, Tirole, The Prudential Regulation of Banks 1994	Freixas, Rochet, Microeconomics of Banking 1997	Hellmann, Murdock, Stiglitz, Liberalization, Moral Hazard in Banking, and Prudential Regulation: Are Capital Requirements Enough? 2000	Barth, Caprio, Levine, Rethinking Bank Regulation: Till Angels Govern 2006	Borio, C. and Zhu, H., Capital Regulation, Risk-taking and Monetary Policy: A Missing Link in the Transmission Mechanism? (2012)

[1] To collect the top cited scholarly work in each of our six periods, we searched Google Scholar for the following search terms in the "title" search: Banking Regulation, Bank Regulation, Financial Regulation, Microprudential Regulation, Micro-prudential Regulation, Microprudential, Macroprudential Regulation, Macro-Prudential Regulation, Macroprudential, and Banking Law. We have also used the following search terms in the whole article search in Google Scholar: Banking Regulation and Bank Regulation. In order to make sure that we did not miss any of the top cited scholarly works which are directly addressing the issue of banking regulation, we have replicated the above search using the Web of Knowledge database. The above search resulted in a generic sample of the top cited scholarly works that touch upon banking regulation. Some of these scholarly works address banking regulation directly as being their key theme, banking regulation seemed to be peripheral to other scholarly works, however. We have excluded the scholarly works in which banking regulation receives a peripheral attention.

Jacklin, Bhattacharya, Distinguishing Panics and Information-based Bank Run 1988	Keeley, Deposit Insurance, Risk and Market Power in Banking 1990	Berger, Herring, Szegö, The Role of Capital in Financial Institutions 1995	Barth, Caprio, Levine, Bank Regulation and Supervision: What Works Best? 2004	Brunnermeier, Crocket, Goodhart, Hellwig, Persuad, Shin, The Fundamental Principles of Financial Regulation 2009	Admati, A. R., DeMarzo, P. M., Hellwig, M. F. and Pfleiderer, P. C., 'Fallacies, Irrelevant Facts, and Myths in the Discussion of Capital Regulation: Why Bank Equity is not Expensive' (2011), *MPI Collective Goods Preprint.*
Furlong, Keeley, Capital Regulation and Bank Risk-taking: A Note 1989	Stiglitz, The Role of the State in Financial Markets 1993	Goodhart, Financial Regulation: Why, how, and where now? 1998	Demirgüç-Kunt, Detragiache, Does Deposit Insurance Increase Banking System Stability? An Empirical Investigation 2002	Laeven, Levine, Bank Governance, Regulation and Risk Taking 2009	Hanson, S., Kashyap, A. and Stein, J., 'A Macroprudential Approach to Financial Regulation' (2011) 25, *Journal of Economic Perspectives.*
Diamond, Dybvig, Banking Theory, Deposit Insurance and Banking Regulation 1986	Bhattacharya, Thakor, Contemporary Banking Theory 1994	Bhattacharya, Boot, Thakor, The Economics of Bank Regulation 1998	Barth, Caprio, Levine, The Regulation and Supervision of Banks Around the World: A New Database 2001	Acharya, A Theory of Systemic Risk of Prudential Regulation 2009	Haldane, A. G. and May, R. M., 'Systemic Risk in Banking Ecosystems' (2011) 469, *Nature.*
Benston, Kaufman, Risk and Solvency Regulation of Depository Institutions 1988	Calomiris, Gorton, The Origins of Banking Panics: Models, Facts and Bank Regulation 1991	Blum, Do Capital Adequacy Requirements Reduce Risks in Banking? 1999	Borio, Towards a Macroprudential Framework for Financial Supervision and Regulation? 2003	Jimenez, Saurina,Credit Cycles, Credit Risk and Prudential Regulation (2005)	Galati, G. and Moessner, R., 'Macroprudential Policy – a Literature Review' (2012)

Table 2.2: Number of Citations received by the Relevant Works of Banking Regulation Sample (as collected on May, 10th 2014)

	1985-1990	1990-1995	1995-2000	2000-2005	2005-2010	2010-2014
1	733	1394	2520	1317	843	470
2	599	1588	701	1250	805	399
3	461	1313	520	907	717	369
4	171	1061	477	748	451	322
5	163	616	391	570	269	237

The top cited scholarly works on banking regulation are however not sufficient for understanding whether and if so why this discourse has failed to take into account systemic risk prior to the crisis. One of the major causes of the financial crisis is that banking regulation has not managed adequately systemic risk, while focusing on idiosyncratic banking risks. To understand whether and if so why the economic discourse on banking regulation failed to develop the regulatory framework for the management of systemic risk (i.e. macro-prudential banking regulation), we therefore trace also the economic discourse on systemic risk for the same period from 1985 to 2014, for which we used a similar procedure. We used the following search terms in the title search in Google Scholar: Systemic Risk, Financial Contagion, Bank Contagion, Banking Contagion, Banking Crisis, Financial Crisis, Bank Crisis, Financial Stability, and Financial Fragility. We used the following search terms in the whole article search: Systemic Risk, Financial Contagion, Financial Crisis, and Banking Crisis. Table 3.3 shows the final refined sample on systemic risk discourse. Table 3.4 shows the number of citations the scholarly works of the systemic risk sample received.

Table 2.3: Systemic Risk Sample

The colours in this table are used to refer to the same discourses referred to in Table 3.1 on Banking Regulation.

1985-1990	1990-1995	1995-2000	2000-2005	2005-2010	2010-2014
G. Gorton, D.J. Mullineux. 1987. The joint production of confidence. Endogenous regulation and nineteenth century commercial-	S. Bhattacharya, A. Thakor. Contemporary Banking Theory. 1994.	G. Kaminsky and C. M. Reinhart 1999. The Twin Crises: The Causes of Banking and Balance-of-Payments Problems	F. Allen and D. Gale. Financial Contagion. Journal of Political Economy	M.K. Brunnermeier – 2008. Deciphering the liquidity and credit crunch 2007-08	Gary Gorton and Andrew Metrick. 2012. Securitized Banking and the Run on Repo

bank clearinghouses					
B. Eichengreen and R. Portes. 1987. An anatomy of financial crises.	B. Bernanke and M. Gertler. 1990. Financial Fragility and Economic Performance.	S. Radelet, J. Sachs, The onset of the East Asian financial crisis. – 1998	T.F. Hellmann, KC Murdock, JE Stiglitz. Liberalization, moral hazard in banking, and prudential regulation: Are capital requirements enough?	C.M. Reinhart, K.S. Rogoff – 2008. Is the 2007 US sub-prime financial crisis so different? An international historical comparison	Acharya, Pedersen, Philippon Richardson. 2010. Measuring Systemic Risk
Schwartz, A. 1988. Financial Stability and the Federal Safety Net	Minsky, H. 1992. The Financial Instability Hypothesis	X. Freixas and J. Rochet. 1997. Microeconomics of banking	C.E.V. Borio, P.W. Lowe – 2002. Asset prices, financial and monetary stability: exploring the nexus. BIS Working Paper No. 114	J.B. Taylor. 2009. The financial crisis and the policy responses: An empirical analysis of what went wrong.	P. Gai, S. Kapadia. 2010. Contagion in Financial Networks
Kindleberger, C. 1988. The International Economic Order - Essays on Financial Crisis and International Public Goods	C. Calomiris, G. Gorton. 1991. The origins of banking panics: models, facts and bank regulation	Demirgüç-Kunt, Detragiache, 1998.The determinants of banking crises in developing and developed countries	Diamond and Rajan. 2001. Liquidity risk, liquidity creation, and financial fragility A theory of banking	G. Corsetti, M. Pericoli, M. Sbracia. 'Some conta-gion, some interdepend-dence': More pitfalls in tests of financial contagion	E. Mendoza. 2010. Sudden Stops, Financial Crises, and Leverage
A. Brimmer. Central Banking and Systemic Risks in Capital Markets	G.G. Kaufman. 1994. Bank contagion: A review of the theory and evidence	J.C. Rochet, J. Tirole, 1996. Interbank lending and systemic risk	G. Kaminsky, and C. M. Reinhart. 2000. On Crises, Contagion, and Confusion	I. Goldstein, A. Pauzner. 2005. Demand–deposit contracts and the probability of bank runs. The Journal of Finance	Haldane, A. G. and May, R. M., 'Systemic Risk in Banking Ecosystems' (2011) 469, *Nature*

Table 2.4: Number of Citations received by the Relevant Works of Systemic Risk Sample (as collected on May, 2014)

	1985-1990	1990-1995	1995-2000	2000-2005	2005-2010	2010-2014
1	173	1061	4323	2114	1992	655
2	149	849	2738	1317	793	548
3	100	702	2515	1190	779	332
4	89	614	1272	1067	516	325
5	184	400	611	1049	474	322

We observed that some of the top cited scholarly works in our banking regulation sample are review articles. We have not excluded them because they reflect the economic discourse at the time of their publication and have influenced future research on banking regulation in the periods following their publications. As such, they function as excellent proxy for economic discourse on banking regulation. Further, it is noteworthy that few scholarly works appear in both samples (four scholarly works), these works address directly both banking regulation and systemic risk such as Haldane and May (2011). The two samples are, however, well-distinct due to their different natures as systemic risk works are theoretically oriented in contrast to the applied research nature of banking regulation. Finally, we have observed that although legal scholars, sociologists and political scientists are contributing to the discourse on banking regulation and systemic risk, none of their works have reached our top cited list. Economists have a dominating influence in the research areas of banking regulation and systemic risk. The term "economic discourse" is not only justified by the fact that its subject-matter investigates questions of predominant economic nature, namely, banking regulation and systemic risk, but also by the fact that economists have been the main and most influential contributors to this discourse.

3. Discourse Analysis of Our Two Samples: Findings

In order to have a clear conceptual framework that guides our discourse analysis, we need to conceptualize and classify the forms of *systemic risk* because systemic risk is the central concept in our systemic risk sample, and is the major rationale for macro-prudential regulation and thus critical for the discourse analysis of the banking regulation sample as well. No consensus has yet been reached on the definition and types of systemic risk (for an overview of various definitions, see: Smaga, 2014); we cannot resolve the intricate definitional issue here. Instead, for the purpose of our discourse analysis, we can distinguish between three types of systemic risk: traditional, exogenously generated and endogenously generated systemic risk. The traditional concept of systemic risk refers to bank runs. Exogenously generated

systemic risk refers to the risk arises from exogenous shock to the financial system that is amplified via *contagion*. Here, an exogenous shock hits one element of the financial system, which is amplified across the financial system via one of the contagion channels (Smaga, 2014). Endogenous systemic risk refers to the financial/credit cycle that underlies the process of accumulation of risk over time. This is the time-dimension of systemic risk that the Bank of International Settlement emphasizes (BIS, 2010). These are not exclusive types of systemic risk; bank runs can be conceived as a type of exogenous confidence shock that is amplified in the system through informational channel (informational asymmetry). Furthermore, the exogenously generated systemic risk materializes and is amplified due to structural vulnerabilities of the financial system (Smaga, 2014). In this sense, both exogenously and endogenously generated systemic risk may imply an understanding of the financial system as an inherently fragile and unstable system. However, since these structural vulnerabilities are not necessary conditions for exogenously generated systemic risk, exogenous systemic risk can still be distinguished from endogenously generated systemic risk. While keeping in mind these relations among these forms of systemic risk, for the purposes of our discourse analysis, this classification of systemic risk forms would be helpful as it will pinpoint which types of systemic risk has dominated each of the time periods of our samples.

Given this classification of the forms of systemic risk, we can now turn to the findings of our discourse analysis. We classify our findings into findings common to both samples, findings relevant to systemic risk sample, findings relevant to banking regulation sample, and finally, findings relevant to the relation between both samples.

3.1. Findings Common to Both Samples

We have observed that the scholars in the two samples adopt diverse approaches. In general, we have distinguished between two broad approaches, informal and formal analysis. The former could be subdivided into three main discourses, historically, theoretically and practically inspired discourses. The formal discourse can be sub-divided into theoretical and econometric analysis. Theoretical formal discourse uses the methods of partial equilibrium, general equilibrium and network analysis. When comparing the two samples according to the degree of their adoption of formal/informal discourses, we have found distinct differences with respect to the sources of knowledge, the modes of reasoning and communicating that

reasoning. The sample on banking regulation is dominated by formal analysis, following mostly a partial equilibrium approach up until the fourth period (1985-2005). In contrast, in the sample on systemic risk the informal discourses dominate.

For practitioners of banking regulation, there is a non-problematic relationship to systemic risk. It is their major concern, concepts such as *contagion* represent an empirical reality they have to deal with, even allowing them to overstep the legal boundaries of their mandate (Brimmer 1989). Practitioners' ease with the concepts of systemic risk and contagion also was an important source of legitimacy in the literature on systemic risk. Especially in the early literature (e.g. in the second period), one finds references to practitioners to justify one's work (e.g. on contagion, Kauffman 1994, s. also Bernanke and Gertler 1990). The style of practitioners, as found for example in the work of Kaminsky and Reinhart (1999, 2000) is to attempt to observe patterns in the data and to develop better forecasting of future events with its help. The practitioners' approach has been well summarized by John B. Taylor (2009). Speaking at the occasion of a conference organized in honour of the former Governor of the Bank of Canada, he writes: "Following an approach to policy advocated by David Dodge throughout his distinguished career in public service, I try to use **empirical evidence to the maximum extent possible** and explain the analysis **in the simplest possible terms, including by using a series of illustrative graphs**." (p. 3, emphasis ours).

Practitioners share this approach to economic analysis with historical reasoning/discourse. Kindleberger (1988), Calomiris and Gorton (1992) operate based on patterns in the data and seek to develop models that fits these patterns, thus operating *inductively* from the data. Especially Kindleberger thereby represents an old style of economics (Kindleberger was the president of the American Economic Association in 1985) which was eclipsed by the rise of formal economic model building. Remarkable in these sources is the use of simple flow charts, comparing countries over long periods of time as points of departure for theoretical reasoning, which has been, in the practitioners' and historical discourse studies in our systemic risk sample, predominantly informal or slightly formal through the use of simple mathematical models.

Informal analysts such as Borio and his group at the Bank of International Settlement (BIS), Brunnermeier (e.g. 2008) or Minsky[2] (1992) seek to develop informally disequilibrium and endogenous risk models without being constrained by mathematical models. While they subject themselves to the rigor of mathematics where possible, they can work out the implications of financial cycle, systemic risk and other crucial concepts for regulation without being constrained by formal models. It allows them to deal with more complex theoretical assumptions and thus to develop a broader picture of financial market developments. Informal analysts (such as Minsky) and historians (such as Kindleberger) relate to longer term empirical facts, which allow them to acknowledge the existence of repeating cycles. In contrast, formal analysts rely primarily on mathematical models. This means that concepts only exist if they can be modelled. They dominate the analysis of the first five periods of the banking regulation sample. In the first four periods of both samples, mathematical modelling uses comparative statics, based on partial equilibrium. They seek to explain financial fragility itself, but not how it can work over a cycle, basing themselves on exogenous shocks rather than endogenous build-up of risk (e.g. Bernanke and Gertler 1990). Models are made simple in order to keep them mathematically tractable.

This relationship to concepts can very well be observed in the contribution by Bernanke and Gertler (1990), in which they seek to define the term "financial fragility". They develop a mathematical theory of how sudden credit squeezes can occur in the economy, based on an unexpected shock to the system, pointing to credit constraints which then lead to a contraction. Using exogenous shocks to vary leverage of borrowers and including moral hazard concerns allowing them to get more or less financial fragility in their model. Compared to the contributions of Minsky, Brimmer and Kindleberger of this period, what is remarkable is the different scope of the papers. Whereas the latter speak of cycles and longer term regularities, Bernanke and Gertler can only provide a mechanism of an economic shift in a snapshot-style. They end their piece with explicit reference to Brimmer (1989), suggesting that they have now provided a model that can accommodate the notion of systemic risk and financial fragility and thus allow the analysis of central banks in this framework (ibid, pp. 108f).

[2] Similar to Borio (2003), Minsky's piece of 1992 titled 'The Financial Instability Hypothesis' enters our top cited scholarly works in the second period of systemic risk sample only when we include the citations it receives post-financial crisis. If not, this piece cannot reach our top cited articles. This piece shares the informal discourse with the pieces of Borio, Brunnermeier, and Kindleberger.

The different styles/discourses we observed in our two samples are described in Table 4.1 below.

Table 3.1: Different Styles/Discourses Observed in Our Samples

Style	Research Question	Method
Informal Analysis: Historical	To test theories with the help of history and to develop theories from historical observations	- Descriptive statistics and informal modeling - inductive
Informal Analysis: Practitioners	Find a solution to a policy/regulatory concern	Descriptive statistics, informal theoretical analysis (eclectic)
Informal Analysis: Theoreticians	To explain and predict system behavior	Informal theoretical analysis: develop and engage critically with economic concepts and theories without models, and apply theories and models informally to regulation
Formal Analysis: Quantitative Approach	To explain and predict system behavior	Mathematical modeling (partial equilibrium, general equilibrium and network analysis) and econometrics

Furthermore, we observe a shift in methods and modelling techniques over the six periods covered from partial equilibrium analysis as is common in neoclassical microeconomics to general equilibrium analysis and network analysis, both of which are more accommodating for thinking about systemic risk. Once the linkages of banks with each other in terms of assets and liabilities are acknowledged, forming networks of mutual indebtedness, the problem of contagion can be modelled (Kaufmann 1994; Franklin and Allen 2000). This allows for models of networks of banks linked via common exposure to assets with the danger of joint over-exposure, in which systemic risk is growing endogenously which then can also be measured (Acharya 2009). There is a shift from comparative statics analysis to dynamic

analysis, e.g. when the time-dimension of risk is included, varying over the cycle (Borio 2003). These shifts in the modeling techniques could be interpreted as part of a paradigm shift that took place in financial economics and banking regulation as each paradigm has, to specific extent, its distinctive methods and modeling techniques. We would return, however, to the discussion of whether the observed patterns indicate a paradigm shift below.

This shift in the thinking about financial regulation allows a broadening of real world phenomena which now can be studied, allowing mathematical modellers to participate in thinking about systemic risk and related concepts, such as contagion. However, the use of mathematical models may well continue to be a problem. One general finding of our samples is the incremental nature of many of the mathematical economists' contributions. This leads us to the hypothesis that mathematical models might sometimes lead to constrain theoretical progress, by excluding observed phenomena that could not yet be accommodated in mathematical models. This can be seen from a comparison of formal and informal analysts. Informal analysts could think about exogenously and endogenously generated forms of systemic risk and discuss them, whereas quantitative scholars could not establish a conversation without a model, and thus excluded such discussions from their discourse. We submit that it is not a coincidence that the three first periods in the banking regulation sample witnessed very little theoretical developments as we will discuss in more detail below.

This communicative closure in mathematical economics, where concepts only exist if they can be included in a mathematical model (this trade-off between rigor and relevance has been emphasized in economic methodology literature, see, e.g. Backhouse 1998; Blaug 2009) seems to us to account also for explaining our finding regarding the relation between both samples discussed below. It suffices here to say that, but for the period of 2010 to 2014, we observed a strong disjunction between both samples. Although some of the important ideas relevant to systemic risk underlying the macro-prudential regulation were discussed starting from the first period in the systemic risk sample, these issues have only appeared in the fifth period of the banking regulation sample. This leads us to a question for further empirical research: Do quantitative models begin to constitute a barrier for perceiving reality because economists become invested in improving existing models rather than investing in understanding reality?

3.2. Findings Relevant to the Systemic Risk Sample

Turning to the specifics of the systemic risk sample, it is remarkable to note that while systemic risk is used as an intuitive concept related to financial crises right from the beginning, it does not receive a systematic definition until 1996 (Rochet and Tirole 1996, 733). Only after 2005 does it crystallize into a measurable format (Acharya 2009, earliest attempt Allen and Gale 2000). Overall, the contagion effects of bank runs are seen as a main component of systemic risk in all the sources (e.g. Bhattacharya and Takor 1993, p. 26, Kaufman 1994), which leads to a strong coupling of the understanding of systemic risk and problems of liquidity (e.g. Freixas and Rochet 1997), but it is important to add that the founding model analysing bank runs (Diamond and Dybvig 1983) used one representative bank, thus making the analysis of contagion channels such as interlinkages between banks virtually impossible (Rochet and Tirole 1996 , 734f).

While the notion of contagion is the centrally shared concept, Kaufman (1994) complains of a dearth of empirical studies, replaced by "causal empiricism" (also Rochet and Tirole 1996 734). This dearth in our sample is only overcome with Kaminsky and Reinhart (1999) who study the interrelationship between banking and foreign exchange crises empirically. A major step forward analytically is taken by Allen and Gale (2000) once they demonstrate the capability to use networks as a conceptual and analytical tool to take into account interbank deposit markets, they are thus able to point to the structural factors which can turn a liquidity shock into a financial crisis, questions which are further developed in the coming 14 years (s. e.g. Gai and Kappadia 2010). However, the question why there might be a liquidity shock remains unanswered.

This literature then mostly relates to the triggers of financial crises, not to their causes. On this front, the dividing analytical position is whether systemic risk is growing endogenously or exogenously. The endogenous position is strongly connected to the notion of financial cycles, booms and busts that are driven by self-reinforcing euphorias and panics (e.g. Kindleberger 1988, Calomiris and Gorton 1991, Minsky 1992, Kaminsky and Reinhart 1999, Borio 2002) vs. a position that posits that systemic risk is exogenous to the banking system (Schwartz 1988). In the beginning of our sample, the question is debated with respect to the Great Depression. Later on, this debate has been expanded when data on global banking crises

became available (Kaminsky and Reinhart 1999, Demirgüc-Kunt and Detragiache 1998, Barth et al).

It is interesting to note that mathematical modellers remain agnostic on this issue as they undertake a simple comparative statics analysis using asymmetric information (e.g. Bernanke and Gertler 1990) or a structural comparison of network structures (Allen and Gale 2000) rather than a long-run cyclical analysis. Questions of the financial cycles, of booms and busts are instead placed at a center stage by informal analysts such as Kindleberger (1988) or Borio and Lowe (2002), and only receive an empirical investigation starting with Reinhart and Rogoff (2008), who undertook simple historical analyses of the run-up to financial crises using charts and simple descriptive statistics. These lacunae in the literature can thus not be explained with mathematical difficulties to describe these phenomena. Rather it might be accounted for by the devaluation of historical approaches using simple statistics in the field of financial economics.

3.3. Findings Relevant to Banking Regulation Sample

We observed the following through reading the works of the first period of the banking regulation sample (1985-1990):

First, the scholarly works emphasize that banking regulation should employ two main regulatory instruments, namely, deposit insurance and capital ratio along with less focused discussions over premium sensitive public deposit insurance, interest rate ceilings, uninsured debt claims, 100% reserve banking, and narrow banking. As to capital regulation, our sample shows a discussion over risk-sensitive capital regulation as non-risk related capital ratios may induce excessive risk taking through changing the composition of the asset side of the balance sheet.

Second, as to the economic rationale of banking regulation, our sample shows a discussion over the triggers of bank runs and panics, and whether they emerge from a money-demand shocks, informational asymmetry or liquidity risk (the liquidation value of the asset is lower than the deposits). The sample shows that there was almost a consensus that deposit insurance is almost the only solution for bank runs except in the case of money demand shocks, where

lender of last resort or interbank markets could be the only appropriate alternatives. In addition to bank runs as the economic rationale for deposit insurance, our sample shows that insolvency/default risk has been conceived as the economic rationale for capital regulation. In our sample, macro-rationales for banking regulations always appear as a side note.

The bank runs and panics discussion implies an analysis of a form of systemic risk that is a result of an exogenous shock channeled from a failing bank to other banks through, mainly, the adverse informational signal of a bank failure, which is combined with the market failure of the depositors' asymmetric information concerning the assets of their banks due to their opaqueness. However, the term "systemic risk" is almost never been mentioned. As the latter takes only the form of bank runs and panics, and since deposit insurance is conceived as an effective regulatory instrument for preventing such runs, the contagion and financial cycle forms of systemic risk were not therefore conceived as key regulatory problems.

The works of the second and third periods of our banking regulation sample (1990-2000) seem to be a natural extension of the works of the first period as they share the above observations. For example, in the second period, there was also no emphasis on "liquidity risk" as underlying rationale for regulation. There was however one theory ,"Random Withdrawal Theory" of bank panics that emphasized liquidity risk in a form of money-demand shock, however, this view was not dominant at this period. Further, it emphasized exogenous money-demand shock that can easily be absorbed by reserve requirements and the central bank acting as lender of last resort. In sum, the works of the second and third periods of our banking regulation sample (1990-2000) share most of the ideas regarding the economic rationale for banking regulation and banking regulatory instruments with the first period. The main new issue in the third period is the debate regarding risk-based capital regulation, how to calculate it, and its effects on the risk-taking incentives of banks.

In the fourth period (2000-2005) of our banking regulation sample, we observe the emergence of three new issues which relate to the then dominant idea of self-regulation:
Authors question the previous consensus on deposit insurance as the optimal tool for addressing bank runs and panics (the only form of systemic risk known by then), pointing to implicit deposit insurance as a more efficient risk management instrument. In addition they controversially debate the effects of banking liberalization and banking deregulation. The

liberalization and market discipline approach to financial regulation camp argued that liberalization would enhance banking stability and result in higher bank development and performance. The opposing view endorsed the position that liberalization would affect negatively banking stability. Lastly, we observe the emergence of macro-prudential regulation in the fourth period of our sample (Borio 2003). However, this article has attracted most of its citations after the outbreak of the financial crisis (143 citations from 2003-2007, 411 citations from 2008 onward).

The fifth Period (2005-2009) of our sample is clearly the "Paradigm Shift Period". In this period, three of the top cited articles tackle explicitly macro-prudential regulation (Acharya 2009; Jimenez and Saurina, 2005; Brunnermeier, Crocket, Goodhart, Hellwig, Persuad, Shin, 2009**)**. Jimenez and Saurina's paper first appeared in January 2005 and received 27 citations over the three years preceding the crisis (2005, 2006 and 2007) with an average citations of 9 citations per year. Starting from 2008 until September 2015, this article received 357 citations with an average of 44.6 citations per year that is around five times the number of average citations per year it received prior to the crisis. If we take only the three years following the crisis (from 2008 until 2010) In order to have a comparable time-window for comparison, this paper received during this period an average citations per year of 28.1 citations that is around three times the average citations the paper received prior to the crisis. The other two articles that tackled macro-prudential regulation in this period appeared post-crisis. This shows that the interest in macro-prudential regulation soared post-crisis, which confirms that the shift to macro-prudential regulation took place post-crisis in the fifth period of our banking regulation sample. The works dedicated to the macro-prudential paradigm exemplify an important shift from the micro-prudential approach of the previous four periods (1985-2005). Both Paradigms (Macro and Micro-Prudential Regulation) have the objective of securing the stability of the financial system. As the works of the first four periods show, micro-prudential regulation seeks to stabilize the system by ensuring the stability of individual banks through, inter alia, capital regulation. Macro-prudential seeks to stabilize the system by focusing on *systemic risk.* In the first world view, banking crises can be prevented if each individual institution is well-capitalized. In the second world view, the financial cycle can lead to an increase in the probability of banking panics, independent of the fact if banks look well capitalized or don't. Further, Interaction between banks, non-banks and markets can endogenously generate

systemic risk. In addition, the object of the regulators' observation and his intervention is systemic risk, its growth or weakening.

Research on banking regulation in this period has shifted form focusing on protection of investors to protection of markets, from focusing on analysis of individual banks to the analysis of interaction of multiple banks, and from static analysis, mainly taking the form of comparative statics to a dynamic analysis of risk and credit/financial cycles. Further, banking regulation research has shifted from partial equilibrium analysis and representative-bank models to network analysis, multiple interacting agents' models and general equilibrium models. Most importantly, it has further shifted from the bank runs form of systemic risk to emphasize contagion and an endogenous (financial cycle) forms of systemic risk, and the interplay of them.

The sixth period of our sample (2010-2014) is an exploratory phase of the macroprudential regulatory paradigm. The top five cited articles in this period relate to macro-prudential regulatory questions. Scholars began to use the cognitive perspective of the macroprudential paradigm to pose new questions and to provide new answers to old questions. Substantively, the top cited articles begin to provide a systemic risk based rationale for old regulatory instruments such as capital and liquidity ratios. As a result, they have made proposals for the amendment of these regulatory instruments to fit the macro-prudential perspective, through, inter alia, counter-cyclical capital ratios, high quality capital and higher capital ratios. The economic rationale of macro-prudential banking regulation in this period relies on credit cycles, transmission channel of risk-taking, and the contribution of the financial institutions to credit crunch and fire-sales. Methodologically, scholars begin to advocate a movement from partial equilibrium to a more focus on general equilibrium and network analysis.

Despite of these important changes at the methodological and substantive fronts, these changes have been formulated in the standard neoclassical language of market failures, where systemic risk itself has been conceptualized as a negative externality, to which individual banks contribute. The works of this period indicate also that there is still much work to be done on almost all the fronts relating to the macro-prudential approach, including, the conceptualization, modeling and quantification of systemic risk, the design and assessment of macro-prudential regulatory instruments, and the coordination of monetary and macro-

prudential policies. Particularly, the endogenous model of systemic risk, which has been Minsky's initial idea (1992) that has been emphasized latter by Borio (2003) seems to be the most challenging concept to model in comparison to systemic risk as a propagation risk (Galati, 2013). As scholars began to take macro-prudential regulation seriously, the common trait of studies at this period is that these studies are exploratory (Borio and Zhu 2012; Haldane 2011; Hanson et al. 2011) or of a review nature (Galati 2013). It is astonishing to find that the top five cited articles in the area of banking regulation are informal, given the highly formalized nature of the economic literature beforehand. As the new regulatory paradigm is unfolding, these papers explore new territory and set the stage for future research.

The exploratory informal nature of this period shows that informality may be required at exploratory phases of research, where informal discussions would naturally develop into semi-formal, and formal ones. The financial crisis was required in order to push the formalism barriers in economics so that we can see informal works become highly cited, setting the stage for more formal works to come, while illustrating failures of existing formal models. As such, informal thinking precedes formal thinking, and indicates to the temporary limitations of the latter.

In addition to the timing of shift to macro-prudential regulation that took place post-crisis and the informal nature of the post-crisis regulatory discourse (period 6 of our sample), the other most important finding of our discourse analysis of the banking regulations sample is that prior to the crisis, only two scholarly works, (Borio, 2003) and (Jimenez and Saurina 2005), discussed some aspects of macro-prudential regulation. Both of these papers got most of their citations post-crisis. Borio's paper is of informal theoretical nature, while the paper of Jimerez and Saurina is of a hybrid (practitioners/econometric nature). Jimenez, Saurina, (2005) used econometrical analysis to show that the credit growth in booms leads to increase of credit risk and higher percentage of non-performing loans, and thus recommended counter-cyclical loan-loss provisioning regulatory intervention. Both Jimenez and Saurina are policy-makers affiliated with the Spanish Central Bank; they have used the same practitioner's discourse, starting from simple informal hypothesis to empirics, and then moving to formulating regulatory policy recommendations. Instead of using simple descriptive statistics, they have used econometric analysis; this merge of econometrics into practitioner's discourse gives more credibility to the research of practitioner's. Formal *theoretical* works of our sample prior to the

crisis were not able to engage with contagion or financial cycle forms of systemic risk and thus failed to discuss or recommend any macro-prudential regulatory interventions. This is consistent with the failure of the same theoretical formal discourse to engage with these forms of systemic risk in our systemic risk sample.

3.4. Preliminary Findings Relevant to the Relation between Both Samples

We have observed a ***strong disjunction*** between the systemic risk sample and the banking regulation sample. Although some of the important ideas relevant to systemic risk underlying the macro-prudential regulation were discussed starting from the first period in the systemic risk sample (1985-1990), these issues have only appeared, peripherally, in the fourth period of the banking regulation sample (2000-2004), and then taken a hold starting from the paradigm shift period (2005-2009).

We have constructed a network showing the citations received by the works in the systemic risk sample from the banking regulation sample (s. figure 4.4 below), the number of citations is rather low (24). Most of these citations are made by macro-prudential authors in our banking regulation sample (19), which leaves the number of sources cited by non-macroprudentialists at five. Of these, one recent source (Gorton and Metrick 2010) is quoted and there is also a self-citation, which leaves the number of genuine citations at three, one of which is Bernanke, an author with strong affiliations with the mainstream. This network citation pattern confirms the observed disjunction between banking regulation and systemic risk discourses. Further, it shows that this disjunnction relates to the micro- macro-prudential distinction in banking regulation. Micro-prudentialists simply overlooked the systemic risk discourse as if it did not exist, they did not even cite it to dismiss these ideas.

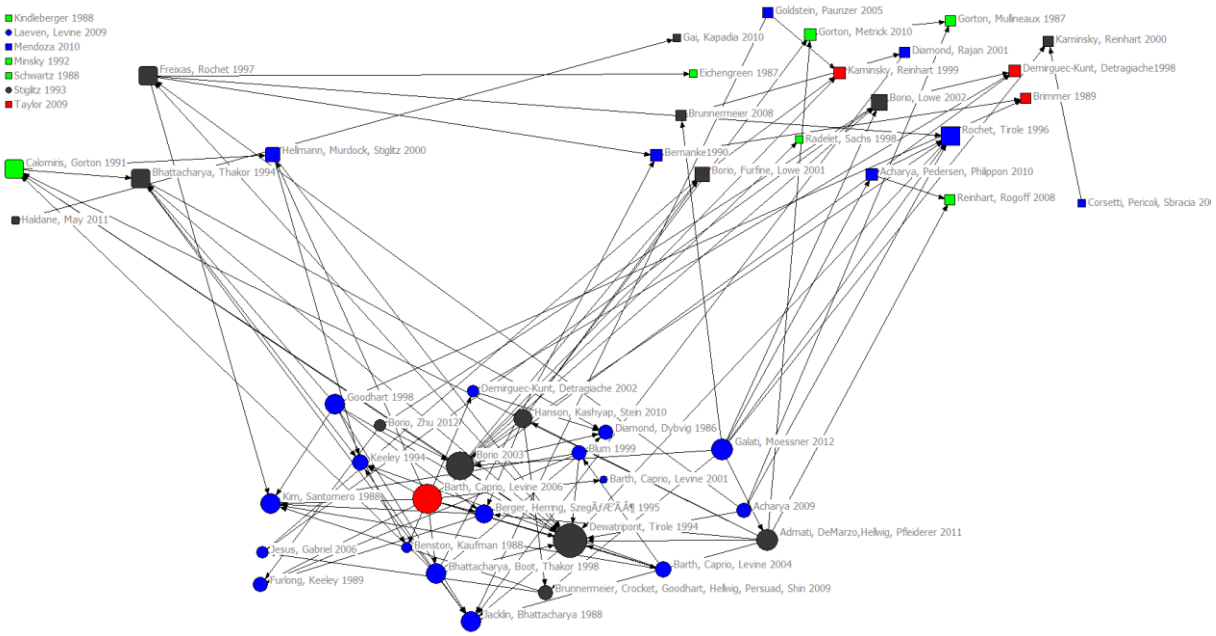

Figure 1 Network showing the citations received from the systemic risk sample by the banking regulation sample.

The works of the systemic risk sample have the node shape of a square, while the works of the banking regulation sample are represented by circles. Scholarly works common to both samples are represented by rounded squares.

This strong disjunction is astonishing given that the work on systemic risk was seeking to investigate the reasons for financial crises, an area of fundamental concern for banking regulation. While further empirical research on the modes of communication and interaction between purely theoretical work and policy oriented applied research is required to explain the observed fragmentation, we will focus in the following on the insights we can gain from our discourse analysis.

4. Why Pre-Crisis Economic Discourse Failed to take systemic risks into account and thus develop Macro-Prudential Regulation?

We identified various sub-discourses within the economic discourse; however, the informal historical and practitioners' discourses were somehow the major discourses in the systemic risk sample that were able to address the contagion/propagation and financial cycle forms of systemic risk and their implications more adequately. These discourses have been overlooked in the banking regulation sample, which has been dominated by the formal discourse. Why did

the economic discourse on banking regulation ignore systemic risk as developed in some of the top cited works in the systemic risk sample? One reason for this disjuncture seems to reside in the fact that the contagion and financial cycle forms of systemic risk, although discussed more seriously in the systemic risk sample, have not been well-conceptualized or quantified in the early three periods of the systemic risk sample, which may explain why banking regulation research, as an applied research, did not take it seriously for its lack of formalization.

A second related point is the impact the initial model of bank runs operating with one representative bank had on the evolution of the entire literature (Rochet and Tirole 1996, 733f). This model made the analysis of contagion channels other than the informational channel by definition impossible. In this respect, mathematical simplicity seems to have played a role as the as the tractability of the Diamond/Dybvig model from 1983 was achieved by mathematical simplification. Unfortunately, Kindleberger's remark (1988, 91) that "it is not evident that the historical record should be set aside in favor of easier mathematics" was ignored.

But the failure of economic discourse to develop macro-prudential regulation prior to the crisis can not only be attributed by being locked into formalism. The literature was also locked into a specific form of modelling, mainly *non-structural partial equilibrium analysis*. Those who were able to pinpoint systemic risk prior to the crisis using mathematical means took a network analysis perspective (most prominently Allen and Gale 2000). Formalism in economic discourse is constraining, but it becomes more constraining when formalism is defined to include specific approaches, while resisting other unfamiliar formal methods. This discursive evidence gives a support to what Brian Arthur (2013) claims to be the failure of equilibrium thinking of neoclassical economics in capturing disequilibrium processes, particularly, crises.

The paper of Jimenez, Saurina, (2005) shows that econometrics is not as constraining as theoretical formal analysis, particularly, when merged into the practitioners' discourse. This brings us to explore why practitioner's, historical and to a limited extent econometrical approaches in comparison to formal theoretical analysis were able to perceive contagion and financial cycle forms of systemic risk and to attempt to address them via regulatory changes in

our systemic risk and banking regulation samples. We suggest that these discourse can enable "gaining" *forms of knowledge* that the formal theoretical approaches may fail to produce. Historical and practitioner's approaches, being empirically guided, do not interpret the data by using the theoretical lens of equilibrium economics, whether partial or general equilibrium. Rather, once they perceive the system to be in disequilibrium or at risk as revealed in the regularities in the data, they begin to think eclectically about the sources of this risk and how it has been accumulated and how it can be addressed. In other words, these informal approaches, being empirically oriented, help the scholars to see what theoreticians of equilibrium models can hardly see. Doubtless, no empirical analysis can be conducted without an underlying theoretical hypothesis; here, historical analysis, practitioners' approach and econometrics when embedded within the practitioners' discourse and thus freed from the theoretical neoclassical straightjacket can proceed on the basis of hypotheses that are not consistent with neoclassical theories. Rubinstein (2006) has shown how econometricians and experimentalist economists were able to find numerous robust regularities in the data that run counter the predictions of relevant dominant theoretical models.

In Kuhnian/Lakaotsian terms, historical and practitioners' approaches can provide the anomalies/counterexamples to the neoclassical paradigm, and that practitioners' and historians can develop hypotheses incompatible with this paradigm (such as endogenous risk) to address these anomalies. This is the major strength of these approaches over the formal approaches as the latter either cannot see these anomalies or accommodate them into their equilibrium models. Network analysis has arisen post-crisis to address these anomalies which have become salient and thus developed into a crisis of the neoclassical paradigm due to the financial crisis that has taken place in U.S. If the crisis took place elsewhere, this anomaly might have not been evolved into a crisis of the neoclassical paradigm.

In sum, our discourse analysis has shown that formal theoretical analysis has impeded the evolution of macro-prudential regulation prior to the crisis. The fact that the post-crisis samples on banking regulation have been exploratory and informal in nature shows that informalism was needed for developing macro-prudential thinking. Particular forms of formalism, particularly, non-structural partial equilibrium analysis has intensified the obstacles to the evolution of a macro-prudential paradigm prior to the crisis.

But there is a larger point lurking behind these surface problems which is that the notion of systemic risk seems to contradict the neoclassical paradigm that assumes the emergence of order at the macro-level from rational action at the micro-level. Systemic risk, on the other hand, postulates a level which extends beyond the individual where risks may accumulate, independent of or maybe even because of rational action of actors at the micro-level. As such, the concept of systemic risk was hardly reconcilable with the typical neoclassical world view, leaving proponents of the theory bereft of the possibility to use the theoretical mainstream for inspiration. This explanation is somehow consistent with the theorization of systemic risk as a negative externality in the fifth and sixth phase of the banking regulation sample. It is at this juncture that the further work on systemic risk and macroprudential regulation currently stands, which will not only decide if the shift to macro-prudential regulation implies a fundamental restructuring of the neoclassical paradigm, but also if banking regulation will again fall into the traps of what we call *regulatory pseudo-optimization*.

5. Dangers of Pseudo-Optimization: Is Economics Inept to Develop Reliable or Truly Optimal Banking Regulation?

The above findings of our discourse analysis show that formalism, particularly, equilibrium formal methods prevented economic discourse on banking regulation from engaging with the concept of systemic risk that was not sufficiently formalized, and thus explains the failure of economics to develop macro-prudential regulation prior to the crisis. Furthermore, the disjunction of policy oriented discourse of banking regulation and the theoretical literature on systemic risk, which we suspect to be due to dominance of informal analysis in systemic risk sample, explains why economists have not engaged with macro-prudential regulation prior to the crisis. In sum, formalism and particular form of formalism (equilibrium modelling) account for why economics did not get banking regulation right prior to the crisis.

Given the findings of our above discourse analysis, we can now investigate whether mainstream (neoclassical) economic research on banking regulation is well-suited for providing the knowledge basis required for developing a dynamically reliable banking regulation in the policy-making sphere. Neoclassical financial economics, understood as

theories which seek to explain the behavior of financial markets, has formed the knowledge base for financial market regulation (Black 2013).. Optimization (and its corollary formalism) has been a cornerstone of neoclassical economics as the rationality of socio-economic agents is represented through optimizing behavior. Optimizing agents maximize their utility subject to constraints (Laville, 2000). The rational choice theory adopted by neoclassical economists has been subject to fierce critique (for a review, see: Laville, 2000). Simon (1957, 1959) suggested a bounded rationality model of human behavior to substitute for the rational choice paradigm. He argued, convincingly, that when faced with complex situations, socio-economic agents do not possess the required information and cognitive capabilities that would enable them to take the decisions that would maximize their utility. Instead of optimizing, socio-economic agents are *satisficing*, they take the decisions that seem best suitable for attaining their objectives, and they do not try to reach the decisions/choices that would maximize their utility.

Optimization theory, although challenged as a valid description of the socio-economic agents' behavior, has been adopted by neoclassical economists without serious challenge as the valid normative prescription for economists and regulators addressing complex policy (including, regulatory) questions. Economists and regulators should adopt the *optimal* regulatory choices that would maximize the desired regulatory objectives, which is normally reduced to a single objective to reduce the complexity of the optimization problem (for a review of optimization techniques in economic theory, see, Dixit, 1990; Intriligator, 2002). In order to optimize the regulatory intervention into the economic system, the economist must first understand the system subject to intervention, and then determine the objectives to be optimized, and finally, select the intervention that would optimize these objectives (Beightler, Phillips, Wilde, 1979). In order to solve the optimization problem, the objective needs to be quantified or at least formalized in a functional form. Formal analysis is required also in order to ensure that the regulatory intervention would secure the optimum value of the objective function. Formal analysis is required also in order to ensure that regulatory interventions would secure the optimum value of the objective function. All these considerations that have become deeply entrenched in economic and legal thinking about financial regulation permit the legitimate study of the cognitive models that economists use to approach the topic of financial markets regulation. Of course, such models and their capacity to produce exact numbers to calculate the regulatory costs have advantages for regulators in their day to day activities. Indeed, the

frantic search for "new methods of measurement and new methods of calculation" for the macro-prudential approach post-crisis (Black 2013, 35) can also be at least partly understood by this need for justification in front of the regulated.

This means that, through its intellectual set-up the neoclassical economic discourse on financial regulation had to adopt a formal approach which has dominated our banking regulation sample prior to the crisis because optimal regulations cannot be developed without formal methods. The fact that systemic risk was overlooked prior to the crisis in the sample on banking regulation can be directly related to this need for formal models. While the informal subset of the economic discourse on systemic risk was able to discuss systemic risk seriously, it did not provide a formal analysis that could be used for developing optimal regulation. While the crisis has helped to overcome this lacking engagement with the concept of systemic risk, even informally as evidenced by the post-crisis exploratory phase in the banking regulation sample, there is still a tendency to return to formally optimize regulation (s. especially Acharya et al 2010).

There are however alternatives to this focus on optimization, which might provide for a better capacity to adapt regulation pre-crisis. Legal scholars (other than law and economics scholars) and management scholars have been avoiding the rhetoric of "optimization", and using instead the rhetoric of "reasonableness" (Pound, 1933) and "reliability" (Power, 2011; Landua, Chisholm, 1995; Simon, 2010). Such reasonable regulation should be contextualized "in view of the actual conditions of time and place rather than an abstract reasonableness under generalized conditions" (Pound 1933, p. 436). Similarly, some management scholars have been suspicious of optimization (Landua, Chisholm, 1995). Instead of optimizing the management of the organization, they have been interested in developing a high reliability theory of organizations (e.g. LaPorte, Consolini, 1991; Weick, Sutcliffe, Obstfeld, 1999; Boin, Shulman, 2008). They argue that organizations should emphasize learning and adaptation to their uncertain and complex environment. Learning, adaptation capacity and handling uncertainty seem to be the main defining characteristics of reliable organizations that optimizing organization may be missing (Landua, Chisholm, 1995).

In legal theory and management studies, it seems that reliable or reasonable regulation differs from optimal regulation in two aspects. First, optimal regulations attempt to maximize the

regulatory objectives, whereas reliable or reasonable regulations are satisficing, they are not maximizing the objective, but similar to the decisions of the boundedly rational agents, they seek to achieve sufficient, not optimal results. Second, optimal regulations are weakly adaptive to changes in their environment and poorly handle uncertainty. Adaptability requires prompt responses to changes, and uncertainty requires taking weak signals seriously (Simon, 2010). In contrast, once we insist on optimizing the regulatory design on the basis of specific understanding of the financial system, the latter would evolve beyond this understanding, transforming our optimized regulatory structure into unreasonable and unreliable design (Kaal, 2013).

Simon (2010) therefore argues that financial regulations should be dynamic and reliable, and not optimized. Optimization of regulation requires the focus on few regulatory objectives, their quantification, and the quantification of economic effects of regulatory intervention. The latter requires normalizing incalculable uncertainty into actuarial risk (Simon, 2010). A reliable and dynamic regulatory approach, on the other hand, emphasizes learning, innovation, and adaptability to uncertainty (ibid). In the same vein, Kaal (2013) advocates that financial regulation should be adaptable to its uncertain and evolving financial system through emphasizing the anticipating capacity of regulations. Regulations should not be statically optimized with reference to previously known facts, rather, regulations should be anticipatory and not reactive (Kaal, 2013, see also, Black, Baldwin, 2010; Black, 2012). Consequently, reliable regulation needs a knowledge basis that would enable the regulatory design to satisfice but not necessarily optimize its objectives and to adapt to uncertainty.

From our systemic risk and banking regulation samples, it is clear that if both discourses had taken the ideas concerning systemic risk seriously that were developed in informal analysis, these discourses could have developed a reliable banking regulation. Exclusive reliance on formalism required for optimization has resulted in overlooking systemic risk that was hard to formalize using the standard method of partial equilibrium analysis. This lead to *pseudo-optimal* banking regulation, in which regulation was optimal in the model but not adequate to cope with reality. Indeed, this model of optimal regulation is founded on a belief in the possibility of social control and quantification of risk (Power, 2009) that leads to rules-based regulatory governance of the form of intensified monitoring and auditing that creates the illusion of that control, while managing no real risks (Power, 2009). It could be argued,

however, that truly optimal regulation could be developed if uncertainty, and adaptability to changes could be taken into account. This argument, however, implies that truly optimal banking regulation would be much more demanding than is currently practiced, as regulators would have to adopt formal optimization techniques in order to develop dynamically adaptive regulation that takes uncertainty seriously, while optimizing the regulatory objective. Such "truly" optimal banking regulation is formally very demanding.[3] Insisting on developing truly optimal regulation, while failing to do so means that at least in the medium term, the economic discourse would remain stuck in "pseudo optimal regulations".

In contrast, a reliable banking regulation approach would attempt to develop satisficing regulations, by following formal and informal techniques. Complementing the formal economic discourse with informal discourse could ensure the development of reliable banking regulation, until a truly optimal regulation could be developed, if possible. The macro-prudential banking regulation under Basel III and Dodd-Frank Act have been adopted without formal development of macro-prudential regulatory instruments, that our samples show to be still under development (see also, Baker, 2013). They are partially but not perfectly reliable,[4] rather than truly optimal regulations.[5] Indeed, some economists began to implicitly endorse the reliable banking paradigm, for example, Danielsson (2013) argues that regulators should rely on simple measures under conditions of uncertainty and insufficient information.

Our samples show that the epistemological requirements that economics need to meet in order to provide the knowledge basis for reliable and reasonable banking regulation have been ignored. For example, the adaptability to uncertainty is one of major requirements of reliable banking regulation. One major technique for doing so is to take weak signals seriously in developing banking regulation. In our banking regulation sample, the weak signals would be the Latin American Debt Crisis and the East Asian Crisis of the late 1990s. However, in our banking regulation sample, these crises have not been seriously addressed by the scholars, indicating that these crises were implicitly assumed to be local phenomena. From a reliable

[3] For example, it is very demanding to take uncertainty formally into account, given the various sources of uncertainty including, inter alia, uncertainty about our understanding of the system, uncertainty flowing from constant and rapid changes in the system, and uncertainty about the effects of regulatory intervention.
[4] These regulations do not yet reflect our formal and informal knowledge gained through the financial crisis.
[5] This does not mean that they will not fail, reliable regulations may fail as well, but at least they are less susceptible to failure in comparison to pseudo optimal regulations because they take uncertainty and unmeasurable objectives into account.

regulation perspective, these crises should have been analysed extensively as representing weak signals of potential regulatory problems of U.S and European banking regulation. Further, we identified various discourses within the economic discourse; however, the practitioners' discourse was somehow the major discourse in the systemic risk sample that was able to address the systemic risk and its implications more adequately. The practitioners' discourse relies on sources of information, which are not promptly accessed by academics. From a reliable regulation perspective, this information is highly valuable and provides a sufficient basis for action. From a formal and quantitative economic discourse perspective, it is not.

Finally, as our exploratory period (2010-2014) of our banking regulation sample shows, the informal research (sufficient for developing reliable banking regulation but not truly optimal banking regulation) has dominated this period. However, economists have not yet acknowledged that their pseudo-optimization approach was a major cause of their epistemological failure to develop reliable banking regulation. If they remain locked into formalism, economic discourse on regulation, disrupted by financial crisis, could go back to its "business as usual" mode of exploring financial regulatory questions through recourse to *pseudo-optimization*. While these may then address current problems in an "optimal way", the financial system will simply evolve beyond the newly established existing regulatory framework. By then, the economic discourse would be lagging behind the actual system while being obsessed with developing optimal regulations to replace existing regulations.

6. Stuck in Pseudo Optimization: Does the Macro-Prudential Shift Reflects A Fundamental Restructuring of Mainstream/Neoclassical Economic Discourse on Banking Regulation?

The neoclassical financial economic paradigm forms the knowledge basis for banking regulatory design; due to its insistence on optimization, formalism, equilibrium modeling, the neoclassical paradigm failed to endorse macro-prudential regulation prior to the crisis. More generally, it fails to develop reliable banking regulation. However, the shift from micro to macro-prudential regulation that took place post-crisis might signal a *deeper shift* in the structure of the neoclassical perspective so that the latter has given up its insistence on formalism, equilibrium thinking and optimization and thus moved away from pseudo-optimization to meeting the epistemological conditions for informing reliable banking regulation. Alternatively, the shift from micro- to macro-prudential regulation may have taken

place without such deeper restructuring of the neoclassical perspective. In this case, the same underlying reasons (optimization, formalism and equilibrium modeling) that prevented economic research from developing reliable banking designs would be persistent.

Faced with the financial crisis, the community of financial neoclassical economists are confronted with a significant anomaly (Kuhn, 1970) or a counterexample (Lakatos, 1978) that does not fit the perspective of neoclassical microeconomics underlying the micro-prudential banking regulation. The micro-prudential paradigm is founded on the perspective of an inherently stable system that could be destabilized due to exogenous shocks. Financial crisis posed a challenge to this perspective, which lead financial economists to endorse the macro-prudential regulatory perspective of an inherently unstable financial system, endogeneity of risk and credit cycles. This could be perceived as a fundamental restructuring of the neoclassical understanding of the functioning of financial markets. Particularly, given these distinct perceptions of the functioning of financial markets, micro- and macro-prudential regulation perceive the role of state and regulation differently. For example, it is very hard to justify financial deregulation under the macro-prudential paradigm. In contrast, under the micro-prudential paradigm, the debate has been intensive concerning deregulation (Periods 2 and 4 of our banking regulation sample, for example, include some debates over deregulation). The macro-prudential paradigm has shifted the debate from "regulation versus deregulation" to a discussion over how to regulate and how strict regulations should be. This shift of regulatory debate is a direct result of the shift in our understanding of financial markets as inherently unstable. Furthermore, given the acknowledgement of the inherent instability, and complexity of the financial system, the macro-prudential paradigm gives a strong justification for giving up the attempt to develop optimal regulatory structures, and instead focus on developing reliable and reasonable banking regulations.

In other words, macro-prudential regulation could be argued to reflect a deeper shift in the structure of the neoclassical perspective because it involves a cognitive shift in our understanding of how financial markets function. Financial economists began to acknowledge that financial markets are inherently unstable, interconnected structurally, unpredictable and thus very complex. This shift in the neoclassical perspective over the functioning of financial markets, along with the shift in the methods from partial equilibrium to general equilibrium and network analysis, combined with a change in the analytical concepts of banking regulatory analysis where the concept of systemic risk dominates the concepts of asymmetry of information in rationalizing banking regulation may signal a *deeper restructuring* of the neoclassical paradigm itself.

However, these shifts may not be sufficient to argue that a deeper restructuring of mainstream economic perspective has taken place. Kuhn (1970) suggested that the dominant paradigm attempts to adapt to new anomalies/counterexamples exemplified by the crisis. Our samples indicate this form of adaptation as scholars begin to conceptualize systemic risk as a negative externality, and not as an emergent property of the financial system. Indeed, the notion of systemic risk, as indicated above, seems to be in contradiction with the neoclassical paradigm. This explanation is somehow consistent with the theorization of systemic risk as a negative externality in the fifth and sixth periods of our samples (particularly, Acharya et al., 2010). By conceptualizing systemic risk as a negative externality, economic research becomes trapped in quantifying the contribution of each individual financial institution to systemic risk in order optimally internalize the negative externality of these institutions (see, e.g. Acharya et al., 2010; Adrian and Brunnermeier, 2010).

In this way, systemic risk is subsumed within the neoclassical market failure paradigm, rather than taking a different perspective by rethinking the concept as an emergent property of the structure of the financial system, and the interaction among its components. The latter path would make the attribution of systemic risk to individual institutions impossible, thereby rendering the internalization of systemic risk as a negative externality into a non-reliable regulatory strategy. By arguing that systemic risk is a negative externality that regulators did not take into account because they were using partial equilibrium rather than general equilibrium and network analysis, macro-prudential regulatory instruments would represent a response to an ***overlooked*** market failure. The latter was overlooked due to ignoring structural network analysis. In this sense, macro-prudential regulation does not disturb the neoclassical microeconomic basis of banking regulation, and thus could be subsumed as its natural extension, where the task of economic research is simplified to quantifying systemic risk, quantifying the contribution of each financial institution to systemic risk, and designing *optimal* regulatory interventions for internalizing these negative externalities.

Similarly, the change in methods and analytical concepts from partial equilibrium to structural network analysis does not imply a shift to reliable regulation as well; it simply implies widening the scope of acceptable methods of formal analysis. In this sense, according to Lakatos (1979), the research programme of neoclassical financial economics protects its hard core of optimization and formalism by widening its methodical toolkit. In sum, the insistence

on neoclassical market failures perspective, the attempt to develop optimal regulatory structures, and widening the formal toolkit to include network analysis indicate to the economic discourse's endogenous resistance mechanisms to the irritations of the financial crisis. Despite of the fundamental changes we observe in the economic discourse post-crisis in our sample, this discourse seems to be utilizing resistance mechanisms to adapt the pre-crisis discourse rather than endorsing a more radical shift. In sum, neoclassical economics forming the knowledge basis for micro-prudential banking paradigm has fundamental characterizing elements, mainly, market failures analysis and the attempt to develop optimized regulatory structures. The shift from micro to macro-prudential regulation does not signal a deeper restructuring of the neoclassical perspective as long as a) systemic risk is conceptualized as a negative externality, and b) the macro-prudential regulatory paradigm is conceived as another attempt to develop optimal regulatory structure.

This evolutionary path would risk, however, losing sight of plausible regulatory instruments that could function at macro or systemic levels, instead of attempting to internalize systemic risk at the micro-level by internalizing systemic risk as an externality to which individual institutions contribute. Furthermore, by taking this path, economic research on banking regulation would retain optimization, formalism, equilibrium modelling and thus would be stuck in the "pseudo optimization" model of regulation.

7. Conclusion

Analyzing the evolution of economic thinking about banking regulation and systemic risk in a longitudinal perspective through content and citation network analysis, this paper has attempted to investigate two interrelated questions. First, why did pre-crisis economics fail to develop a framework for macro-prudential regulation even if economists were thinking about systemic risks? We attributed this failure to the fact that economic discourse on banking regulation has been locked into formalism, particularly, non-structural partial equilibrium analysis. In addition to formalism and equilibrium modelling, we then demonstrated that *optimization* dominates the economic discourse on banking regulation, which turns to be in fact *regulatory pseudo-optimization.*

Second, combining our discourse analysis with some Kuhnian and Lakatosian insights, we inquired whether the shift to macro-prudential regulation reflects some fundamental changes in the neoclassical microeconomic perspective underlying banking regulation. We found that the neoclassical economic discourse is employing forms of resistance to any fundamental shifts; the economic discourse conceptualizes systemic risk as market failure taking the form of negative externalities, and insists on formalism and developing optimal regulatory structures. These forms of resistance seem to be pushing macro-prudential thinking to evolve into becoming an extension to neoclassical-micro-prudential thinking on one hand, and to deviate from the reliable regulatory structure. It seems therefore that the neoclassical discourse is stuck in the pseudo-optimization model of regulation. As we have shown, this model largely excludes historical and practitioners' discourses, though being valuable sources of knowledge, and ignores weak signals. We think that economists have not recognized yet the limits of optimization and its corollary formalism to develop truly optimal regulation. This lack of awareness holds the danger that the formal approaches would dominate the economic discourse on banking regulation in the future again, and by doing so, the economic discourse would return to its "business as usual" of pseudo- optimization of banking regulation.

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