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Abstract	This chapter analyses IT governance disclosure for a sample of (from Italy, Germany, France and Spain) to observe if, how and report on their IT governance issues and to verify if after the chave started to pay more attention to IT governance. Since IT (like other aspects of banking business) can be influenced by the environment we examine whether any differences in Supervisor IT issues induce differences in IT governance across countries. It governance transparency, as a key mechanism of corporate governance transparency, as a key mechanism of corporate governance in original IT governance framework; ii) perform a control on banks public disclosure and a selected number of Supervisidocuments (2008–2015) to build up IT governance indices; at multidimensional analysis to detect causal relationships between				

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Sabrina Leo and Ida Claudia Panetta

4.1 Introduction

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Even if first scientific research regarding the concept of IT governance was developed in the 1960s, only in the late 1990s did this topic obtain systematic attention 7 from scholars. From then on, the concept of IT governance has become an object of 8 greater attention and has been analysed in the broader context of corporate gover- 9 nance mechanisms. The literature provides various definitions and a range of 10 constructs to describe the concept of IT governance (see Table 4.1) in the form of 11 different structures, processes, domains, facets, and elements, analogous to the 12 study of corporate governance in general. 13

It is important to note however that IT governance merits distinct attention 14 within other corporate governance mechanisms for two reasons:

- most organizations in today's complex and competitive business environment 16 rely heavily on IT to improve operating efficiency and sustain competitive 17 advantage (Mata et al. 1995); 18
- IT governance can help firms to arrange and specify an efficient IT decision- 19 making structure for a range of IT-related topics, such as IT investment, IT principles, and IT infrastructure management (Sambamurthy and Zmud 1999; 21 Weill and Ross 2004; Xue et al. 2008, 2011). 22

Therefore, the effective governance of IT can support organizations in generat- 23 ing value-added objectives on top of IT, thereby contributing to the broader 24 objectives of corporate governance (Weill and Ross 2004). 25

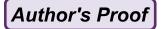
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1	Table 4.1	IT governance:	most	aitad.	definitions

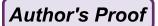
t1.2	Authors (year)	Definitions of IT governance
t1.3	ITGI (2003, p. 10)	[it ensured that] the organization's IT sustains and extends the organization's strategy and objectives
t1.4	IT Governance Institute (2003, p. 11)	[] consists of the leadership and organizational structures and processes that ensure that the organization's IT sustains and extends the organization's strategies and objectives
t1.5	Weill and Ross (2004, p. 8)	[] is decision rights and accountability framework to encourage desirable behaviour in using IT
t1.6	ISO/IEC 17799 (2005)	[] is integral part of organizational management and responsibility of managing and supervising boards and it consists of leadership, organizational structure and processes that ensure IT is used as enhancer of organizational strategy and goals
t1.7	Webb et al. (2006, p. 7)	[] is the strategic alignment of IT with business such that maximum business value is achieved through the development and maintenance of effective IT control and accountability, performance management and risk management
	Spremić (2009, p. 906)	[] implies that IT processes are fully integrated into life cycle of business process and it influences on quality of service and business
t1.8		agility

IT, as for other industries, is an intrinsic component of banks' operational functioning too; and has become the backbone of almost all banking processes considering the growing role assumed in: a) supporting management in strategic decisions; b) facilitating the automated control environment on which core banking data are based; c) developing new products and services to compete in the financial markets; and d) the improvement of distribution channels.

While IT has emerged as a strategic resource in today's banking business environment, it can also raise critical issues, such as effective IT decision making and management control, IT investment priorities, and IT risk management. Regarding the latter, one lesson learned from the financial crisis that began in 2008 was that banks' IT and data architectures were, on the one hand, necessary to improve banks' efficiency and risk management process, and, on the other, deeply inadequate to support the broad management of financial risks.

Banks' capacity to capture robust data for timely and automated risk identification increasingly relies on data and technology infrastructures. Two are the relationships between risk management and IT that are most relevant:

- risk management in banks is increasingly supported by IT: for instance, data bases allow the recording and analysis of risk events, systems support models for
 risk quantification, internal rating models, etc.;
- the more that IT penetrates the banking processes, the greater the dependence of
 business activities on IT, which, in turn, increases the relevance of IT risk
 management.
- The lack of the ability of many banks to efficiently and effectively provide Senior Management with a true picture of the risks the organization faces—more



evident during the global financial crisis—has led to a renewed attention on IT 50 management from regulators.

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For instance, at the international level BCBS and EBA have intervened defining 52 a set of new rules (e.g. Basel III framework) and guidelines (e.g. Principles for 53 effective risk data aggregation and risk reporting) which affect—albeit indirectly— 54 IT governance. However, regulators do not specifically address banks requisites for 55 effective IT governance and risk management systems, even so these changes likely 56 result in strategy overhaul, process review and IT systems impact on the banking 57 industry. 58

Given the awareness that risk management systems have failed in many cases 59 due to inadequate corporate governance mechanism rather than the failure of IT 60 systems strictu sensu, in this chapter we wish to highlight if banks have begun to 61 ascribe greater importance to the coordinated management of all IT resources, in 62 other words to IT governance.

We explore the attention payed to IT governance in four EU countries by a 64 sample of banks and national Supervisors, to point out if, after the crisis, the interest 65 on this topic as well as the level of investments in IT has increased.

In contrast to previous studies which use case studies and/or questionnaires to 67 investigate IT governance practices, we base our analysis on banks' public disclosure. We root our research on the largely shared assumptions that firms with good 69 IT governance tend to disclose more on related mechanisms (e.g. Clarkson et al. 70 2004). 71

To observe if the attention to IT governance has increased in the last few years, 72 we develop an original descriptive framework of IT governance (ITGF) disclosure 73 tailored to the banking sector.

Using the ITGF we perform a content analysis to measure the level of attention 75 on IT governance through the years (2008–2015) and cross countries from both 76 banks and Supervisors.

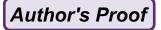
This study, to the extent that constitutes a pilot study, provides several insights 78 into the academic debate within the macro strand of literature on corporate gover- 79 nance mechanisms, and more specifically on the less analysed topic of IT gover- 80 nance focusing on the banking sector.

The chapter is organized as follows: Sect. 2 provides the background of the 82 research, including the existing literature and development of research questions, Sect. 3 describes the research methodology and the sample and data collection, the 84 main results are presented in Sect. 4; finally, Sect. 5, presents the conclusions and 85 outlines areas for future research. 86

4.2 **Background and Development of Research Questions**

4.2.1 IT Governance and Transparency

Traditionally, the literature has deepened our understanding of the role of Information Technology issues in the banking sector and typically analyses linkages with 90



efficiency: the results demonstrate that on the one hand IT is considered a key resource in improving banks' operating efficiency (Banker et al. 2009; Berger 2003; State of Chiasson and Davidson 2005; Chowdhury 2003; Fuβ et al. 2007; Zhu et al. 2004); and, on the other, the presence of a weak or non-existent relationship between IT and bank productivity (CEA 2001; McKinsey Global Institute 2001; Beccalli 2007).

More recently a limited part of literature has started to look at IT in the banking sector from another perspective: IT governance (e.g. Pardo et al. 2011).

Broadly speaking, IT governance provides structures, processes, and relational mechanisms to control and monitor the effectiveness of IT (Peterson 2004; De Haes and Van Grembergen 2009; Willson and Pollard 2009). IT governance and its mechanisms are conceptualized in the literature following corporate governance principles (Korac-Kakabadse and Kakabadse 2001; ITGI 2003; Weill and Ross 2004; Peterson 2004; Jordan and Musson 2004; Mähring 2006; Raghupathi 2007; Van Grembergen and De Haes 2009; Heart et al. 2010); and decision rights, accountability, and risk management are some linked mechanisms included in more recent research (Brown 1997; Sambamurthy and Zmud 1999; Weill and Ross 2004; Brown and Grant 2005; Parent and Reich 2009; Huang et al. 2010).

In trying to identify effective IT governance arrangements, scholars have extended their analysis to different areas of IT governance (Sambamurthy and Zmud 1999; Kambil and Lucas 2002; Trites 2004; Weill and Ross 2004; Andriole 2009; Huang et al. 2010; Xue et al. 2011), covering areas such as the role of the Board of Directors, the effectiveness of the IT steering committee, IT control and firm performance, IT investment performance, and IT audit issues (Trites 2004; Huff et al. 2006; Mähring 2006; Boritz and Lim 2008; Gu et al. 2008; Merhout and Havelka 2008; Prasad et al. 2009).

While most of the principles of corporate governance are integrated into the major IT governance literature, scholars seem to have paid less attention to IT governance transparency. The latter is defined as the ability of firms to provide adequate and relevant IT governance information in a timely and effective manner to stakeholders (investors, policy makers, and regulatory bodies), to enable them to assess management's behaviour in using IT (Millar et al. 2005; Eldomiaty and Choi 2006; Raghupathi 2007; Joshi et al. 2013).

As demonstrated in the existing literature, firms provide information on IT governance—voluntarily—if they obtain benefits such as a reduced cost of capital (Barry and Brown 1985, 1986; Vanstraelen et al. 2003; Easley and O'Hara 2004), an improvement in liquidity (Diamond and Verrecchia 1991; Kim and Verrecchia 1994), and better information intermediation (Bhushan 1989; Lang and Lundholm 1996).

Based on the study of Lang and Lundholm (1996) and Clarkson et al. (2004), we infer that the more firms have good IT governance in place, the more they are incentivised to disclose.

Based on this theoretical premise, the first two research questions that we try to answer are:

4	IT Governance:	Who	Cares	More?	First	Evidence	from	EU	Banks	and	Su	pervisors
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Q1 Has the level of IT governance disclosure changed after financial turmoil?	135
Q2 What topics of IT governance are publicly disclosed and where (in which public	136
document) the information on IT governance topics can be found?	137

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In our knowledge, there is no specific study on IT governance disclosure in the 138 banking sector, except the contribution from Joshi et al. (2013) that demonstrate differences in level of disclosure are related to varying institutional settings. 140

4.2.2 Changes in the IT Risk Management Regulation Framework

Since IT governance (like other aspect of banking business) can be influenced by the regulatory environment, it is important to understand in which direction Supervisors and Regulators have moved. As mentioned above, the recent financial 145 turmoil has catalysed attention, among others, on risk management and in particular 146 on the processes, data management and the new emerging risks such as IT risk.

IT risk is differently defined across time and countries as shown in the Table 4.2. 148 In the banking sector, it is generally considered as a key type of operational risk; 149 subject to very specific challenges given that the financial system has become more 150 complex and interconnected (EBA 2015a).

More specifically, from an IT governance perspective, Parent and Reich (2009) 152 identify several types of IT risks such as IT project risk, IT competence risk, IT infrastructure risk, business continuity, and information risk, which can have 154 adverse impacts on business.

Generally, for the assessment of IT risks all banks have mechanisms and 156 measures in placein certain forms depending on regulation at the local level. 157

Table 4.2 IT-related-risk: main definition

Authors (year)	Definitions
Loch et al. (1992)	[] IT operational risk could result in the disclosure, modification, destruction, or denial of use of IT resources
Straub and Welke (1998, p. 442)	[] define "systems risk" as uncertainty related to using computer- based systems and interpret this risk to be "broadly construed to mean modification, destruction, theft, or lack of availability of computer assets such as hardware, software, data, and services"
Jordan and Silcock (2005)	An IT risk is something that can go wrong with IT and cause a negative impact on the business
ITGI (2008)	[] IT risk is business risk – specifically, the business risk associated with the use, ownership, operation, involvement, influence and adoption of IT within an enterprise
Goldstein et al. (2011, p. 610)	[] IT operational risk is any threat that may lead to the improper modification, destruction, theft, or lack of availability of IT assets
EBA (2015b)	[] operational risk related to information and communication technologies



The renewed interest in risk management has culminated in the necessity to review the regulatory framework. In fact, at the international level the BCBS has:

- started a comprehensive review of Basel II, culminating in the release of a
 reform package known as the Basel III Framework (corresponding to Capital
 Requirements Regulation (CRR) and Capital Requirements Directive (CRD IV)
 in EU countries) which has affected—albeit indirectly—IT governance, emphasizing that risk management systems should have appropriate Management
 Information Systems (MIS);
- rolled out a new set of Principles with the aim to develop banks' Risk Data
 Aggregation and Risk Reporting, requesting banks to comply starting
 from 2016.
- In the renewed Basel framework, there is no specific reference to IT related risk and IT risk management process, (nor in other international regulatory intervention); IT risk is considered as a sub-type of operational risk (art 85 CRD IV).
- Articles 4 and 321 to 325 of the CRR set out the measures that financial institutions should take to manage operational risk (and the related capital they need to hold to cover such risks), including risks related to cyber-attacks (CRR, CRD IV). Banks also need to have contingency lens that ensure continuity of their business and limit losses in case of severe disruptions.
- The CRD IV requires banks to perform a major update to their IT risk management in terms of:
- process: the implementation of rules and standards in their business, leading to
 new opportunities and adapted business processes;
- 181 data: under the new rules, banks will need to demonstrate data quality and 182 traceability;
- technology: one of the biggest impacts from a technological standpoint is the
 ability to produce integrated reports, with consistent reporting across the
 company.
- Furthermore, in Europe, to reinforce the importance of adequate IT risk management for banks, the EBA Guidelines provide direction to the Supervisors for assessing banks' IT risk (EBA 2016): one more time, regulators don't address banks specific requests for an effective IT risk management system, but set a framework for Supervisors to monitor this topic at an institutional level.
- 191 Considering that all these changes in the regulatory environment may result in 192 strategy overhaul, process review and IT systems impact, we want to examine 193 whether any differences in Supervisors' attitude to IT concerns at the national level, 194 will induce differences in banks' IT governance, and level of investments in IT 195 projects. So, the last research questions are:
- 196 Q3 To what extent—if any-has Supervisors' behaviour beens affected by the attention paid by banks to this theme?
- 198 Q4 Have Supervisors' indications influenced the banks' level of IT systems 199 investment?



4.3 Research Methodology

Our analysis is devoted to evaluate IT governance practices for a sample of EU 201 banks and to observe if the attention to this issue has increased over time 202 (2008–2015) and/or varies across countries (Italy, Germany, France and Spain). 203 Geographical differences can be surely influenced by different regulatory 204 approaches used by Supervisors at the national level. 205

The first two research questions are oriented towards analysing the level 206 (O1) and the content (O2) of disclosure of IT governance performed by each 207 institution; to investigate IT governance transparency, we use content analysis to 208 build-up the dataset to be employed in the empirical analysis (Weber 1985). 209 Information is obtained from public disclosure documents of banks included in 210 the sample (see Sect. 3.2). 211

To carry out the content analysis, we identify a set of items related to IT 212 governance grouped into four focus areas/categories (IT Role & Responsibility, 213 IT Resources & Plans, IT Risk Management, IT Investment); the resulting original 214 IT governance framework (ITGF) is elaborated by adapting and enriching the 215 Joshi et al. (2013) approach to fit our purpose (see Sect. 3.1).

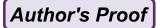
For each focus area under ITGF, the items were selected on the basis of current 217 literature (see Tables 4.3, 4.4, 4.5 and 4.6), including terms that have emerged from 218 the regulatory environment and practitioner debate as well as on a pilot study we 219 conducted on bank annual reports. 220

Using the selected set of items within the ITGF, we inspect the institutions' 221 documents using the program MAXQDA to verify whether each item is present 222 (1 = present; 0 = not present) and how many times it is enumerated. We then build 223 up a unique dataset to be used to measure the level of IT governance disclosure. In 224 particular for each institution (bank and Supervisor) it was possible to compute:

- a total IT governance score, which represents the number of times that each item 226 is disclosed in the reports analysed; for example, if we find evidence of Internal 227 Audit position five times in the Annual report, then it is assigned an item score of 228 5. As it is difficult to discriminate if institutions write a short sentence or an 229 entire section regarding IT governance in their reports, we decided to consider 230 not only the presence of each item (0,1), but also the total number of times they 231 are enumerated (item score). The underlying assumption is that the more banks 232 and Supervisors mention ITGF items, the higher the level of disclosure. The total 233 IT governance score (or focus area score) is obtained by simply adding the 234 scores related to items within ITGF (or within focus areas).
- a total IT governance disclosure index (ITGF_Index) and four IT governance 236 indices, one for each focus area within ITGF (ITRR_Index, ITRP_Index, 237 ITRM_Index, ITINV_Index) are constructed. The indices are obtained by simply adding the score of each focus area divided by the number of items in each 239 category (Bollen et al. 2006; Joshi et al. 2013): 240

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3.1 Table 4.3 ITRR Index: description of items and literature references

3.2	N°	Items	Description	Relevant literature
3.3	1	IT audit/EDP audit	Presence of IT and information assets related risk are on the agenda of the Audit or Risk committee	Hadden and Hermanson (2003), De Haes and Van Grembergen (2008), Joshi et al. (2013)
3.4	2	Information security control function	Presence of control function related to information security	Pilot study
3.5	3	Business continuity management	Presence of responsible for business continuity	
3.6	4	CERT/SOC	Presence of Computer Emergency Response Team/Security Operations Centre	
3.7	5	Data manage- ment office/ centre	Presence of organizational position related to Data management	_,0
3.8	6	IT service/ function	Presence of specific organizational position	
3.9	7	CIO	Presence of CIO or an equivalent position with respect to IT and information assets at an executive level	Peterson (2004), De Haes and Van Grembergen (2008), Joshi et al. (2013)
3.10	8	CISO	Presence of CISO with respect to IT security at an executive level	Pilot study
3.11	9	IT management	Presence of senior management dedicated to IT asset	
3.12	10	Technology committee	Presence of a special committee which looks after IT and related technology architecture, projects, and governance issue at an executive level	Premuroso and Bhattacharya (2007), Joshi et al. (2013)
	11	Other IT committee	Presence of; i) a committee looking after IT and information assets at the board level; ii) a committee which monitors IT management, IT spending, and related cost allocations (IT steering committee); iii) a committee which looks after strategic planning and	Sambamurthy, et al. (1993), Karimi et al. (2000), Peterson (2004), Trites (2004), Van Grembergen and De Haes (2004), Nolan and McFarlan (2005), De Haes and Van Grembergen (2008), Joshi
3.13			investment decisions on IT and information assets (IT planning committee)	et al. (2013)

$$ITY_Index = \frac{1}{Ny} \sum_{i=1}^{Ny} (x_i)$$

Where IT $Y_{Index} = IT$ governance Index related to the focus area/categories Y (namely GF: entire Governance Framework; RR: Role and Responsibility; RP: Resources and Plans; RM: Risk Management; INV: Investment); $x_i = Sum$ of

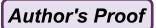


Table 4.4	ITRP Index:	description o	f items and	literature references
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N°	Items	Description	Relevant literature
1	Information security policy	Presence of a clear information and security policy	Trites (2004), Jordan and Silcock (2005), Joshi
2	IT plan/s		et al. (2013)
3	IT strategy	Presence of any kind of reference to IT strategies	Pilot study
4	EDP	Presence of explicit reference to Electronic Data Processing	
5	IT resources governance	Presence of specific IT process and procedures in place	
6	IT processes/ procedures		8
7	IT/Data infra- structure/	Terms related to the relevance assumed by data governance after 2008 financial crisis,	SSG (2010), BCBS (2013)
	Architecture	as a key resource to support strategic plan- ning and tactical decision making	.0
8	IT resources/ solution	Presence of explicit reference to IT resources and solutions	Pilot study
9	ITIL/COBIT/	Presence of explicit reference to the adop-	ITGI (2003), De Haes
	NIST	tion of any IT governance framework/	and Van Grembergen
0	ISO 27001-5	standard	(2008), Joshi et al.
11	Other IT gov- ernance Standards	4.80	(2013)

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the item scores within each focus area/categories, and N_v number of items 244 included in Y focus area/categories.

These indices are used to compare the level of IT governance disclosure across 246 time and countries (Q1). From the dataset, it is also possible to have a look at how 247 and where banks disclose details on IT governance (Q2).

To measure changes in attention paid by different Authorities to IT governance, 249 we perform content analysis on a selected group of Supervisors' documents. We 250 consider items included in the first three focus areas (ITRR, ITRP, ITRM), verify-251 ing whether each item is present (1 = present; 0 = not present) in the Authorities' Annual reports or national law. The underlying hypothesis is that in these kinds of 253 documents it is possible to find signals of a greater level of attention to IT 254 governance paid by Supervisors. Starting from the resulting original dataset we 255 build a comprehensive ITGF_Index for each Authority.

To evaluate the influence of Supervisors' attitude on banks' IT governance 257 behaviour we investigate the relationship between ITGF_Index_Banks and 258 ITGF_Index_Supervisors (Q3) using an OLS regression model estimates.

Finally, we calculate the banks' level of investments in IT systems (ITEXP), as a 260 proxy of banks' efforts to maintain IT systems and security at adequate levels and 261 infer that related internal controls remain "robust". We measure the level of 262 investments in IT considering all expenditure (registered both in the Balance 263

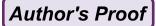


1 Table 4.5 ITRM Index: description of items and literature references

t5.2	N°	Items	Description	Relevant literature
	1	Cyber risk/ Attack IS breach	Presence of reference to identification of IT risk	Jordan and Silcock (2005), Joshi et al. (2013), Regulatory
t5.4	2	IT fraud		environment & practitioners
t5.3 t5.5	3	IT Incident/ failure		debate
t5.6	4	IT risk		
t5.7	5	IT risk/Business continuity/Cyber security model	Presence of elements related to the evaluation of IT risk	Pilot study
t5.8	6	IT risk appetite		C.
t5.9	7	IT risk assessment		
t5.10	8	IT risk report		
t5.11	9	Business conti- nuity plan	Presence of IT and related technology continuity plans; these	Jordan and Silcock (2005), Joshi et al. (2013)
t5.12	10	Contingency plan	plans, in case of disaster, are also expressed required by regulatory	
t5.13	11	Disaster recov- ery plan	framework	
	12	Information/ Cyber security plan	Presence of special program to mitigate IT risk	Jordan and Silcock (2005), De Haes and Van Grembergen (2008), Merhout and Havelka
t5.14 t5.15	13	IT risk management		(2008), Joshi et al. (2013)
t5.16	14	IT risk regula- tion/compliance	Presence of explicit reference to regulations and compliance requirements	Trites (2004), Jordan and Silcock (2005), Li et al. (2007)

t6.1 **Table 4.6** ITINV Index: description of items and literature references

t6.2	N°	Items	Description	Relevant literature
t6.3	1	Expenses in income statement	Presence of IT related expenses, mentioned under the administrative cost	Joshi et al. (2013)
t6.4	2	Investment in balance sheet	Presence of IT related investment, mentioned as intangible assets	
t6.5	3	IT budget	Presence of information regarded budget on IT and information assets	Takemura et al. (2005), De Haes and Van Grembergen (2008)
t6.6	4	IT Expenses	Presence of information on the overall IT expenditure	Takemura et al. (2005), De Haes and Van Grembergen (2008)
t6.7	5	IT hardware/ software	Presence of information on IT hardware/ software cost mentioned under the IT expenditure	Takemura et al. (2005)



Sheet and Income Statement) made by banks to maintain an adequate level of the 264 efficiency of the system. The level of investments in IT over time is normalised by 265 Total Assets to obtain the ITEXP Index. We use this index to verify if there is an 266 influence of Supervisors' indications on the banks' level of IT investments (Q4).

The analysis, at this stage, can be considered as a pilot study (with a limited 268 sample size) to test banks' and supervisors' behaviour on IT governance issues.

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4.3.1 IT Governance Framework: Development of Categories

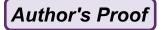
The existing IT governance literature does not propose any single standard frame- 272 work to assess IT governance using disclosure practices: all empirical analysis, 273 except Joshi et al. (2013), are based on surveys and/or single case studies, in other 274 words are based on internal information. Analysing banks' from 'outside' we are 275 aware that banks do not disclose all aspects of their IT governance, also because 276 they are not forced to describe specific procedures relating to their IT strategy and 277 so on. Following Lang and Lundholm (1996) and Clarkson et al. (2004), we assume 278 that the more banks have good IT governance in place, the more they are incentiv- 279 ized to disclose.

Considering this premise, we expect to find some clues of specific structural IT 281 governance mechanisms in place in each institution analysed. For example, a bank 282 might disclose the presence of a Technology Committee to implement IT strategy, 283 or of CIO to support business goals with IT management at the top level. The 284 underlying assumption is that the dissemination of this kind of information makes 285 clear to stakeholders that the bank has an IT governance structure and that— 286 probably-IT policies and procedures are in place.

To develop content categories, we construct a so-called IT Governance Frame- 288 work according to previous scholars contributions in assessing IT governance and 289 base this on our pilot study conducted on the Annual Reports of banks/Supervisors 290 and on key international regulations; Tables 4.3, 4.4, 4.5 and 4.6 provide a brief 291 description and highlight the supporting literature for each item included in each of 292 the four focus areas/categories.

According to the prevalent literature (Table 4.3) we suggest that the level of 294 transparency on IT roles and responsibilities (IT Role & Responsibility, ITRR) can 295 be used as a proxy of good IT governance practices. In our view it is possible to 296 summarise previous scholars' contribution on the relevance of IT roles assigned 297 among firms, focusing on the following: 298

_	IT strategic roles;	299
_	IT senior management;	300
_	IT operational roles;	301
_	IT control roles.	302



The definitions of corporate governance (OECD 1999, 2004), of which IT governance can be considered a sub-set, presents a need for leadership (strategic roles), direction (Senior Management) and control (roles). Therefore, IT governance must be driven from the highest levels within the organisation not only from the IT department or business unit levels (operational roles) across the organisation (Webb et al. 2006). In order for IT to be effectively governed the presence of a variety of roles can be considered a necessary premise (Table 4.3).

Compared with previous studies, we extend the number of items related to control functions: starting from the main three obligatory control functions in banks defined by Basel documents (risk control, compliance and internal audit), we consider IT risk control, IT compliance, and IT audit; the underlying assumption is that with a growing level of complexity and interdependencies of banks' technology and operating structures, IT control roles should be reinforced.

With the second focus area (IT Resources & Plans, ITRP) we aim to investigate the relevance attributed to IT resources/process and infrastructures, in the belief that, due to both competitive and regulatory pressures, the relevance of IT management elements would increase, and consequently, the related information in public documents (Table 4.4).

To capture IT risk management practices (IT Risk Management, ITRM) we construct an index that considers the main phases of risk management processes: identification, evaluation, treatment and monitoring. The basic assumption is that the main constituent of IT risk management should be communicated to all relevant stakeholders. With this indicator, we try to determine if banks disclose IT-related risk management policies/processes in place, and if IT risk is treated jointly or independently with respect to the operational risk management framework (Table 4.5).

The last focus area ITINV, concentrates on IT budget/investments. In the past two decades, practitioners and scholars (ITGI 2003; Weill and Ross 2004) have paid great attention to this topic, but the major part of these studies typically focus on the relationship between the disclosure on IT financial matters and economic benefits for firms. In our research, we analyse IT investments as an attribute of IT governance disclosure, since budgeting and investments are the responsibilities of Top Management (ITGI 2003); and better IT governance practices are based on clear information on IT investments useful to assess the business value of IT (Table 4.6).

88 4.3.2 The Sample and the Data Collection

Countries selected for our analysis are France, Germany, Italy and Spain due to the dimension of the national banking system in term of total assets, representing together around 73% of total assets of the EU banking sector (ECB 2016). For each country, we consider the three major banks, being sure to include in the sample at least one G-SIB for each country: the final sample consists of 12 international



banking groups (Table 4.7). As mentioned in the previous pages, to perform the 344 content analysis, we record data from different sources of public disclosure of banks 345 included in the sample (281 documents), namely: 346

- Annual Reports;
 Corporate Governance reports;
 347
 348
- Corporate Governance reports;
 Pillar III reports;
 348
 349
- Final In reports,
 CSR/Sustainability reports, if any.
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To calculate the ITGF_Index for Supervisors we perform the content analysis on 352 the following sources: 353

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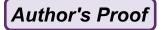
- Supervisors' Annual Reports (30 documents in total, Table 4.8);
- Regulations which, during the period 2008–2015:
 - put in place the Basel III framework; 356

Table 4.7 Banks' sample composition and documents collected (2015)

Country	Total assets (bln €) ^a	Share of Euro area total assets ^a	Bank	G-SIB (2015) ^b	Total assets (mln €)	Share of total assets of countries banking system	N° of documents analysed
France	6940	25%	Crédit Agricole	×	1,529,294	20%	8 ⁽¹⁾⁽²⁾
			BNP Paribas	×	1,292,206	17%	16 ⁽¹⁾⁽²⁾
			Société Générale	×	1,334,391	17%	15 ⁽¹⁾⁽³⁾
Germany	6955	25%	Deutsche Bank	×	1,629,130	21%	32
			CommerzBank		532,641	7%	23 ⁽¹⁾
		C	Landesbank Baden- Württemberg		234,015	3%	23 ⁽¹⁾
Italy	2724	10%	Unicredit	×	860,433	22%	32
			Intesa San Paolo		676,496	17%	32
			Monte dei Paschi di Siena		169,012	4%	24 ⁽⁴⁾
Spain	3664	13%	Banco Santander	×	1,340,260	48%	32
			BBVA		397,303	14%	24 ⁽³⁾
			Banco Sabadell		208,628	7%	20 ⁽⁵⁾

Note: ⁽¹⁾ no separated CG Report; ⁽²⁾ no separated Pillar III; ⁽³⁾ no separated CSR Report; ⁽⁴⁾ CSR n.a.; ⁽⁵⁾ Separated CG Report for 2009; Pillar III n.a. In English, for the period 2011–2015; CSR n.a. for the period 2013–2014

Source: aECB (2016), p. 69; bFSB (2015), p. 2; bank's website



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t8.1	Table 4.8	Supervisors'	sample comp	osition and	documents	collected
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t8.2	Supervisor (acronym)	Country	N° of annual report analysed (time span)
t8.3	Supervisory and Resolution Authority—Autorité de Contrôle prudentiel et de résolution (ACPR)	France	6 (2010–2015)
t8.4	Federal Financial Supervisory Authority—Bundesanstal für Finanzdienstleistungsaufsicht (BaFin)	Germany	8 (2008–2015)
t8.5	Bank of Italy—Banca d'Italia (Bol)	Italy	8 (2008–2015)
t8.6	Bank of Spain—Banco de España (BoS)	Spain	8 (2008–2015)

- apply EBA Guidelines on internal Governance (GL44);
- specifically refer to the BCBS (2013) Principles of effective Risk Data aggregation and Risk Reporting (PRDARR);

and any other specific regulation on IT governance, if available in English (see Table 4.9).

Even if we find other important regulatory provisions in the analysed countries, it was difficult to perform further content analysis because of the absence of English translations.

6 4.4 Results and Discussion

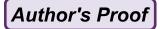
Table 4.10 provides descriptive statistics for the variables employed in this study.
The mean for the overall IT disclosure index (ITGF_Index) is 2.85, representing that on average, during the period considered, banks mentioned around 117 times items within ITGF (consisting of 41 items); however, the range of the index is broad among the sample (from 0.3 to 17). Similar considerations can be done for Supervisors' ITGF index (from 0.03 to 1.8) even if the mean value and the range of variation are smaller than for banks.

Table 4.11 provides the evolution of IT Governance Indices calculated for the banks' sample and grouped by country (Q1). Looking at the results it is evident that there is a generalized increase of IT governance disclosure through the years with more intensity starting from 2013 and for Risk Management issues. ITINV_Index doesn't indicate any particular evidence since it shows depressed values across the year and across country.

It is also possible to highlight differences across countries. For instance, Spanish banks in the sample have started to pay greater attention to ITRM categories in 2012 and give more importance to all items related to ITRR and ITRP focus areas in 2015. Spain differs from other countries, also because of the presence of a larger number of roles and responsibilities related to IT governance.

4 IT Governance: Who Cares More? First Evidence from EU Banks and Supervisors

t9.1	19.1 Table 4.9 Regulations considered in ITGF_Index for supervisors	TGF_Index for super	rvisors		
19.2	References	Italian implementation	French implementation	German implementation	Spanish implementation
19.3	EBA Guidelines on Internal Governance EBA/CEBS (2011)	• Circular 288/2015 • 15th update (2013) of Circular no 263/2006 • 15th up date	• Article 511.41 French Monetary and Financial Code(Code Monétaire et Financier), update in 2014	• German Banking Act, 2012 (Kreditwesenge setz– KWG)	Adoption of the Guide- lines as their own on 27 June 2012
		(2015) of Circular no 285/2015		MaRisk	
4.61	19.4 BCBS Principles for effective Risk Data Aggregation and Risk Reporting (2013)	• 15th update (2015) of Circular no 285/2015	Not found	• German Banking Act (Kreditwesengesetz- KWG) • Circular 10/2012 MaRisk	Not found
19.5	CRD IV—Directive 2013/36/EU of the European Parliament (2013)	• 15th update (2013) of Circular no 263/2006 • 15th update (2015) of Circular no 285/2015	• French Monetary and Financial Code (Code Monétaire et Financier), update in 2014	• German Banking Act (Kreditwesengesetz– KWG)	• Ley 10/2014 • Royal Decree 84/2015 • Circular 2/2016 • Law 14/2013 of 29 November 2013
19.6	Other		• Regulation 97-02 of 21 February 1997, relating to internal control in credit institutions and investment firms (revised in 2010)	QQ S	



	t10.1	Table 4.10	Descriptive	statistics
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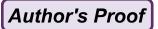
t10.2	Variable	Obs	Mean	Std. dev.	Min	Max
t10.3	ITGF_Index_Banks	96	2.847257	2.082997	0.2909091	16.95844
t10.4	ITRR_Index	96	0.4554924	0.7064599	0	6.090909
t10.5	ITINV_Index	96	0.4666667	0.3802123	0	2
t10.6	ITRM_Index	96	1.329454	1.114778	0	7.285714
t10.7	ITRP_Index	96	0.5956439	0.7446337	0	3.181818
t10.8	ITEXP_Index	96	0.0012736	0.0010066	0	0.0056655
t10.9	ITGF_Index_Supervisors	90	0.660019	0.5650148	0.02849	1.823362

t11 1	Table 4.11	Evolution of	banks' IT	governance indicesa:	distribution by country ^b
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t11.2		2008	2009	2010	2011	2012	2013	2014	2015
t11.3	ITGF_Index								
t11.4	France	6.91	7.42	5.22	6.13	7.15	5.77	7.93	10.07
t11.5	Germany	3.93	3.88	4.64	5.5	6.97	8.11	10.47	9.79
t11.6	Italy	8.67	10.56	8.3	9.91	8.28	9.04	10.03	12.92
t11.7	Spain	5.27	6.62	5.83	7.09	6.38	8.46	13.85	23.72
t11.8	Total	24.77	28.48	23.99	28.62	28.79	31.38	42.29	56.5
t11.9	ITRR_Index					A			
t11.10	France	0.18	0.55	0.55	0.55	0.64	0.55	0.64	2.55
t11.11	Germany	0.55	0.45	0.64	0.55	0.73	1.36	1.91	1.82
t11.12	Italy	1.27	1.27	1.09	1	1	1.27	1.27	2.36
t11.13	Spain	1.73	1.45	1.27	1	1.36	1.82	2.73	7.64
t11.14	Total	3.73	3.73	3.55	3.09	3.73	5	6.55	14.36
t11.15	ITRP_Index								
t11.16	Germany	0.18	0.36	0	0.82	0.91	1.55	1.91	1.64
t11.17	Spain	0.27	0.36	0.09	0.09	0.82	0.91	1.73	4.82
t11.18	France	0.73	0.55	0.55	1.18	1.18	1.09	1.36	1.45
t11.19	Italy	2.73	4.82	3.55	4.91	3.82	3.64	4.09	5.09
t11.20	Total	3.91	6.09	4.18	7	6.73	7.18	9.09	13
t11.21	ITRM_Index								
t11.22	France	4.8	5.13	3.73	4	4.33	3.53	5.33	5.67
t11.23	Germany	1	0.67	0.6	0.93	1.93	1.60	3.85	4.13
t11.24	Italy	3.67	3.27	2.87	3.2	2.87	3.33	3.47	4.47
t11.25	Spain	2.47	3.60	3.47	5	3.20	4.73	8.20	10.07
t11.26	Total	11.93	12.67	10.67	13.13	12.33	13.2	20.85	24.33
t11.27	ITINV_Index								
t11.28	France	1.20	1.20	0.40	0.40	1.00	0.60	0.60	0.40
t11.29	Germany	2.20	2.40	3.40	3.20	3.40	3.60	2.80	2.20
t11.30	Italy	1	1.20	0.80	0.80	0.60	0.80	1.20	1
t11.31	Spain	0.80	1.20	1	1	1	1	1.20	1.20
t11.32	Total	5.20	6.00	5.60	5.40	6.00	6.00	5.80	4.80
t11.33	Note: aITGF	Index is t	he sum of	the indic	es related	to the fou	r focus ar	eas (ITRR	Index.

t11.33 Note: ^aITGF_Index is the sum of the indices related to the four focus areas (ITRR_Index, ITRP_Index, ITRM_Index, ITINV_Index)

^bThe value of indices for each country is calculated as the sum of banks' indices included in the sub-sample



4 11 Governance. Who cares More: Phist Evidence from Eo Danks and Supervisors	
Italian banks recorded a slight upward trend over time for all indices particularly for the ITRP_Index. To answer to Q2 we analysed the percentage of IT governance items disclosed by banks in the sample (Table 4.12) and the documents in which they are disclosed (Table 4.13). Considering data reported in the following Tables we notice a lack of disclosure of organizational positions (see category ITRR); more attention is paid instead to IT services/functions and to Operational roles relating to business continuity. ITRP exhibits an increasing attention to IT resources and to Electronic Data Processing starting from 2013. While few banks refer to IT policy and IT plans. Within ITGF, ITRM is the most reported focus area; an increasing number of banks in the sample refer directly to IT risk, starting to consider it as a specific category instead of being included under operational risk. Business continuity plans and Information security are critically important. Finally, ITINV, indicates that in the most part banks report IT expenditures, but this seems mainly related to accounting policies instead of disclosure about investment plans. Maybe this attitude is due to the strategic and competitive relevance of IT investments and the need for banks to preserve the related programs' details. Table 4.13 represents the banks' preferences regarding the documents used to disclose about IT governance (Q2). Considering the general content of the four types of documents we would expect to find more evidence regarding items grouped as follows:	388 389 390 391 392 393 394 395 396 397 398 399 400
 ITRR and ITRP in the CG Report; ITRM in the Pillar III Report; ITINV in the Annual Report. 	407 408 409
Looking at the results it is evident that banks included in the sample use the Annual Report as the most important document to disseminate information on IT governance issues. It is true for ITRR and ITRP categories as well as ITRM. Surprisingly, banks do not refer to RM practices in the Pillar III Report but—again—prefer the Annual Report. As expected information related to the ITINV focus area is described in the Annual Report, even if we note that some banks often include IT expenses in the CSR Report, suggesting that banks assign to IT investment a specific role in value creation for all stakeholders. Before analysing the results of the Supervisors' behaviour, we would like to point out that it was not possible to find out the English version of dispositions which transposed CRD IV and EBA Guidelines into national regulation (Table 4.9), namely:	411 412 413 414 415 416 417 418
 the Code monétaire et financier, updated in 2014, for France; 15th update to Circular 263/2006 and 285/2015, for Italy. Nevertheless, we performed the content analysis using the available version of	423 424

Nevertheless, we performed the content analysis using the available version of 425 the three documents: while in Italy we have some findings due to the use of English 426 terms in national legislation, for France we have no results. Considering these 427



t12.1 Table 4.12 Percentage^a of banks disclosing IT governance items

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t12.2	Categories	Items	2008	2009	2010	2011	2012	2013	2014	2015
t12.3	ITRR	IT audit/EDP audit	_	_	_	_	8%	8%	17%	25%
t12.4		Information security control function	-	-	-	-	-	-	-	8%
t12.5		Business continuity management	17%	25%	25%	33%	25%	50%	33%	33%
t12.6		CERT/SOC	25%	25%	42%	25%	25%	25%	42%	42%
t12.7		Data management Office/centre	8%	-	17%	25%	25%	8%	8%	25%
t12.8		IT service/Function	58%	50%	25%	33%	50%	42%	58%	67%
t12.9		CIO	25%	17%	8%	_	8%	17%	25%	25%
t12.10		CISO	-	_	_	_	_	_	17%	42%
t12.11		IT management	25%	25%	8%	25%	17%	8%	17%	25%
t12.12		Technology committee	_	8%	8%	8%	8%	8%	17%	25%
t12.13		IT committee	-	-	8%	-	- (-	_	_
t12.14	ITRP	Information security policy	_	-	_	-	-	-	_	-
t12.15		IT plan	17%	17%	-	8%	17%	17%	25%	42%
t12.16		IT strategy	-	-	-	17%	-	25%	42%	33%
t12.17		EDP	17%	25%	25%	25%	33%	50%	50%	42%
t12.18		IT resources governance	17%	17%	8%	8%	8%	8%	17%	33%
t12.19		IT processes/ procedures	17%	17%	17%	33%	33%	33%	33%	50%
t12.20		IT/Data Infrastruc- ture/Architecture	42%	58%	42%	67%	67%	67%	92%	75%
t12.21		IT resources/ solutions	25%	17%	8%	25%	33%	33%	25%	50%
t12.22		ISO 27001-5	8%	8%	8%	8%	8%	17%	17%	25%
t12.23		ITIL/COBIT/NIST	25%	25%	17%	33%	25%	17%	42%	33%
t12.24		Generic standards	_	_	_	_	_	_	_	_
t12.25	ITRM	Cyber risk/Attack IS breach	_	-	8%	25%	25%	25%	33%	67%
t12.26		IT fraud	-	-	-	-	8%	8%	8%	17%
t12.27		IT incident/failure	58%	67%	42%	67%	50%	50%	67%	75%
t12.28		IT risk	33%	42%	25%	33%	58%	67%	83%	83%
t12.29		IT risk/Business continuity/Cyber security model	_	8%	_	_	_	_	_	17%
t12.30		IT risk appetite	-	-	-	-	-	-	_	8%
t12.31		IT risk assessment	-	_	-	-	-	-	_	17%
t12.32		IT risk report	-	-	-	-	-	-	8%	8%
t12.33		Business continuity plan	67%	67%	67%	83%	75%	75%	75%	75%

(continued)



Table 4.12 (con	tinued)
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abic 4.12	(continued)								
Categories	Items	2008	2009	2010	2011	2012	2013	2014	2015
	Contingency plan	67%	58%	67%	58%	58%	58%	58%	58%
	Disaster recovery plan	25%	17%	17%	17%	17%	17%	8%	25%
	Information/Cyber security plan	50%	25%	33%	33%	42%	42%	75%	75%
	IT risk management	8%	8%	8%	8%	8%	_	33%	17%
	IT risk regulation/ compliance	-	-	-	-	-	-	8%	-
ITINV	Expenses in income statement	58%	67%	67%	67%	67%	67%	67%	67%
	Investment in balance sheet	58%	58%	58%	58%	58%	58%	67%	67%
	IT budget	-	8%	-	-	-			_
	IT expenses	67%	58%	33%	33%	42%	33%	50%	42%
	IT hardware/ software	8%	17%	25%	17%	8%	25%	17%	8%

^aNumber of banks that disclose the Items of each category within ITGF divided by the number of t12.46 banks included in the sample

limitations, we analyse the percentage of Supervisors that enumerate the items 428 included into three focus areas (Table 4.14): ITRR, ITRP, ITRM. Comparing 429 results between banks and Supervisors we notice a homogeneous behaviour 430 between the two groups regarding the items enumerated.

This evidence allows us to deepen our understanding of the existence of a 432 relationship between Supervisors' attitude and banks' behaviours (Q3).

We estimate the relationship between the ITGF_Index for banks and Supervisors 434 using OLS regression with control variables equal to Country (dummies 1-4), the 435 banks' size effect expressed by the natural logarithm of Total Asset (LogTa) and 436 annual GDP growth: given the impossibility to control for bank and/or time fixed 437 effect—due to the limited sample size-, we decided to control for geographical 438 differences (Country and GDP) and banks' size. We use the 0 constant model to 439 avoid the dummy variable trap. The model estimates, reported in Table 4.15, 440 provide the following results:

- the coefficient of ITGF_Index_Supervisors is significantly positive as expected 442 (1.75) and its magnitude suggests that changes in banks' behaviour are positively 443 related to Supervisors' attention to IT;
- the selected control variables, with the exception of GDP, have a strong high 445 influence on the dependent variable; in particular, it seems that larger banks pay 446 more attention to IT issues (LogTa 3.54). 447

The model demonstrates good explanatory power expressed by the R-squared 449 (0.81) and F test (although the F test for zero slopes in the absence of a constant is 450 not easily interpretable). 451

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113.1 Table 4.13 Distribution IT governance items by type of documents

-					-1/- (2)												
t13.2		2008		2009		2010		2011		2012		2013		2014		2015	
113.3 CAT	DOC	n.	%	n.	%	n.	%	n.	%	n.	%	n.	%	n.	%	n.	%
113.4 ITRR	AR	28	89	26	63	56	29	24	71	30	73	33	09	40	56	26	61
113.5	D	ı	ı	1	7		С	ı	ı		2	4	7	11	15	21	13
113.6	PIII	3	7	3	7	5	13	4	12	5	12	10	18	13	18	15	6
t13.7	CSR	10	24	11	27	7	18	9	18	5	12	8	15	∞	11	25	16
113.8	Total	41	100	41	100	39	100	34	100	41	100	55	100	72	100	158	100
t13.9 ITRP	AR	23	53	27	40	59	63	39	51	39	53	42	53	63	63	80	56
t13.10	DO	9	14	6	13	1	2	13	17	8	11	10	13	12	12	20	14
t13.11	PIII	3	7	16	24	11	24	13	17	20	27	20	25	19	19	30	21
t13.12	CSR	11	26	15	22	5	H	12	16	7	6	7	6	9	9	13	6
t13.13	Total	43	100	29	100	46	100	TT.	100	74	100	79	100	100	100	143	100
t13.14 ITRM	AR	104	58	111	58	104	65	125	63	115	62	123	62	187	09	189	52
t13.15	5)	12	7	18	6	15	6	16	8	12	9	19	10	33	11	99	15
t13.16	PIII	31	17	40	21	40	25	52	26	55	30	53	27	73	23	68	24
t13.17	CSR	32	18	21	11	1	1	4	2	3	2	3	2	19	9	31	8
t13.18	Total	179	100	190	100	160	100	197	100	185	100	198	100	312	100	365	100
t13.19 ITINV	AR	10	83	12	80	6	69	∞	29	6	09	7	47	∞	62	5	63
t13.20	DO	1	ı	ı	ı	ı	ı	ı	ı	ı		ı	ı	ı	ı	-	13
t13.21	PIII	I	ı	1	7	1	8	1	8	5	33	5	33	4	31	I	I
t13.22	CSR	2	17	2	13	3	23	3	25	1	7	3	20	1	∞	2	25
t13.23	Total	12	100	15	100	13	100	12	100	15	100	15	100	13	100	∞	100

t13.24CAT = ITGF categories; DOC = type of documents [AR = Annual Report; CG = Corporate Governance Report; PIII = Pillar III report; CSR = CSR report]; n. = number of items found in each type of documents under each ITGF category; % = n. divided by Total Items of each ITGF category

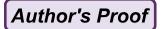


Table 4.14 Percentage^a of supervisors enumerating IT governance keywords

ategories	Items	2008	2009	2010	2011	2012	2013	2014	2015
ΓRR	IT audit/EDP audit	-	_	-	25%	_	25%	25%	25%
	Information security control function	_	_	_	_	_	-	_	_
	Business continuity management	-	-	_	_	25%	25%	25%	25%
	CERT/SOC	25%	-	-	-	_	_	_	-
	Data management Office/centre	_	_	_	_	_	-	_	_
	IT service/ Function	50%	25%	50%	25%	50%	75%	75%	75%
	CIO	25%	_	_	_	_	-	-	-
	CISO	-	_	-	-	25%		-)	_
	IT management	-	_	-	25%	50%	25%	25%	25%
	Technology committee	_	-	_	-	5	-	-	-
	IT committee	-	_	-	-	-	_	_	-
RP	Information secu- rity policy	_	-	-	7	-	25%	25%	25%
	IT plan	-	_	25%	25%	-	75%	100%	75%
	IT Strategy	_	- ,	1	25%	_	50%	25%	50%
	EDP	_	- X	-	25%	50%	50%	50%	50%
	IT resources governance	-		-	-	-	50%	50%	50%
	IT processes/ procedures	- (25%	25%	50%	50%	75%	50%
	IT/Data infrastruc- ture/Architecture		-	50%	75%	50%	75%	50%	75%
	IT resources/ solutions	25%	25%	25%	25%	50%	50%	50%	50%
	ISO 27001-5	-	_	-	-	_	_	_	_
	ITIL/COBIT/ NIST	_	_	_	_	_	-	_	-
	Generic standards	_	_	-	_	_	_	_	_
TRM	Cyber Risk/Attack IS Breach	_	_	_	_	_	_	_	75%
	IT fraud	-	_	-	-	_	_	_	_
	IT incident/failure	25%	_	-	-	-	25%	25%	25%
	IT risk	25%	25%	25%	25%	25%	50%	50%	75%
	IT risk/Business continuity/Cyber security model	_	_	_	_	_	25%	25%	25%
	IT risk appetite	_	_	_	_	_	_	_	_
	IT risk assessment	_	_	_	_	_	25%	25%	50%
	IT risk report	_	_	_	_	_	_	_	_

(continued)



t14.33 Table 4.14 (cont	iniied)
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t14.34	Categories	Items	2008	2009	2010	2011	2012	2013	2014	2015
t14.35		Business continu-	-	-	_	-	50%	75%	75%	75%
		ity plan								
t14.36		Contingency plan	-	25%	25%	-	75%	100%	75%	75%
t14.37		Disaster recovery	25%	-	25%	25%	25%	50%	50%	50%
		plan								
t14.38		Information/Cyber	_	_	_	_	25%	25%	25%	75%
		security plan								
t14.39		IT risk	_	_	-	_	_	50%	25%	25%
		management								
t14.40		IT risk regulation/	_	_	_	_	_	25%	25%	25%
		compliance								

t14.41 ^aNumber of supervisors which refer about the Items of each category within ITGF divided by the number of authorities considered in the study. We remind that—at this stage of the analysis—four supervisors are included in the sample

Regarding the last research question (Q4), we measure the level of investments in IT systems (IT Expenditure, ITEXP_Index) considering all expenditures made by banks; we expect an increasing level of investments, considering, on one hand, the growing level of business complexity expressed by banks' dimension, and, on the other, the increase in Supervisors' attention to IT concerns. Furthermore, we control for Country dummies and we considered the influence of the annual GDP growth rate.

Looking at the level of ITEXP_Index, it seems that banks in the sample have invested adequately in the maintenance of existing IT infrastructure, instead of commissioning large-scale and expensive IT change programmes. In fact, the Index remains substantially steady over the time within each country (Table 4.10). To assess if there is a relationship between the level of investment made by banks and the increasing level of attention paid to IT governance concerns by Supervisors we perform an OLS regression; the results are summarised in Table 4.16 and show the absence of influence of increased Supervisors' attention to IT on bank IT investment policy (the coefficient is not significant). There is a more significant link between banks size and the level of IT investment made, even if the intensity of this relation is not so high.

In addition, the level of investment does not depend on the state of the economy (GDP); this suggests that IT investments are not pro-cyclical.

4 IT Governance: Who Cares More? First Evidence from EU Banks and Supervisors

AU3 115.1 Table 4.15 Model OLS estimates of ITGF_Index_Banks

t15.2 Source	SS	df	MS		Number of obs $= 90$	
115.3					F(6, 84) = 51.23	
t15.4 Model	928.674208	7	132.667744		Prob > $F = 0.0000$	
t15.5 Residual	214.941063	83	2.58965136		R-squared = 0.8121	
t15.6 Total	1143.61527	06	12.7068363		Adj R-squared = 0.7962	162
115.7					Root MSE = 1.6092	
AU4 t15.8 ITGF_Index_Banks	Coef.	Std. Err.	t	P > t	[95% Conf.	[Interval]
t15.9 ITGF_Index_Supervisors	1.753872	0.4240605	4.14	0.000	0.9104329	2.597312
t15.10 GDP	15.37453	8.117	1.89	0.062	-0.7698561	31.51892
t15.11LogTa	3.542551	0.5545266	6.39	0.000	2.43962	4.645482
t15.12 dummy1	-19.80093	3.28289	-6.03	0.000	-26.33047	-13.27139
t15.13 dummy2	-17.30702	3.127079	-5.53	0.000	-23.52665	-11.08738
t15.14 dummy3	-22.25799	3.510357	-6.34	0.000	-29.23995	-15.27603
t15.15 dummy4	-17.59086	3.183921	-5.52	0.000	-23.92335	-11.25817
t15.16Note: Dependent variable = ITGF_Index_Banks, the level of IT governance disclosure recorded by banks. Independent variable = ITGF_Index_Supervisors, level of IT governance disclosure of Supervisors. Control variables = LogTa. logarithm of banks' Total Asset; Countries dummy variables (dummy) = Gerlevel	Index_Banks, the level of Supervisors. Control of	of IT governance discle	ssure recorded by urithm of banks' 7	banks. Independen	t variable = ITGF_Indexies dummy variables (du	x_Supervisors,
many, dummy2 = Spain, dummy3 = France, dummy4 = Italy); and GDP, the annual GDP growth rate	= France, dummy4 =	Italy); and GDP, the an	nual GDP growth	rate	•	•
We estimate OLS regression with o	with dummy variables and no constant	o constant				

t16.1 Table 4.16 Model 2 OLS estimates of ITEXP_Index

t16.2 Source	SS	df	MS		Number of obs $= 90$	
116.3					F(7, 83) = 28.01	
t16.4 Model	0.00017228	7	0.000024611		Prob > F = 0.0000	
t16.5 Residual	0.00007294	83	0.0087879		R-squared = 0.7026	
t16.6 Total	0.000245219	06	0.027247		Adj R-squared = 0.6775	75
116.7		Ç			Root MSE = 0.00094	
t16.8 ITEXP_Index	Coef.	Std. Err.	t	P > t	[95% Conf.	[Interval]
t16.9 ITGF_Index_Supervisors	0.0005165	0.000247	2.09	0.040	0.0000252	0.0010079
t16.10 LogTa	0.0012927	0.000323	4.00	0.000	0.0006502	0.0019352
t16.11 GDP	0003268	0.0047284	-0.07	0.945	-0.0097315	0.0090779
t16.12 dummy1	-0.0065061	0.0019124	-3.40	0.001	-0.0103098	0.0027024
t16.13 dummy2	-0.0061942	0.0018216	-3.40	0.001	-0.0098174	0.0025711
t16.14 dummy3	-0.0073953	0.0020449	-3.62	0.001	-0.0114625	0.0033281
t16.15 dummy4	-0.0062605	0.0018547	-3.38	0.001	-0.0099495	0.0025715
116.16Note: Dependent variable = ITEX	ITEXP, level of investment in IT disclosed by banks. Independent variables = ITGF Index Supervisors, the level of IT	n IT disclosed by ban	iks. Independent	variables = ITGF	Index Supervisors, th	e level of IT

avoie. Dependent variable = 11EAF, level of investment in 11 disclosed by banks. Independent variables = 11OF_Index_Supervisors, the level of 11 governance disclosure of Supervisors; LogTa, logarithm of banks' Total Asset. Control variables = Countries dummy variables (dummyl = Germany, dummy 2 = Spain, dummy 3 = France, dummy 4 = Italy); GDP, the annual GDP growth rate We estimate OLS regression with dummy variables and no constant.



Concluding Remarks: Key Findings, Limitation and Future Research

IT governance represents an important aspect to monitor for both supervisors and 474 banks as the reach and complexity of IT continues to increase across the financial 475 sector. IT sits in a critical part of banks as it is the backbone of all banking 476 processing. In fact, while IT plays a key role in supporting banking business, it 477 has also revealed its dark side during the recent financial turmoil: banks have shown 478 an inadequate ability to exploit the potential that IT can ensure to provide Senior 479 Management with a true picture of the risks the bank faces. Therefore, IT gover- 480 nance, ensuring that IT processes are fully integrated into all business processes— 481 risk management included—can be considered a strategic asset for banks and a new 482 challenge for Supervisors.

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One of the questions to which this study sought to answer is whether this 484 awareness has been reached before by banks or by Supervisors.

As far as the scope of this study is concerned, we have analysed public corporate 486 disclosure of IT governance practices across major EU banks. Adopting a revised 487 descriptive framework of IT governance disclosure developed by Joshi et al. (2013), we conduct a content analysis to examine the level of attention paid to IT governance issues across time (2008–2015) and countries (Germany, Spain, France, Italy). It is important to underline that corporate disclosure of IT governance does 491 not adhere to any standardised or mandatory reporting format which could be used 492 by banks. This is an important premise to develop our research: as reported in the 493 literature, the fact that banks' IT governance disclosure is voluntary and linked to 494 the benefits that it can ensure, leaves space for further research to investigate if IT 495 governance practices are in place.

Similar considerations can be made on the Supervisors' side. There are no 497 provisions at the international level regulating directly IT governance: some of 498 the more recent interventions concerning this issue (EBA, BCBS, EC) only indirectly affect IT Governance, allowing regulators large degrees of autonomy to 500 regulate the issue at a national level. This permits us to use the same methodology developed for banks to analyse the differences in Supervisors' behaviour.

Even if at this stage the analysis can be considered as a pilot study (with a limited 503 sample size), we can summarize some key findings: i) banks have an increasing 504 level of IT disclosure, more evident starting from 2012; ii) banks, within the IT 505 Governance Framework, seem to pay more attention to IT Risk Management; and 506 iii) prefer Annual Reports to release information on IT governance topics; iv) there 507 is a positive relationship between Supervisors' and banks' attention to IT; while v) 508 there is no evidence of Supervisors' influence on bank IT investments. At this stage 509 of the study, these results can't be considered statistically strong, because: i) the 510 sample includes a limited number of both banks and Supervisors; ii) the 511 unavailability of all the national regulatory provisions in English. Consequently, 512 we cannot exclude alternative explanations, such as the presence of causality bias. 513



Despite this, the study contributes to the existing literature in several ways. It is intended to enrich the current understanding of IT governance in banks, focusing on the level and on the content of IT governance disclosure. Secondly, it highlights the regulatory environment that favours IT governance practices in banks and tries to measure the intensity of this relationship. In so doing, our anlaysis adds to the IT governance disclosure literature providing an original methodological framework based on a solid theoretical background.

The theoretical approach used in this study may well serve as a basis for further analysis. The study may be replicated across the rest of EU countries using a larger dataset and this would allow the findings to be statistically more robust.

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AU4	Please clarify whether [95% Conf. Interval] can be made as single entity in headings of Tables 4.15 and 4.16.	
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