

Regulatory Novelty after Financial Crises: Evidence from International Banking and Securities Standards, 1975-2016

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Abstract:

Financial crises are often presented as triggers for important innovations in international regulation of financial markets, but existing evidence for this claim primarily derive from the analyses of individual initiatives, assessed against noncomparable benchmarks. In order to provide systematic evidence of financial crises' impact on international financial regulatory change, this paper develops a novel text-as-data approach to measure regulatory novelty. We use this approach to analyze the full population of international banking and securities standards between 1975 and 2016. Contrary to theoretical expectations, our empirical findings indicate rules designed by international banking and securities regulators following financial crises are on average as likely to build on existing international regulations as those designed before a crisis. We also find that international banking rules published after the 2008 Global Financial Crisis are an important exception.

Keywords: Financial Regulation, Financial Crisis, Regulatory Novelty; Text-as-Data, International Standard-setters.

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1 Introduction

Financial crises have long been recognized within the political economy literature as important catalysts for economic policy reforms at the national and international levels. Over the years numerous studies have theorized how crises alter the political economy in ways that enable economic reforms; for instance, a crisis may weaken powerful opponents to regulation or provide a window of opportunity for policy entrepreneurs to promote regulatory change. Paradoxically, while existing studies find that financial crises trigger policy reforms in areas as diverse as macroeconomic adjustments (Frieden, 2015; Walter, 2013), capital account liberalization (Pepinsky, 2012), and trade policy (Ballard-Rosa, Carnegie and Gaikwad, 2018), there exists scholarly disagreement about the effect of financial crises on one of the policy areas more directly related to these events: the design of financial regulatory policies.

Scholarship documents that it is often in the immediate aftermath of a financial crisis (rather than before) when financial reforms are more likely to be introduced both at the domestic level, as well as at the international level (within international standard-setting bodies). Though high-profile international regulatory reforms such as the Basel Agreement are known responses to crisis, scholars vary in their evaluations of to what extent international financial reforms negotiated in immediate aftermath of a financial crisis mark breaks from past policies or, rather, incrementally build upon them. For instance, a few studies emphasize that the 2008 global financial crisis led to novel international reforms to regulate global financial markets (Baker, 2013; Pagliari, 2012; Wilf, 2016). In contrast, other works highlight the incremental nature of many reforms (Moschella and Tsingou, 2013) and conclude that the crisis led to largely “status quo” – rather than novel – policies (Helleiner, 2014).

The persistent disagreements among scholars regarding the nature of international regulatory change after financial crises are often amplified by two common research design characteristics. First, insights about international financial regulations often analyze one, or a few, rules. It’s often unclear how to aggregate findings across individual studies. Second, existing studies often assess regulatory change against benchmarks that are not readily comparable to other regulatory initiatives. As a result, it is often

difficult to generally characterize the regulatory response and to evaluate the general effect of financial crisis on the agenda of international standard-setting bodies.

This paper takes a different approach. Rather than focusing on one specific international regulatory initiative, this paper analyses the full population of international financial standards from two of the oldest and most significant international standard setting bodies – the Basel Committee on Banking Supervision (BCBS) and the International Organization of Securities Commissions (IOSCO) – from 1975 through 2016. We use quantitative text analysis to develop a data-driven, quantitative measure of the regulatory novelty of the rules issued by these two international standard-setting bodies across time. Using the textual similarity of each new international rule compared to all rules previously published by the same regulatory authority, we measure the extent to which each new international financial regulatory initiative builds upon, or departs from, existing initiatives.¹ Regulatory initiatives that build upon existing regulations have relatively similar word patterns to one or more existing regulations; in contrast, rules that regulate new areas of the financial sector, or that introduce new regulatory approaches, have word patterns that are less similar to all existing regulations.

When we statistically test the hypothesis that post-crisis periods are moments when international standard-setting bodies adopt particularly novel regulatory approaches, two main findings emerge. First, in contrast to our theoretical expectation, rules designed by international banking and securities regulators following financial crises often have regulatory novelty that is not higher, on average, than for international rules written before financial crises. Said differently, in the aftermath of a crisis, international standard-setting bodies are often as likely to build on and adapt existing international regulations as they are in the pre-crisis period. This is consistent with authors who emphasize that international financial regulatory policy making is often incremental in nature. Second, international banking rules published after the global financial crisis are an important exception. Following the 2008 crisis, new international banking standards designed by the Basel Committee display especially high levels of novel

¹Throughout the paper, the terms “international regulation”, and regulatory “initiatives”, “rules”, “standards” and “reform” are used interchangeably to describe best practice documents that are formally written and published by international standard setting bodies.

content as compared to the agenda adopted by this body before the crisis. Together, our basic theoretical expectation that major financial crises are major breaking point in the agenda of international standard-setting bodies and lead to especially high levels of novelty in their rule-making does not generally and empirically hold.

The paper continues as follows. Section 2 reviews existing literature and current debates about the connection between financial crises and international financial regulatory change. It explains how scholarly insights have been limited by a lack of comparable indicators across reforms. Section 3 outlines our approach to measure regulatory change after a crisis. Section 4 analyzes the international banking and securities standards that have been negotiated in the aftermath of the late 1990s' Asian Financial Crisis and the late 2000s' Global Financial Crisis. Section 5 concludes with discussion and further implications.

2 Financial Crises and International Regulatory Change

2.1 Theoretical Insights

Scholarship often characterizes financial market regulation as a policy domain with high barriers to change. Financial regulatory policies often impose concentrated, observable costs on regulated firms. Therefore, during normal times, policymakers seeking to strengthen regulations typically face opposition from powerful, vested interests that seek to limit the regulatory burden of new rules, and includes financial firms (Lall, 2012; Young, 2013) and other, non-financial groups (Pagliari and Young, 2014). Though regulatory changes that correct market failures may be supported by the public at large (Chaudoin and Wilf, 2019; Young and Yagci, 2019), the technical complexity of the issue and the collective action problems associated with regulating finance means that the public rarely mobilizes to demand financial regulations. As a result, policymakers' efforts to challenge regulatory opposition are unlikely to be rewarded during normal times (Aizenman, 2009).

Financial crises are often identified within this literature as moments when obstacles to regulatory change are most likely to be overcome. First, major financial crises have often the effect of revealing lim-

itations of existing regulatory policies and may create windows of opportunities for norm entrepreneurs to promote new regulatory ideas and approaches (Baker, 2013). Second, financial crises are moments where the standard equilibrium – of high mobilization against, and low mobilization in favor of, regulation – is most likely to be interrupted. During financial crises, the costs of the failure of regulatory policies to keep up with financial sector innovation become clear to the general public. As financial regulatory policy gains salience, policymakers face domestic pressure to initiate new regulatory initiatives from voters as well as from groups normally not engaged in this policy domain (Oatley and Nabors, 1998; Singer, 2007; Pagliari and Young, 2016). Simultaneously, the political capital of the financial industry and its capacity to oppose regulatory changes is often challenged in the aftermath of crises (Young, 2013).

Moreover, in an era of increasingly mobile capital, unilateral regulatory responses create a regulator's dilemma, where increased regulatory stringency will increase financial stability but competitively disadvantage domestic financial firms vis-a-vis foreign firms (Kapstein, 1989). As a result, after crisis, national regulators who face national pressures to increase regulatory stringency have more incentives to coordinate regulatory responses with foreign counterparts in order to level the international playing field (Kapstein, 1989; Oatley and Nabors, 1998; Singer, 2007). For instance, the Basel Committee on Banking Supervision (BCBS) has emerged as the primary site to coordinate banking regulations in response to the return of international banking crises in the aftermath of the end of the Bretton Woods exchange rate system (Kapstein, 1989; Goodhart, 2011). This was followed by the creation of other standard-setting bodies such as the International Organization of Securities Commissions (IOSCO) coordinating securities regulations, the International Association of Insurance Supervisors coordinating best practices among insurance supervisors, and the International Accounting Standards Board coordinating national accounting standard setting bodies (Singer, 2007; Buthe and Mattli, 2011).

2.2 Empirical limitations

Though financial crises are commonly understood as the most likely triggers for important expansions in the agenda of international standard-setting bodies such as the BCBS and IOSCO, the extent to which

new rules will break new ground and depart from existing ones remains elusive. Empirical works on this topic – those that investigate the impact of crises on international regulatory reforms – have reached vastly different conclusions. Some empirical works find that financial instability results in major international organization and international rule changes. For instance, the 1988 Basel Capital Accord that harmonizes minimum capital requirements for internationally active banks emerged out of national and international political dynamics triggered by the Latin American debt crisis (Oatley and Nabors, 1998). Other studies, instead, emphasize that not every crisis is followed by major reform. For instance, Singer (2007) details how the 1987 US stock market crash highlighted the interconnectedness of securities markets but failed to generate an international securities agreement comparable to the Basel Capital Accord for international banks.

Moreover, within related literature that analyzes the character (rather than causes) of post-crisis international regulatory reforms, significant disagreement remains. For instance, while some scholars have described the East Asian financial crisis of 1997-98 as a turning point in international financial regulation given the expansion in the scope of regulatory cooperation to cover new sectors (Walter, 2008), other scholars have argued that the set of changes represented only "modest" change compared to the extent of the crisis (Soederberg, 2003: 391).

And, similar disagreements exist about how to interpret the wave of international financial regulatory reforms negotiated in the aftermath of the 2008 global financial crisis (GFC). The scale of the GFC that began in 2007 had no equivalent in the post-Bretton Woods era. For some, the crisis led to the creation of important new regulatory initiatives, the emergence of innovative regulatory approaches, and, more broadly, marked a significant turning point in the international regulatory architecture (Baker, 2013; Pagliari, 2012; Wilf, 2016). Others, instead, describe regulatory changes triggered by the crisis as, at best, tweaking the pre-crisis international financial architecture without challenging the existing policy paradigm (Moschella and Tsingou, 2013; Helleiner, 2014; Fioretos, 2016).

Two traits of many existing analyses help explain scholars' vastly different conclusions about how to characterize post-crisis international regulatory reforms. First, most studies either analyze one reform

or compare a few reforms. Early scholarship on international financial regulation focused on the 1988 Basel Capital Accord and utilized in-depth case studies (e.g. Kapstein 1989; Oatley and Nabors 1998). A small-n approach remains dominant, even though the number and scope of international regulations have greatly expanded throughout the 1990s and beyond. Many studies of the regulatory response to the 2008 Global Financial Crisis analyze one or few selected initiatives such as measures introduced after the crisis to regulate hedge funds (Helleiner and Pagliari, 2009), derivatives (Knaack, 2015), resolution regimes for too-big-to-fail financial institutions (Quaglia, 2017), and shadow banking (Ban, Seabrooke and Freitas, 2016). This focus has the advantage of providing in-depth understanding about the nature and determinants of individual initiatives. However, given the large number and diversity of existing international regulatory initiatives that have emerged in recent years, it has become more difficult to generalize findings or assessments of the overall character of international regulatory reforms from individual studies.

Second, a variety of benchmarks are used to evaluate international regulatory change. Take, for instance, the Basel III banking standards, which are arguably the linchpin post-GFC efforts to increase stability of international banks. Some scholars argue that Basel III was a success. Drezner points to the relative short negotiation time of Basel III (two years) compared to the previous Basel II (six years) (Drezner, 2013), and Wilf (2016) provides stock price evidence that equity investors perceived Basel III to increase regulatory stringency. For other scholars, Basel III was a limited response. Lall (2012: 609) argues that international regulators moved "from failure to failure", and Admati and Hellwig (2013: 180) argue that Basel III minimums, though an increase from previous standards, remain "outrageously low." As a result, attempts to evaluate the nature of post-crisis international reforms rely mostly on very different benchmarks that are often not readily comparable across regulatory initiatives.

In sum, while a large literature has identified financial crises as the most likely catalyst for competing benchmarks that cannot be applied across different reforms. How can we assess the overall impact of crises over international regulatory change? The next section outlines a unique, data-driven approach to analyze international regulatory change that will be used to test the main hypothesis that post-crisis

periods are moments of when international standard-setting bodies adopt novel regulatory approaches .

3 A Text-Based Measure of Regulatory Novelty

This section describes how we conceptualize and measure international financial regulatory change. Two aspects distinguish our approach from existing studies. First, in contrast with analyses of one or a few individual reforms, our approach includes the entire population of rules designed by two important international standard setting bodies. This provides a bird’s-eye view of patterns of regulatory change. Second, we use quantitative text analysis to arrive at an objective, data-driven measure of the regulatory novelty of each rule within the population.

3.1 Regulatory Novelty: Conceptual Definition

To explore regulatory change across a range of financial sector actors and rules, we need a suitable measure. Existing literature commonly evaluates post-crisis regulatory reforms against a set of subjective expectations about what regulatory outcomes could have been expected. For instance, Moschella and Tsingou (2013: 2) argue that ”the process of international financial reform has fallen short of initial (and proclaimed) expectations of rapid and revolutionary transformation.” However, because both the root cause of crisis and the expected regulatory response are often highly contested, it is often unclear what should be the appropriate baseline.

In this paper we compare the content of each new international regulation against all regulations previously written by the same international standard setting body. Such an approach is relational, and lies in contrast to a researcher defining a specific regulatory outcome that should have been expected. By comparing a rule with all past rules by the same standard-setter, we aim to measure the level of ”regulatory novelty” of each standard, defined as the extent to which a new international regulatory initiative builds upon or departs from previous regulations. From this perspective, ”regulatory novelty” overlaps with the notion of ”incrementalism” in policy change, which captures the extent to which decision-makers respond to new problems primarily by engaging in a local search for options rather than introducing

novel grand designs (Lindblom, 1959). The concept is used in recent scholarly analysis to describe post-crisis international financial regulatory reforms (Moschella and Tsingou, 2013; Helleiner, 2012; Fioretos, 2016).

3.2 Measuring Regulatory Novelty: Operational Definition

Existing studies that compare the degree to which new international financial standards depart from previous ones typically involve in-depth, qualitative analyses of hand-picked pairs of regulatory initiatives, such as comparing Basel II Agreement with its predecessor Basel I (Tarullo, 2008), or Basel III with Basel II (Lall, 2012; Admati and Hellwig, 2013). This paper's approach complements case-specific studies by comparing a new standard with the entire population of previous regulatory initiatives by same standard-setter. Specifically, we measure "regulatory novelty" as the degree to which a new international rule's text is most similar to previously published rules by the same international standard setting body. The main assumption behind this approach is that vocabulary differences in any two international regulations capture differences in the extent to which build they upon or depart from each other. Two dimensions are particularly likely to drive differences in the vocabulary used by the same regulator: the regulatory scope and the regulatory approach. The first dimension captures the specific set of markets or institutions that are the primary target of a regulatory intervention. All else equal, a new regulatory initiative that targets markets or institutions that have so far remained outside the regulatory perimeter will display more regulatory novelty than will a regulatory initiative that seeks to revise previous international rules targeted at the same market actor. For example, new international rules targeting for the first time shadow banking institutions or financial benchmarks can be understood to have greater regulatory novelty than international standards that revise rules surrounding already-regulated institutions such as commercial banks or insurers. The second dimension of regulatory novelty concerns the type of regulatory instruments adopted. All else equal, a new international rule that introduces new approaches to regulate a given market or institution is more novel than a regulatory initiative that simply re-calibrate existing regulatory tools. For example, international standards introducing new tools such as liquidity and leverage requirements to the regulation of internationally-active banks can be understood to

have greater regulatory novelty than standards tightening or loosening the capital requirements already imposed upon these institutions.

In both cases, we expect that this novelty will be reflected in the vocabulary used by regulators. For example, the first time that hedge funds or credit rating agencies are regulated, or the first time that liquidity (rather than capital) requirements for banks are introduced, vocabulary will differ from all other rules; this low similarity with all existing rules captures high regulatory novelty. In contrast, a new international rule that directly builds upon a previous international rule, or that incrementally revises an existing standard, will share a high percentage of meaningful words in common with those relevant, past rules. That is, high text similarity with one or more previously issued international financial standards is a good proxy for a new regulation that exhibits low regulatory novelty.

To measure the extent to which the text of a new international initiative is similar to the text of a broad range of existing rules we use a text-as-data approach (Grimmer and Stewart, 2013) and measure the cosine similarity across different rules. Cosine similarity is a bag of words approach to text similarity that collapses the word content of a document into a vector of wordcounts over m -dimensions, where each dimension represents a specific word (Mihalcea, Corley and Strapparava, 2006; Huang, 2008). Location and sequence of words does not affect this value. Within political science, cosine similarity has been recently used to compare document similarity among legislation (Garrett and Jansa, 2015), parliamentary speeches (Martocchia Diodati, Marino and Carlotti, 2018), and bilateral tax treaties (Arel-Bundock and Lechner, 2018).

This measure is particularly suitable to our analysis for three reasons. First, while "substring matching" methods such as those employed in plagiarism detection software are better suited to identify cases where new rules directly reuse text from past rules, our approach allows to identify the topical similarity of two texts written independently (Wilkerson, Smith and Stramp, 2015; James, Pagliari and Young, 2020). Second, unlike other "bag of words" approaches such as Wordscore that compare the distribution of words against an anchor document (Laver, Benoit and Garry, 2003), our approach to measure regulatory novelty does not require the researcher to select reference documents to guide the analysis. Third,

cosine similarity provides a standardized measure that is easier to interpret across multiple documents. Between any two document texts, the measure is bounded between 0 and 1. Two rules with high cosine similarity (near 1.00) have similar document words and relative word densities, while two rules with low cosine similarity (near 0.00) have fewer common words and more dissimilar word distributions.²

To measure regulatory novelty of a given international standard, we want to know how distinct the new rule is compared to all previous rules by the same standard-setter. We start by identifying a population of international standards set by a given regulator. For each rule we identify the previous international standard with the highest cosine similarity, that is, the standard that shares the most similar word densities with all previously published rules by the same regulator. We call this measure “Maximum Cosine Similarity” (MaxSim). A formal definition, along with empirical examples that build intuition about the measure’s construction, may be found in Appendix A.

3.3 Data

We analyze the set of international financial regulations that have been written by the two oldest and most established international standard setting bodies. Rules written by the BCBS are the set of international banking regulations, and rules written by IOSCO are the set of international securities regulations. The unit of analysis is an international standard, which is a document written and publicly posted by an international standard setting body. As defined by the Financial Stability Board, standards may include statements of principles, best practices and/or guidelines.

While existing studies of BCBS and IOSCO rules typically focus on selected, high profile regulatory initiatives, we analyze each group’s entire population of publicly available international financial regulatory standards. We collect all the documents available on the “publications” page of each organization’s website.³ We coded the subset of publications on each page that constitute international standards; one

²These are standardized by document and are not affected by document length. In regression analysis, we additionally control for cleaned document word count.

³BCBS (<https://www.bis.org/bcbs/publications.htm>) and IOSCO (https://www.iosco.org/publications/?subsection=public_reports).

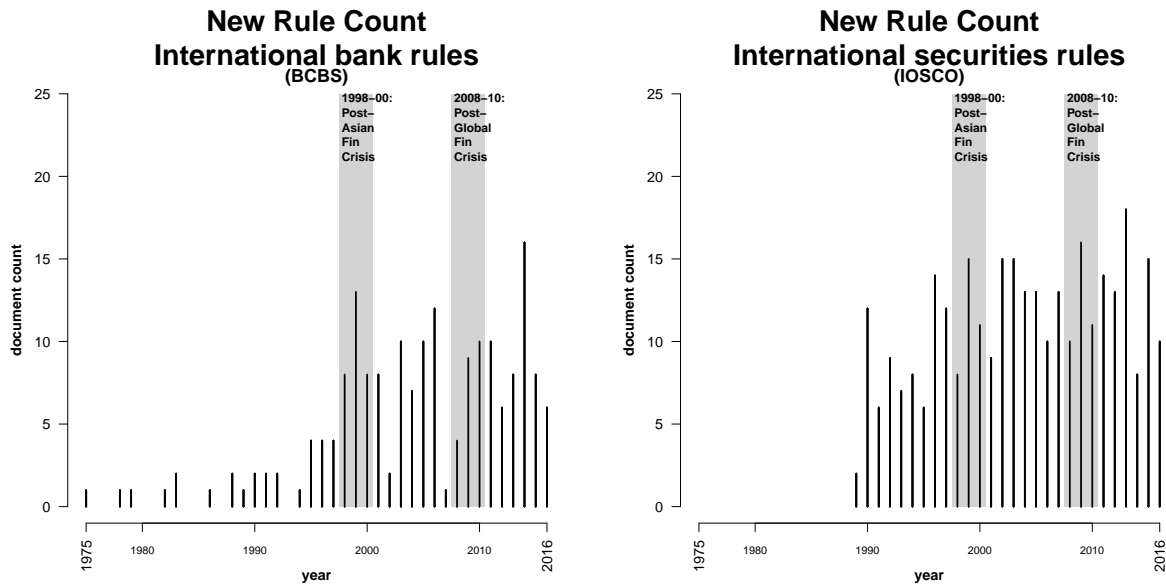


Figure 1: Annual count of new banking (left) and securities (right) international standards, 1975-2016.

document is one international standard.⁴ The BCBS and IOSCO have incentives to make agreed-upon international standards publicly accessible, and, where documents have been updated over time, both original and revised versions of documents are available. This process resulted in a set of 184 BCBS international standards that span the years 1975–2016 and 303 IOSCO international standards that span the years 1989–2016.⁵

Figure 1 graphs the annual count of new international bank and securities rules. The number of new

⁴For international banking regulations, these were documents that the BCBS coded as “Standards” or “Guidelines” or “Sound Practices”; we excluded BCBS publications categorized as: “Implementation reports”, “FAQs”, “Consultative”, “QIS”, “Working Papers”, “Newsletters” and “Other”. For international securities regulations, standards were the documents that IOSCO coded as “Final report” type, excluding the “Implementation” category; we excluded IOSCO publications categorized as: “Consultation report”, “Preliminary report” and “Other”.

⁵BCBS was established in 1974, and the first available document is in 1975; IOSCO was established in 1983, and the first available document is 1989. The baseline statistical analysis runs through 2011, and includes 139 international bank (e.g. BCBS) rules and 238 international securities (e.g. IOSCO) rules. In robustness checks, a maximum of 183 BCBS rules between 1978 and 2016 and 302 IOSCO rules between 1989 to 2016 enter into analysis; the earliest observation from BCBS and IOSCO each fall out of the analysis because there are no previous documents and Maximum Cosine Similarity is therefore undefined.

international rules spikes in the aftermath of financial crisis (the gray areas). This is consistent with both general theoretical expectations that post-crisis periods have increased likelihood of being a period of new regulatory cooperation (Singer, 2007), and conventional wisdom about the post-GFC period, in particular, as one with many new rules.

Rather than frequency of new international rules, however, we are interested in rules' level of regulatory novelty, proxied for by textual similarity. The next section illustrates and validates our approach using this data from international banking and securities standards.

3.4 Illustration and Validation

We use the `r` package `quanteda` (Benoit et al., 2018) to compute cosine similarity. We pre-process each text by stemming and removing punctuation and stop words as defined by `quanteda`. Our analysis is lexical, such that synonyms are treated as distinct terms. These decisions are appropriate given the data at hand, which define regulatory rules and principles; precise terminology is essential, and, should an organization use new terms for existing concepts, this represents a change in regulatory approach that is of interest.

As an initial check that our measure of regulatory novelty identifies important and expected variation, we consider a selection of international standards for which qualitative literature indicates the rule is either especially novel or especially derivative.

Figure 2 displays the full set of cosine similarity values with all other international rules by the same regulator for two international securities (IOSCO) rules (top row) and two international bank (BCBS) rules (bottom row) written in the post-Global Financial Crisis period.⁶ The two graphs to the left are those that the literature identifies as known revisions, and therefore we expect high MaxSim, indicating low regulatory novelty. The two graphs to the right are those that the literature identifies as novel post-GFC regulations, and therefore we expect low MaxSim, indicating high regulatory novelty.

⁶To provide data transparency, Figure 2 includes cosine similarity between the rule of interest and all rules by the same regulator; however, as described above, in our measure of novelty, only rules written prior to the rule of interest will ever enter into selection of Maximum Cosine Similarity.

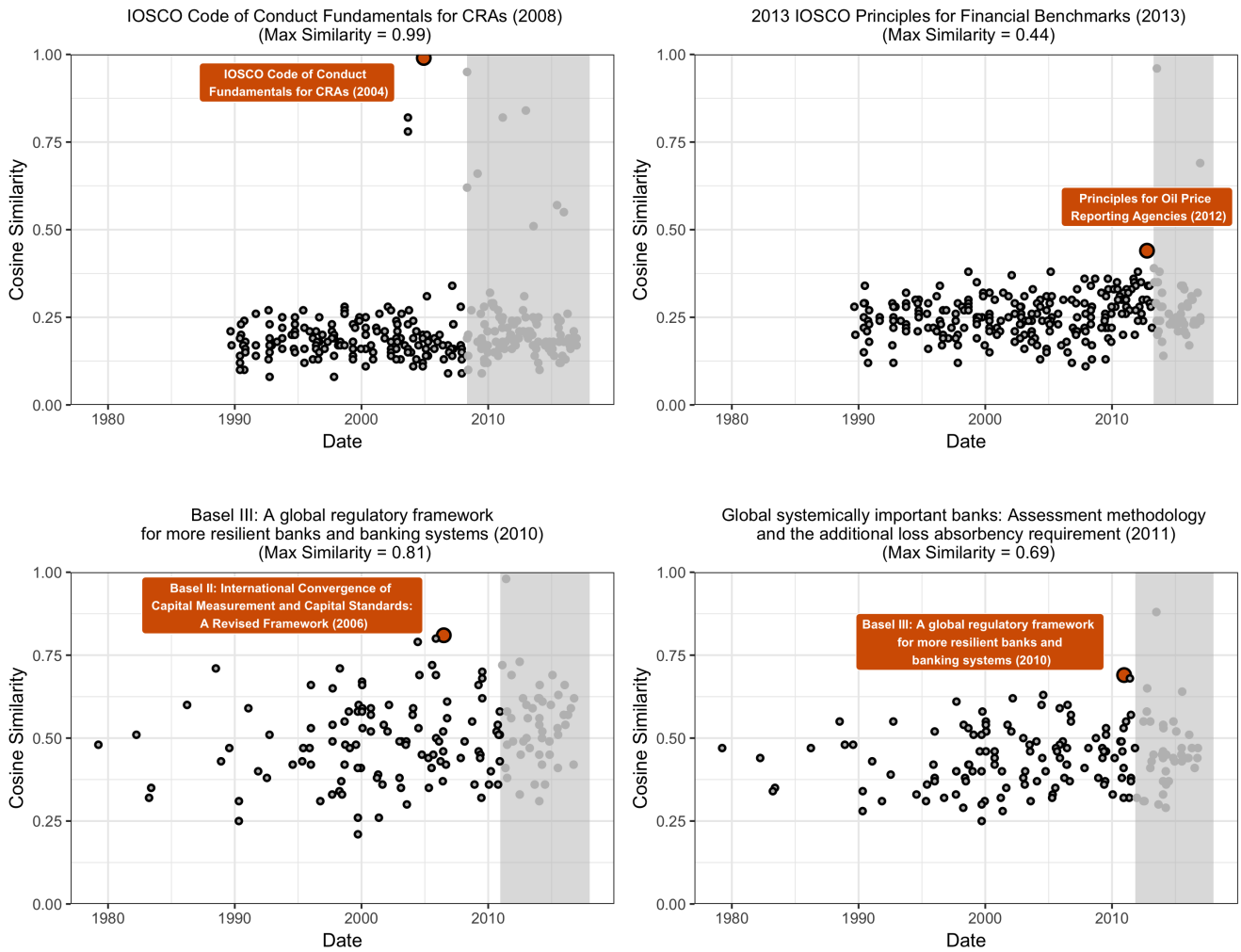


Figure 2: **Identifying Maximum Cosine Similarity among all cosine similarities; examples from two IOSCO (top row) and two BCBS (bottom row) post-Global Financial Crisis rules.** Each graph plots cosine similarity between one international standard and the text of every other final document by the same regulator. $MaxSim_i$ (orange dot) is the highest cosine similarity among all previously written, pre-crisis rules. Consistent with substantive knowledge that left graphs are known incremental reforms, and right graphs are known to introduce new regulatory tools, MaxSim for each left graph is higher than for each right graph.

The top-left graph of Figure 2 shows the 2008 IOSCO standard concerning credit rating agencies. In this case, the GFC led international regulatory authorities to closely look at the role of rating agencies, and IOSCO updated a previous set of recommendations that it had published in 2004 (in orange) in the aftermath of the Enron scandal. The specific regulatory provisions of the 2008 rule – addressing conflict of interests and poor historical performance of rating agencies – did not significantly depart from the 2004 initiative (Pagliari, 2012). Consistent with the literature, the graph shows that MaxSim is very high (0.99 out of 1.00 max) for this rule.

In contrast, the top-right graph of Figure 2 shows a 2013 IOSCO standard concerning “Principles of Financial Benchmarks”. This international rule tackled a wholly new issue that emerged after it was uncovered, in 2012, that the LIBOR index had been manipulated (Dao, Godwin and Ramsay, 2016). The highest cosine similarity to “Principles of Financial Benchmarks” is a loosely related 2012 set of “Principles for Oil Reporting Agencies” (in orange). As such, MaxSim is relatively low for this standard (0.44), consistent with substantive knowledge. The important comparison is that the known IOSCO rule revision (regarding credit rating agencies) has a relatively low measure of regulatory novelty and the known IOSCO regulatory expansion (regarding financial benchmarks) has a relatively high measure of regulatory novelty.

The bottom-left graph of Figure 2 displays cosine similarity between Basel III and all other BCBS international rules. Basel III sets minimum capital regulations for internationally active banks and directly builds upon its predecessor agreement, Basel II (Wilf, 2016).⁷ Thus, not surprisingly, the MaxSim is relatively high for Basel III (0.81).

Finally, the bottom-right graph of Figure 2 displays cosine similarity between Globally Systemically Important Bank (G-SIB) capital charges – a 2011 regulation on the largest international banks – and every other BCBS international rule. The G-SIB rule is the BCBS’s main post-GFC regulatory attempt

⁷Though, Basel III is widely acknowledged to introduce new regulatory approaches (such as liquidity and leverage ratio minimums) to complement existing regulatory approaches (focused on regulatory capital minimums). The new approaches – liquidity and leverage minimums, among others – are broadly discussed in the 2010 Basel III rule and detailed within subsequent, separate BCBS rules.

to deal with too-big-to-fail banks; the BCBS required especially large, “systemically important” financial institutions to hold additional regulatory capital. Consistent with substantive knowledge that this is a new regulatory tool that expanded upon existing approaches to bank regulation (Helleiner, 2014), the standard has a relatively low level of MaxSim (0.69) with all previous rules, indicating relatively high regulatory novelty. The important comparison is that the known BCBS rule revision (Basel III) has a relatively low measure of regulatory novelty and the known BCBS regulatory expansion (regarding systemically important banks) has a relatively high measure of regulatory novelty.

We additionally validate our measure of novelty by comparing levels of Maximum Cosine Similarity among documents that are and are not known revisions of previous documents. Appendix Figure B.1 shows the distribution of MaxSim for documents that are known revisions of previous documents (dark black, solid line) as compared to non-revision documents (light black, dotted line). Mean MaxSim of international rules known to be revisions is nearly 1 (indicating lower levels of novelty), while non-revision documents have lower average levels of MaxSim (indicating higher levels of novelty).

3.5 Limitations

Though the above approach provides a new perspective to evaluate regulatory change, it is important to note that this paper’s focus on regulatory vocabulary is unlikely to map onto certain dimensions of regulatory change discussed within the existing literature.

First, our measure observes and analyzes the extent to which the text of new standards build upon or depart from existing published initiatives; in doing so, it focuses uniquely on what is on the books and takes this observed data as given. One limitation of this focus is that proposed rules that did not become an international standard because of lack of agreement among regulatory authorities (Kapstein, 1989; Singer, 2007) remain invisible to the project. Additionally, unwritten norms and informal conventions could theoretically substitute for regulatory text. This blind spot could affect the results of the analysis as the formalization of existing conventions could produce reforms that are only “novel” on paper.

Second, the extent to which a new international standard builds upon or departs from previous rules does not necessarily match the actual impact that this change will have over market actors (Wilf, 2016;

Winecoff, 2017). For instance, both a regulatory initiative that requires a 10% minimum international bank capital and a revision of the same standard that doubles the minimum requirement to 20% would share most relevant terms but would have a very different impact over the regulated entities. Moreover, in some cases seemingly small regulatory adjustments may have important unintended, long-term consequences (Moschella and Tsingou, 2013; Grabel, 2018). Instead of attributing a particular value to each initiative, our statistical analysis places equal weight on every international standard. This is consistent with the purpose of our analysis of analyzing the full population of international standards, future research could weight these rules to differentiate their significance.

Third, the soft-law nature of international financial standards means that the impact of these standards ultimately depends on the way they are implemented domestically across different jurisdictions (Newman and Posner, 2018). The existing literature highlights how countries often implement the same set of internationally-agreed commitments after a crisis in very uneven and distinct ways (Walter, 2008; Helleiner, Pagliari and Spagna, 2018). Nonetheless, an extensive literature details how international financial standards have wide-ranging, empirical effects; they act as focal point regulations for domestic regulatory reforms in industrialized and emerging markets (Zaring, 1998), influence domestic political battles over the design of regulatory policies (Newman and Posner, 2018), and affect market actors' valuation of regulated firms (Wilf, 2016).

Fourth, by comparing the extent to which the text of new standards builds upon or departs from existing published initiatives from the same standard-setting body, our approach does not capture instances of forum-shifting, whereby an issue is moved towards a new standard-setting body (e.g. the establishment of the Financial Stability Board in the aftermath of the GFC) or policy diffusion whereby a seemingly novel standard is actually copied from a different standard-setting body.

With these caveats in mind, the next section turns to statistical analysis to test our hypothesis that post-financial crisis periods are associated with international regulatory change .

4 Correlates of regulatory novelty

Because this study is interested to examine the impact of crises on the overall regulatory agenda of international standard-setting bodies – rather than the impact of crises on individual regulations – we select crises on the basis of their real world significance as well as their importance in the context of the literature on international financial reforms. In the post-Bretton Woods era it is possible to identify three main international financial crises which directly affected a large significant number of countries: the 1980s debt crisis, the late 1990s’ Asian Financial Crisis (AFC) and the late 2000s’ Global Financial Crisis (GFC). Of these three crises, we omit the 1980s debt crisis because there are not enough BCBS pre-crisis observations and IOSCO was established after the 1980s’ crisis outbreak.⁸

We use our validated measure of regulatory novelty to analyze whether reforms introduced in the aftermath of financial crises display especially high degrees of regulatory novelty. Pre-crisis levels of regulatory novelty become the benchmark against which to determine whether post-crisis regulatory novelty is especially high or low.

Figure 3 plots international rules by publication date (x-axis) and Maximum Cosine Similarity (MaxSim, y-axis) for international bank regulators (BCBS, left graph) and international securities regulators (IOSCO, right graph). Rules with relatively high levels of MaxSim are those that build upon previous rules, while rules with relatively low levels of MaxSim indicate relatively novel rules. Figure 3 shows that BCBS and IOSCO standards widely vary in regulatory novelty. At many times, including the post-GFC period, new rules are a mix of both incrementally updated, pre-crisis initiatives (relatively high MaxSim) and new issues and approaches (relatively low MaxSim).

4.1 Data and statistical model

We move from descriptive statistics to statistical analysis. The unit of observation is an international standard. After missing data, a set of 183 BCBS (banking) rules from 1978-2016 and 302 IOSCO

⁸The BCBS began as a consultative organization such that there are only six BCBS regulations prior to the onset of the 1982 Latin American debt crisis.

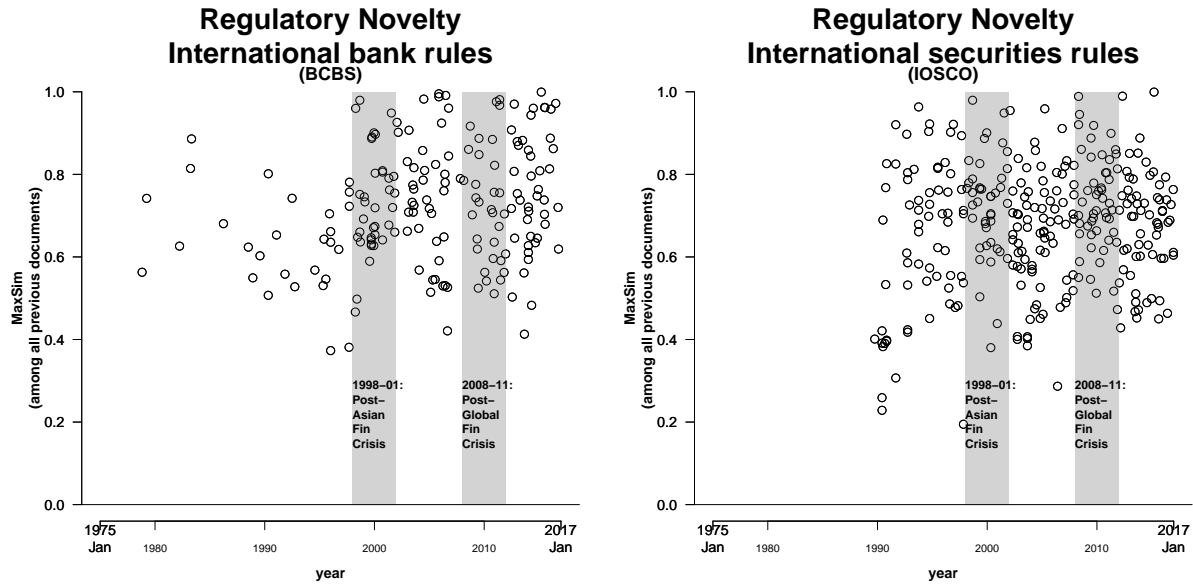


Figure 3: **Maximum Cosine Similarity (MaxSim) for BCBS rules (left) and IOSCO rules (right).** Each dot is an international standard, plotted by publication date (x-axis) and its Maximum Cosine Similarity to all previous rules (y-axis).

(securities) rules from 1989–2016 compose the dataset.

We operationalize two dependent variables. The first dependent variable is *Rule Novelty*, measured by MaxSim (described above). Again, this captures Maximum Cosine Similarity between the international standard and all previously published international rules by a given regulator (BCBS or IOSCO). Because the dependent variable is a continuous value bounded between 0 (low MaxSim/high novelty) and 1 (high MaxSim/low novelty), we use a beta regression model (Cribari-Neto and Zeileis, 2009; Ferrari and Cribari-Neto, 2004).⁹ For ease of interpretation, the complement value (1-MaxSim) enters into analysis, such that higher values indicate higher levels of novelty.

A second dependent variable is *Highly Novel Rule*, a binary measure that takes the value of 1 when MaxSim is in the lowest rolling quartile, and 0 otherwise. Observations that take a value of 1 therefore have especially low MaxSim (lower than or equal to the first quartile value of all previous rules), indicating a rule that is especially unlike existing rules.¹⁰ We expect higher levels of the variable *Rule Novelty*,

⁹An alternative, OLS model using a logit-transformed dependent variable does not change the substantive results.

¹⁰Given the rolling measure, in each corpus (BCBS and IOSCO) we omit the ten earliest observations (which have only a

and higher likelihood of a *Highly Novel Rule* during post-crisis periods.

The explanatory variable of interest is a crisis indicator that takes a value of 1 for years after initial crisis outbreak. Baseline analysis uses a four-year post-crisis period, (1998–2001 for the AFC and 2008–2011 for the GFC). This is a reasonable time in which to observe new rules that emerge in reaction to crisis; in robustness checks, we show that results are not sensitive to this specific choice. We expect a positive and statistically significant coefficient, which would indicate higher average levels of regulatory novelty in post-crisis periods as compared to each pre-crisis period.

Finally, we control for variables that might affect an international standard’s level of regulatory novelty. We first add an indicator (*Revision Rule Indicator*) for new rules that explicitly update or revise a previous regulation. These are rules that BCBS or IOSCO decide to reconsider and re-write. By definition, such document is likely to be similar to the text it revises and, therefore, to have a relatively high MaxSim, indicating low novelty. We control for document length, which we operationalize as the logged value of total words in a document after cleaning ($\ln(\text{Document word count})$). We add a control indicator for coauthored documents (*Co-authored document*); these are coauthored by multiple international standard setting bodies.¹¹ We are agnostic about the direction of any effect, but think it plausible that these documents may address a different set of issues, and therefore use different language than, initiatives written solely by the BCBS or solely by IOSCO. Finally, for *RuleNovelty* estimates, we add a controls for the logged count of previous documents with cosine similarity values ($\ln(\text{Previous doc ct})$); the greater number of previous final documents that exist when a rule is written, the more likely there might be one document that a new rule expands upon.¹² In regressions of *HighlyNovelRule*, the dependent variable is based on a rolling MaxSim that implicitly controls for this across-time change. In robustness checks, we show that results are robust to, and are not driven by, the specific decisions associated with very small sample against which to determine whether the rule is or is not “highly novel”). For this reason, model estimates of *HighlyNovelRule* are based on samples with ten fewer observations and later sample start dates.

¹¹12% of BCBS and 19% of IOSCO rules are coauthored; excluding these documents from the sample does not change substantive results.

¹²Logged values capture the assumption that when many previous documents exist, the marginal effect of one additional new document is small, but there is a greater overall probability of a similar previous document.

model selection, crisis dates, and post-crisis period lengths.

We estimate the following regression equation to test whether post-crisis periods are associated with higher levels of regulatory novelty:

$$Novelty_i = \alpha + \beta_1 PostCrisisPeriod_i + \beta_j \mathbf{X}_{ij} + \epsilon_i \quad (1)$$

where $Novelty_i$ measures regulatory novelty (either $RuleNovelty_i$ or $HighlyNovelRule_i$) of international rule i , $PostCrisisPeriod_i$ is an indicator for an international standard written in post-crisis periods (1998 and after for Asian Financial Crisis, and 2008 and after for Global Financial Crisis), and \mathbf{X}_{ij} is a matrix with a set of j control variables, and ϵ_i is a normally distributed error term.

4.2 Results

Table 1 reports in the top half the estimates of regulatory novelty within international banking rules written by the BCBS (top half) following the GFC (Models (1) and (2)) and following the AFC (Models (3) and (4)). The bottom half reports instead the same results for international securities rules written by IOSCO following the GFC (Models (5) and (6)) and following the AFC (Models (7) and (8)). In each set of these four sets, the first model presents beta regression estimates of the bounded, but continuous measure of $RuleNovelty_i$ (which takes values between 0 (low novelty) and 1 (high novelty), and then logistic regression estimates for the binary variable $HighlyNovelRule_i$ (which takes the value of 1 when MaxSim is especially low (such that novelty is especially high)).

The top half of Table 1 indicates that regulatory novelty is especially high for bank rules in the aftermath of the Global Financial Crisis (as compared to before the crisis), but especially low in the aftermath of the Asian Financial Crisis. The post-GFC variable in Models (1) and (2) is positive and statistically significant, indicating that bank rules written in the years 2008 through 2011 – as compared to all bank rules written through 2007 – have higher average levels of $RuleNovelty$ (Model (1)), and are, on average, more likely to be a $HighlyNovelRule$ (Model (2)). This controls for characteristics of each rule (document length, and whether it is revised or co-authored), and, for Model (1), additionally controlling for number of previous rules.

International bank (BCBS) standards

<i>D.V.</i>	Rule Novelty	Highly Novel Rule	Rule Novelty	Highly Novel Rule
<i>Regression model</i>	(<i>beta reg</i>)	(<i>logistic reg</i>)	(<i>beta reg</i>)	(<i>logistic reg</i>)
	(1)	(2)	(3)	(4)
Crisis Period				
Post-Global Fin Crisis (2008+)	0.339** (0.140)	1.515** (0.589)		
Post-Asian Fin Crisis (1998+)			-0.715*** (0.211)	-2.384** (0.995)
Controls				
Document length (ln)	-0.288***	-0.881***	-0.229***	-0.887
Revision doc ind.	-0.950***	-1.218*	-0.705***	-0.029
Co-authored doc ind.	0.234*	0.319	-0.033	0.482
Previous documents (ln)	-0.091		0.278**	
Constant	1.928***	5.707***	0.680	6.377
<i>Observations</i>	139	129	65	55
<i>Years</i>	1978-2011	1990-2011	1978-2001	1990-2001
<i>Log Likelihood</i>	119.515	-56.596	56.490	-17.298

Note: Significant at <1 percent (***), <5 percent (**), and <10 percent (*).

International securities (IOSCO) standards

<i>D.V.</i>	Rule Novelty	Highly Novel Rule	Rule Novelty	Highly Novel Rule
<i>Regression model</i>	(<i>beta reg</i>)	(<i>logistic reg</i>)	(<i>beta reg</i>)	(<i>logistic reg</i>)
	(5)	(6)	(7)	(8)
Crisis Period				
Post-Global Fin Crisis (2008+)	-0.109 (0.109)	-0.261 (0.556)		
Post-Asian Fin Crisis (1998+)			0.126 (0.139)	0.163 (0.899)
Controls				
Document length (ln)	-0.172***	-0.963***	-0.273***	-1.404***
Revision document ind.	-0.980***	-16.471	-1.029***	-17.404
Co-authored doc ind.	-0.099	-0.783	0.033	-17.032
Previous documents (ln)	-0.181***		-0.349***	
Constant	1.697***	6.538***	3.035***	9.113**
<i>Observations</i>	238	228	108	98
<i>Years</i>	1989-2011	1990-2011	1989-2001	1990-2001
<i>Log Likelihood</i>	167.280	-71.374	90.224	-18.286

Note: Significant at <1 percent (***), <5 percent (**), and <10 percent (*).

Table 1: **Correlates of international regulatory novelty:** Dependent variable is, alternatively, $RuleNovelty_i$, analyzed with beta regression, or, an indicator for $HighlyNovelRule_i$, analyzed with logistic regression. The explanatory variable of interest is post-crisis period.

In contrast, however, we found that post-AFC rules did not display higher regulatory novelty than the in the pre-crisis period. The post-AFC variable in Models (3) and (4) is negative and statistically significant, indicating that bank rules written in the years 1998 through 2001 – as compared to all bank rules written through 1997 – have lower levels of *RuleNovelty* (Model (3)), and are less likely to be a *HighlyNovelRule* (Model (4)).

The bottom half of Table 1 indicates that regulatory novelty of securities rules displays high levels of variation. In the aftermath of both the Global Financial Crisis and the Asian Financial Crisis, new rules' regulatory novelty is not especially high nor low. The post-GFC variable is statistically insignificant in both Models (5) and (6), indicating that securities rules written in the years 2008 through 2011 display levels of *RuleNovelty* and rates of *HighlyNovelRule* that are neither especially high nor especially low as compared to the set of securities rules written through 2007. Moreover, the post-GFC coefficient estimates are negative. This indicates that data slightly trends toward relatively lower levels of novelty, rather than the expectation that major crisis would lead to higher novelty. Similarly to Models (5) and (6), the post-AFC variable in Models (7) and (8) is statistically insignificant, indicating that levels of *RuleNovelty*, and likelihood of *HighlyNovelRule*, for securities rules written between 1998 and 2001 are neither especially high nor low as compared to the set of securities rules written through 1997. Together, novelty in securities rules show high levels of variation and do not display the expected trend toward regulatory novelty in the aftermath of major crises.

The estimated effect magnitude is plotted in Figure 4, which displays predicted probabilities for the *HighlyNovelRule* regressions (Table 1, Models (2), (4) (6), and (8)).¹³ Holding other variables at their sample means, the expected probability that a new banking rule written in the aftermath of the GFC is highly novel is 42%, up from 14% prior to the GFC (top left graph). In contrast, the top right graph shows that bank rules in the aftermath of the Asian Financial crisis were much less likely to be highly novel (3% likelihood from 1998 through 2001, as compared to 25% prior to 1998). Securities rules (bottom graphs)

¹³Estimated effect magnitudes for *RuleNovelty* regressions (Table 1, Models (1), (3), (5), and (7)) have substantively consistent results and may be found in Appendix B.2. We display predicted probabilities in the main text because this is a commonly used quantity with an intuitive interpretation.

Predicted Probability Highly Novel Rule

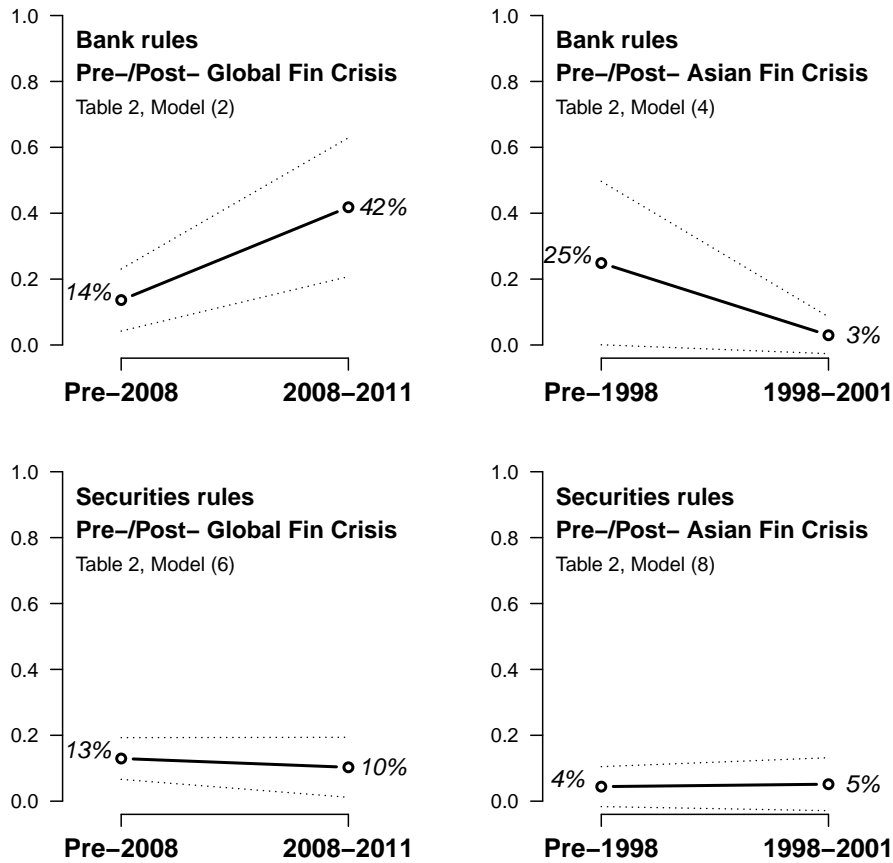


Figure 4: **Estimated substantive effect, $HighlyNovelRules_i$** : These graphs show the predicted probabilities of new rules being $HighlyNovelRules_i$, holding other variables at their sample mean levels. Based on Table 1, Model (2), (4), (6), and (8); estimates from predict function in R. Appendix Figure B.2 displays estimated substantive effect for $RuleNovelty_i$ (Table 1, Model (1), (3), (5), and (7)).

do not change much from pre- to post-crisis periods. The bottom left graph shows a slight decrease in the expected probability of highly novel securities rules written after the GFC (from 13% prior to 2008 to 10% between 2008 and 2011). The bottom right graph shows the expected probability of a highly novel securities rule slightly increases from 4% prior to 1997 to 5% between 1998 and 2001.

Figure 5 summarizes the overall empirical findings. For international bank rules, we find an increase in regulatory novelty for rules written just after the GFC (Table 1, Models (1) and (2)), but a decrease in regulatory novelty for rules written just after the AFC (Table 1. In securities rules, we find high variation in regulatory novelty and no clear trend in either the post-GFC or post-AFC periods (Table 1, Models (5)

	post-Global Financial Crisis	post-Asian Financial Crisis
Bank rules	Novelty! (+)	lack of novelty (-)
Securities rules	high variation (n/s)	high variation (n/s)

Figure 5: **Summary of empirical findings.**

through (8)). We next discuss robustness checks and the broader significance of these findings.

4.3 Robustness checks

These findings are robust to a number of alternative specifications and operationalizations. First, the choice of beta regression does not drive statistical results. An alternative to beta regression, a log-transformed dependent variable regressed in an OLS model, exhibits identical estimate signs and statistical significance (see Appendix Table B.1). Additionally, findings are not driven by the choice of a post-crisis period of four years; post-crisis periods as short as three years (1998 to 2001, and 2008 to 2011) and as long as nine years (1998 to 2006, and 2008 to 2016) lead to similar findings (see Appendix Tables B.1 and B.2, respectively). For international securities rules for the 9-year post-crisis period, the estimated coefficient for the post-GFC period becomes positive (flips signs) but remains statistically insignificant; all other post-crisis indicators retain the estimated sign and statistical significance at less than 10% confidence. One could argue that the post-Global Financial Crisis period should begin in 2009 rather than 2008; using an alternative GFC start date of 2009 maintains especially novel bank rules and high variation in novelty of securities rules (Appendix Table B.2). The estimated coefficient for the post-GFC securities rules becomes positive (flips signs) but remains statistically insignificant. Finally, including co-authored documents in the baseline sample does not drive the key results; excluding these observations from the sample leads to consistent estimate signs and statistical significance (Appendix

Table B.3). Together, we have confidence in the statistical findings.

4.4 Discussion

We theoretically expected post-crisis periods to be moments when international standard-setting bodies adopt novel regulatory approaches. Our empirical results (summarized in Figure 5) surprisingly found that only international bank rules in the aftermath of the Global Financial Crisis exhibit the expected trend. While, the existing literature has largely focused on the 2010 Basel III international standard which revised the 2004 Basel II agreement as the lynchpin of the post-GFC international rules (Admati and Hellwig, 2013), our results suggests that the broader range of BCBS's post-GFC rules as a whole deviated to a greater extent from existing rules compared to the standards designed by the same body in previous periods.

While the BCBS's post-GFC rules are consistent with expectations that post-crisis periods are moments when regulatory organizations are likely to write novel rules, the response of the same standard-setter to AFC does not. Instead, we find a decrease in regulatory novelty for rules written just after the AFC. While the existing literature emphasizes the many regulatory innovations associated with Basel II renegotiation (Lall, 2012), international bank standards written during this period as a whole display especially low levels of regulatory novelty than those negotiated before the crisis, suggesting that bank regulators during this period largely built upon existing rules' scopes and approaches.

In securities rules, we find high variation in regulatory novelty and no clear trend in either the post-GFC or post-AFC periods. Importantly, this does not mean that there was no innovation within international securities rules following crisis; a number of post-crisis standards in international securities tackled new issues and problems such as the example of the 2013 IOSCO standard concerning "Principles of Financial Benchmarks" illustrates. Our analysis highlights, instead, that these innovations are, indeed, not more prevalent than in the pre-crisis period. And, alongside the negotiation of innovative regulations, post-crisis periods are characterized by the revision of existing rules or the tackling of new problems through the revision of existing rules and approaches in a way that is not dissimilar from pre-crisis period.

What explains these findings? In this concluding section points towards different ways in which these results support or challenge the insights coming from existing literature regarding the determinants of regulatory change in international finance.

First, our empirical analysis has shown that there is variation in the level of regulatory novelty associated with different crises. From a political economy perspective, the origin, severity and type of crises will shape the incentives faced by policymakers in different countries to promote or oppose broad regulatory change (Simmons, 2001; Drezner, 2007; Helleiner, 2014). For instance, IPE scholars have theorized that the distribution of market power in international finance means that crises originating in core countries are more likely to generate international regulatory cooperation than those originating in the periphery (Simmons, 2001). This explanation is consistent with the lack of increase in regulatory novelty after the AFC which originated in emerging markets, thus creating incentives for core countries that had been affected only indirectly to promote their existing policies onto emerging markets in order to minimize adjustment costs for their firms (Drezner, 2007). On the contrary, the fact that the GFC originated in the US and engulfed the world's main financial centers gave incentive to policymakers in these countries to internationalize the novel rules designed domestically in order to avoid putting their firms at a disadvantage against foreign competitors (Helleiner, 2014).

At the same time, the focus on the origin and nature of the crisis cannot explain the different reaction to banking and securities regulators to the GFC. The fact that the GFC involved a number of non-bank financial institutions (including money market funds, repo markets, OTC derivatives counterparties, and securitized assets), which fall under the remit of securities regulators and only indirectly under bank regulators' jurisdiction, suggests that especially high regulatory novelty should be found in international securities rules rather than international bank rules.

Second, our finding that different international regulatory bodies react differently to the same crisis calls for greater attention to how the institutional features a regulatory body such as membership, mandate, and internal structure may mediate its responsiveness to a crisis (Woyames Dreher, 2020). For instance, the explicit prudential mandate to preserve financial stability that is at the core of banking

regulation could explain how the rules from the BCBS displayed greater regulatory novelty after a financial crisis that threatened the stability of global banking system compared to IOSCO, whose members' mandate tend to prioritize preserving market integrity and protecting investors.

Moreover, since decisions within international standard-setting bodies such as the BCBS and IOSCO are taken by consensus, the scope and composition of the membership can be expected to influence the capacity of organizations to deviate from the status quo and the approach taken (Moschella and Tsingou, 2013). The lack of statistical effect for international securities after both financial crises could reflect the relatively large membership of IOSCO and its wide-ranging regulatory issues; with a large membership and many issues, it may be difficult to observe statistically significant average data trends in regulatory novelty. However, statistical findings persist when controlling for rules written by specific IOSCO committees (e.g. Technical Group, Emerging Markets Group) and when dropping the rules written by the Emerging Markets Committee, which might address a different set of issues than the other rules (see Table B.4 in the Appendix). Within international bank rules, the BCBS expanded its membership in 2009 to all G20 countries; theoretically, the changing composition of regulators comprising the BCBS could change modal member preferences, resulting in new ideal point policies (Downs, Rocke and Barsoom, 1998) that are expressed as novel regulations. In practice, however, existing studies suggests that officials from the original BCBS members drove the post-crisis BCBS agenda, with only limited input from new BCBS members (Walter, 2016).

This point highlights the importance of looking beyond formal institutional characteristics of regulatory agencies. Different studies have theorized how the process of setting international standards in finance is influenced by informal characteristics of the individuals that populate these bodies, such as regulators' shared mindsets, technical training, and normative orientations shaping (Porter, 2003; Mügge, 2011; Tsingou, 2015; Seabrooke and Tsingou, 2014; Moschella and Tsingou, 2013). As a result, while financial crises may trigger new regulatory initiatives, continuity in the internal operation of standard-setting process are likely to bias regulatory change towards incremental adjustments upon the existing rules (Moschella and Tsingou, 2013; Helleiner, 2012). From this perspective, our findings concerning

the higher novelty associated with banking standards after the GFC provide some support for the notion that the Basel Committee has witnessed from 2008 onwards a rapid ideational shift driven by "an insiders' coup d'état" (Baker, 2013) which have promoted new ideas and approaches such as the rise to prominence of macroprudential ideas.

While a more complete theoretical explanation of what factors mediate the impact of crises on regulatory novelty remains outside the scope of the paper, in the conclusion we suggest a few potential pathways for scholars to test these approaches more systematically by building upon the data and approach outlined in this paper.

5 Conclusion

Though financial crises are most likely moments when financial regulatory concerns elevate to the top of the international public policy agenda, much is still unknown about crises' systemic effects on international financial regulatory cooperation. This paper provides a unique perspective of the population of international bank and securities rules with specific focus on across-time regulatory novelty. Our empirical findings indicate that international standard setting bodies often do not write novel regulations during post-crisis moments at an especially high rate compared to non-crisis moments. This ran counter to theoretical expectations that post-crisis moments would be characterized by high rates of regulatory novelty. Simultaneously, an important exception is evidence of high regulatory novelty in international bank rules following the 2008 Global Financial Crisis. This shows that campaigns of many new rules that display regulatory novelty are possible, even if they should not be taken as a given.

This paper provides systematic evidence of financial crises' impacts on international financial regulatory change. Two major contributions emerge from this work. First, while existing literature provides many insights about specific international financial regulatory reforms – often highlighting failures and successes – the collective character of international financial regulation has remained elusive. This is the first study to assess regulatory change across the entire population of international standards that have emerged to coordinate financial regulatory policies since the 1970s.

Second, this paper incorporates, for the first time, a text as data approach to understand the evolution of international financial regulatory policies. This paper contributes to the literature by developing a unique approach to measure regulatory change that can be used within other contexts outside of finance. We join a growing list of scholars who use text as a new source of data and insights into areas of international political economy as varied as bilateral investment treaties (Arel-Bundock and Lechner, 2018), preferential trade agreements (Allee and Lugg, 2016), and central bank preferences (Baerg and Lowe, 2020).

This paper complements existing case-based analyses of international financial regulatory reform by providing the broad context – the full population of international rules – within which each case falls. A theoretical explanation to inform the surprising key empirical findings is left for future analyses. In particular the approach and data identified in this study provides a potential pathway that future studies could follow to more systematically test the large set of accumulated theories about the determinants of regulatory change. We suggest here a few potential avenues. First, while the characteristics of a crisis can be expected to influence the regulatory response, the focus of our analysis on two crises selected on the basis of their "systemic" nature and the significance for the literature prevents us from systematically testing this. Further research should build upon our analysis to incorporate a broader range of crises and other market shocks (e.g. scandals) and investigate their impact across the population or subset of reforms. Second, while our focus on just two standard-setting bodies limits our capacity to test the impact of different institutional design features over the response of a regulator to crisis, further research could probe this by expand this approach developed in this paper to a broader range of regulatory bodies, both at the international and domestic level. Third, further work could build upon recent empirical innovations within this literature which has tracked the career histories (Seabrooke and Tsingou, 2020), educational background (Chwioroth, 2009) and hierarchies (Ban and Patenaude, 2019) among the individuals working within regulatory bodies and explore how these relate to the patterns in regulatory change across the population of reforms highlighted by our study.

Additionally, further research may consider extending this approach to analyze other types of textual

evidence to capture additional dimensions of regulatory change that remain outside of the purview of the paper. For instance, while our corpus has investigated exclusively the text of existing regulatory standards, a different data sample that captures other textual sources such as minutes, speeches, journalistic accounts could be the basis for interesting future research that applies beyond the analysis of the rules on the books. Further work could build upon our approach and extend it to the work of domestic regulatory agencies to investigate variation in the way countries respond to crises beyond the focus on a few specific flagship domestic reforms that is common in the existing literature. Finally, while this paper has focused on the level of novelty in the rules by the same single standard-setting bodies, further work could expand the population-level type of analysis developed in this paper to other standard-setting bodies and to investigate the interaction between different regulators.

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Appendix A Maximum Cosine Similarity

A.1 Formal definition of Maximum Cosine Similarity

We start by identifying a population of international standards. Formally, let i be an international standard from the full population of an international regulator’s standards, $N = \{1, 2, \dots, i, \dots, n\}$. Let $D = \{d_1, d_2, \dots, d_n\}$ be associated with the set of N , where d_i is the publication date of international standard i . Let $S = \{s_1, s_2, \dots, s_n\}$ also be associated with the set of N , where s_i is the text of international standard i .

Cosine similarity is a “bag of words” approach to text similarity, which collapses the word content of a document into a vector of wordcounts over m –dimensions, where each dimension represents a specific word (Mihalcea, Corley and Strapparava, 2006; Huang, 2008). Thus, the text of a given international standard, s_i , may be represented by an m –dimensional vector $\vec{s}_i = \{s_{i1}, s_{i2}, \dots, s_{im}\}$, for all possible words $M = \{1, 2, \dots, m\}$. Cosine similarity for any two international standards, i and j , is calculated as a function of their text vectors \vec{s}_i and \vec{s}_j as in Equation 2.

$$CosSim(s_i, s_j) = \frac{\vec{s}_i \vec{s}_j}{\sqrt{\vec{s}_i} \sqrt{\vec{s}_j}} \quad (2)$$

Between any two document texts, s_i and s_j , the value of cosine similarity is bounded between 0 (completely distinct document words) and 1 (completely similar document words). Low cosine similarity between two documents indicates documents that likely address different issues, while high cosine similarity indicates documents that likely address similar issues. To measure novelty of a given international standard, i , we want to know how distinct the new rule is compared to all previous rules. An international standard with relatively low cosine similarity with all previous standards likely indicates it addresses a new topic or takes a new approach to existing regulation. International standards that update or incrementally revise an existing international rule will share a high percentage of meaningful words in common with the past initiative, resulting in relatively high cosine similarity between the two document texts.

Thus, *maximum* cosine similarity – between the new international rule’s text and all previously published rules by the same regulator – offers a measure of novelty for an international standard. Formally, for a given international standard, i , we create a set A_i that contains the cosine similarity values between the new international standard text (s_i) and each international standard text previously published by the same regulatory body, as in Equation 3.

$$A_i = \{CosSim(s_i, s_j) \mid \forall j \in N \text{ s.t. } i \neq j \ \& \ d_j < d_i\} \quad (3)$$

The measure of an international standard’s novelty is $MaxSim_i$, which is the maximum value of the set of cosine similarity values between the new rule’s text and all previously published texts, as in Equation 4.

$$MaxSim_i = max(A_i) \quad (4)$$

Some models we can analyze the degree to which post-crisis reforms are novel in comparison to pre-crisis international rules. For these models, we impose an additional constraint on the set of A_i to consider only documents with dates prior to d' , where d' indicates some crisis date. In these cases the quantities of interest are calculated as follows:

$$A_{i,d'} = \{CosSim(s_i, s_j) \mid \forall j \in N \text{ s.t. } i \neq j \ \& \ d_j < d_i, d'\} \quad (5)$$

I. Most frequent five words in select BCBS documents

(stemmed, in decreasing order)

Document	Most frequent word stems
Basel I (1988)	capit, bank, risk, countri, weight
Basel II (2004)	bank, risk, exposur, capit, credit
Basel III (2010)	bank, capit, risk, tier, credit
Y2K (1997)	year, applic, test, bank, issu
Y2K (1998)	supervisor, year, bank, contri, issu
Y2K (1999)	bank, year, plan, supervisor

II. Cosine Similarity

Document pair	Cosine similarity
Basel I (1988) and Basel II (2004)	0.70
Basel II (2004) and Basel III (2010)	0.82
Y2K (1997) and Y2K (1998)	0.51
Y2K (1998) and Y2K (1999)	0.65

III. Maximum Cosine Similarity

Document	Maximum Cosine similarity with all previous docs
Basel I (1988)	0.62 (max sim with: 1986, “Management of Off-Balance Sheet Exposures”)
Basel II (2004)	0.76 (max sim with: 1986, “Management of Off-Balance Sheet Exposures”)
Basel III (2010)	0.82 (max sim with: 2004, “Basel II: International Convergence of Capital...”)
Y2K (1997)	0.38 (max sim with: 1989, “The relationship between bank supervisors and external auditors”)
Y2K (1998)	0.65 (max sim with: 1996, “The Supervision of Cross-border Banking”)
Y2K (1999)	0.75 (max sim with: 1997, “Core principles for effective banking supervision”)

Table A.1: Example of (I.) frequent document words, (II.) cosine similarity between pairs of documents, and (III.) maximum cosine similarity values.

$$MaxSim_{id'} = \max(A_{id'}) \quad (6)$$

This additional constraint is appropriate to capture novelty of an international standard written after the onset of crisis. For instance, the novelty of a rule written in 2012 may be more similar to an international standard written in 2011, which is captured in the full set of previous rules ($MaxSim_{id'=\emptyset}$), but very different from all pre-crisis documents ($MaxSim_{id'=2008}$).¹⁴ To capture novelty of post-GFC rules compared to pre-GFC rules, $MaxSim_{id'=2008}$ better captures this quantity than $MaxSim_{id'=\emptyset}$.

In sum, for a given international standard, i , Max Similarity ($MaxSim_i$) offers a measure of regulatory novelty.

A.2 Empirical intuition

The novelty measure discussed above in Appendix A.1 is based on the intuition that a new international regulation that updates or incrementally revises an existing international standard will share a high percentage of meaningful words in common with at least one past rule; high cosine similarity with this previous rule will lead to high maximum similarity, indicating low novelty. In contrast, the text vocabulary of an international rule that regulates new market actors and institutions, or that tackles new problems associated with already-regulated actors, is likely to differ in text vocabulary with all previous rules and have low maximum similarity, indicating high novelty.

¹⁴ $MaxSim_{id'=2008}$ is necessarily subset of $MaxSim_{id'=\emptyset}$, and therefore will always be less than or equal to $MaxSim_{id'=\emptyset}$.

Table A.1 builds readers' intuitions about the measure. For six BCBS documents regarding two well-known issues – the Basel Capital Accord (and its revisions, 1988, 2004, and 2010) and Year 2000 (Y2K) issue guidance between 1997 and 1999 – the table moves readers from a document's word contents (top table), to the cosine similarity between that document and other documents (middle table), and then to the measure of “max similarity” for that document (bottom table). First, the original, 1988 Basel Capital Accord identified rules for regulatory capital that international banks should hold; Basel II (finalized in 2004) was a significant revision and extension of Basel I, and Basel III (finalized in 2010) was a revision of Basel II sparked by the 2008 Global Financial Crisis. We know that all three documents address regulatory capital rules for international banks, but differ in regulatory details. We also know that Basel II marked a significant extension in scope of Basel I (Claessens, Underhill and Zhang, 2008); Basel III comprises a main document that was a revision of Basel II, and a number of new, associated rules (e.g. regarding liquidity and leverage) that were issued as separate documents. The similarities between the main Basel I, Basel II, and Basel III documents, though, we see bear out in the data. Cosine similarity between Basel I and Basel II is 0.70, which is lower than the 0.82 cosine similarity between Basel II and Basel III. Second, in 1997, bank regulators discussed the Y2K problem – many businesses' fears that computer systems would crash when years rotated from 1999 to 2000 – and published international best practices. The first Y2K document, published in 1997, was a new issue and very different from all previous rules. It was a novel item for regulators to discuss, and had a max similarity of only 0.38 (within the lowest quartile of BCBS max similarity values). Subsequent Y2K documents published in 1998 and 1999, however, had precedent, such that the 1998 Y2K document had max similarity of 0.65 and the 1999 document had even higher max similarity of 0.75. New issues and new regulatory approaches have low max similarity, and additional work on an issue will have a precedent, and higher max similarity. Across the entire data set, median max similarity to all previous documents is 0.720 for BCBS documents and 0.697 for IOSCO documents.

Appendix B Additional Figures and Tables

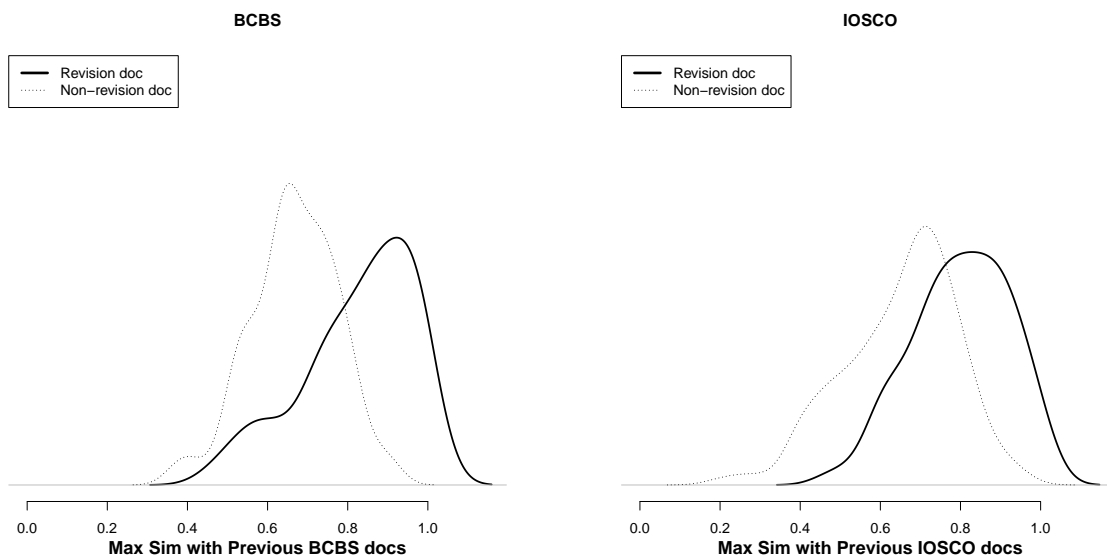


Figure B.1: **Revision and non-revision densities.** Revision documents are expected to have relatively high max similarity compared to non-revision documents. These figures' density plots of max sim by revision and non-revision show that this bears out in the data.

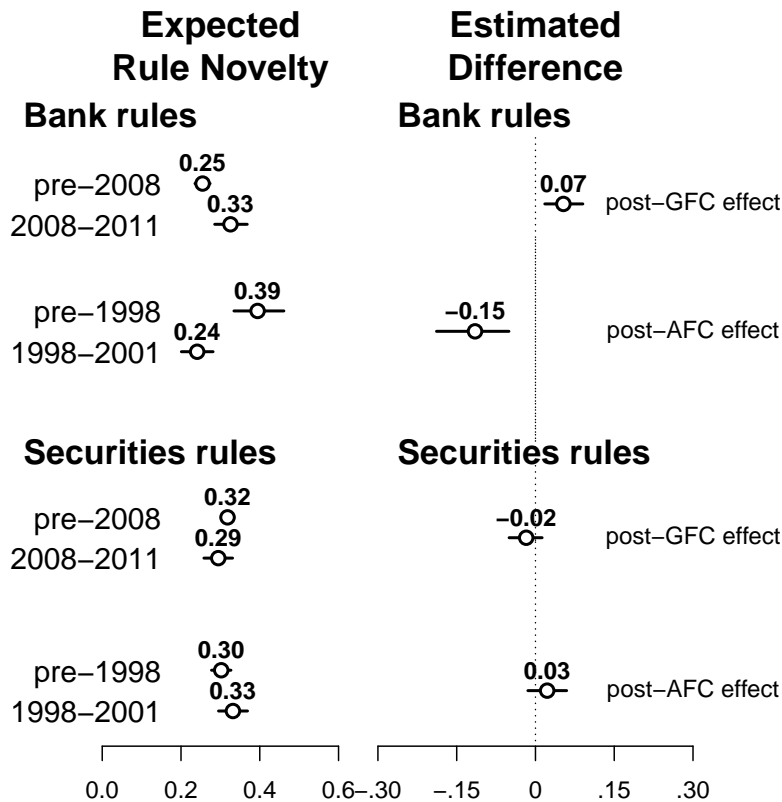


Figure B.2: **Estimated substantive effect, $RuleNovelty_i$** : Based on Table 1, Model (1), (3), (5), and (7) (from top row to bottom row, respectively), the left side of the graph displays Expected Rule Novelty for pre- and post-crisis periods. These are based on fitting each model with 1000 bootstrapped samples (with replacement), and then holding variables at their means and varying the value of pre- (0) and post- (1) crisis periods. The point estimate is the mean value of the 1000 bootstrapped point estimates, and confidence intervals are the 5% and 95% point estimates. The right side of the graph shows the Estimated Difference of these values, which is the substantive effect of crisis on rule novelty. Estimated Difference point estimate is the mean value of the 1000 estimated sample differences, and confidence intervals are the 5% and 95% values. While post-GFC bank rules are associated with greater novelty, post-AFC bank rules, and all post-crisis securities rules are not.

**Post-AFC Int'l Bank Rules (1998–2001)
MaxSim Date and Rule Novelty**

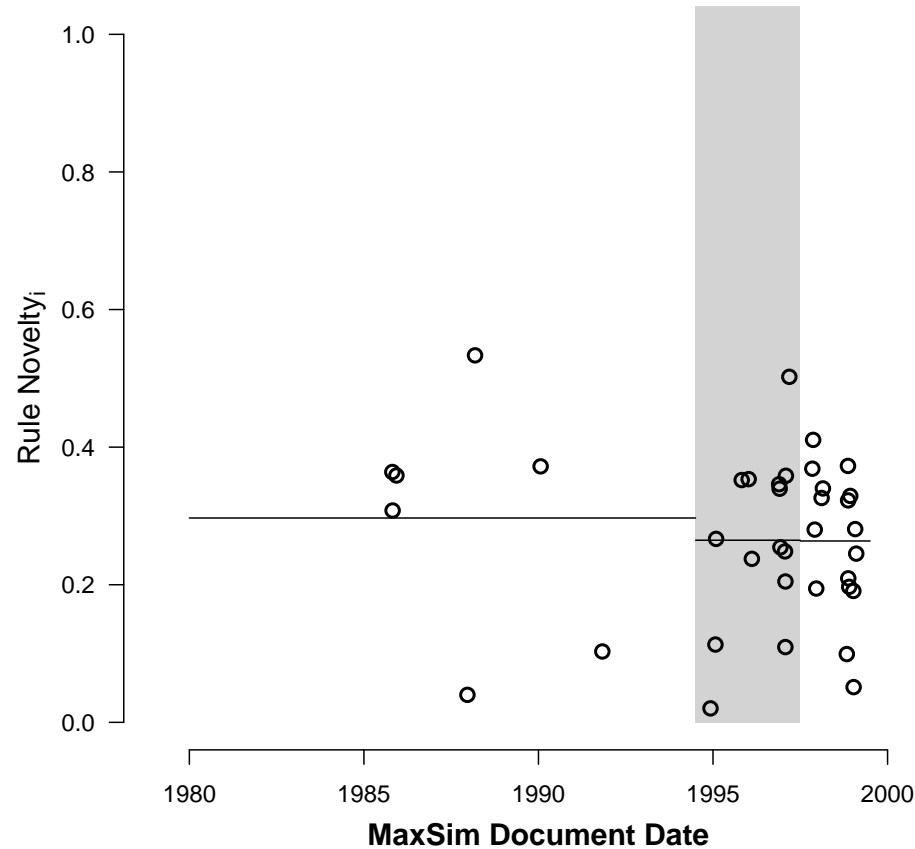


Figure B.3: Post-AFC international bank rules, plotted by $RuleNovelty_i$ (y-axis) and most similar, previous document publication date (x-axis): For the sample of 37 post-AFC international banking rules (i.e. rules written between 1998 Jan 1 and 2001 Dec 31), the above graph plots each rule’s level of $RuleNovelty_i$ and the most-similar, past document’s publication date (MaxSim document date). For post-AFC international banking rules whose most similar previous document was written before 1995 ($n=7$), average levels of $RuleNovelty_i$ are relatively high (0.297) as compared to international bank rules whose most similar previous document was written in 1995 or after (0.264) ($n=30$); within the latter set of documents, there is only the slightest difference in average $RuleNovelty_i$ for 14 documents whose most similar previous document was written between 1995 and 1997 (0.265) as compared to 16 documents whose most similar previous document was written in 1998 or after (0.264). Together, this indicates that post-AFC international bank rules seem to update 1995-1997 rules documents, and 1998 and beyond rules at about equal rates; thus, it is possible that both the Mexican Peso Crisis and the Asian Financial Crisis shocked international bank rules. To separate out a unique effect of each crisis is an interesting prospect that would require additional analysis that is outside the scope of this paper’s inquiry.

International bank (BCBS) standards: Log-transformed dv (left table) and 3-year post-crisis period (right table)

<i>D.V.</i>	In(Rule Novelty) (<i>ols reg</i>)		In(Rule Novelty) (<i>ols reg</i>)		Rule Novelty (<i>beta reg</i>)		Highly Novel Rule (<i>logistic reg</i>)	
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
<i>Regression model</i>								
Crisis Period								
Post-Global Fin Crisis (2008+)	0.397*** (0.148)				0.409*** (0.153)	1.087* (0.657)		
Post-Asian Fin Crisis (1998+)			-0.644*** (0.200)				-0.727*** (0.218)	-2.185** (1.003)
Controls								
Document length (ln)	-0.342***		-0.212***		-0.280***	-0.678**		-0.846
Revision doc ind.	-1.016***		-0.730***		-0.877***	-1.187*		-0.019
Co-authored doc ind.	0.352**		-0.040		0.192	-0.308		0.472
Previous documents (ln)	-0.104		0.266**		-0.092			0.312**
Constant	1.929***		0.091		1.856***	4.213*		6.051
<i>Observations</i>	139		65		129	119		57
<i>Years</i>	1978-2011		1978-2001		1978-2010	1990-2010		1978-2000
<i>Log Likelihood</i>					111.200	-52.100		47.565

Note: Significant at <1 percent (***), <5 percent (**), and <10 percent (*).

International securities (IOSCO) standards: Log-transformed dv (left table) and 3-year post-crisis period (right table)

<i>D.V.</i>	In(Rule Novelty) (<i>ols reg</i>)		In(Rule Novelty) (<i>ols reg</i>)		Rule Novelty (<i>beta reg</i>)		Highly Novel Rule (<i>logistic reg</i>)	
	(5)	(6)	(7)	(8)	(1)	(2)	(3)	(4)
<i>Regression model</i>								
Crisis Period								
Post-Global Fin Crisis (2008+)	-0.110 (0.093)				0.409*** (0.153)	1.087* (0.657)		
Post-Asian Fin Crisis (1998+)			0.121 (0.115)				-0.727*** (0.218)	-2.185** (1.003)
Controls								
Document length (ln)	-0.100***		-0.169***		-0.280***	-0.678**		-0.846
Revision document ind.	-0.854***		-0.873***		-0.877***	-1.187*		-0.019
Co-authored doc ind.	-0.113		-0.111		0.192	-0.308		0.472
Previous documents (ln)	-0.090**		-0.192***		-0.092			0.312**
Constant	0.152		1.046**		1.856***	4.213*		6.051
<i>Observations</i>	238		108		129	119		57
<i>Years</i>	1989-2011		1989-2001		1978-2010	1990-2010		1978-2000
<i>Log Likelihood</i>					111.200	-52.100		47.565

Note: Significant at <1 percent (***), <5 percent (**), and <10 percent (*).

Table B.1: Correlates of international regulatory novelty – Rule Novelty as log-transformed value in OLS regression (left tables) and 3-year post-crisis periods (right tables): The left tables show beta regression results (Table 1, Model (1), (3), (5) and (7)) are robust to using an OLS model with a log-transformed dependent variable. The transformation will not change model estimates of Table 1, Model (2), (4), (6) and (8), such that those estimates are omitted from this table for clarity. The right tables show that Table 1 results do not substantively change when using a 3-year post-crisis period (2008-2010 for Global Financial Crisis, 1998-2000 for Asian Financial Crisis).

International bank (BCBS) standards: exclude co-authored documents (left table) and drop years 1995-1997 (right table)

D.V.	Rule Novelty (beta reg) (5)	Highly Novel Rule (logistic reg) (6)	Rule Novelty (beta reg) (7)	Highly Novel Rule (logistic reg) (8)
<i>Regression model</i>				
Crisis Period				
Post-Global Fin Crisis (2008+)	0.323** (0.147)	1.523** (0.631)		
Post-Asian Fin Crisis (1998+)			-0.659*** (0.228)	-2.318* (1.186)
Controls				
Document length (ln)	-0.319***	-1.089***	-0.248***	-1.246*
Revision document ind.	-0.899***	-1.081	-0.573***	-0.226
Previous documents (ln)	-0.081	7.335***	0.266*	9.123*
Constant	2.136***		0.818	
<i>Observations</i>	115	105	52	42
<i>Years</i>	1978-2011	1990-2011	1978-2001	1990-2001
<i>Log Likelihood</i>	98.371	-46.846	43.442	-13.763

Note: Significant at <1 percent (***), <5 percent (**), and <10 percent (*).

International securities (IOSCO) standards: exclude co-authored documents (left table) and drop years 1995-1997 (right table)

D.V.	Rule Novelty (beta reg) (1)	Highly Novel Rule (logistic reg) (2)	Rule Novelty (beta reg) (3)	Highly Novel Rule (logistic reg) (4)
<i>Regression model</i>				
Crisis Period				
Post-Global Fin Crisis (2008+)				
Post-Asian Fin Crisis (1998+)			0.346* (0.209)	0.996 (1.561)
Controls				
Document length (ln)			-0.244***	-3.105*
Revision doc ind.			-0.990***	-18.314
Co-authored doc ind.			-0.031	-17.652
Previous documents (ln)			-0.447***	
Constant			3.008***	21.454*
<i>Observations</i>			82	72
<i>Years</i>			1989-1994; 1998-2001	1989-1994; 1998-2001
<i>Log Likelihood</i>			70.166	-6.668

Note: Significant at <1 percent (***), <5 percent (**), and <10 percent (*).

Table B.3: Correlates of international regulatory novelty – exclude co-authored documents from sample (left tables) and drop observations between 1995 and 1997 (right tables): The left tables show Table 1 results do not substantively change when excluding co-authored international rules from each sample. The right tables show Table 1 results do not substantively change when dropping 1995 through 1997, which may be a period of regulatory novelty attributable to the 1994 Mexican Peso Crisis. This provides some evidence that the baseline results are not driven by regulatory novelty attributable to the 1994 Mexican Peso Crisis.

Int'l bank (BCBS) standards: control for BCBS document type (left table)

<i>D.V.</i>	Rule Novelty (beta reg)	Highly Novel Rule (logistic reg)	Rule Novelty (beta reg)	Highly Novel Rule (logistic reg)
<i>Regression model</i>	(1)	(2)	(3)	(4)
Crisis Period				
Post-Global Fin Crisis (2008+)	0.323** (0.143)	1.558** (0.615)	-0.726*** (0.232)	-2.093 (1.364)
Post-Asian Fin Crisis (1998+)				
Controls				
BCBS - Guideline ind.	-0.078 (0.143)	-0.654 (0.696)	0.041 (0.199)	-0.547 (1.615)
BCBS - Sound Practice ind.	-0.081 (0.161)	-0.912 (0.830)	0.143 (0.201)	-0.155 (1.225)
Document length (ln)	-0.303***	-0.981***	-0.245***	-1.143
Revision doc ind.	-0.969***	-1.594**	-0.647***	-0.269
Co-authored doc ind.	0.239	0.385	-0.131	-16.111
Previous documents (ln)	-0.073	0.320**		
Constant	2.050***	7.105***	0.601	8.465
<i>Observations</i>	134	124	64	54
<i>Years</i>	1978-2011	1990-2011	1978-2001	1990-2001
<i>Log Likelihood</i>	115.304	-52.300	56.771	-13.703

Note: Significant at <1 percent (***), <5 percent (**), and <10 percent (*).

Int'l securities (IOSCO) standards: control for document type (left table) and exclude Em Mkt Committee docs (right table)

<i>D.V.</i>	Rule Novelty (beta reg)	Highly Novel Rule (logistic reg)	Rule Novelty (beta reg)	Highly Novel Rule (logistic reg)
<i>Regression model</i>	(5)	(6)	(7)	(8)
Crisis Period				
Post-Global Fin Crisis (2008+)	-0.113 (0.109)	-0.285 (0.562)	-0.127 (0.125)	-0.457 (0.614)
Post-Asian Fin Crisis (1998+)				
Controls				
IOSCO - Technical Comm ind.	0.028 (0.125)	-0.528 (0.652)	0.015 (0.129)	-0.085 (0.156)
IOSCO - Em Mkt Comm ind.	0.172 (0.146)	-0.718 (0.775)	-0.603 (0.634)	-1.000 (1.562)
Document length (ln)	-0.177***	-0.933***	-0.730***	-1.447**
Revision document ind.	-0.957***	-16.561	-1.052***	-17.560
Co-authored doc ind.	-0.052	-1.252	-0.048	-16.937
Previous documents (ln)	-0.176***	-0.363***	-0.204***	-0.370***
Constant	1.658***	6.804***	1.740***	2.851***
<i>Observations</i>	238	228	183	85
<i>Years</i>	1989-2011	1990-2011	1989-2011	1990-2001
<i>Log Likelihood</i>	168.477	-76.054	133.329	-64.140

Note: Significant at <1 percent (***), <5 percent (**), and <10 percent (*).

Table B.4: Correlates of international regulatory novelty – extra controls for document type (left tables) and exclude IOSCO Emerging Markets Committee document type (right tables): The left tables show Table 1 results do not substantively change when adding controls for document type. For international bank rules, the BCBS distinguishes between “Standard”, “Sound Practices”, and “Guidelines”; we add indicators for each category, and let “Standard” be the reference category. Five observations are not categorized; these are BCBS/IOSCO jointly-authored documents that are listed on IOSCO but not BCBS’s. For international securities rules, IOSCO identifies the committee that publishes the standard, with “Technical Committee”, “Emerging Markets Committee” and “IOSCO board” as three relevant committees; we add indicators for each category and let “IOSCO board” be the reference category. The right tables Table 1 results do not substantively change when excluding Emerging Markets Committee rules from IOSCO dataset. The other documents are either written by the “Technical Committee” or “IOSCO board”; we add indicators for these categories and let “IOSCO board” be the reference category.