

20. A novel and quantitative perspective of the SEC

Juan Pablo Pardo-Guerra

Dear members of the workshop.

I attach a paper that covers my research on the interactions between regulation and technological change in financial markets. The paper focuses on the United States and uses computer-aided techniques to analyze the speeches of SEC commissioners throughout its history. In doing so, it argues that the SEC is captured by a legal logic of regulation that subordinates discussions of technology to matters of disclosure and enforcement. This accounts, I argue, for the SEC's relative failure in regulating market technologies in recent decades, despite having the congressional mandate that it would need to do so. Preliminary evidence suggests that the story in the UK and Europe is similar, though with some minor difference in regulatory styles and paths.

For this workshop, the paper matters for the following reasons:

1. There is no doubt that markets will continue to become more reliant on technology to increase efficiencies. The push for real-time settlement is an example, as is the push to move more derivatives onto order books. These changes involve expanding the scope, operation and speed in the interest of costs, efficiency and interconnectivity. Indeed, this is an old story: focus on how to reduce trading costs are central to such things as the mechanization of the back office in the 1960s and the automation and the demutualization of stock exchange in the late 1990s and early 2000s, for example.
2. The challenge, however, is about the type of regulation that we need for these markets. One possibility is to set the breaks on innovation by, for example, dictating tick sizes or minimum resting times, two options that have been considered by the SEC in the United States. These forms of regulation, however, will invariably create pressure to innovate around them, creating further complexities and sources of opacity in the market—an arms race, of sorts, where regulations beget innovations that try to work around the objectives of the regulation. This is, in my view, entirely undesirable.
3. A different option is to reshape the way financial regulation is done. So far, financial regulation has been concerned mostly with either 1) macroeconomic stability; 2) investor protection; 3) innovation in contracts. There is very little work within regulatory institutions on market technologies (other than surveillance) and even less historical memory. The great challenge for financial regulation is not the speed or efficiency of markets, but the deeply embedded logics that have driven financial regulation over the past five to eight decades.

4. What my paper alludes to, then, is the importance of rethinking the way regulators work. This involves not only focusing more on technology in a generic manner, but building competencies, expertise, and alliances that would allow regulators to more effectively shape the structures of securities markets. Consider, for example, the issue of 'technology hubs' raised by the organizers. Disclosure-enforcement logics will not work with these. Rather, what might work is fomenting innovation while keeping a strong grip of the development of standards and devices. This could involve expanding efforts to certify market platforms and market organizations using public market infrastructures; it may also involve certifying technology-related professionals working in the industry; but it may also involve closer oversight and control over standards in financial markets. One of the key standards of communication (FIX), for instance, was largely developed outside the regulatory sphere, despite the fact that it had tremendous consequences on the shape of securities markets globally.

5. The danger, then, is not technology per se, but rather the way we approach its regulation. This is what I want to impress upon the workshop's participants: the urgency to think about financial regulation as the regulation of safety-critical technologies, rather than the regulation of promises and debts.

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A NOVEL AND QUANTITATIVE PERSPECTIVE OF THE SEC

by *Juan Pablo Pardo-Guerra*

Quantitative analysis of speeches by the Securities and Exchange Commission (SEC) to categorize topics shows that regulators focus too often on issues of disclosure and transparency rather than on issues of market architecture and design.

Financial regulation today confronts a particularly challenging landscape. Three decades of intense innovation radically transformed markets, calling on regulators to develop new competencies and expertise about the architectures of the marketplace.

Recent events suggest, however, that regulators may not have developed the type of skills that are necessary for securing the stability of a highly technological and interconnected marketplace. As an illustration, consider the 2015 legal case brought by the Securities and Exchange Commission against UBS ATS. UBS was accused of violating rule 612 of Regulation National Market System by providing some of the platform's users the ability to submit sub-penny orders to the platform's matching engine. As the legal scholar James Angelo noted, the importance of this case isn't necessarily the allegations against UBS but rather the tardiness in the SEC's reaction: Although it was informed about the technicalities of UBS ATS six years earlier, the SEC only intervened in 2015.

This is not the only instance of belated regulatory action. To this we might add other cases of technology-related events where regulators' interventions were considerably lagged with respect to the event. Think, for instance, of the relatively unsatisfactory report by the SEC on the 2010 'flash crash', or the CFTC's quite delayed prosecution of Navinder Sarao for market manipulating. If anything, the recent controversies around technology in financial markets have reinforced a public image of regulators as reactive responders rather than

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proactive engineers.

What explains this apparent sluggishness? In this article, I explore the reasons why one regulator, the Securities and Exchange Commission, may be structurally unable to deal with rapid technological innovations in the marketplace. This analysis matters for two practical reasons.

Firstly, in an age of great uncertainty, understanding the constraints of regulatory action is important for designing novel strategies that secure the stability, fairness and efficiency of the market. Ours is not a time to reduce regulation on ideological grounds but rather a historical moment to rethink how regulatory institutions might guarantee the long-term sustainability of the marketplace, particularly in the context of a fast pace of innovation.

Secondly, financial markets are considerably more complex now than when current regulatory institutions were established. This is in part due to changes in the architecture and design of markets such as the proliferation of trading venues, changes in market participants and the development of new trading strategies. Yet, regulators have not adequately focused on these changes but instead prioritized corporate governance. Were regulators better able to keep up with those essential changes in markets, participants could have greater confidence in both the markets and those that police them.

The argument I present in this article is the following: Regulators have faced such relative complications dealing with innovation because of how regulatory organizations were constituted historically. In particular, financial regulators are disproportionately populated by lawyers and accountants who share a specific understanding of what matters for regulating markets (namely compliance, disclosure, and enforcement). This leads to a limited perspective that regulators have for dealing with changes in the technological fabric of the marketplace, as well as delays in how they respond to surprises. In this study, I analyze seven decades of commissioner speeches to identify the matters of concern and areas of focus that drew most of the SEC's attention in the markets it regulates.

THREE HYPOTHESES OF REGULATORY RESPONSES

There are three possible explanations for the SEC's apparent difficulty in regulating technology.

One is politics: The SEC was constrained by Washington in terms of how it approached the market. There is much research on how government agencies and departments effectively simply echo the concerns of the incumbent administration. As an example, it is entirely possible that the SEC was merely replicating a broader governmental view that favored light-touch regulation of national telecommunications. This does not explain, however, the fact that since the mid-1960s, the SEC was given a rather broad mandate to shape the key infrastructures supporting the market. The SEC, for instance, was instrumental in supporting the development of the Consolidated Tape and the Inter-Market Trading System, two systems that became part of the backbone of the National Market System - though leaving most of their development to

third parties and self-regulatory organizations. Throughout its recent history, the SEC was clearly aware of the importance of technology, yet it did little to shape how it evolved.

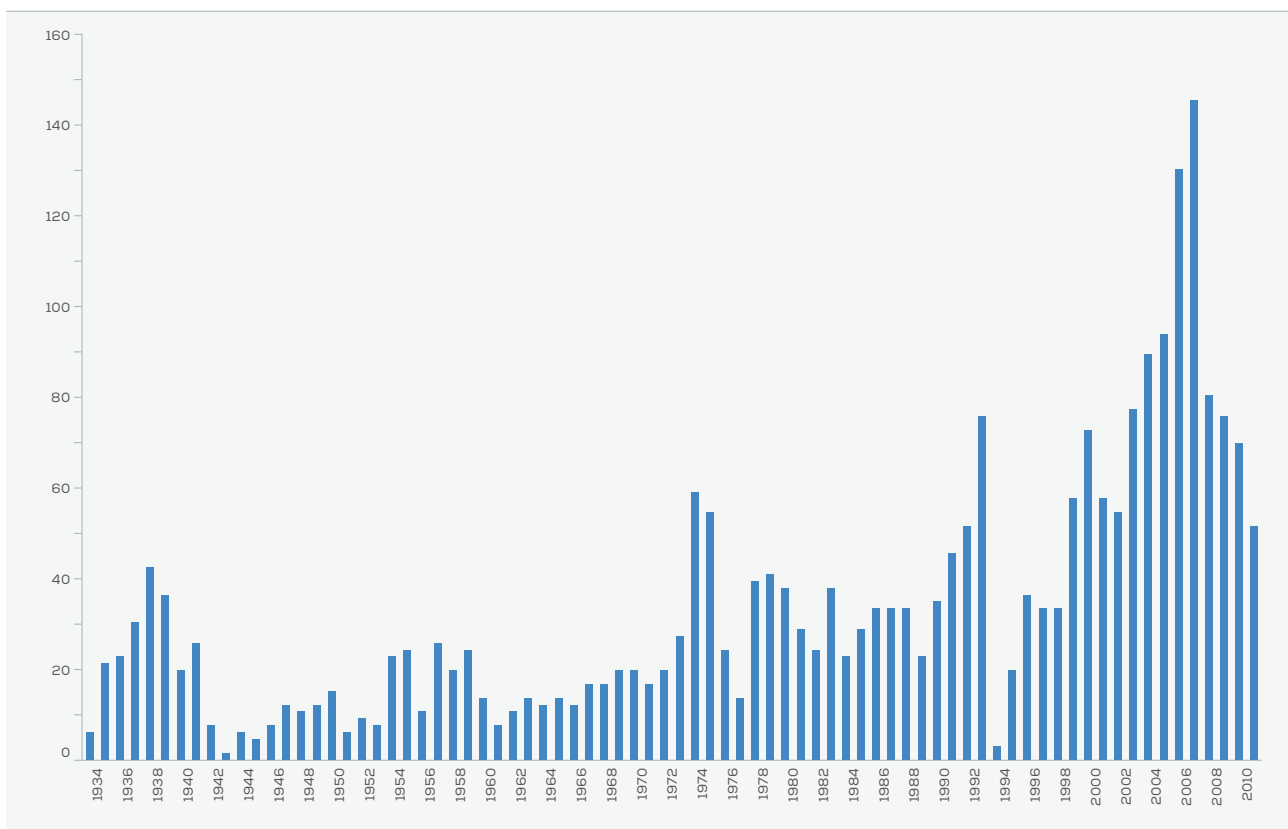
A second source of constraints on action may be the relative availability of resources. A common trope about the SEC is that it is a chronically understaffed organization. This may well be the case - overseeing multi-trillion dollar markets in addition to regulating corporate disclosure is a hefty responsibility. Specifically, in a highly technological domain, hiring experts is necessary - and notoriously expensive. In 2011, for example, the Wall Street Journal reported on the increased competition for professionals between Wall Street and Silicon Valley: At the time, the starting salary for a trading systems programmer with no advanced degree was between 75,000 USD and 95,000 USD, about ten percent above the equivalent starting-level position in Silicon Valley (Peterson 2011); this figure is close to the reported initial salary at Tradebot Systems of between 50,000 USD and 100,000 USD before bonuses.

The SEC, on the other hand, is known for its limited budget and low salaries, even in comparison to other government agencies. In 2002, for example, Forbes reported that the salaries of attorneys at the Federal Deposit Insurance Corporation were 36% greater than those of their peers at the SEC (97,800 USD and 72,000 USD respectively; Simons 2002).

Resource limits are not a compelling explanation. Although a small organization, the SEC has a budget comparable to other government agencies in charge of regulating highly technical industries. Consider the Federal Aviation Authority (FAA): It may seem a better-financed organization (15.3 billion USD in 2013, in comparison to the 1.4 billion USD for the SEC), but it is also considerably larger (46,000 employees compared with the 4,200 at the SEC). On a per full time equivalent basis, the budgets for the FAA and SEC are actually equal (at approximately 330,000 USD per year per full-time employee). The SEC has also attracted information technologies specialists with competitive salaries (recent positions advertised by the SEC, for example, include an IT specialist with a minimum of one year of managerial experience, and with an expected salary of between 137,000 USD and 226,000 USD per year, lower yet not substantially so to similar positions in the industry; SEC 2016). However, most IT experts within the SEC work in maintaining and re-developing EDGAR, the regulator's central electronic dataset for corporate filings or in the Division of Enforcement's forensic laboratory (SEC 2015).

A third explanation lies within the organization itself. Perhaps the trouble with regulating technology has as much to do with external constraints as with ingrained organizational dynamics. As organizational sociology has demonstrated, institutions are often defined and dominated by specific logics of action that determine how they process information, how they deal with uncertainty and how they develop courses of action. These 'institutional logics' take multiple forms, from organizational procedures to informal codes of conduct and expectations of behavior. They also define relevant frames of perception and analysis (such as questions of "what matters?"), as well as the meaning, interpretation and possible reaction to situations of uncertainty (such as questions of "what can we do?"). Perhaps some of the SEC's attitude towards the regulation of technology was the result of the institutional logics that mediated the regulator's relation to the changing marketplace.

Figure 01: Number of SEC speeches by year



The question then is: What were these logics about?

VISUALIZING REGULATORY CONCERNS

Delineating the institutional logics of organizations requires in-depth analysis of their everyday activities as well as meticulous historical research into how they tackled moments of breakdown and crisis. In this article, however, I discern the institutional logics of the SEC by making use of machine learning techniques, namely unsupervised topic models to identify what mattered most to the regulator over time.

Topic models are a widely used mechanism for classifying texts. At the core, topic models provide a probabilistic account of the distribution of words within a particular corpus. As probabilistic models, they do not discern syntactic structure. Rather, topic models identify the empirical co-occurrences of words within a bounded collection that, for an analyst, may be ostensibly interpreted as expressing some underlying concept. For example, in a collection of texts, the word “report” may co-occur with the words “account” and “corporation” with a relatively large frequency, signaling the existence of a bundle of terms notionally related to the concept of corporate disclosure. Topic models have been applied to identify themes in collections of texts ranging from newspaper articles, government documents and transcripts from the meetings of the Federal Open Market Committee. In these cases, topic models were used as a means for identifying the evolution of meaningful frames concerning public attitudes towards arts funding, changing views on national security and the use of macroeconomic theory in crafting policy decisions.

For this study, I resorted to unsupervised topic models based on a Latent Dirichlet Allocation (LDA) (Blei, Ng and Jordan 2003) applied on the speeches given by SEC commissioners between 1933 and 2011. I initially obtained a total of 3,863 speeches from the SEC website which were processed and normalized by removing idiosyncratic features associated to their source. Overall, 97% of the speeches were appropriate for processing. The files were then selected according to word length: Some documents in the SEC archive are merely introductory remarks by commissioners with relatively sparse information about the organization and its world view. Consequently, I dropped speeches with less than 1,500 words (or approximately, shorter than a ten minute speech). This resulted in 2572 speeches, distributed as shown in Figure 01.

The subset of substantive speeches was then cleaned of common English ‘stop words’ (e.g. “the”, “a”, “and”) and punctuation signs, and was then stemmed, removing word suffixes to collapse the corpus’ vocabulary into a smaller collection of meaningful terms (for instance, ‘government’ and ‘governmental’ are both mapped onto the term ‘govern’, in the same way as ‘technologies’, ‘technological’ and ‘technology’ are mapped onto ‘technol’). The texts were then processed through a standard LDA algorithm (Blei et al. 2003). Here, an important parameter that determines the quality of outputs is the number of topics that the user considers useful in accounting for the variability and clustering of terms in the corpus. After testing models containing from 5 to 30 topics, I settled on a solution formed by 15 topics. Table 01 summarizes the chosen topic models and the parameters of their implementation. As in other studies, the themes of each topic model were discerned by interpreting the output with respect to the existing literature

Table 01: Topic model of the SEC Commissioner Speeches corpus, indicating the top 20 words for each topic

Public mandate	Rulemaking	Public companies	Investment information	Public offers	Corporate finances	Accounting standards	Investment management	Market structure	Enforcement	Corporate disclosure	Accounting disclosure	Global markets	Investment intermediaries	Corporate governance
busi	market	compani	investor	secur	compani	account	fund	market	commiss	disclosur	account	foreign	firm	corpor
govern	regul	act	year	commiss	capit	statemen	invest	trade	case	compani	audit	market	bank	sharehold
corpor	regulatori	hold	new	act	invest	compani	ser	exchang	law	report	standard	regul	complianc	compani
would	investor	util	make	requir	stock	report	investor	commiss	court	inform	report	intern	broker	director
problem	financi	case	time	rule	market	year	commiss	secur	enforc	staff	financi	secur	examin	rule
public	municip	power	work	offer	secur	incom	mutual	system	secur	requir	auditor	capit	dealer	board
econom	risk	plan	know	public	industri	earn	manag	order	olat	registr	commiss	issuer	custom	manag
must	secur	state	think	pro	bank	case	industri	price	action	account	public	investor	risk	propos
industri	agenc	secur	today	would	year	finstat	hedg	stock	insid	pro	independ	state	ser	proxi
respons	rate	pro	way	registr	billion	cost	compani	rule	sec	use	intern	countri	secur	compens
system	rule	interest	need	compani	offer	requir	would	broker	act	file	profess	unit	program	vote
regul	would	section	get	issuer	institut	principl	rule	would	inform	statemen	committe	global	super	requir
nation	commiss	reorgan	market	propos	rate	opinion	fee	execut	fraud	issu	issu	compani	manag	would
law	disclosur	system	like	exchang	increas	form	also	investor	lawyer	materi	compani	standard	acti	govern
need	bond	oper	inform	invest	corpor	asset	act	competit	trade	financi	manag	world	tie	execut
power	system	court	peopl	regul	price	present	pro	futur	corpor	would	qualiti	regulatori	busi	commiss
concern	pro	sion	busi	inform	insur	registr	director	option	would	finstat	pro	requir	also	disclosur
interest	credit	public	even	section	bond	gener	asset	dealer	public	includ	board	ifr	area	committe
make	reform	would	good	sion	share	practic	requir	new	investig	relat	would	exchang	regul	interest
american	capit	commiss	say	exempt	percent	balanc	staff	industri	conduct	year	control	develop	procedur	independ

on financial regulation.

To better understand the relevance of these 15 topics, it is best to see how their frequency within SEC speeches evolved over time. Consider Figure 02, showing the relative prevalence of each of these topics in the corpus as well as a re-coded version that groups topics into five possible categories: oversight, rules and enforcement, corporate finance, investment and market structure. Market structure contains discussion of technology and is thus the variable of interest. Note that in the formative period of the SEC, the most common topics were those relative to either the original mandate of the regulator or matters of public issues and public companies. This concern with the regulation of publicly listed corporations has to be interpreted in the context of the SEC's focus on securing a market for corporate issues to produce 'corporate democracy'.

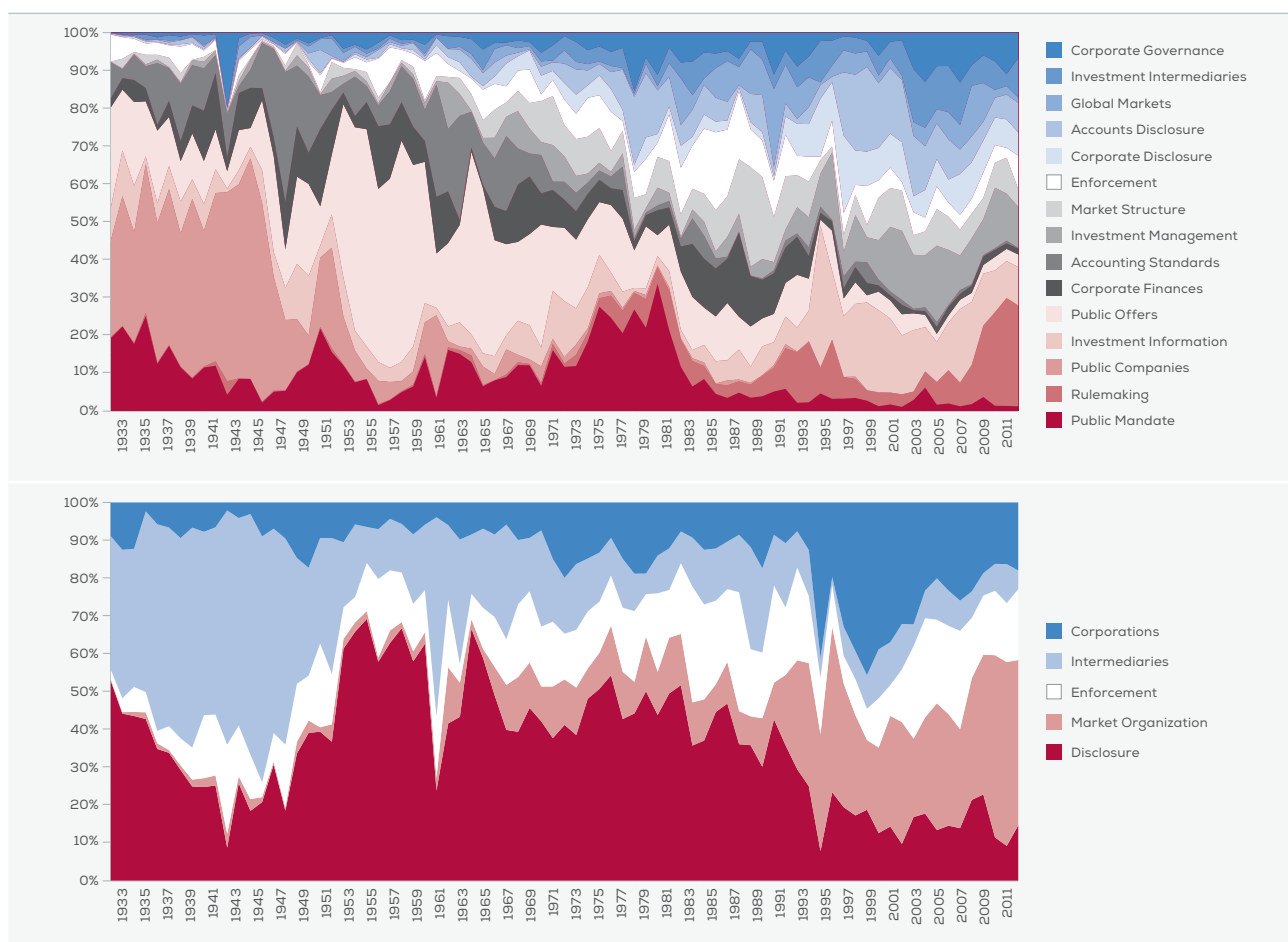
Contrast this with a second period, where the topic of public mandate increases and market structure makes a notable appearance. While corporations did not disappear from the sight of the regulator, the reorganization of the national securities markets surrounding the first efforts to create the National Market System (roughly, 1968-1987) shifted slightly the emphasis of the SEC, requiring repeated justifications of its role and authority in the marketplace. In contrast, the most recent period of the SEC is notably characterized by a logic of disclosure and rulemaking: Transparency, for example, is a matter of enforced disclosure - the SEC's role here is to establish the normative framework for the proper operation of the financial system. The existence of these three logics is important since they demonstrate that the SEC

had the flexibility to adapt to a changing environment. Had the findings indicated a single, stable and dominant logic of action, then the SEC's arms length relation to technology would be hardly surprising. The transitions show, however, that institutional change occurred but that it wasn't directed towards a closer recognition of technology as an object of regulation but rather coordinated by a central principle of disclosure and enforcement.

DISCLOSURE, RATHER THAN DESIGN

The topic models signal what Khademian (1992) describes as an "overarching logic disclosure-enforcement" at the SEC. What explains this emphasis and its relative continuity throughout time? A likely source of stability may be a process called imprinting: At origin, organizations create constraints, commitments and habits that endure over long periods of time. By inference, then, the logics that framed the early work to create the SEC could have played a role in its later history. There is support for this hypothesis. As a product of crisis, the SEC was founded to protect investors through the rule of legislation, policy, disclosure and reporting. Politically, a focus on disclosure rather than direct market intervention provided a sensible agreement with Wall Street and mirrored the practices and actions of an expanding New Deal state bureaucracy. The Securities Act that lay at the foundation of the SEC, after all, had the "outstanding purpose, I might say the principal purpose, [of providing] full disclosure [...] of all material facts concerning an issue of securities that is offered for sale to the public" (SEC Speeches; Commissioner Ferguson

Figure 02: Evolution of topics for the SEC speeches, 1933-2011



1933). Disclosure was a palatable agreement. “While [the] Act was pending in Congress at its last session”, said founding Commissioner Pecora in 1933, “opposition to it was advanced by certain interests upon the ground that these reporting requirements by listed corporations placed an unnecessary and unwarranted burden upon corporations. [...] I ask you a simple question: Suppose you were approached by another person with a proposal to buy an interest in his business for a certain price. Would you under those circumstances feel that you were entitled to truthful and adequate information concerning the condition of that business to enable you to determine whether you wanted to buy that interest in such business and if so, what would be a fair price to pay for it? Fairness and commonsense both dictate an affirmative answer to this question.” (SEC Speeches; Commissioner Pecora 1933). Centrally, a specific professional group guided much of the organizational imprinting of the SEC: The cadres of lawyers and jurists that managed the difficult tensions of working between a highly self-regulated industry and the institutions of enforcement, courts and the law. That legal professionals heavily populate the SEC is well established in the literature. Seligman writes (1982: 110), for instance, “that what distinguished the SEC was its ability to attract staff attorneys”. Khademan (1992: 89-94) also notes that, despite their increased presence in government bureaucracies, economists were always subordinated to the SEC’s lawyers and their concerns. Law matters and arguably continues to do so, imprinted onto the organization and its logic of action. Biographical data of SEC commissioners

confirms this observation: Over its history, at least half of the commissioners held a law degree, with more than 30% having worked in public administration. (Contrast these numbers with the career distribution of, for instance, JP Morgan’s Board of Directors where currently only one of 12 members has a background in law.)

REGULATING INFRASTRUCTURES, RATHER THAN BEHAVIORS

That organizations are imprinted does not negate the possibility of change. The SEC conducts essential work towards improving market stability. Nevertheless, it could be improved by incorporating technical expertise and more ambitious attitudes towards the evolution of the markets’ infrastructures.

A possible solution may be to bypass existing organizational structures by unbundling existing market regulations. This would involve separating oversight of investment decisions and market behaviors - the current purview of the SEC - from oversight of market infrastructures. The expertise exists, if not within the SEC, certainly in a number of forums that have been part and parcel of the automation of financial markets.

