

DYNAMIC REGULATION FOR INNOVATION

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BY

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ABSTRACT

A large consensus in the literature suggests that law has a diminishing capacity to react to innovation. After summarizing the commonalities between the law and technology literature and the literature on dynamic regulation in the analysis of the so-called pacing problem between regulation and innovation, the chapter evaluates proposed remedies for the pacing problem and distinguishes dynamic regulatory remedies.

Keywords: Growth of Technology, Innovation, Regulation of Innovation, Pacing Problem, Dynamic Regulation, Feedback Effects, Optimized Information for Regulation, Anticipatory Regulation

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I. Introduction

The disruptive properties of innovation are firmly established in the literature. Bower and Christensen coined the phrase “disruptive innovation,” pointing out that technological changes that damage established companies typically present different performance attributes that existing customers value and improve such performance attributes so rapidly that established markets can be invaded (Bower and Christensen 1995). Disruptive innovation is associated with the emergence of new technologies that precipitate a paradigm shift for product technology or create entirely new paradigms (Kostoff et al. 2004, Walsh and Linton 2000) and exemplifies Schumpeter’s “Creative Destruction” (Schumpeter 1962, Spencer and Kirchhoff 2006) as scientific discoveries change the existing technological product paradigms and provide the foundation for more competitive new technologies and products to emerge. Disruptive technological innovations facilitate exponential improvements in the value proposition for customers by enabling discontinuous innovations of processes, products, and services that are increasingly impacting industry practices, consumer preferences and behavior, products, and delivery channels. In lieu of a widely accepted definition disruptive innovation, different scholars focus on different aspects of disruptive innovation such as substitutable technological learning curves, customer behavior, industry-wide product technology factors, product newness, market factors, or a combination of these factors (Kostoff et al. 2004).

The implications of disruptive technologies and innovation can be significant for market participants. The implications of disruptive technologies and innovation

have been examined since the mid 1990s (Christensen 1997, Moore 1991). The literature has warned businesses that smaller entrepreneurial firms can take advantage of disruptive technologies and redefine markets (Charitou and Markides 2003, Downes and Nunes 2013) if market leaders do not sustain their market dominance through the use of disruptive technologies. Market leaders' lack of investment in disruptive technologies can then result in the sudden loss of market dominance and even total replacement in such markets (Bower and Christensen 1995). Market leaders, successful institutions, and managers fail when they do not distinguish sustaining technologies from disruptive technologies (Kostoff et al. 2004). Unless businesses acquire the disrupter startup or incubate a competing business that embraces the disruptive technology, the startup can attract new lower-end consumers by offering inexpensive substitutes for products and gradually move upmarket by attracting higher-end consumers over time (Bower and Christensen 1995, King and Baatartogokh 2015).

The recognition of the increasing scale of regulatory issues presented by disruptive innovation creates an important commonality between the law and technology literature and the literature on dynamic regulation. The law and technology literature recognizes that legal institutions' capacity to react to innovative technologies is diminishing because innovation driven by science and technology is accelerating while federal and state agencies' regulatory processes have slowed down and are continuing to slow down (McGrath 2013, Desilver 2014, Hall and Khan 2003, Rycroft 2006, Garrett 2015, Marchant 2011). This combination causes the so-called "pacing problem" between innovation and regulation, e.g., innovation develops faster than applicable regulation (Allenby 2011, Askland 2011). Similarly, the literature on dynamic regulation of

innovation describes regulatory challenges presented by disruptive innovation associated with the timing of regulation, facts-based, ex-post, trial-and-error-rulemaking with stable and presumptively optimal rules in the existing regulatory framework (Popper 1957, Kirchner 2011), and ever increasing unknown future contingencies in rulemaking (Kaal and Vermeule 2016).

Proposals in the law and technology literature intended to address the disconnect between regulation and innovation are broad and have evolved over time. Proposals range from a more direct involvement of experts in regulatory processes to self-regulatory approaches (Butenko and Larouche 2015). While some see disruptive innovation predominantly as a competition law and antitrust issue (Graef et al. 2014), others suggest early intervention (Black and Baldwin 2010), litigation (Calabresi 1982), and principles-based regulation (Carter and Marchant 2011) as remedies because the existing rulemaking procedures lack sufficient speed and flexibility (Barefoot 2015). Yet others propose networks for the diffusion of improved regulatory technology, early intervention (Cortez 2014), rulemaking petitions (Croston 2011), and retrospective review (Wiener 2004, Bull 2015). Many scholars see research, development, and public operation as the only ways to identify harmful innovation because ex ante regulation has diminished significance in the context of regulation of disruptive innovation and artificial intelligence (Scherer 2016). Finally, some favor sunset clauses and experimental regulations (Ranchordas 2015, Sabel and Simon 2011), a governance coordinating committee (Marchant and Wallach 2013), and an integrated framework for governing emerging technologies (Paddock and Masterton 2013).

Contrasting the regulatory solutions proposed by the law and technology literature with the approach of dynamic regulation, this paper highlights the potential of dynamic regulatory feedback processes and methods to address the evolving disconnect between regulation and innovation, including the so-called “pacing problem” between innovation and regulation, e.g., innovation develops faster than applicable regulation (Marchant 2011, Moses 2013, Butenko and Larouche 2015, Moses 2011). The core proposals in the law and technology literature intended to address the pacing problem include regulation via the judiciary, early stage regulation of innovation, and principle-based regulation (Calabresi 1982, Mandel 2009, Black and Baldwin 2010). None of these proposals uses dynamic regulatory elements. By contrast, dynamic regulation emphasizes dynamic elements in regulating innovation.

This article has V parts. Part II discusses the consensus in the literature on law’s diminishing capacity to react to innovation, and it evaluates the so-called pacing problem, as discussed in the literature. Part III describes the solutions for the pacing problem as proposed by law and technology literature. Part IV contrasts the proposed solutions in the law and technology literature with the dynamic regulatory proposals for the pacing problem between law and innovation. Part V concludes.

II. Law’s Diminishing Capacity to React to Innovation—“The Pacing Problem”

The law and technology literature and the literature on dynamic regulation recognize that legal institutions’ capacity to react to innovative technologies is diminishing. A “pacing problem” exists between innovation and regulation, e.g., innovation develops faster than applicable regulation (Marchant 2011, Moses 2013,

Butenko and Larouche 2015, Moses 2011). Innovation driven by science and technology is accelerating, yet simultaneously, federal and state agencies' regulatory processes have slowed down (McFrath 2013, Desilver 2014, Hall and Khan 2003, Garrett 2015, Marchant 2011). While the extent and causes of the ossification of rulemaking remain empirically uncertain (Johnson 2008, Jordon 2000), some consensus exists that the legal and evidentiary burdens placed on regulatory authorities have increased substantially over time, precipitating the remarkable slowdown in rulemaking by regulatory agencies (Mashaw and Harfst 1991, McGarity et al. 2010, Blais and Wagner 2008).

Several timing factors can help explain the pacing problem. The growing divergence between the time cycles of technological innovation and the time cycles of the government contributes significantly to the pacing problem (Butenko and Larouche 2015). Collingridge suggests that regulators responding to disruptive innovation are faced with regulatory hurdles during the early stages of an innovation because of information asymmetries about the innovation's possible impact (Collingridge 1980). Entrenched innovation during a later stage of a product cycle also creates issues for regulation because it becomes much more costly to implement regulatory changes for innovating corporations (Collingridge 1980). For example, the growth of innovative technological systems makes them larger and more complex and in effect more resistant to regulatory demands.

Systemic factors can also help explain the increasing divergence between regulation and innovation. Such factors include the political and ideological structures in the rulemaking process, the political gridlock in a two-party system that impedes the passing of legislation, legislators' disagreement on how outdated statutes should be

updated, and the need for crises to precipitate legislative action (Kahn 2007). An ever-increasing emphasis on analytical requirements to justify regulatory authorities' rulemaking and the need for regulatory authorities to meet legislatively imposed requirements further complicate timely adjustments to innovation. (Marchant 2011) The disconnect between regulation and innovation may also be associated with regulators' lacking utilization of a fuller range of regulatory tools (Butenko and Larouche 2015). The balance between the dominance of the public side in regulation and the lesser prominence of private actors is of special concern (Butenko and Larouche 2015). The most traditional and widely recognized drawbacks of the traditional rulemaking system under the Administrative Procedure Act (APA) include its lacking speed, cumbersomeness, and the quantity of litigation it generates via its notice and comment procedures (Sussking and McMahon 1985, Coglianese 1997, Baram 1982, Holley-Walker 2007). The pacing problem can also be seen as a result of the goal of legal certainty in rulemaking, e.g., regulation is commonly perceived as a source of predictability and is meant to last; as innovation accelerates, rulemaking driven by legal certainty cannot keep pace (Brownsword and Somsen 2009).

Finally, the existing regulatory infrastructure contributes to the pacing problem. In the existing regulatory framework the regulatory challenges presented by disruptive innovation are largely associated with facts-based, ex-post, trial-and-error-rulemaking with stable and presumptively optimal rules (Popper 1957, Kirchner 2011), the slow speed of regulation, and ever-increasing unknown future contingencies in rulemaking (Kaal and Vermeulen 2016). Because facts-based, ex-post, trial-and-error-rulemaking cannot anticipate regulatory issues created by innovation, rulemakers may not at all—or

much too late—realize what new regulatory demands apply to a given innovation and associated regulatory issue. Rulemakers' near exclusive reliance on stable and presumptively optimal rules (Kaal 2013, Kaal 2014a, Kaal 2014b, Kaal and Lacine 2014) created to attain permanent solutions for perceived regulatory issues (Kaal 2014b) ignores the ever-changing environment for rules driven by the exponential growth of technology and the associated exponential growth of innovation. The timing of regulation in an environment of exponential innovation is a primary problem for regulators. Formal rulemaking in the existing regulatory infrastructure is almost always too time-consuming (Sunstein 1999, McGarity 1992) because the speed of product innovation often makes regulations pertaining to an innovative product obsolete before such regulations are finalized (Barefoot 2015). Finally, the existing regulatory infrastructure with stable and presumptively optimal rules is largely incapable of addressing the ever-increasing unknown future contingencies associated with disruptive innovation. Given the pace of innovation, future contingencies in rulemaking are likely to increase substantially, making the dynamic anticipation of future contingencies more important for rulemaking.

III. Remedies for the Pacing Problem—Prior Literature

The law and technology literature has evaluated the role of regulation in relation to innovation for more than a decade. Richard Susskind suggested that "we are on the brink of a shift in [the] legal paradigm, a revolution in law" (Susskind 1996). Others talk about the Rule of Law being displaced by the Rule of Technology (Brownsword 2008). A scholarly consensus in the law and technology literature perceives the role of regulation

in relation to innovation as an important element for ensuring the compliance of innovation with fundamental rights (Mandel 2013, Moses 2013, Brownsword and Goodwin 2012). The consensus in the literature also emphasizes regulation as an important balancing factor for maximizing the benefit and minimizing the harm of innovation. In very general terms, those who critique the harm associated with innovation generally favor more regulation (Black and Baldwin 2010, Brownsword and Goodwin 2012) and, in particular, so-called “risk-based regulation,” e.g., perceived risks of innovation trigger tiered legal intervention depending on the level of risk (Black and Baldwin 2010, Brownsword and Goodwin 2012). Those who mostly see societal benefits associated with innovation favor a lack of or a downgrading of regulation (Thierer 2012).

Technological innovation outpacing the law comports with historical concerns about additional or amended and ever growing statutes and regulations encumbering the law. In the 1980s, most prominently, Guido Calabresi argued against updating statutes via administrative agencies to align the original intentions behind the law with changing circumstances (Calabresi 1982). His core arguments in this context included administrative agencies’ lack of democratic credentials, their capture by vested interests, and their conflicts and biases originating in their preferences against modifications and in favor of the status quo (Calabresi 1982). Instead, Calabresi suggested that the judiciary has the necessary knowledge, skills, and insights to evaluate emerging fact-based changes and innovations and to revise and revitalize existing but outdated and ineffectual statutes to promote “conformity with a complex legal landscape” (Calabresi 1982).

In more recent times, an academic consensus evolved on core legal approaches to the regulatory challenges presented by disruptive innovation. A substantial portion of law

and technology academics agree that innovation needs an incremental, reflexive, and cooperative regulatory approach (Marchant and Wallach 2013, Sarewitz 2011), utilizing both public rulemaking and private rulemaking (Marchant and Wallach 2013, Bowman 2013). On the other hand, because innovation policy is fraught with uncertainty, some call for the public sector to embrace a radical change in orientation leading to policy prescriptions that are typically frowned upon by governments: adaptation, co-evolution, agility, and improvisation (Rycroft 2006). Others want to align regulatory policies with technological innovation by including sunset provisions in new technology regulations which would take effect 18 months after enactment of the regulations in accordance with Moore's Law (In 1965, Intel's co-founder Gordon Moore observed that the number of transistors per square inch on integrated circuits doubled every year and Moore predicted that this trend will continue into the foreseeable future) (Thierer 2012).

Regulatory reform can also play a role in the relationship between regulation and innovation. Regulatory reform can be more than a response to innovation; it can also be a response to the shifting values that are associated with the innovation in question. According to the law and technology literature, regulatory updates and timely regulatory reforms are necessary in order for regulation to play a relevant role during innovation-driven change (Moses 2013, Brownsword 2008). If changing values and societal norms are driving innovation, calling for a regulatory reform, introducing a regulatory update where regulatory reform is needed can deteriorate the relationship between regulation and innovation (Mandel 2013).

Informal regulation is another proposed remedy for the shortcomings of the existing regulatory structure with regard to innovative technologies (Wu 2011). Some

suggest that traditional rulemaking is regularly impracticable in rapidly developing industries where highly informal methods can be justified.¹ For instance, regulatory agencies confronting disruptive innovations could use “threats” for the disruptive industries, packaged in guidance documents, warning letters etc., rather than relying on traditional regulatory means in the existing regulatory framework.² Such threats could help avoid regulation that is inappropriately calibrated or premature because threats signal regulatory intent appropriately, are more flexible, and can be better fine-tuned.³

A widely discussed remedy for the pacing problem is principles-based regulation. As contrasted with more rigid rules-based regulation, principles-based regulation emphasizes general and abstract guiding principles for desired regulatory outcomes (Black 2008, Carter and Marchant 2011). Regulated entities in principle-based regulation have discretion in how they comply with the principles. This gives them the ability to respond to the changing industry practices, it provides them with flexibility and freedom, and it can help improve relationships regulators and regulated companies (Askland 2011).

The literature on law and technology proposes several other possible remedies to address the pacing problem between innovation and regulation (Askland 2011). These proposed remedies include: administrative law strategies such as online fora, e.g., e-

¹ Wu 2011 at 1841 (“There are three main ways in which agencies regulate: rulemaking; adjudication; and informal tools of guidance, also called nonlegislative or interpretative rules. Over the last two decades, agencies have increasingly favored the use of the last of these three, which can include statements of best practices, interpretative guides, private warning letters, and press releases.”).

² Wu 2011 at 1849 (“Of the three options, the first—making law—may be the worst alternative. What sounds attractive is the prospect of an orderly, planned approach to the future. The problem is that, with so little known about the industry, issuing specific rules based on guesses about the future runs a grave risk of creating a bad law, or at least a law that is much worse than one issued after more development. Such lawmaking suffers from all of the defects that Friedrich Hayek identified with central planning—impressive in a world of perfect information, but terrible in this world.”)

³ Wu 2011 at 1843 (“Both agency and industry will sometimes share an interest in an informal and flexible regime that resembles an unenforceable “letter of intent” in the world of private contracts.”)

rulemaking (Noveck 2004, Benjamin 2006, Noveck and Johnson 2008, Farina 2010), negotiated rulemaking, direct final rulemaking (Gaudet and Marchant 2011), adaptive management in law using continual feedback to rapidly adjust policy in light of changing facts (Ruhl 1997), temporary legislation with sunset clauses (Gersen 2007, Mooney 2004, President's Council on Bioethics 2002), periodic reviews, issue-specific legislative initiatives,⁴ specialized courts (Maryland Business and Technology Court Task Force 2000, Ponte 2002), and independent institutions with decision-making authority (example: Internet Corporation for Assigned Names and Numbers (ICANN)).

IV. Dynamic Regulation for Innovation

The utilization and integration of dynamic elements in the regulation of innovation is based on several key observations. First, the existing regulatory framework is sub-optimally equipped for remedying the existing and future regulatory challenges associated with exponential innovation (Kaal and Vermeulen 2016). Second, the nature of disruptive exponential innovation has a potentially destabilizing effect on society. The faster the cycle of disruptive innovation, the shorter the timeline for society to adapt and respond to such innovation with a familiar pattern of laws, regulation and frameworks. The acceleration of this cycle enhances the unpredictability and contingency effects of innovation, making it increasingly difficult to make regulatory policy under a foundation of shifting “cultural constructs, ideologies, and institutional verities” (Allenby 2011). Third, dynamic regulation is not merely utopian as the literature on dynamic regulation

⁴ Examples include the Food and Drug Administration Modernization Act of 1997, Pub. L. No. 105-115, 111 Stat. 2296 (codified as amended at 21 U.S.C. § 301 (2012)) and the Digital Millennium Copyright Act, Pub. L. No. 105-304, 112 Stat. 2860 ((codified as amended in scattered sections of 17 U.S.C.).

has already introduced several dynamic regulatory mechanisms that allow for at least some dynamic elements in regulation (Kaal and Lacine 2014, Kaal and Vermeulen 2016). Fourth, with the amount of data growing exponentially (IDC/EMC 2011), it may be reasonable to assume that other dynamic regulatory tools may become available and coincide with exponential innovation.

The author sees dynamic elements in the regulation of innovation as a supplement to the existing regulatory framework. The intent here is to help optimize that framework. Dynamic regulation may serve a role similar to litigation—despite the many drawbacks of litigation in the context of exponential disruptive innovation— in the existing regulatory infrastructure. If and when the existing regulations turn out to be suboptimal and insufficient in addressing the new regulatory needs associated with disruptive innovation, dynamic regulatory tools may help anticipate and clarify regulatory needs.

1. Remediating the Pacing Problem

The law and technology literature proposals intended to address the pacing problem have practical limitations. These proposals include regulation via the judiciary (Calabresi 1982), early stage regulation of innovation (Mandel 2009), and principles-based regulation (Black and Baldwin 2010). None of these proposals uses dynamic regulatory elements.

Addressing the regulatory issues associated with innovation outpacing law via the judiciary is insufficient in the face of exponential innovation. While the judiciary undoubtedly would have the necessary knowledge, skills, and insights to evaluate emerging fact-based changes and innovations to revise and revitalize existing but

outdated and ineffectual statutes (Calabresi 1982), increasing evidence shows that the court system cannot sufficiently counterbalance the shortcomings in the legislative system with regards to the pacing problem (Marchant 2011). The doctrine of stare decisis and the courts' adherence to and application of precedent decided decades or centuries earlier illustrate that the court system is actually structured as a suspension system for rapid change in order to provide stability and predictability. Litigation in the court system can take years, which increases the likelihood that the court system will not react in a timely manner, much less in real-time, to exponential innovation.

Dynamic regulatory mechanisms are already replacing and will continue to replace litigation. Dynamic regulatory mechanisms such as deferred prosecution agreements (DPAs) produce relevant, real-time, decentralized, high quality information for regulation in most industries and are used as a preferred alternative to litigation by both prosecutors and corporations (Kaal and Lacine 2014). DPAs produce superior feedback effects for regulation as the prosecutor's investigation and DPA negotiations and executions signal regulatory needs real-time. DPAs may be particularly suitable to address the challenges presented by exponential and disruptive innovation. Rather than requiring traditional APA rulemaking with all its aforementioned shortcomings or, even worse, Congressional action, prosecutors' investigation of innovation-driven regulatory challenges, DPA negotiation, and/or DPA execution could signal real time regulatory needs pertaining to innovative technologies. Given the extent of the ever increasing regulatory challenges associated with exponential innovation and the worsening pacing problem, dynamic regulatory mechanisms akin to DPAs, among other dynamic regulatory mechanisms, may be needed.

A broad consensus exists within the law and technology literature that regulation of innovation should take place at an earlier stage of innovation (Collingridge 1980, Mandel 2009, Moses 2013). The literature assumes that early regulatory intervention in evolving innovation sends a powerful signal. If the signal is negative in the form of a prohibition, among others, it will undermine any further support for the innovation/product. If the signal is supportive in the form of a subsidy, among others, it will encourage investments or other support towards the innovation/product. In practice, however, early regulatory intervention in innovation is rare. Regulation mostly does not keep pace as the innovation evolves and as the understanding and use of innovative technology spreads (Brownsword and Goodwin 2012). Moreover, early regulatory intervention in evolving innovative products/services etc. is subject to massive information asymmetries and associated regulatory uncertainty. The early stage of innovation often provides insufficient information on possible risks and benefits of the innovation. In the later stages of more matured innovation, it is often not possible to alter the status quo of regulation.

Dynamic regulatory mechanisms do not encounter the challenges of early regulatory intervention. Dynamic regulatory mechanisms are based on improved, real-time, high quality, and decentralized information as well as feedback effects (Kaal and Lacine 2014, Kaal and Vermeulen 2016). Because in a dynamic regulatory framework, the regulatory challenges associated with innovation would become transparent in real-time, early regulatory intervention would not be necessary. Accordingly, the challenges of early regulatory intervention, such as stunting innovation in the case of a negative signal/intervention, the inability to keep pace with later stage innovation, and information

asymmetries and the associated regulatory uncertainty can be avoided. In the theoretical dynamic regulatory framework, feedback effects and real-time information on regulatory challenges associated with innovation allow regulatory intervention if and only when needed.

The law and technology literature heralded principles-based regulation as another promising remedy for the pacing problem. As contrasted with more rigid rules-based regulation, principles-based regulation emphasizes general and abstract guiding principles for desired regulatory outcomes (Black 2008, Carter and Marchant 2011). Regulated entities in principles-based regulation have discretion in how they comply with the principles. This gives them the ability to respond to the changing industry practices, it provides them with flexibility and freedom, and it can help improve relationships between regulators and regulated companies. The downsides of principles-based regulation include a costly and time consuming change from rules-based regulations to principles-based regulation, uncertainty, and compliance problems because of uncertainty (Askland 2011).

Dynamic regulatory mechanisms can avoid the downsides of principles-based regulation. Similarities between dynamic regulatory mechanisms and principles-based regulation include the ability to respond to changing industry practices and the ability to improve relationships between regulators and regulated companies. Dynamic regulation can respond to changing industry practices through feedback effects and enhanced information for regulation. Dynamic regulation improves the relationship between regulators and companies through for-cause regulation based on real-time high quality information for regulation and associated feedback effects. As dynamic regulation is a

regulatory supplement in the existing rulemaking framework, costly implementation would not be necessary, unlike in the case of principles-based regulation. Dynamic regulatory mechanisms also avoid legal uncertainty more than principles-based regulation because in the dynamic framework rulemaking can happen after feedback processes that are transparent to both the affected industries and the regulators.

2. *Optimizing Anticipatory Governance*

A large part of the law and technology literature recognizes the need for anticipatory governance of innovative technology. Anticipatory governance is the process of “guiding future technologies toward desired societal outcomes” (Barben et al. 2008, Sarewitz 2011). This literature recognizes that the pace of innovation is incompatible with existing regulatory approaches that demand comprehensive knowledge as a basis for taking regulatory action because innovation is too decentralized, too fast, and too pervasive (Sarewitz 2011). Anticipatory governance allows for regulators to act on multiple inputs in an effort to manage emerging technologies while such management is still possible, allowing for *foresight, engagement, and integration* (Guston 2014). Foresight, defined as the analysis of alternative futures, is a key concept in anticipatory governance, allowing governments to detect trends, visualize alternative futures, and foster improved outcomes (Fuerth and Faber 2012). However, the United States lacks an anticipatory system at the national level because no mechanism exists for bringing foresight and policymaking into an effective relationship (Fuerth and Faber 2012).

Anticipatory rulemaking in the dynamic regulatory framework has commonalities with the concept of foresight in the law and technology literature. Similar to the concept

of foresight in that literature, anticipatory rulemaking in the theoretical framework of dynamic regulation allows governments to act on multiple levels of information for rulemaking, detect trends, visualize alternative futures, and foster improved outcomes.

Dynamic regulation conceptualizes and uses several tools to accomplish anticipatory rulemaking. It relies on the use of institution-specific, decentralized, and timely information⁵ in combination with feedback effects (Kaal 2014b). Feedback effects can occur in several settings including feedback processes between different public and private rulemakers, feedback processes between outcomes and institutions, intra- and interjurisdictional feedback processes, and feedback processes between rules and rulemaking processes.⁶ For instance, DPAs and venture capital investments provide at least some estimation as to where innovative trends exist and what possible regulatory challenges may be associated with them (Kaal and Lacine 2014, Kaal and Vermeulen 2016). DPAs and venture capital investment decisions increase the availability of relevant, decentralized, and timely information for rulemaking⁷ and facilitate feedback

⁵ Including information on the functioning of financial institutions, information pertaining to how financial institutions, or decision makers in financial institutions, actually act and how they are expected to react to unforeseen contingencies in the future helps incorporate dynamic elements into financial regulation. Several mechanisms can increase the information for rulemaking in a more timely fashion, including but not limited to: 1. Contingent Capital, 2. Governmental Contracts in the form of Non- and Deferred Prosecution Agreements, 3. Venture Capital finance allocation, and 4. Crowdfunding.

⁶ Rules as outcomes are the result of the institutional design of rulemaking and reinforce the institutional design. Existing rules create a feedback effect for the rulemaking process itself. Rules with suboptimal characteristics are the results of institutional arrangements and reinforce suboptimal institutional arrangements and rulemaking processes. Stable and presumptively optimal rules reinforce a rulemaking process with an institutional structure that perpetuates stable elements in rules.

⁷ Private rulemakers can have a comparative advantage over public rulemakers because, unlike their public counterparts, they often can produce necessary, comparable, decentralized, and institution-specific information for rulemaking. Unlike public rulemakers, private rulemakers often have access to decentralized information and can more readily react to emerging, decentralized, and institution-specific information. Interaction between public rulemakers and private rulemakers, including the exchange of emerging information, creates a feedback process between them that increases the availability, timeliness, and quality of information available to the public rulemaker. Based on the optimized information for rulemaking, the public rulemaker can take regulatory action when the relevant information for rulemaking becomes available. The interplay between public and private rulemakers and the associated feedback process enables a learning process and optimization process for the public rulemaker.

effects.⁸

Dynamic regulatory tools, such as DPAs and venture capital investments, can serve as regulatory supplements enabling rulemakers to adapt to regulatory contingencies if and when they arise because feedback effects associated with such dynamic regulatory tools provide relevant, timely, decentralized, and institution-specific information ex-ante. By increasing the availability of information ex-ante, dynamic regulatory tools help lower unforeseen contingencies in the rulemaking process pertaining to innovation. Improved information for rulemaking also helps maintaining certainty in the rulemaking process.

V. Conclusion

Dynamic regulation can help optimize anticipatory governance for innovation by emphasizing the adaptation to and anticipation of unforeseen contingencies associated with innovation. Rulemaking in the dynamic framework is seen as an integral part of innovation that supports the innovation but also curtails it for its own sake and maximization of societal welfare. Regulation of innovation in a dynamic framework is only triggered as a supplement to the existing rulemaking framework if and when feedback effects anticipate otherwise unforeseen contingencies and regulatory needs associated with innovation.

⁸ The rulemaking process is enhanced through the competition between private- and public rulemakers. Competition between different public rulemakers can require public rulemakers to meet consumers' and legal addressees' quality expectations and preferences. Consumer choice can add a dynamic element to the rulemaking process because public rulemakers in a given jurisdiction can adjust rulemaking to consumer choice once consumers have opted out of a suboptimal regulatory regime in that jurisdiction. Consumer choice creates a feedback effect for the public rulemaker. Consumer choice can thus facilitate appropriate information for rulemaking and enable anticipation and modification of the public rulemaker's next action in the rulemaking process. Feedback effects may exist between public rulemakers and parties who are subject to informal rules if public rulemakers observe the preferences and efficient solutions of parties who are subject to informal rules. In effect, parties who are subject to informal rules are signaling their preferences and efficient solutions to the public rulemaker. Public rulemakers can benefit from the additional insights such signaling may produce for the public rulemaking process.

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