

Regulating Regtech: The Benefits of a Globalized Approach

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Abstract:

Regulatory technology, or RegTech, helps financial institutions around the world comply with a myriad of data-driven financial regulations. RegTech's algorithms make thousands of decisions every day: they identify and block suspicious clients and transactions, monitor third party exposures, and maintain statutory capital thresholds. This article tackles one of the main problems of RegTech: the risks posed by inherently opaque algorithms that make the aforementioned decisions. It suggests that due to the fundamental importance of RegTech for the robustness of global finance, a globalized model of regulating RegTech's algorithms should be adopted. This model should be based on two facets of regulation: first, the soft law harmonizing instruments implemented by transgovernmental networks of cooperation; and, second, the domestic administrative instruments that adapt global requirements to particular jurisdictions.

INTRODUCTION

The financial system's actors operate in the dynamic reporting and compliance environment prompted by the aftermath of the global financial crisis of 2008 ("the Global Financial Crisis of 2008"). In the post-crisis years, global and domestic regulators have created a regulatory regime that necessitates the collection, analysis, and reporting of granular data in real-time or near-to-real-time.²

The Dodd-Frank Act (US),³ the Bank Recovery and Resolution Directive (EU),⁴ and the Basel Committee's "Principles for effective risk data aggregation and risk reporting" require⁵ financial institutions to collect, calculate, and report aggregated risk data from across the banking group.

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² Douglas W Arner, János Barberis & Ross P Buckley, "FinTech, RegTech, and the Reconceptualization of Financial Regulation" (2017) 37:3 Nw J Intl L & Bus 373.

³ Dodd-Frank Wall Street Reform and Consumer Protection Act, 12 USC §5301(2010).

⁴ Directive of the European Parliament and of the Council 2014/59/EU of 15 May 2014 establishing a framework for the recovery and resolution of credit institutions and investment firms and amending Council Directive 82/891/EEC, and Directives 2001/24/EC, 2002/47/EC, 2004/25/EC, 2005/56/EC, 2007/36/EC, 2011/35/EU, 2012/30/EU and 2013/36/EU, and Regulations (EU) No 1093/2010 and (EU) No 648/2012, of the European Parliament and of the Council, [2014] OJ, L 173/190.

⁵ The Basel Committee on Banking Supervision, Principles for Effective Risk Data Aggregation and Risk Reporting (2013), online: <<https://www.bis.org/publ/bcbs239.htm>>.

Stress testing and risk management procedures promulgated under the Basel III international regulatory framework for banks⁶ and the EU Directive on the taking-up and pursuit of the business of Insurance and Reinsurance⁷ require banks and insurance companies to model, analyze scenarios, and forecast a vast array of risks. Additionally, the Financial Action Task Force's Standards on Combating Money Laundering and the Financing of Terrorism & Proliferation⁸ require banks to monitor low-quality data generated by payment systems.

RegTech. To manage the growing pool of data, supervised financial institutions employ regulatory technology, or RegTech. RegTech promises to process large sets of data, generate reports for regulatory compliance and reporting, and utilize the same data for multiple regulatory ends.⁹ As data-laden instruments proliferate, global financial institutions benefit from data mining algorithms that recognize complex patterns, structure data, and create risk models.¹⁰ Transaction monitoring is improved by the real-time analytical capabilities of cloud analytics: "an integrated technology architecture that streams and fuses different data types at gigabyte to petabyte scale, powered by cloud computing power with advanced predictive analytical capabilities."¹¹

Potential. Using multiple media outlets, the financial and information technology sectors are promoting RegTech's "enormous potential to enable better compliance solutions"¹² and improve the functioning of the financial system. To date, the positive reaction to RegTech has also dominated the narrative of regulators, who have praised technology for offering "the prospect of continuous monitoring that would improve efficiency."¹³ For example, the UK Financial Conduct Authority's ("the FCA")

6 The Basel Committee on Banking Supervision, *Basel III: The Liquidity Coverage Ratio and liquidity risk monitoring tools* (2013), online: <<https://www.bis.org/publ/bcbs238.htm>>; The Basel Committee on Banking Supervision, *Basel III: the net stable funding ratio* (2014), online: <<https://www.bis.org/bcbs/publ/d295.htm>>

7 Directive of the European Parliament and of the Council 2009/138/EC of 25 November 2009 on the taking-up and pursuit of the business of Insurance and Reinsurance (Solvency II), [2009] OJ, L335/1.

8 The Financial Action Task Force, *International Standards on Combating Money Laundering and the Financing of Terrorism & Proliferation: the FATF Recommendations* (2012), online: <<http://www.fatf-gafi.org/publications/fatfrecommendations/documents/fatf-recommendations.html>>.

9 The Institute of International Finance, *RegTech in Financial Services: Technology Solutions for Compliance and Reporting* (2016) at 12, online: <<https://www.iif.com/publication/research-note/regtech-financial-services-solutions-compliance-and-reporting>>

10 Ross P Buckley et al, "The road to RegTech: the (astonishing) example of the European Union" (2020) 21:1 *Journal of Banking Regulation* 26–36; Dirk A Zetzsche et al, "The Future of Data-Driven Finance and RegTech: Lessons from EU Big Bang II" (2019) European Banking Institute Working Paper No 35

11 The Institute of International Finance, *supra* note 8 at 14.

12 *Ibid* at 1.

13 Arner, Barberis & Buckley, *supra* note 1 at 384.

technology implementation policy is “remarkable in its embrace of fluidity and agility.”¹⁴ Over a span of just several months, the FCA announced the innovation policy on its website, established its first partnerships with the IT sector, and signed several international cooperation agreements.¹⁵

Risks. However, the prevailing discourse on RegTech underestimates the potential negative effects of technology, such as the ability to cause harm and disrupt decision-making practises in organizations. Compounding these risks are the opacity, unaccountability, and bias of unregulated black-box algorithms used by RegTech. These algorithms search for correlations between the inputted data and the desired outcome and make a decision or, as Pedro Domingos explains, “in goes the data and the desired result and out comes the algorithm that turns one into the other.”¹⁶ This form of artificial intelligence is trained “by recursively evaluating the output of each algorithm against a desired result, allowing the machine to learn by making its own connections with the available data.”¹⁷

Machine learning raises a number of issues that require legal evaluation and scientific research. For example, how do we verify and validate decisions of black-box algorithms, ensure decision-making transparency, minimize potential bias, and increase accountability and safety? The answers to these questions depend on the computer scientists’ ability to understand and explain how these algorithms infer meanings. Meanwhile, in the absence of transparency and certainty, some regulators approach algorithms with caution and prudence. Depending on the objectives of pertinent regulations, this approach may include setting minimum standards of review and revision for algorithms, the duty of regulated industries to periodically disclose the use of algorithms to regulators, and the duty to perform ongoing monitoring of algorithms to ensure that they comply with the regulatory ends.¹⁸

This article suggests that, due to the fundamental importance of RegTech for the robustness of global finance, a globalized, prudential model of

¹⁴ Jo Ann S Barefoot, “Regulatory Innovation” (2016) 19:3 Fintech Law Report: E-Banking, Payments & Commerce in the Mobile World 1 at 2.

¹⁵ *Ibid* at 2-3.

¹⁶ Pedro Domingos, *The Master Algorithm: How the Quest for the Ultimate Learning Machine Will Remake Our World* (New York: Basic Books, 2015) at 6.

¹⁷ Kevin Petrasic, Benjamin Saul & Matthew Bornfreund, “The Emergence of AI RegTech Solutions for AML and Sanctions Compliance”, (25 April 2017), online: *White&Case* <<https://www.whitecase.com/publications/article/emergence-ai-regtech-solutions-aml-and-sanctions-compliance>>.

¹⁸ Joshua A Kroll et al, “Accountable Algorithms” (2016) 165 U Pa L Rev 633.

regulating RegTech's algorithms should be adopted. This model should be based on two facets of regulation. First, global networks of financial cooperation should adopt not only financial instruments, but also minimum technological standards that guide the implementation of financial norms across jurisdictions. Second, domestic regulators should promulgate guidelines and recommendations that adapt global requirements to suit the needs of particular jurisdictions. This prudential approach will not only foster innovation, but also allow those who are harmed by RegTech to hold accountable the responsible parties through domestic institutions. With these considerations in mind, Part I of this article will scrutinize global regulatory processes that inform the development of RegTech and will probe technology that is being developed to address the regulatory requirements. Part II will focus on certain dangerous features of algorithms. Finally, Part III will introduce a globalized model of regulation for RegTech and explain its benefits.

1. ORIGINS OF REGTECH

1.1. GLOBAL FINANCIAL REGULATORS

The emergence of global financial regulations is a part of the overwhelming tendency toward globalization: the process of intensification of global interconnectedness, in which people, capital, technology, and ideas transcend boundaries with increased speed and frequency.¹⁹ The interconnected world grants place to a plurality of actors, such as: states and their subdivisions, international organizations, informal networks of cooperation, private companies, and private-public alliances. These actors of globalization are contributing to the creation of multiple, and often clashing, legal or quasi-legal regimes that cannot be reduced to "rigidly territorialist or positivist visions of legal authority."²⁰ The past decades have witnessed the proliferation of convergent regulatory regimes in many domains of interdependence, such as: human rights, finance and banking, environment, health, and safety, law enforcement. These regimes have different pedigrees; while some were established by the treaties between states (the textbook example is the World Trade Organization), others were formed by arrangements

¹⁹ Michael Freeman, *Lloyd's Introduction to Jurisprudence*, 9th ed (London, UK: Sweet & Maxwell, 2014) at 1377.

²⁰ Paul Schiff Berman, *Global Legal Pluralism: A Jurisprudence of Law beyond Borders* (Cambridge, UK: Cambridge University Press, 2012) at 25.

between domestic officials responsible for specific areas of regulation²¹ (the International Organization of Securities Commissions and the Basel Committee on Banking Supervision) or by private or mixed public and private alliances (the Codex Alimentarius Commission and the Internet Corporation for Assigned Names and Numbers).²²

One such regime, the transgovernmental networks of financial cooperation, was created to counter the inadequacies of localized responses to contemporary challenges.²³ In the wake of the Global Financial Crisis of 2008, the realm of global finance felt the need for the unification of fragmented regulatory efforts. And yet, much of the post-crisis comparative research showed that regulators from major financial hubs were reluctant to adopt reporting and compliance regulations that could make their markets less attractive to investments and business operations.²⁴ In this context, the periodic meetings of domestic watchdogs under the auspices of transgovernmental networks of cooperation, such as the G20 and G7 summits, the Financial Stability Board, and the Basel Committee on Banking Supervision, were instrumental in mobilizing joint actions. The harmonized regulatory standards and practices promulgated by these entities structured what were otherwise uncoordinated domestic responses.

1.1.1. TRANSGOVERNMENTAL NETWORKS OF COOPERATION: AN OVERVIEW

This section offers an insight into the pedigree, structure, mechanisms of work, and common features of the following transgovernmental networks of cooperation: the Basel Committee on Banking Supervision; the Financial Stability Board; and the Financial Action Task Force. It seeks to demonstrate that these entities have accumulated much unrecognized global jurisdiction and that the exercise of this jurisdiction fostered the development of a compliance infrastructure that is known today as RegTech. The discussion starts with one of the oldest and most influential networks - the Basel Committee on Banking Supervision - and then

²¹ Richard B Stewart, "U.S. Administrative Law: A Model for Global Administrative Law?" (2005) 68 Law & Contemp Probs 63 at 65.

²² Benedict Kingsbury, Nico Krisch & Richard B. Stewart, "The Emergence of Global Administrative Law." (2005) 68:3-4 Law & Contemp Probs 15 at 22.

²³ Stewart, *supra* note 20 at 64.

²⁴ The International Bar Association's Task Force on the Financial Crisis, *A survey of current regulatory trends* (2010) at 6, online: <www.ibanet.org/LPD/Task_Force_on_the_Financial_Crisis.aspx>.

tackles two cooperation forums that were created later: the Financial Stability Board and the Financial Action Task Force.²⁵

(a) The Basel Committee on Banking Supervision

The Basel Committee on Banking Supervision (“the Basel Committee,” “the Committee,” “BCBS”) was established by the central bank governors of the Group of Ten countries at the end of 1974, in the aftermath of several international bank failures.²⁶ Presently, the Basel Committee is comprised of forty-five members from twenty-eight jurisdictions, representing the central banks and various authorities responsible for banking supervision. The goal of the Committee’s work is “to enhance financial stability by improving the quality of banking supervision worldwide.”²⁷ In order to achieve this goal, it provides “a forum for regular cooperation between its member countries on banking supervisory matters.”²⁸ Throughout the course of its work, the Basel Committee has adopted a series of highly influential global frameworks on capital adequacy for banks that are commonly known as Basel I, II and III. These frameworks lay the foundation for the harmonization of national laws and regulations and for their coordinated enforcement among the member states.²⁹

Due to the absence of any formal supranational authority, the decisions of the Committee are not legally binding on its members. In other words, the Basel Committee can only rely on its members’ good faith commitments to achieve its mandate.³⁰ At the same time, lurking behind this statement is the Committee’s expectation that its standards will be fully implemented “by BCBS members and their internationally active banks”³¹ through incorporation of these standards into local regulatory frameworks “within the pre-defined time frame established by the Committee.”³² Indeed, the opinions expressed by some participants of the

²⁵ David Zaring, “Informal Procedure, Hard and Soft, in International Administration” (2004) 5 *Chic J Intl L* 547 at 551.

²⁶ *Ibid* at 555.

²⁷ The Bank for International Settlements, “History of the Basel Committee”, online: <<https://www.bis.org/bcbs/history.htm>>.

²⁸ *Ibid*.

²⁹ Daniel K Tarullo, “Law and Governance in a Global Economy” (1999) 93 *Proceedings of the Annual Meeting-American Society of International Law* 105 at 108.

³⁰ The Basel Committee on Banking Supervision, *The Basel Committee Charter* (2016), s 3, online: <<http://www.bis.org/bcbs/charter.htm>>.

³¹ *Ibid*, s 12.

³² *Ibid*, s 5.

Committee's meetings suggest that they perceive the agreements reached as legally binding.³³

(b) The Financial Stability Board

In April 2009, the heads of states and governments of the G20 established the Financial Stability Board ("the FSB"), the successor to the Financial Stability Forum. Its mandate is similar to that of the Basel Committee. It "coordinate[s] at the international level the work of national financial authorities and international standard setting boards"³⁴ and "develop[s] and promote[s] the implementation of effective regulatory, supervisory and other financial sector policies."³⁵ To successfully carry out its mandate, the Financial Stability Board brings together the following groups of entities:

- (a) Authorities from jurisdictions responsible for maintaining financial stability, such as ministries of finance, central banks, and supervisory and regulatory authorities;
- (b) International financial institutions; and
- (c) International standard setting, regulatory, supervisory and central bank bodies.³⁶

The members of the FSB include: senior policymakers from the G20 countries, Hong Kong, Singapore, Spain, and Switzerland, standard-setters (the International Association of Insurance Supervisors, the International Accounting Standards Board, the International Organization of Securities Commissions), and other transgovernmental networks (the Basel Committee, the Committee on the Global Financial System). Akin to the Basel Committee, the FSB adopts decisions that are not legally binding on its members and that are enforced through informal peer pressure.

(c) The Financial Action Task Force

The Financial Action Task Force on Money Laundering ("FATF") was created by the G-7 in Paris in 1989. Currently, the organization comprises thirty-five member jurisdictions represented by various ministries, financial

³³ Zaring, *supra* note 24 at 558.

³⁴ The Financial Stability Board, online: *Standard-Setting Bodies in the Compendium* <<http://www.fsb.org/what-we-do/about-the-compendium-of-standards/wssb/>>.

³⁵ *Ibid.*

³⁶ The Financial Stability Board, *The Financial Stability Board Charter* (2012), s 5.

regulatory authorities, and law enforcement agencies, and includes two regional organizations – the European Commission and the Gulf Cooperation Council. The FATF is a standard-setting entity. Its “International Standards on Combating Money Laundering and the Financing of Terrorism & Proliferation”³⁷ are implemented by countries “through measures adapted to their particular circumstances.”³⁸ The FATF’s decisions are not legally binding and it operates by generating political will amongst its members.

1.1.2. Common Features of Transgovernmental Networks

A survey of constitutional documents, organizational structures, and methods of work of transgovernmental networks suggests that they display some common qualities:³⁹

i. Membership. These networks are comprised of the representatives of regulators. The officials who attend the meetings may not be professional diplomats, and often “they are banking supervisors who began their careers working on ordinary matters of domestic supervision.”⁴⁰ For example, the Basel Committee’s meetings are often attended by “head[s] of banking supervision, head[s] of banking policy/regulation, central bank deputy governor[s], head[s] of financial stability department[s] or equivalent.” The decisions reached at these meetings do not bind the states; it is sufficient that the participants “have the authority to commit their institutions.”⁴¹

ii. Constitution. These networks are not created pursuant to international law. Their founding documents tend to be less specific, detailed, and constraining, than treaties that create international organizations. For example, the FSB’s Charter directly states that it “is not intended to create any legal rights or obligations”⁴² for the members of the Board. The Basel Committee’s Charter contains similar provisions.⁴³

³⁷ The Financial Action Task Force, *supra* note 7.

³⁸ The Financial Action Task Force, online: *FATF Recommendations* <<http://www.fatf-gafi.org/publications/fatfrecommendations/documents/fatf-recommendations.html>>.

³⁹ Zaring, *supra* note 24 at 569-572 (The list of shared characteristics presented in this Article draws from Zaring’s list).

⁴⁰ *Ibid* at 569.

⁴¹ The Basel Committee on Banking Supervision, *supra* note 29, s 8.3.

⁴² The Financial Stability Board, *supra* note 35, s 3.

⁴³ The Basel Committee on Banking Supervision, *supra* note 29, s 3.

iii. Enforcement of Decisions. Due to their informal constitution, these regulatory networks cannot coerce their members into implementing the decisions reached at the meetings. Thus, the domestic implementation of the networks' decisions "depends on and can generally be accomplished by the initiative of the relevant participating national officials, often through the exercise of their existing administrative authority."⁴⁴

iv. Decision-making Process. Since formal international organizations frequently "provide a forum for informal networking among domestic regulatory officials,"⁴⁵ it is difficult to track when transgovernmental deliberations occur and how the decisions are made. In order to increase the legitimacy of the final documents, the networks introduced a self-imposed obligation of soliciting comments on proposed measures from interested parties. For instance, the Basel Committee's Charter indicates that input from all relevant stakeholders is compulsory for standards and is strongly recommended for other types of promulgated documents, such as guidelines and sound practices.⁴⁶ As a rule, responses to public consultations are published online. Similarly, the FSB demonstrates a limited commitment to public accountability by publishing its reports on its website and by holding public consultations on policy proposals.

Some authors suggest that, due to the aforementioned features, transgovernmental networks of cooperation offer an effective alternative to traditional, command-and-control systems of regulation.⁴⁷ Their procedural agility and organizational fluidity allow them to quickly respond to global regulatory challenges. Their institutional design promotes greater cooperation and consensus amongst the members. Their members are experts who share similar goals and values and tend to agree on the common framework to achieve their objectives.

This is not to imply that transgovernmental cooperation is the perfect model of regulation of the globalized financial market. Since globalization undermined the normativity imposed by states, various domestic

⁴⁴ Stewart, *supra* note 20 at 68.

⁴⁵ *Ibid* at 66.

⁴⁶ The Basel Committee on Banking Supervision, *supra* note 29, s 17.

⁴⁷ See e.g. Ross P Buckley, "Reconceptualizing the Regulation of Global Finance" (2016) 36:2 Oxf J Leg Stud 242 (commenting that the Bretton Woods financial framework and the World Bank Group institutions were designed to "promote international trade but keep finance essentially national" at 244); Dimitris N Chorafas, *Financial Cycles: Sovereigns, Bankers, and Stress Tests* (New York: Palgrave Macmillan, 2015) (arguing that "major supranational banks, such as the European Central Bank, cannot single-handedly regulate thousands of banks across Europe due to purely practical limitations, such as jurisdictional variations in "accounting, auditing, and management rules" at 30).

procedures that ensure “constitutionally valid...identification of public priorities and policy goals”⁴⁸ are absent at the global level. Voluminous research demonstrates that these transgovernmental networks have been criticized for their opacity and lack of legitimacy.⁴⁹ Although a full-fledged democratic review of the decisions made by these transgovernmental networks would be desirable, it would be difficult to implement in practice. For example, the US Congress requires reports from competent domestic agencies prior to signing off on the recommendations of the Basel Committee but, due to practical limitations, Congress’s interventions are at best fragmented.⁵⁰ Such restrictions as a lack of time, resources, and expertise are commonly invoked by the legislative branch to justify delegated legislation and administrative rulemaking.⁵¹ However, a comprehensive analysis of the transgovernmental legitimacy is beyond the scope of this article, suffice it to say that the scholars of global administrative law have studied this issue thoroughly and suggested various bottom-up and top-down approaches to boost the accountability of transgovernmental networks of cooperation. These approaches include public consultations, notice and comment procedures, intra-institutional dialogue, cross-institutional reviews, and judicial review of global administrative actions.⁵²

1.2. Technological Infrastructure for Compliance With Financial Regulations

The dearth of legitimacy and accountability does not preclude these transgovernmental networks of cooperation from exercising considerable influence over the regulation of global finance. In fact, in the aftermath of the Global Financial Crisis of 2008, their rule-making activity proliferated. Voluminous soft-law instruments, such as standards, guidelines, and best practices, created a solid foundation for a global system of financial regulation. Financial institutions are subject to persistent regulatory scrutiny of their capital and funding levels, investment and lending activities, and managers’ conduct.⁵³ Global regulators and their domestic

48 Kenneth A Bamberger, “Technologies of Compliance: Risk and Regulation in a Digital Age” (2010) 88:4 Tex L Rev 669 at 724.

49 See e.g. Kingsbury, Krisch & Stewart, *supra* note 21; Stewart, *supra* note 20; Richard B Stewart, “Remedying Disregard in Global Regulatory Governance: Accountability, Participation, and Responsiveness” (2014) 108:2 Am J Intl L 211.

50 Kingsbury, Krisch & Stewart, *supra* note 21 at 33.

51 A W Bradley, *Constitutional and Administrative Law*, 16th ed (Harlow, UK: Pearson, 2015) at 582–583.

52 Kingsbury, Krisch & Stewart, *supra* note 21 at 27.

53 Lawrence G Baxter “Adaptive Financial Regulation and Regtech: A Concept Article on Realistic Protection for Victims of Bank Failures” (2016) 66:3 Duke LJ 567 at 580-581.

counterparts require financial institutions to report granular data systematically and frequently, conduct periodic stress tests, and monitor transactions in real-time.⁵⁴ This approach to regulation, also known as “safety-and-soundness” supervision, requires that financial institutions utilize regulatory technology, or RegTech.⁵⁵ The word “RegTech” describes nothing in particular, rather it refers to a host of arrangements, such as:

- Data mining algorithms and predictive analytics technology that can aggregate data, identify patterns and organize data into consumable information that can be used for reporting and modelling institutions hypothetical risks;
- Algorithms that monitor low quality transaction metadata produced by payment systems to recognize money laundering and terrorism financing;
- Automated interpretation of qualitative information conveying the behaviour of individuals, such as e-mails and spoken word.⁵⁶

Financial sector, IT companies and regulators maintain that using technology for regulatory compliance improves the functioning of the financial system⁵⁷ and offers an enormous potential for “increasing efficiency, [and] profitability.” The following paragraphs explore in more detail how RegTech furthers the goals of efficient reporting and compliance.

1.2.1. Monitoring, Reporting, and Blocking of Transactions

Recommendation 10 of the FATF’s “International Standards on Combating Money Laundering and the Financing of Terrorism & Proliferation,” (“the Standards”) imposes on financial institutions an obligation to conduct Customer Due Diligence (“CDD”) when:

- (i) establishing business relations;

⁵⁴ The Institute of International Finance, *supra* note 8 at 6.

⁵⁵ See Kevin Petrasic et al, “Algorithms and bias: What lenders need to know”, (20 January 2017), online: [White&Case </www.whitecase.com/publications/insight/algorithms-and-bias-what-lenders-need-know>](http://www.whitecase.com/publications/insight/algorithms-and-bias-what-lenders-need-know).

⁵⁶ The Institute of International Finance, *supra* note 8 at 12.

⁵⁷ See e.g. the Institute of International Finance, *supra* note 8; The United Kingdom, Financial Conduct Authority, Regulatory sandbox (2015), online: <https://www.fca.org.uk/firms/regulatory-sandbox>; Deloitte, RegTech is the new FinTech: How agile regulatory technology is helping firms better understand and manage their risks (2016).

⁵⁸ The Institute of International Finance, *supra* note 8 at 1.

- (ii) carrying out occasional transactions:
 - (i) above the applicable designated threshold (USD/EUR 15,000); or ...
 - (iii) there is a suspicion of money laundering or terrorist financing; or
 - (iv) the financial institution has doubts about the veracity or adequacy of previously obtained customer identification data.

Know your customer (“KYC”) procedures that are performed by financial institutions as a part of the CDD process involve: identifying potentially dangerous clients through the analysis of data generated from public and private information channels; conducting post-facto checks on transactions based on their embedded metadata; and monitoring, flagging, blocking, and reporting of illegal transactions in real or close to real-time.⁵⁹

For some time now, financial institutions have been using instructional algorithms to meet the compliance requirements imposed by the Standards.⁶⁰ The textbook definition of an instructional algorithm states that it is a sequence of precise directions telling a computer how to perform a task.⁶¹ According to Pedro Domingos, “the data goes into the computer, the algorithm does what it will with it, and out comes the result.”⁶² For example, the instructional algorithms used for anti-money laundering compliance “flag cash transactions over a certain currency amount, block transactions to certain countries, use customer data to select accounts for additional monitoring, and categorize merchant accounts based on prior transactions.”⁶³ The inputs, such as the currency amount, the list of countries, and customers’ names, are fed into a computer by a financial institution’s employee, and the outputs of the computer analysis (such as flagged or blocked transactions) are then reviewed by compliance officers for accuracy.

Machine learning algorithms transform the way financial institutions approach reporting and compliance requirements. These algorithms search for correlations between the inputted data and the inputted desired outcome and make a decision or, as Domingos explains: “in goes

⁵⁹ The Institute of International Finance, *supra* note 8 at 9.

⁶⁰ Petrasic, Saul & Bornfreund, *supra* note 16.

⁶¹ Domingos, *supra* note 15 at 1.

⁶² *Ibid* at 6.

⁶³ Petrasic, Saul & Bornfreund, *supra* note 16.

the data and the desired result and out comes the algorithm that turns one into the other.”⁶⁴ This form of artificial intelligence is trained “by recursively evaluating the output of each algorithm against a desired result, allowing the machine to learn by making its own connections with the available data.”⁶⁵

Thus, rather than relying on instructional algorithms and human resources for data analysis, financial institutions are now employing machine learning algorithms that can learn to perform a task well and perform it on their own.⁶⁶

A comparison of the features of machine learning and instructional algorithms is presented below.

Table 1. Instructional Algorithms v. Machine Learning Algorithms.

Instructional Algorithms	Machine Learning Algorithms
Require developers to establish rules that identify potentially criminal transactions.	Do not require developers to establish rules that identify potentially criminal transactions.
<p>An algorithm can:</p> <ul style="list-style-type: none"> –Flag cash transactions over a certain currency amount; –Block transactions to certain countries; –Use customer data to select accounts for additional monitoring; and –Categorize merchant accounts based on prior transactions. 	<p>The system is trained to identify transactions by analyzing the following information:</p> <ul style="list-style-type: none"> –Where a customer opens an account relative to their home address; –What time of day an account was opened; –Duration between transactions; –Whether a customer uses a mobile telephone; etc.
Requires a significant amount of bank resources to review the transactions that are flagged or blocked to weed out false positives.	The accuracy of such a system would be significantly higher, and the resources needed to monitor the output would be significantly lower.

⁶⁴ Domingos, *supra* note 15 at 6.

⁶⁵ Petrasic, Saul & Bornfreund, *supra* note 16.

⁶⁶ Andrew Tutt, “An FDA for Algorithms” (2017) 69 Admin L Rev 83 at 94.

Unable to adapt to changes in criminal behaviour intended to evade detection.

Continually improves its accuracy automatically.

The comparison draws from Kevin Petrasic, Benjamin Saul & Matthew Bornfreund, “The Emergence of AI RegTech Solutions for AML and Sanctions Compliance,” (25 April 2017), online: *White&Case* <<https://www.whitecase.com/publications/article/emergence-ai-regtech-solutions-aml-and-sanctions-compliance>>.

1.2.2. Risk Data Aggregation and Management, Modelling, and Stress Testing

The unsettling experience of the Global Financial Crisis of 2008 taught regulators to mistrust the risk monitoring and risk prevention infrastructures of individual financial institutions. The prudential approach to risk management required the adoption of complex rules that “set capital, leverage and liquidity at levels sufficient to protect financial stability, all backed up with periodic reviews and ‘stress tests’.”⁶⁷ A number of documents adopted by the Basel Committee require financial institutions to conduct automated aggregation and reporting of risk data and liquidity risk monitoring. The Basel Committee’s 2014 “Standards – Supervisory Framework for Measuring and Controlling Large Exposures” instruct all internationally active banks to evaluate and control liabilities to their counterparties “across their books and operations.”⁶⁸ In addition, the recovery and resolution planning regime under the FSB’s “Key Attributes of Effective Resolution” requires certain financial institutions to report their “main counterparty exposures and institutional structure.”⁶⁹ These global requirements correspond to the provisions of one of the most significant laws adopted following the Global Financial Crisis of 2008 - the US Dodd-Frank Act of 2010.

Modelling and stress testing are based on voluminous and low-quality data that should be “structured, well defined, accurate and complete.”⁷⁰ In order to model existing, potential, and hypothetical risks, this data “must

⁶⁷ Arner, Barberis & Buckley, *supra* note 1 at 396.

⁶⁸ The Institute of International Finance, *supra* note 8 at 7-8.

⁶⁹ *Ibid* at 7.

⁷⁰ *Ibid* at 6.

constantly be enhanced through automated ingestion.”⁷¹ Analysis of numerous data sources for reporting, modelling, and stress testing require using powerful data mining and machine learning algorithms that are developed by the risk management sector of RegTech. In addition, cloud computing RegTech facilitates interconnectivity between different branches of a financial institution, thereby enabling the production of shared knowledge “that could provide a service for different subsidiaries within a single [financial institution], such as a central data repository on the cloud.”⁷² Data mining algorithms based on machine learning can help organize and analyze large volumes of unstructured data on the cloud.

2. Criticism Of Technology

Based on the aforementioned descriptions, it may appear that RegTech is merely a constellation of sophisticated tools that help financial institutions and regulators achieve their reporting and compliance goals. Indeed, “a tool” or “an instrument” metaphor has been frequently used in the parlance of regulators and financial consultancies; but this discourse is only a half-truth. As extensive research demonstrates, normative and practical issues arise from the convergence of technology and law into one phenomenon.

First of all, the regulation of RegTech is susceptible to the phenomenon of regulatory capture. Regulatory capture occurs when financial regulators prioritize the interests of regulated entities over broader public interest.⁷³ When it comes to regulating complex technology, the decision-making process is often dominated by experts who belong to insulated professional networks, or epistemic communities.⁷⁴ These expert communities are valued by regulators for their capacity to generate knowledge about a complex phenomenon and convert that knowledge into laws, regulations, and public policy. Since many members of these expert networks work for big corporations, epistemic communities foster the development of technocorporatism: that is, the convergence of corporate technical expertise and political authority. As a result, the interests of corporations have a much greater sway over the regulation of

⁷¹ *Ibid* at 9.

⁷² *Ibid* at 12.

⁷³ Eva Micheler & Anna Whaley, “Regulatory Technology: Replacing Law with Computer Code” (2020) 21 Eur Bus Org L Rev 349 at 363 [footnote omitted].

⁷⁴ Peter Haas & Ernst Haas, “Learning to Learn: Improving International Governance” (1995) 1:3 Global Governance 255 at 260.

technology than any other considerations.⁷⁵ The results of the FCA's recently held public consultation on innovations in the financial sector corroborate this troubling trend. Two stakeholders - financial institutions and technology companies - dominated the reform discussions with the regulator.⁷⁶ Regrettably, the influence of partisan interests in these discussions with regulators forecloses a more holistic understanding of the social effects of algorithms.⁷⁷

When thousands of decisions need to be made on a daily basis, often in real-time or close to real-time, financial institutions tend to prioritize algorithms' efficiency.⁷⁸ The code of an instructional algorithm is valued for its ability to determine outputs by acting upon restricted sets of inputted data.⁷⁹ However, algorithms are not immune from making mistakes that go unnoticed without human intervention.⁸⁰ Luckily, most instructional algorithms are controllable by the programmers, which means that their code can be corrected to prevent the dissemination of unfair and erroneous decisions. Machine learning algorithms, on the other hand, are harder to control because they learn through the process of data analysis by making their own connections and inferences.

Additionally, algorithms are bemoaned for the opacity that occurs when a recipient of an algorithm's output does not understand how or why a decision has been inferred from the inputted data. In 2018, the EU's General Data Protection Regulation ("GDPR")⁸¹ made an attempt to introduce a "right to explanation" of decisions made by artificially intelligent systems. However, commentators point out that both *de facto* and *de jure*, such a right does not exist.⁸² In part, this is due to the fact that the enforcement of this right encounters practical difficulties. Machine learning algorithms that make predictions based on input-output-result correlations are not concerned

75 E.J. Woodhouse, "(Re)Constructing Technological Society by Taking Social Construction Even More Seriously" (2005) 19:2-3 Social Epistemology 199 at 206.

76 The Financial Conduct Authority, Feedback Statement: Call for Input on Supporting the Development and Adopters of RegTech (July 2016), online: <<https://www.fca.org.uk/publication/feedback/fs-16-04.pdf>>.

77 Kate Crawford, "Can an Algorithm Be Agonistic? Ten Scenes from Life in Calculated Publics" (2016) 41:1 Science, Technology, & Human Values 77 at 79.

78 Cathy O'Neil, Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy (New York: Crown, 2016) at 95.

79 Antoinette Rouvroy & Thomas Berns, "Gouvernementalité algorithmique et perspectives d'émancipation: Le disparate comme condition d'individuation par la relation?" (2013) 177:1 Réseaux 163 at 169 [translated by the author].

80 Bamberger, *supra* note 47 at 722.

81 Regulation 2016/679 of the European Parliament and of the Council of 27 April 2016 on the Protection of Natural Persons with Regard to the Processing of Personal Data and on the Free Movement of Such Data, and Repealing Directive 95/46/EC (General Data Protection Regulation), [2016] OJ, L 119/1.

82 Sandra Wachter, Brent Mittelstadt & Luciano Floridi, "Why a Right to Explanation of Automated Decision-Making Does Not Exist in the General Data Protection Regulation" (2017) 7:2 Int Data Priv Law 76.

with giving explanations. Such “correlations stand for a probability that things will turn out the same in the future”⁸³ but they do not explain the reasons for a prediction. Several scientific models are currently being developed to help explain the significance of inputted data for an algorithm’s decision. One model quantifies the influence of inputs in systems that process personal information; it uses an algorithm to measure “the degree of influence of input variables on outputs, given black-box access to a trained prediction algorithm.”⁸⁴ This general metric model can be tailored to increase the transparency of decision-making in healthcare, education, predictive policing, and other sectors that use personal information to aid in decision-making. However, these metrics cannot be applied to inputs without clear semantics, such as “image or speech recognition, and automated video surveillance.”⁸⁵

3. Rethinking Regtech And Algorithms: A Globalized Approach To Financial Innovation

In light of algorithms’ intrinsic risks, a prevailing approach to RegTech places the duty to ensure safety of algorithms on the regulated industry. In broad strokes, current regulation of RegTech’s algorithms is based on a two-fold process: (1) determining policy objectives of regulations; and (2) aligning algorithms with the regulatory ends through such mechanisms as continuous monitoring, supervision, static and dynamic analysis, purpose specifications.⁸⁶ The manifestations of this approach are found in the instruments adopted by some domestic watchdogs. For example, the Canadian Office of the Superintendent of Financial Institutions, a federal agency responsible for implementing the Basel Committee’s decisions, demands that federally regulated financial institutions periodically review their margin models “in light of developments in...modelling technologies” and enhance their models to ensure that they meet the requirements established by the regulator.⁸⁷

Another example of a prudential approach comes from the European Union, where the European Commission adopted new rules revising the

83 Mireille Hildebrandt & Serge Gutwirth, *Profiling the European Citizen: Cross-Disciplinary Perspectives* (New York: Springer Science & Business Media, 2008) at 18.

84 Bryce Goodman & Seth Flaxman, “European Union Regulations on Algorithmic Decision Making and a ‘Right to Explanation’” (2017) 38:3 *AI Mag* 50 at 56.

85 Anupam Datta, Shayak Sen & Yair Zick, “Algorithmic Transparency via Quantitative Input Influence” in Tania Cerquitelli, Daniele Quercia & Frank Pasquale, eds, *Transparent Data Mining for Big and Small Data* (Cham: Springer International Publishing, 2017) 71 at 92.

86 Kroll et al, *supra* note 17.

87 Canada, Office of the Superintendent of Financial Institutions, *Margin Requirements for Non-Centrally Cleared Derivatives* (2017), s 3.2.3.

EU's *Markets in Financial Instruments Directive* ("MiFID II") framework.⁸⁸ MiFID II introduces quality and resilience requirements for the trading systems of investment firms that engage in algorithmic trading. Such firms "shall have in place effective systems and risk controls," that must be "resilient and have sufficient capacity," and "fully tested and properly monitored."⁸⁹ The Commission's Delegated Regulation with regard to regulatory technical standards for investment firms⁹⁰ requires firms to implement internal mechanisms, governance arrangements, preliminary tests and stress tests, and self-assessments to ensure that their algorithms meet the necessary levels of accountability and transparency.

3.1. The Case Of The Fca's Regulatory Sandbox

The prudential approach to innovation reached its peak in 2016, when the FCA announced the establishment of its first technological accelerator called a "regulatory sandbox."⁹¹ (The Financial Conduct Authority 2015). The term "sandbox" is borrowed from the IT sector, where it "represents a virtual environment to test in isolation a new process or software."⁹² Sandbox testing of new technology resembles clinical trials. First, several potential consumers are selected to test new applications and determine their feasibility and safety. Then, based on the results of a sandbox testing and other information provided by a sandbox applicant, the regulator determines whether the technology is ready to be released in the market. According to Christopher Woolard,⁹³ to encourage companies to participate in its regulatory sandbox, the FCA introduced several flexible procedures that mitigate the regulatory requirements during the testing stage:

i. Tailored Authorizations. If, upon the preliminary examination of a sandbox application, the authority determines that an innovation might be beneficial to the consumers, it will issue "testing parameters and

88 Directive 2014/65/EU, of the European Parliament and of the Council of 15 May 2014 on markets in financial instruments and amending Directive 2002/92/EC and Directive 2011/61/EU, 2014 O.J. (L 173) 349.

89 *Ibid*, art. 17(1).

90 Commission's Delegated Regulation (EU) 2017/589 of 19 July 2016 supplementing Directive 2014/65/EU of the European Parliament and of the Council with regard to regulatory technical standards specifying the organisational requirements of investment firms engaged in algorithmic trading.

91 The Financial Conduct Authority, *supra* note 57.

92 Arner, Barberis & Buckley, *supra* note 1 at 410.

93 Christopher Woolard, "Speech by Christopher Woolard, FCA Director of Strategy and Competition" (Speech delivered at the Innovate Finance Global Summit 11 April 2016), online: <<https://www.fca.org.uk/news/speeches/innovate-finance-global-summit>>.

customer safeguards”⁹⁴ that it deems reasonable for the tested technology, firms, and customers participating in the testing process. In case of a successful testing, a firm must apply for additional regulatory authorizations.

ii. Legal Guidance and Statutory Interpretations. Since the financial sector is a highly regulated environment, where “many rules...pre-date smartphones, let alone blockchain or biometric identifiers,”⁹⁵ the FCA will provide individual legal guidance to participating companies on a case-by-case basis.

iii. Waivers. Although the FCA cannot modify the domestic statutory requirements, it can waive and modify its own rules that “have become unduly burdensome or are not achieving their objectives.”⁹⁶

iv. No Enforcement Action Letters. No enforcement action letters can be issued by the FCA in those instances when the authority, at its own discretion, determines that individual guidance or waivers do not apply, but, nevertheless, believes that ‘the safe space’ is warranted “in light of the particular circumstances and characteristics”⁹⁷ of the sandbox test. These letters apply only for the duration of the test and only to the matters within the authority’s jurisdiction.

The UK-born prudential approach has become the mainstay of innovation in other jurisdictions. For instance, the Canadian Securities Administrators encourage provincial regulators to consider applications for time-limited registrations from innovative businesses that then may be permitted to test their products and services throughout the country. As part of this process, local securities regulators have been invited to monitor the sandbox process, provide guidance on the application of current laws and regulations, and otherwise support potential innovators. Business models eligible to participate in provincial regulatory sandboxes include: artificial intelligence for trades or recommendations, cryptocurrency or distributed ledger technology-based ventures, and compliance support services.⁹⁸

⁹⁴ *Ibid.*

⁹⁵ *Ibid.*

⁹⁶ *Ibid.*

⁹⁷ *Ibid.*

⁹⁸ The Canadian Securities Administrators, “The Canadian Securities Administrators Launches a Regulatory Sandbox Initiative” 23 February 2017, online: <<http://www.csa-acvm.ca/aboutcsa.aspx?id=1555>>.

Similar initiatives have also been implemented in Australia and Singapore.⁹⁹

3.2. Toward The Global Model Of Regulation Of Regtech

The increase of domestic sandbox initiatives encourages transgovernmental cooperation between regulators. Frequently, these partnerships are established through bilateral agreements under which “officials may pool information and discuss and coordinate regulatory policies and enforcement practises.”¹⁰⁰ Oftentimes, RegTech cooperation is introduced as part of a broader cooperation framework. The FCA and the Australian Securities and Investments Commission (“ASIC”) were the first regulators to sign the cooperation agreement “to make it potentially easier for innovative firms to access new markets, by providing information to one another.”¹⁰¹ The ASIC has also entered into similar cooperation agreements with Kenya, Singapore, the UK, and the Canadian province of Ontario. These agreements are supposed to “help break down barriers to entry by enabling ASIC to refer fintech start-up businesses to international regulators to... receive informal assistance on the regulatory environment they may face.”¹⁰² (the Australian Securities and Investments Commission, n.d.). Potentially, under this regime, RegTech developed in a foreign country could be accepted as “equivalent to or compatible” with domestically developed technology.¹⁰³

With the growth of technology-driven reporting and compliance, the number of transgovernmental agreements for the provision of informal assistance is likely to multiply. Some commentators expect that in the near future regulators around the world will create regulatory regimes that promote further harmonization of technological infrastructure.¹⁰⁴ One of the first attempts to boost global regulatory cooperation regarding RegTech was recently made by the Basel Committee. The Committee

99 The Australian Securities and Investments Commission, *Further measures to facilitate innovation in financial services* (2016), online: <<http://asic.gov.au/regulatory-resources/find-a-document/consultation-papers/cp-260-further-measures-to-facilitate-innovation-in-financial-services/>>; The Monetary Authority of Singapore, *Response to feedback received – FinTech Regulatory Sandbox Guidelines* (2016).

100 Stewart, *supra* note 20 at 65.

101 Woolard, *supra* note 96.

102 The Australian Securities and Investments Commission, “International Cooperation and Referrals”, online: <<http://asic.gov.au/for-business/your-business/innovation-hub/international-cooperation-and-referrals/>>;

103 Stewart, *supra* note 20 at 65.

104 Arner, Barberis & Buckley, *supra* note 1.

released “Sound Practices: Implications of fintech developments for banks and bank supervisors,”¹⁰⁵ which encourages financial institutions and domestic regulators to implement RegTech for effective compliance with the regulatory requirements and explains why the regulators and the regulated industries will benefit from using innovative technology. The goal of the Committee’s sound practices is to promote consistency between distinct approaches to regulatory supervision and to create a basis for a more profound regulatory cooperation.¹⁰⁶

The harmonization of data-laden financial instruments may provide an additional impetus for the development of global technological infrastructures. A recent global survey of more than 250 experts and leaders of financial institutions indicated that inconsistent regulations across different nations cost financial institutions from five to ten percent of their annual revenue.¹⁰⁷ Against this backdrop, it is reasonable to expect that the near future will see the coming of age of ambitious plans to harmonize financial regulations, particularly, by way of “developing common compliance tagging and reporting standards across multiple jurisdictions.”¹⁰⁸

Because the enforcement of global financial instruments depends on technological infrastructure, the transgovernmental networks should embrace the need for prudential regulation of RegTech. Soft law mechanisms, such as guidance, best-practices, and codes of conduct, that are already familiar to transgovernmental networks of cooperation offer a solid foundation toward building a globalized, prudential approach to regulation of algorithms. There are several reasons why the harmonization of requirements by transgovernmental networks of cooperation may be an effective mechanism for ensuring the responsible use of technology by financial institutions:

First, the representatives of the member states who participate in the transgovernmental meetings and negotiate global financial instruments usually implement them at the national level. Therefore, any potential enforcement mechanisms are often taken into consideration during the

105 The Basel Committee on Banking Supervision, *Sound Practices: Implications of fintech developments for banks and bank supervisors* (Bank for International Settlements, 2017).

106 The Basel Committee on Banking Supervision, *supra* note 29, s 14.

107 The International Federation of Accountants, “Patchwork Financial Regulation a \$780 Billion Drag on the Economy” (2018), online: <<https://www.ifac.org/news-events/2018-04/patchwork-financial-regulation-780-billion-drag-economy>>.

108 Arner, Barberis & Buckley, *supra* note 1 at 407.

negotiation stage.¹⁰⁹ In order to achieve a smooth implementation of soft-law instruments, the members of transgovernmental networks may stipulate harmonized standards not only for financial regulations, but also for the technological infrastructure that ensures compliance with such regulations. These standards may require that reporting and compliance algorithms meet some review and revision thresholds¹¹⁰. These rules may be based on the aforementioned models of prudential regulation that have already been implemented in several countries, including: the duty to establish governance and monitoring structures, the duty to conduct stress tests and preliminary testing, and the duty to upgrade the technological infrastructure and report failures and disruptions.

Second, transgovernmental networks are equipped with procedural mechanisms that ensure the accountability of their members to the cooperation regime. They promulgate rule-implementation procedures and set implementation deadlines that should be met by each member of the network. For example, the Basel Committee engages in “monitoring the implementation of BCBS standards in member countries and beyond with the purpose of ensuring their timely, consistent and effective implementation and contributing to a ‘level playing field’ among internationally active banks.”¹¹¹ Similarly, the Financial Stability Board “promote[s] member jurisdictions’ implementation of agreed commitments, standards and policy recommendations through monitoring of implementation, peer review and disclosure.”¹¹² These procedural mechanisms can be expanded to ensure due compliance of regulated industries with global RegTech standards. They may establish technology implementation deadlines and cross-jurisdictional peer review of domestic RegTech implementation practises.

As was mentioned in Part I above, global networks of cooperation are no less susceptible to regulatory capture than local financial regulators. Big corporations and special interest groups can have a significant impact on development of international policy.¹¹³ Therefore, the question remains how to protect global decision-making about the regulation of algorithms

109 Dieter Kerwer, “Rules that Many Use: Standards and Global Regulation” (2005) 18:4 *Governance: An International Journal of Policy, Administration, and Institutions* 611 at 626.

110 Danielle Keats Citron & Frank Pasquale, “The Scored Society: Due Process for Automated Predictions” (2014) 89:1 *Wash L Rev* 1 at 19.

111 The Basel Committee on Banking Supervision, *supra* note 29, s 2(e).

112 The Financial Stability Board, *supra* note 35, s 2(i).

113 Abigail C Dushman, “Horizontal Review between International Organizations: Why, How, and Who Cares about Corporate Regulatory Capture”(2011) 22:4 *Eur J Int Law* 1089 at 1113.

from undue influence. Ultimately, domestic institutions – notice and comment procedures, legislative supervision of regulatory agencies, judicial review of administrative decision-making- may be better equipped to mitigate the effects of capture than global networks.

4. Conclusion

Regulatory technology has had a profound influence on global and domestic systems of financial regulation. Originally devised as a tool for effective reporting and compliance, RegTech is transforming the legal norms and changing procedures for elaboration and enforcement of financial regulations. The prudential approach to RegTech and, by extension, to algorithms requires global and domestic regulators to rethink how they bring relevant expertise to bear on their decision-making process. This means that laws, rules, and regulations should be developed by regulators in partnership with computer scientists, the representatives of the IT industry, bankers, and actors of civil society. This article has demonstrated that transgovernmental entities are institutionally and procedurally equipped for a multi-stakeholder discussion that may result in policy guidance and cross-jurisdictional standards for prudential regulations of reporting and compliance algorithms.

Finally, because the phenomenon of RegTech is still in its embryonic stage, the issues that were analyzed and discussed in this Article command further empirical research and theoretical debates. New grounds for inquiry will naturally come to light as RegTech continues to pervade environmental compliance, airplane tracking, and other domains.¹¹⁴

114 Douglas W. Arner, János Barberis & Ross P. Buckley, "FinTech, RegTech, and the Reconceptualization of Financial Regulation" (2017) 37:3 *NwJ Intl L & Bus* 373 at 385.

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