# NOTES

## Preface

1 Michael Corkery and Matthew Goldstein, "North Korea Said to Be Target of Inquiry Over $81 Million Cyberheist," *New York Times,* March 22, 2017, DealBook, https://www.nytimes.com/2017/03/22/business/dealbook/north-korea-said-to-be-target-of-inquiry-over-81-million-cyberheist.html?_r=0.

2 "GDP (current US$)—Bangladesh," World Bank, https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=BD.

3 Niaz Alam, "The Great Bangladesh Cyber Heist Shows Truth Is Stranger Than Fiction," *Dhaka Tribune,* March 12, 2016, https://www.dhakatribune.com/uncategorized/2016/03/12/the-great-bangladesh-cyber-heist-shows-truth-is-stranger-than-fiction.

4 FinCyber Project, "Cybersecurity and the Financial System," Carnegie Endowment for International Peace, https://carnegieendowment.org/specialprojects/fincyber/.

5 FinCyber Project, "Protecting Financial Stability: G20 Proposal," Carnegie Endowment for International Peace, https://carnegieendowment.org/specialprojects/protectingfinancialstability/.

6 FinCyber Project, "Cyber Resilience and Financial Organizations: A Capacity-building Tool Box," Carnegie Endowment for International Peace, https://carnegieendowment.org/specialprojects/fincyber/guides.

7 FinCyber Project, "Timeline of Cyber Incidents Involving Financial Institutions," Carnegie Endowment for International Peace, https://carnegieendowment.org/specialprojects/protectingfinancialstability/timeline.

## Part I: Strategy and Overview of Recommendations

8 Deloitte, "Realizing the Digital Promise: COVID-19 Catalyzes and Accelerates Transformation in Financial Services," 2020, https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Financial-Services/gx-fsi-realizing-the-digital-promise-covid-19-catalyzes-and-accelerates-transformation.pdf.

9 Christine Lagarde, "Payments in a Digital World," speech, Deutsche Bundesbank online conference on banking and payments in the digital world, Frankfurt am Main, September 10, 2020, https://www.ecb.europa.eu/press/key/date/2020/html/ecb.sp200910~31e6ae9835.en.html.

10 Lily Hay Newman, "The Billion-Dollar Hacking Group Behind a String of Big Breaches," *Wired,* April 4, 2018, https://www.wired.com/story/fin7-carbanak-hacking-group-behind-a-string-of-big-breaches/.

11 United Nations Security Council, "Letter Dated 31 July 2019 From the Panel of Experts Established Pursuant to Resolution 1874 (2009) Addressed to the Chair of the Security Council Committee Established Pursuant to Resolution 1718 (2006)." U.S. Government Joint Advisory, "Alert (AA20-239A) FASTCash 2.0: North Korea's BeagleBoyz Robbing Banks," August 26, 2020, https://us-cert.cisa.gov/ncas/alerts/aa20-239a.

12 Tim Maurer and Arthur Nelson, "COVID-19's Other Virus: Targeting the Financial System," *Strategic Europe* (blog), April 21, 2020, 1, https://carnegieeurope.eu/strategiceurope/81599.

13 David E. Sanger, "U.S. Indicts 7 Iranians in Cyberattacks on Banks and a Dam," *New York Times*, March 24, 2016, https://www.nytimes.com/2016/03/25/world/middleeast/us-indicts-iranians-in-cyberattacks-on-banks-and-a-dam.html.

14 Tim Maurer et al., "Toward a Global Norm Against Manipulating the Integrity of Financial Data," Carnegie Endowment for International Peace, March 2017, https://carnegieendowment.org/2017/03/27/toward-global-norm-against-manipulating-integrity-of-financial-data-pub-68403; European Systemic Risk Board, "Systemic Cyber Risk," February 25, 2020, https://www.esrb.europa.eu/pub/pdf/reports/esrb.report200219_systemiccyberrisk-101a09685e.en.pdf; Greg Ros, "The Making of a Cyber Crash: A Conceptual Model for Systemic Risk in the Financial Sector," European Systemic Risk Board, Occasional Paper Series No 16, May 2020, https://www.esrb.europa.eu/pub/pdf/occasional/esrb.op16~f80ad1d83a.en.pdf.

15 Davey Winder, "$645 Billion Cyber Risk Could Trigger Liquidity Crisis, ECB's Lagarde Warns," *Forbes*, March 10, 2020, https://www.forbes.com/sites/daveywinder/2020/02/08/645-billion-cyber-risk-could-trigger-liquidity-crisis-ecbs-lagarde-warns/.

16 Mark Bendeich and Leika Kihara, "Cyber Threat Could Become Banking's Most Serious Risk," Reuters, January 24, 2019, https://www.reuters.com/article/davos-meeting-cyber-kuroda/davos-cyber-threat-could-become-bankings-most-serious-risk-boj-idUSS8N1PK01N.

17 Hugh Son, "Jamie Dimon Says Risk of Cyberattacks 'May Be Biggest Threat to the US Financial System,'" CNBC, April 4, 2019, https://www.cnbc.com/2019/04/04/jp-morgan-ceo-jamie-dimon-warns-cyber-attacks-biggest-threat-to-us.html.

18 Financial Stability Board, "Effective Practices for Cyber Incident Response and Recovery: Consultative Document," April 20, 2020, https://www.fsb.org/2020/04/effective-practices-for-cyber-incident-response-and-recovery-consultative-document/.

19 IOSCO Cyber Task Force, "Final Report," The Board of the International Organization of Securities Commissions, June, 2019, https://www.iosco.org/library/pubdocs/pdf/IOSCOPD633.pdf.

20 Gerald J. Schueler, "The Unpredictability of Complex Systems," *Journal of the Washington Academy of Sciences* 84, no. 1 (1996): 3–12; John H. Holland, "Complex Adaptive Systems," *Daedalus* 121, no. 1, (1992): 17–30; George A. Polacek et al., "On Principles and Rules in Complex Adaptive Systems: A Financial System Case Study," *Systems Engineering* 15, no. 4 (2012): 433–47, https://doi.org/10.1002/sys.21213.

21 Ryan Browne, "Banks Must Behave 'More Like Technology Companies' to Survive, Finance Execs Say," CNBC, November 18, 2019, https://www.cnbc.com/2019/11/18/banks-must-behave-like-tech-companies-to-survive-amid-fintech-threat.html; Gregory Barber, "Every Tech Company Wants to Be a Bank—Someday, at Least," *Wired*, November 16, 2019, https://www.wired.com/story/tech-companies-banks/.

22 Financial Stability Board, "Effective Practices for Cyber Incident Response and Recover: Consultative document," April 20, 2020, https://www.fsb.org/2020/04/effective-practices-for-cyber-incident-response-and-recovery-consultative-document/.

23 For a comprehensive overview of individual countries' red team testing frameworks, see: Raymond Kleijmeer, Jermy Prenio, and Jeffery Yong, "FSI Insights on Policy Implementation No 21—Varying Shades of Red: How Red Team Testing Frameworks Can Enhance the Cyber Resilience of Financial Institutions," Financial Stability Institute, November 2019, https://www.bis.org/fsi/publ/insights21.pdf.

24 "Digital Finance Package: Commission Sets Out New, Ambitious Approach to Encourage Responsible Innovation to Benefit Consumers and Businesses," European Commission, Brussels, September 24, 2020, https://ec.europa.eu/commission/presscorner/detail/en/IP_20_1684.

25 Hanna Ziady, "New Zealand Spy Agency Investigating 'Severe' Cyberattack on Shody Exchange," CNN Business, August 28, 2020, https://www.cnn.com/2020/08/27/investing/new-zealand-stock-exchange-cyber-attack/index.html.

26 This is modeled after the exercise series carried out by the financial sector's Securities Industry and Financial Markets Association: "Cybersecurity Exercise: Quantum Dawn V," Security Industry and Financial Markets Association (SIFMA), https://www.sifma.org/resources/general/cybersecurity-exercise-quantum-dawn-v/.

27 This is modeled after the Financial Systemic Analysis & Resilience Center (FSARC): "Identifying Cyber Threats With FSARC," JP Morgan, October 9, 2018, https://www.jpmorgan.com/commercial-banking/insights/cyber-threats-fsarc.

28 For example, in 2014, the U.S. Department of Justice and the Federal Trade Commission issued a joint statement for that purpose regarding the sharing of cyber threat information. The 2015 U.S. Cybersecurity Information Sharing Act (CISA) goes a step further by making clear that "activity authorized by CISA does not violate federal and state antitrust laws." U.S. CERT, "Cybersecurity Information Sharing Act—Frequently Asked Questions," accessed July 20, 2020, https://www.us-cert.gov/sites/default/files/ais_files/CISA_FAQs.pdf.

29 Relatedly, see also the submissions by members of the World Economic Forum's "Global Coalition to Fight Financial Crime" to inform the European Commission's Anti-Money Laundering Action Plan: "Press Release: Statement on the European Commission Action Plan on Preventing Money Laundering and Terrorism Financing," Global Coalition to Fight Financial Crime, Brussels, August 26, 2020, https://www.gcffc.org/press-release-statement-on-the-european-commission-aml-action-plan/.

30 Jim Edwards, "A False Rumor on WhatsApp Started a Run on a London Bank," Business Insider, May 13, 2019, https://www.businessinsider.com/whatsapp-rumour-started-run-on-metro-bank-2019-5.

31 Joseph S. Nye, "Deterrence and Dissuasion in Cyberspace," *International Security* 41, no. 3 (January 2017): 44–71, https://doi.org/10.1162/ISEC_a_00266.

32 International Committee of the Red Cross, "Building Respect for the Law," https://www.icrc.org/en/what-we-do/building-respect-ihl.

33 This would build on the ICRC's existing publications on the topic, including: Laurent Gisel, Tilman Rodenhäuser and Knut Dörmann, "Twenty Years On: International Humanitarian Law and the Protection of Civilians Against the Effects of Cyber Operations During Armed Conflicts," *International Review of the Red Cross* (2020), 0 (0), 1–48, https://international-review.icrc.org/sites/default/files/reviews-pdf/2020-09/Twenty-years-on-IHL-and-cyber-operations.pdf; Laurent Gisel, Tilman Rodenhäuser, and Kubo Mačák, "Cyber Attacks Against Hospitals and the COVID-19 Pandemic: How Strong Are International Law Protections?," *Humanitarian Law & Policy Blog* (blog), ICRC, April 2, 2020, https://blogs.icrc.org/law-and-policy/2020/04/02/cyber-attacks-hospitals-covid-19/; Peter Maurer et. al., "Call to Governments: Work Together to Stop Cyber Attacks on Health Care," ICRC, May 25, 2020, https://www.icrc.org/en/document/governments-work-together-stop-cyber-attacks-health-care.

34 U.S. Department of Homeland Security, "Joint Advisory—Alert (AA20-239A) FASTCash 2.0: North Korea's BeagleBoyz Robbing Banks," August 26, 2020, https://us-cert.cisa.gov/ncas/alerts/aa20-239a.

35 United Nations Security Council, "Letter Dated 31 July 2019 From the Panel of Experts Established Pursuant to Resolution 1874 (2009) Addressed to the Chair of the Security Council Committee Established Pursuant to Resolution 1718 (2006)," August 30, 2019, https://www.securitycouncilreport.org/atf/cf/%7B65BFCF9B-6D27-4E9C-8CD3-CF6E4FF96FF9%7D/S_2019_691.pdf.

36 Global Infrastructure Hub, "Funders and Strategic Partners," accessed July 20, 2020, https://www.gihub.org/about/funders-and-strategic-partners/; and Global Partnership for Financial Inclusion, "GPFI," accessed July 20, 2020, https://www.gpfi.org/.

37 The changing nature of the financial system also influences what Harvard professor Joseph Nye calls "deterrence by entanglement"—the more entangled actors are in a system, the more likely it is that they will be deterred from attacking parts of the system. See Nye.

## Priority #1: Cyber Resilience

38 G20 Finance Ministers and Central Bank Governors, "Communiqué," March 17, 2017, Carnegie Endowment for International Peace, https://carnegieendowment.org/files/g20-communique.pdf.

39 "FSB Publishes Stocktake on Cybersecurity Regulatory and Supervisory Practices," October 13, 2017, https://www.fsb.org/2017/10/fsb-publishes-stocktake-on-cybersecurity-regulatory-and-supervisory-practices/.

40 "FSB Publishes Stocktake on Cybersecurity Regulatory and Supervisory Practices."

41 GFMA and IIF, "Discussion Draft Principles Supporting the Strengthening of Operational Resilience Maturity in Financial Services," October 2019, https://www.gfma.org/wp-content/uploads/2019/10/discussion-draft-iif-gfma-operational-resilience-principles-october-2019.pdf.

42 Bank of England, Financial Conduct Authority, and Prudential Regulatory Authority, "Building Operational Resilience: Impact Tolerances for Important Business Services."

43 Davey Winder, "$645 Billion Cyber Risk Could Trigger Liquidity Crisis, ECB's Lagarde Warns," *Forbes*, accessed March 10, 2020, https://www.forbes.com/sites/daveywinder/2020/02/08/645-billion-cyber-risk-could-trigger-liquidity-crisis-ecbs-lagarde-warns/.

44 Art Lindo, "Oversight of Cyber Resilience in the Financial Regulatory System: Seminar for Senior Bank Supervisors From Emerging Economies," October 25, 2019, http://pubdocs.worldbank.org/en/388141572546457065/Day-5-ArtLindo-FRB-CyberResilience.pdf.

45 G7 Finance Ministers and Central Bank Governors, "Press Release," G7 Information Centre, University of Toronto, October 13, 2017, http://www.g7.utoronto.ca/finance/171013-cybercrime.html.

46 G7 Finance Ministers and Central Bank Governors, "Press Release," G7 Information Centre, University of Toronto, October 13, 2017, http://www.g7.utoronto.ca/finance/171013-cybercrime.html.

47 Italian Ministry of the Economy and Finance, "The G7 Reaffirms Its Commitment to Strengthening Cybersecurity in the Financial Sector," October 11, 2018, http://www.dt.mef.gov.it/en/news/2018/G7_cyber_security.html.

48 Bank of Japan, "G-7 Fundamental Elements for Threat-Led Penetration Testing and Third Party Cyber Risk Management in the Financial Sector," Press Release, October 15, 2018, https://www.boj.or.jp/en/announcements/release_2018/rel181015k.htm/.

49 "Cybersecurity: Coordinating Efforts to Protect the Financial Sector in the Global Economy," (conference, Banque de France and the French Ministry for the Economy and Finance, Paris, France, May 10, 2019), https://www.banque-france.fr/en/conferences-and-media/seminars-and-symposiums/research-conferences-and-symposiums/french-presidency-g7-2019-cybersecurity-coordinating-efforts-protect-financial-sector-global-economy.

50 Leigh Thomas, "G7 Countries to Simulate Cross-Border Cyber Attack Next Month: France," Reuters, May 10, 2019, https://www.reuters.com/article/us-g7-france-cyber-idUSKCN1SG1KZ.

51 Jaime Vazquez and Martin Boer, "Addressing Regulatory Fragmentation to Support a Cyber-Resilience Global Financial Services Industry," n.d., https://www.iif.com/portals/0/Files/private/iif_cyber_reg_04_25_2018_final.pdf.

52 GFMA and IIF, "Discussion Draft Principles Supporting the Strengthening of Operational Resilience Maturity in Financial Services."

53 Marc Saidenberg, John Liver, and Eugene Goyne, "2020 Global Bank Regulatory Outlook: Four Major Themes Dominating the Regulatory Landscape in 2020," EY, January 20, 2020, https://assets.ey.com/content/dam/ey-sites/ey-com/en_gl/topics/banking-and-capital-markets/ey-global-regulatory-outlook-four-major-themes-dominating-the-regulatory-landscape-in-2020_v2.pdf.

54 Bank of England and Financial Conduct Authority, "Building the UK Financial Sector's Operational Resilience," July 2018, https://www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/discussion-paper/2018/dp118.pdf.

55 "Building Operational Resilience: Impact Tolerances for Important Business Services," Bank of England and Financial Conduct Authority, December 2019, https://www.bankofengland.co.uk/prudential-regulation/publication/2018/building-the-uk-financial-sectors-operational-resilience-discussion-paper.

56 "Building Operational Resilience: Impact Tolerances for Important Business Services."

57 Bank of England, "CBEST Implementation Guide," Bank of England, 2016, https://www.bankofengland.co.uk/-/media/boe/files/financial-stability/financial-sector-continuity/cbest-implementation-guide.pdf.

58 Jeffrey Roman, "Bank of England Launches Cyber Framework," BankInfoSecurity, June 10, 2014, https://www.bankinfosecurity.com/bank-england-launches-cyber-framework-a-6934.

59 Alex Hern, "Operation 'Waking Shark II' Tests the Ccybersecurity of Britain's Banks," *Guardian,* November 12, 2013, https://www.theguardian.com/technology/2013/nov/12/operation-waking-shark-ii-tests-cybersecurity-banks; Bank of England, "Sector Simulation Exercise: SIMEX 2018 Report," September 27, 2019, https://www.bankofengland.co.uk/report/2019/sector-simulation-exercise-simex-2018-report.

60 David Milliken, "U.S. and UK to Test Financial Cyber-Security Later This Month," Reuters, November 2, 2015, https://www.reuters.com/article/us-britain-usa-cybersecurity-idUSKCN0SR1DW20151102.

61 SIFMA, "Cybersecurity Exercise: Quantum Dawn V," February 28, 2020, https://www.sifma.org/resources/general/cybersecurity-exercise-quantum-dawn-v/.

62 National Cyber Security Centre, "Cyber Security Information Sharing Partnership (CiSP)," September 2016, https://www.ncsc.gov.uk/information/cyber-security-information-sharing-partnership--cisp-.

63 Andrew Gracie, "Cyber in Context," Speech at the UK Financial Services Cyber Security Summit, London, July 2015, https://www.bankofengland.co.uk/-/media/boe/files/speech/2015/cyber-in-context.pdf.

64 Stephen Jones, "A Resilient Banking Sector," UK Finance, December 7, 2018, https://www.ukfinance.org.uk/blogs/resilient-banking-sector.

65 Bank for International Settlements (BIS), "Cyber Resilience: Range of Practices," December 2018, https://www.bis.org/bcbs/publ/d454.pdf.

66 European Commission, "Executive Summary of the Impact Assessment Accompanying the Document: Proposal for a Regulation of the European Parliament and of the Council on Digital Operational Resilience for the Financial Sector," Commission Staff Working Document, September 24, 2020, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=SWD:2020:199:FIN.

67 The ESAs are the European Banking Authority, the European Securities and Markets Authority (ESMA) and the European Insurance and Occupational Pensions Authority (EIOPA). European Commission, "FinTech Action Plan: For a More Competitive and Innovative European Financial Sector," March 2018, https://ec.europa.eu/info/publications/180308-action-plan-fintech_en.

68 European Supervisory Authorities, "Joint Advice of the European Supervisory Authorities," April 10, 2019, https://www.esma.europa.eu/sites/default/files/library/jc_2019_26_joint_esas_advice_on_ict_legislative_improvements.pdf.

69 European Banking Authority, "EBA Guidelines on ICT and Security Risk Management," November 28, 2019, https://eba.europa.eu/eba-publishes-guidelines-ict-and-security-risk-management.

70 European Banking Authority, "EBA Guidelines on ICT and Security Risk Management," November 28, 2019, https://eba.europa.eu/eba-publishes-guidelines-ict-and-security-risk-management.

71 European Banking Authority, "Guidelines on Outsourcing Arrangements," June 5, 2019, https://eba.europa.eu/regulation-and-policy/internal-governance/guidelines-on-outsourcing-arrangements.

72 European Commission, "Consultation Document: Digital Operational Resilience Framework for Financial Services: Making the EU Financial Sector More Secure," December 2019, https://ec.europa.eu/info/sites/info/files/business_economy_euro/banking_and_finance/documents/2019-financial-services-digital-resilience-consultation-document_en.pdf.

73 European Commission, "Consultation Document: Digital Operational Resilience Framework for Financial Services: Making the EU Financial Sector More Secure."

74 European Banking Federation, "Digital Operational Resilience Framework: EBF Key Messages on the Commission Consultation," April 6, 2020, https://www.ebf.eu/cybersecurity/ebf-key-messages-on-the-commission-consultation-on-a-digital-operational-resilience-framework/.

75 European Commission, "Communication From the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on a Digital Finance Strategy for the EU," September 24, 2020, https://ec.europa.eu/transparency/regdoc/rep/1/2020/EN/COM-2020-591-F1-EN-MAIN-PART-1.PDF.

76 European Commission, "Executive Summary of the Impact Assessment Accompanying the Document: Proposal for a Regulation of the European Parliament and of the Council on Digital Operational Resilience for the Financial Sector," Commission Staff Working Document, September 24, 2020, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=SWD:2020:199:FIN.

77 European Commission, "Executive Summary of the Impact Assessment Accompanying the Document: Proposal for a Regulation of the European Parliament and of the Council on Digital Operational Resilience for the Financial Sector," Commission Staff Working Document, September 24, 2020, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=SWD:2020:199:FIN.

78 European Banking Authority, "EBA Guidelines on ICT and Security Risk Management."

79 European Commission, "Executive Summary of the Impact Assessment Accompanying the Document: Proposal for a Regulation of the European Parliament and of the Council on Digital Operational Resilience for the Financial Sector," Commission Staff Working Document, September 24, 2020, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=SWD:2020:199:FIN.

80 Euro Cyber Resilience Board Secretariat, "Cyber Information and Intelligence Sharing: A Practical Example," Cyber Information Sharing and Intelligence Sharing Initiative, European Central Bank, September 2020, https://www.ecb.europa.eu/paym/groups/euro-cyber-board/shared/pdf/ciisi-eu_practical_example.pdf.

81 Euro Cyber Resilience Board Secretariat, "Cyber Information and Intelligence Sharing: Community Rulebook," Cyber Information Sharing and Intelligence Sharing Initiative, European Central Bank, August 2020, https://www.ecb.europa.eu/paym/groups/euro-cyber-board/shared/pdf/ciisi-eu_community_rulebook.pdf.

82 EU member states currently implementing TIBER-EU: Belgium, Denmark, Finland, Germany, Ireland, Italy, Norway, Romania, Sweden, and the Netherlands.

83 Weuro Jaakko, "Resilience of Financial Market Infrastructure and the Role of the Financial Sector in Countering Hybrid Threats," Presidency Issues Note for the Informal ECOFIN Working Session, September 9, 2019, https://eu2019.fi/documents/11707387/15400298/Hybrid+Threats+Informal+ECOFIN+final+Issues+Note+2019-09-09_S2.pdf/29565728-f476-cbdd-4c5f-7e0ec970c6c4/Hybrid+Threats+Informal+ECOFIN+final+Issues+Note+2019-09-09_S2.pdf.

84 Based on written input received from officials at Singapore's Cyber Security Agency and the Monetary Authority of Singapore on October 16, 2020.

85 Aquiles A. Almansi and Yejin Carol Lee, "Financial Sector's Cybersecurity: A Regulatory Digest," World Bank Group, Financial Sector Advisory Center, November 2019, http://pubdocs.worldbank.org/en/940481575300835196/CybersecDIGEST-NOV2019-FINAL.pdf.

86 Monetary Authority of Singapore, "Technology Risk Management Guidelines," Consultation Paper, March 2019, https://www.mas.gov.sg/-/media/Consultation-Paper-on-Proposed-Revisions-to-Technology-Risk-Management-Guidelines.pdf.

87 "Consultation Paper on Proposed Revisions to Business Continuity Management Guidelines," Monetary Authority of Singapore, March 2019, https://www.mas.gov.sg/-/media/MAS/News-and-Publications/Consultation-Papers/Consultation-Paper-on-Proposed-Revisions-to-Business-Continuity-Management-Guidelines.pdf.

88 "Minutes of the Federal Open Market Committee" (U.S. Federal Reserve System, January 28, 2020), https://www.federalreserve.gov/monetarypolicy/files/fomcminutes20200129.pdf.

89 FS-ISAC, "FS-ISAC & MAS to Strengthen Cyber Info Sharing Across Nine Countries," Press Release, November 14, 2017, https://www.fsisac.com/newsroom/fs-isac-and-mas-to-strengthen-cyber-information-sharing-across-nine-countries.

90 FS-ISAC, "FS-ISAC Launches the Ceres Forum: World's Premier Threat Information Sharing Group for Central Banks," Reston, Virginia and Singapore, June 11, 2018, https://www.fsisac.com/newsroom/fs-isac-launches-the-ceres-forum-worlds-premier-threat-information-sharing-group-for-central-banks-regulators-and-supervisors; CSA Singapore, "11 CII Sectors Tested on More Complex Cyber Attack Scenarios," September 4, 2019, https://www.csa.gov.sg/news/press-releases/exercise-cyber-star-2019.

91 Federal Reserve System, "Enhanced Cyber Risk Management Standards," Advance Notice of Proposed Rulemaking, Fall 2019, 7100-AE61, Office of Information and Regulatory Affairs,

OMB, https://www.reginfo.gov/public/do/eAgendaViewRule?pubId=201910&RIN=7100-AE61.

92 Robert Armstrong, Kiran Stacey, and Laura Noonan, "US Banks Face Tighter Scrutiny of Cyber Defences," *Financial Times,* June 17, 2019, https://www.ft.com/content/69a25232-8eaa-11e9-a1c1-51bf8f989972.

93 Federal Reserve System, "Enhanced Cyber Risk Management Standards," Advance Notice of Proposed Rulemaking, Fall 2019, 7100-AE61, Office of Information and Regulatory Affairs, OMB, https://www.reginfo.gov/public/do/eAgendaViewRule?pubId=201910&RIN=7100-AE61.

94 Randal Quarles, "Speech by Vice Chairman for Supervision Quarles on the Financial Regulatory System and Cybersecurity," Board of Governors of the Federal Reserve System, February 2018, https://www.federalreserve.gov/newsevents/speech/quarles20180226b.htm.

95 Randal Quarles, "Speech by Vice Chairman for Supervision Quarles on the Financial Regulatory System and Cybersecurity," Board of Governors of the Federal Reserve System, February 2018, https://www.federalreserve.gov/newsevents/speech/quarles20180226b.htm.

96 Robert Armstrong, Kiran Stacey, and Laura Noonan, "US Banks Face Tighter Scrutiny of Cyber Defences," *Financial Times,* June 17, 2019, https://www.ft.com/content/69a25232-8eaa-11e9-a1c1-51bf8f989972.

97 Art Lindo, "Oversight of Cyber Resilience in the Financial Regulatory System: Seminar for Senior Bank Supervisors From Emerging Economies."

98 Board of Governors of the Federal Reserve System, "Strategic Plan 2020–23, December 2019," 2019, 20.

99 "Minutes of the Federal Open Market Committee" (U.S. Federal Reserve System, January 28, 2020), https://www.federalreserve.gov/monetarypolicy/files/fomcminutes20200129.pdf.

100 New York State Department of Financial Services, "NYDFS 23 NYCRR 500," 2017, https://www.dfs.ny.gov/docs/legal/regulations/adoptions/dfsrf500txt.pdf.

101 Aquiles A. Almansi and Yejin Carol Lee, "Financial Sector's Cybersecurity: A Regulatory Digest," World Bank Group, Financial Sector Advisory Center, July 2020, http://pubdocs.worldbank.org/en/361881595872293851/CybersecDigest-v5-Jul2020-FINAL.pdf.

102 Aquiles A. Almansi and Yejin Carol Lee, "Financial Sector's Cybersecurity: A Regulatory Digest," World Bank Group, Financial Sector Advisory Center, July 2020, http://pubdocs.worldbank.org/en/361881595872293851/CybersecDigest-v5-Jul2020-FINAL.pdf.

103 Institute for Development and Research in Banking Technology, "Indian Banks—Center for Analysis of Risks and Threats (IB-CART)," last modified September 30, 2020, https://www.idrbt.ac.in/ib-cart.html.

104 Institute for Development and Research in Banking Technology, "Indian Banks—Center for Analysis of Risks and Threats (IB-CART)," last modified September 30, 2020, https://www.idrbt.ac.in/ib-cart.html.

105 Reserve Bank of India, "Financial Stability Report," July 2020, https://www.rbi.org.in/Scripts/FsReports.aspx.

106 "Cyber Threats Against Banking Industry on the Rise in Post Covid-19 Lockdown Phase, Says RBI," *Hindu Business Line,* https://www.thehindubusinessline.com/money-and-banking/cyber-threats-against-banking-industry-on-the-rise-in-post-covid-19-lockdown-phase-says-rbi/article32201404.ece.

107 Reserve Bank of India, "Financial Stability Report," July 2020, https://www.rbi.org.in/Scripts/FsReports.aspx.

108 "CBI to Set Up Cyber-Crime Investigation Branch in Mumbai," *Business Standard,* March 1, 2016, https://www.business-standard.com/article/news-ians/cbi-to-set-up-cyber-crime-investigation-branch-in-mumbai-116030100949_1.html.

109 Rajeev Jayaswal, "Govt Plans Cyber Security System for Financial Sector," *Hindustan Times,* August 18, 2020, https://www.hindustantimes.com/india-news/govt-plans-cyber-security-system/story-bHRwwBeFVGLIrA3VMmOaDO.html.

110 Bank of England, Financial Conduct Authority, and Prudential Regulatory Authority, "Building Operational Resilience: Impact Tolerances for Important Business Services."

111 European Banking Authority, "EBA Guidelines on ICT and Security Risk Management," https://eba.europa.eu/regulation-and-policy/internal-governance/guidelines-on-ict-and-security-risk-management.
112 "Consultation Paper on Proposed Revisions to Business Continuity Management Guidelines," Monetary Authority of Singapore, March 2019, https://www.mas.gov.sg/-/media/MAS/News-and-Publications/Consultation-Papers/Consultation-Paper-on-Proposed-Revisions-to-Business-Continuity-Management-Guidelines.pdf.
113 Art Lindo, "Oversight of Cyber Resilience in the Financial Regulatory System: Seminar for Senior Bank Supervisors From Emerging Economies."
114 Global Financial Markets Association, "Response to Bank of England and FCA Discussion Paper on 'Building the UK Financial Sector's Operational Resilience,'" October 2018, https://www.afme.eu/portals/0/globalassets/downloads/consultation-responses/tao-gfma-response-to-bank-of-england-fca-building-uk-financial-resilience-5-oct-2018.pdf.
115 International Organization of Securities Commissions, "About CPMI-IOSCO," accessed July 20, 2020, https://www.iosco.org/about/?subsection=cpmi_iosco.
116 Committee on Payments and Market Infrastructures and The Board of the International Organization of Securities Commissions, "Guidance on Cyber Resilience for Financial Market Infrastructures."
117 Committee on Payments and Market Infrastructures and The Board of the International Organization of Securities Commissions, "Guidance on Cyber Resilience for Financial Market Infrastructures."
118 The Board of the International Organization of Securities Commissions, "Cyber Task Force Final Report," June 2019, https://www.iosco.org/library/pubdocs/pdf/IOSCOPD633.pdf.
119 Committee on Payments and Market Infrastructures, "Reducing the Risk of Wholesale Payments Fraud Related to Endpoint Security," Bank for International Settlements, May 8, 2018, 178, https://www.bis.org/cpmi/publ/d178.htm.
120 "FSB Publishes Stocktake on Cybersecurity Regulatory and Supervisory Practices," October 13, 2017, https://www.fsb.org/2017/10/fsb-publishes-stocktake-on-cybersecurity-regulatory-and-supervisory-practices/.
121 Financial Stability Board, "Summary Report on Financial Sector Cybersecurity Regulations, Guidance and Supervisory Practices," October 13, 2017, https://www.fsb.org/2017/10/summary-report-on-financial-sector-cybersecurity-regulations-guidance-and-supervisory-practices/.
122 Financial Stability Board, "FSB Publishes Stocktake on Cybersecurity Regulatory and Supervisory Practices," press release, October 13, 2017, https://www.fsb.org/2017/10/fsb-publishes-stocktake-on-cybersecurity-regulatory-and-supervisory-practices/.
123 Financial Stability Board, "Effective Practices for Cyber Incident Response and Recovery: Consultative Document," April 20, 2020, https://www.fsb.org/2020/04/effective-practices-for-cyber-incident-response-and-recovery-consultative-document/.
124 Aquiles A. Almansi and Yejin Carol Lee, "Financial Sector's Cybersecurity: A Regulatory Digest," World Bank Group, Financial Sector Advisory Center, November 2019, http://pubdocs.worldbank.org/en/940481575300835196/CybersecDIGEST-NOV2019-FINAL.pdf.
125 Basel Committee on Banking Supervision, "Consultative Document: Principles for Operational Resilience," August 2020, https://www.bis.org/bcbs/publ/d509.pdf.
126 Basel Committee on Banking Supervision, "Consultative Document: Principles for Operational Resilience," August 2020, https://www.bis.org/bcbs/publ/d509.pdf.
127 Bank for International Settlements (BIS), "Cyber Resilience: Range of Practices," December 2018, https://www.bis.org/bcbs/publ/d454.pdf.
128 Committee on Payments and Market Infrastructures, "Payment, Clearing and Settlement Operators Meet on Global Cyber-Resilience," Press Release, September 14, 2018, https://www.bis.org/press/p180914.htm.
129 Committee on Payments and Market Infrastructures and The Board of the International Organization of Securities Commissions, "Guidance on Cyber Resilience for Financial Market Infrastructures," Bank for International Settlements, 2016, http://www.bis.org/cpmi/publ/d138.htm.
130 Bank for International Settlements, "BIS Annual Report 2018/2019," 2019, https://www.bis.org/about/areport/areport2019.pdf#bis2025.

131 Agustin Carstens, "The New BIS Strategy—Bringing the Americas and Basel Closer Together" (Speech, Fourteenth ASBA-BCBS-FSI High-level Meeting on Global and Regional Supervisory Priorities, Lima, 1 October 2019), https://www.bis.org/speeches/sp191001.htm.
132 Bank for International Settlements, "FSI Publications," https://www.bis.org/fsi/publications.htm?m=1%7C17%7C161.
133 Senior officials at the Financial Stability Institute in written correspondence with the authors, May 2020.
134 European Banking Federation, Global Financial Markets Association, and International Swaps and Derivatives Association, "International Cybersecurity, Data and Technology Principles," letter, May 2016, https://www.gfma.org/wp-content/uploads/0/83/197/211/13187d1e-077f-43c5-85a1-1da370608a2b.pdf.
135 Financial Services Sector Coordinating Council, "The Financial Services Sector Cybersecurity Profile," October 25, 2018, https://fsscc.org/files/galleries/Financial_Services_Sector_Cybersecurity_Profile_Overview_and_User_Guide_2018-10-25.pdf.
136 Financial Services Sector Coordinating Council, "The Financial Services Sector Cybersecurity Profile," October 25, 2018, https://fsscc.org/files/galleries/Financial_Services_Sector_Cybersecurity_Profile_Overview_and_User_Guide_2018-10-25.pdf.
137 European Banking Authority, "EBF Response to the EBA Guidelines on ICT and Security Risk Management," accessed July 20, 2020, https://eba.europa.eu/node/82021/submission/62742.
138 Asia Securities Industry & Financial Markets Association (ASIFMA), "Response to Consultation Paper: Proposed Revisions to Guidelines on Business Continuity Management," April 2019, https://www.asifma.org/wp-content/uploads/2019/04/final-asifma-response-to-mas-consultation-paper-on-guidelines-on-business-continuity-management.pdf.
139 SIFMA, "Quantum Dawn V Fact Sheet," accessed January 5, 2020, https://www.sifma.org/wp-content/uploads/2019/11/QuantumDawnV-Factsheet_2019.pdf.
140 FS-ISAC, "FS-ISAC Upcoming Events, Summits, Webinars and Exercises," accessed July 20, 2020, https://www.fsisac.com/events.
141 Chris Keeling, "Waking Shark II Desktop Cyber Exercise: Report to Participants," November 12, 2013, https://www.bba.org.uk/wp-content/uploads/2014/02/Banking_3192106_v_1_Waking-Shark-II-Report-v1.pdf.pdf.
142 Bank of England, "Sector Simulation Exercise: SIMEX 2018 Report," September 27, 2019, https://www.bankofengland.co.uk/report/2019/sector-simulation-exercise-simex-2018-report.
143 Shaun Waterman, "Bank Regulators Briefed on Treasury-Led Cyber Drill," *FedScoop*, July 20, 2016, https://www.fedscoop.com/us-treasury-cybersecurity-drill-july-2016/.
144 Financial Services Information Sharing and Analysis Center, "Exercises Overview," accessed July 20, 2020, https://www.fsisac.com/hubfs/Resources/FS-ISAC_ExercisesOverview.pdf.
145 David Milliken, "U.S. and UK to Test Financial Cyber-Security Later This Month," Reuters, November 2, 2015, https://www.reuters.com/article/us-britain-usa-cybersecurity-idUSKCN0SR1DW20151102.
146 European Central Bank, "UNITAS Crisis Communication Exercise Report," December 2018, https://www.ecb.europa.eu/pub/pdf/other/ecb.unitasreport201812.en.pdf.
147 Leigh Thomas, "G7 Countries to Simulate Cross-Border Cyber Attack Next Month: France," Reuters, May 10, 2019, https://www.reuters.com/article/us-g7-france-cyber-idUSKCN1SG1KZ.
148 Leigh Thomas, "G7 Countries to Simulate Cross-Border Cyber Attack Next Month: France," Reuters, May 10, 2019, https://www.reuters.com/article/us-g7-france-cyber-idUSKCN1SG1KZ.
149 UK National Cyber Security Centre, "Exercise in a Box," 2019, https://exerciseinabox.service.ncsc.gov.uk/
150 Isabel Skierka et al., "CSIRT Basics for Policy-Makers: The History, Types & Culture of Computer Security Incident Response Teams," Working Paper, New America and Global Public Policy Institute, May 2015, https://static.newamerica.org/attachments/2943-csirt-basics-for-policy-makers/CSIRT%20Basics%20for%20Policy-Makers%20May%20

2015%20WEB%2009-15.16efa7bcc9e54fe299ba3447a5b7d41e.pdf.

151 GEANT, "TF-CSIRT: Computer Security Incident Response Teams—GÉANT," accessed July 20, 2020, https://www.geant.org:443/People/Community_Programme/Task_Forces/Pages/TF-CSIRT.aspx.

152 Isabel Skierka et al., "CSIRT Basics for Policy-Makers: The History, Types & Culture of Computer Security Incident Response Teams," Working Paper, New America and Global Public Policy Institute, May 2015, https://static.newamerica.org/attachments/2943-csirt-basics-for-policy-makers/CSIRT%20Basics%20for%20Policy-Makers%20May%202015%20WEB%2009-15.16efa7bcc9e54fe299ba3447a5b7d41e.pdf.

153 Robert Morgus et al., "National CSIRTs and Their Role in Computer Security Incident Response," New America and Global Public Policy Institute, November 2015, https://d1y8sb8igg2f8e.cloudfront.net/documents/CSIRTs-incident-response.pdf.

154 European Union Agency for Cybersecurity, "NIS Directive Details," https://www.enisa.europa.eu/topics/nis-directive. Accessed September 26, 2020.

155 "FC3—Finance and Cyber Continuity Center: Israel's National Financial CERT," senior officials from the Israeli Ministry of Finance in written correspondence with the authors, April 16, 2020.

156 CERTFin, "CERT Finanziario Italiano (CERTFIN) - RFC 2350," Bank of Italy, https://www.certfin.it/media/pdf/rfc2350.pdf. Accessed September 26, 2020.

157 CERTFin, "CERT Finanziario Italiano (CERTFIN) - RFC 2350," Bank of Italy, https://www.certfin.it/media/pdf/rfc2350.pdf. Accessed September 26, 2020.

158 GEANT, "TF-CSIRT: Computer Security Incident Response Teams - GÉANT," accessed July 20, 2020, https://www.geant.org:443/People/Community_Programme/Task_Forces/Pages/TF-CSIRT.aspx.

159 Finance and Cyber Continuity Center, "FC3—Finance and Cyber Continuity Center: Israel's National Financial CERT," April 16, 2020.

160 "FC3—Finance and Cyber Continuity Center: Israel's National Financial CERT," senior officials from the Israeli Ministry of Finance in written correspondence with the authors, April 16, 2020.

161 "FC3—Finance and Cyber Continuity Center: Israel's National Financial CERT," senior officials from the Israeli Ministry of Finance in written correspondence with the authors, April 16, 2020.

162 "FC3—Finance and Cyber Continuity Center: Israel's National Financial CERT," senior officials from the Israeli Ministry of Finance in written correspondence with the authors, April 16, 2020.

163 "FC3—Finance and Cyber Continuity Center: Israel's National Financial CERT," senior officials from the Israeli Ministry of Finance in written correspondence with the authors, April 16, 2020.

164 Brian F. Tivnan, "Financial System Mapping," November 7, 2018, https://www.mitre.org/publications/technical-papers/financial-system-mapping.

165 Telis Demos, "Banks Build Line of Defense for Doomsday Cyberattack," *Wall Street Journal*, December 3, 2017, https://www.wsj.com/articles/banks-build-line-of-defense-for-doomsday-cyberattack-1512302401.

166 Sheltered Harbor, "Sheltered Harbor - About," accessed July 20, 2020, https://shelteredharbor.org/index.php/about#who.

167 Stacy Cowley, "Banks Adopt Military-Style Tactics to Fight Cybercrime," *New York Times*, May 20, 2018, https://www.nytimes.com/2018/05/20/business/banks-cyber-security-military.html.

168 Rob Nichols, Gregory Baer, Jim Nussle, Kevin Fromer, Steven Silberstein, and Kenneth Bentsen to Financial Institution CEOs, May 14, 2019, https://www.shelteredharbor.org/images/SH/Docs/Sheltered_Harbor_Trade_Assn_Exec_Letter_Genericfinal_051619.pdf.

169 Rob Nichols, Gregory Baer, Jim Nussle, Kevin Fromer, Steven Silberstein, and Kenneth Bentsen to Financial Institution CEOs, May 14, 2019, https://www.shelteredharbor.org/images/SH/Docs/Sheltered_Harbor_Trade_Assn_Exec_Letter_Genericfinal_051619.pdf.

170 Federal Deposit Insurance Corporation and Office of the Comptroller of the Currency, "Joint Statement on Heightened Cybersecurity Risk," January 16, 2020, https://occ.gov/news-issuances/bulletins/2020/bulletin-2020-5a.pdf.

171 U.S. Federal Financial Institutions Examination Council, "Cybersecurity Resource Guide for Financial Institutions," October 2018, https://www.ffiec.gov/press/pdf/FFIEC%20Cybersecurity%20Resource%20Guide%20for%20Financial%20Institutions.pdf.
172 For the purposes of this section, exchanges refer to those that operate in a regulated and secure market, and are distinct from "cryptocurrency exchanges."
173 European Central Bank, "Cyber Resilience Oversight Expectations for Financial Market Infrastructures," December 2018, https://www.ecb.europa.eu/paym/pdf/cons/cyberresilience/Cyber_resilience_oversight_expectations_for_financial_market_infrastructures.pdf.
174 Darrell Duffie and Joshua Younger, "Cyber Runs: How a Cyber Attack Could Affect U.S. Financial Institutions," Hutchins Center on Fiscal and Monetary Policy, Brookings Institution, June 2019, https://www.brookings.edu/research/cyber-runs/.
175 World Federation of Exchanges, "WFE Response to the EU Commission's Digital Operational Resilience Framework for Financial Services: Making the EU Financial Sector More Secure," March 2020, https://www.world-exchanges.org/storage/app/media/regulatory-affairs/WFE%20response%20EU%20Consultation%20Digital%20Resilience%20FINAL.pdf.
176 Rohini Tendulkar, "Cyber-Crime, Securities Markets, and Systemic Risk," Joint Staff Working Paper of the IOSCO Research Department and World Federation of Exchanges, July 2013, https://www.world-exchanges.org/storage/app/media/research/Studies_Reports/2013-cyber-crime-securities-markets-amp-systemic-risk.pdf.
177 Rob Stock, "Five Eyes Cybersecurity Agencies Will Be Involved in Fight Against NZX Cyberattackers," *Stuff,* August 29, 2020, https://www.stuff.co.nz/business/122604872/five-eyes-cybersecurity-agencies-will-be-involved-in-fight-against-nzx-cyberattackers.
178 Nish and Naumaan, "The Cyber Threat Landscape: Confronting Challenges to the Financial System."
179 "The Evolving Advanced Cyber Threat to Financial Markets," SWIFT and BAE Systems, 2018, https://www.baesystems.com/en/cybersecurity/feature/the-evolving-advanced-cyber-threat-to-financial-markets.
180 Nish and Naumaan, "The Cyber Threat Landscape: Confronting Challenges to the Financial System."
181 FinCyber Project, "Timeline of Cyber Incidents Involving Financial Institutions," Carnegie Endowment for International Peace, accessed July 20, 2020, https://carnegieendowment.org/specialprojects/protectingfinancialstability/timeline.
182 "Consultation Paper on Proposed Revisions to Business Continuity Management Guidelines," Monetary Authority of Singapore, March 2019, https://www.mas.gov.sg/-/media/MAS/News-and-Publications/Consultation-Papers/Consultation-Paper-on-Proposed-Revisions-to-Business-Continuity-Management-Guidelines.pdf.
183 European Commission, "Executive Summary of the Impact Assessment Accompanying the Document: Proposal for a Regulation of the European Parliament and of the Council on Digital Operational Resilience for the Financial Sector," Commission Staff Working Document, September 24, 2020, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=SWD:2020:199:FIN.
184 Carmen Reinicke, "3 Reasons One Wall Street Firm Says to Stick With Cloud Stocks Amid the Coronavirus-Induced Market Rout," Business Insider, March 30, 2020, https://markets.businessinsider.com/news/stocks/wedbush-reasons-own-cloud-stocks-coronavirus-pandemic-tech-buy-2020-3-1029045273#2-the-move-to-cloud-will-accelerate-more-quickly-amid-the-coronavirus-pandemic2.
185 Sara Castellanos, "Nasdaq Ramps Up Cloud Move," *Wall Street Journal,* September 15, 2020, https://www.wsj.com/articles/nasdaq-ramps-up-cloud-move-11600206624.
186 Mark Carney, "Enable, Empower, Ensure: A New Finance for the New Economy" (Speech, Mansion House Bankers' and Merchants' Dinner, London, June 20, 2019), http://www.bankofengland.co.uk/speech/2019/mark-carney-speech-at-the-mansion-house-bankers-and-merchants-dinner.
187 Tim Maurer and Garrett Hinck, "Cloud Security: A Primer for Policymakers," Carnegie Endowment for International Peace, August 31, 2020, https://carnegieendowment

.org/2020/08/31/cloud-security-primer-for-policymakers-pub-82597.

188 Buckley LLP, "Democratic Members Request FSOC Designate Cloud Providers as Systemically Important," *InfoBytes Blog*, August 29, 2019, https://www.lexology.com/library/detail.aspx?g=049d5593-658b-4379-835b-9a42bc26758b.

189 White and Williams LLP and Osborne Clarke LLP, "Threat Information Sharing and GDPR: A Lawful Activity That Protects Personal Data," FS-ISAC, 2018, https://www.osborneclarke.com/wp-content/uploads/2019/01/Threat-Information-Sharing-and-GDPR_Final_TLP-WHITE.pdf.

190 Based on input from officials at the European Central Bank.

191 European Central Bank, "Major European Financial Infrastructures Join Forces Against Cyber Threats," February 2020, https://www.ecb.europa.eu/press/pr/date/2020/html/ecb.pr200227_1~062992656b.en.html.

192 "Exemptions," ICO, May 15, 2020, https://ico.org.uk/for-organisations/guide-to-data-protection/guide-to-the-general-data-protection-regulation-gdpr/exemptions/.

193 "Exemptions," ICO, May 15, 2020, https://ico.org.uk/for-organisations/guide-to-data-protection/guide-to-the-general-data-protection-regulation-gdpr/exemptions/.

194 Stephanie von Maltzan, "No Contradiction Between Cyber-Security and Data Protection? Designing a Data Protecton Compliant Incident Response System," *European Journal of Law and Technology* 10, no. 1 (May 16, 2019), http://ejlt.org/article/view/665. Also known as IT-Security incidents. Key issues such as information exchange formats and sharing platforms remain on the agenda of the cybersecurity community, especially for incident responders. Incident Response activities require additional processing of personal data, so may themselves create a privacy risk. Current developments towards Incident Response show that systems are increasingly insecure to data breaches, especially due to the massive amounts of personal data and the possibility of linking this data to personal identifiers. Therefore, the joint project ITS. Overview has set itself the goal of creating a detailed overview of IT-Security incidents in different industrial sectors that can be correlated and exchanged among companies to be able to quickly identify cyberattacks. This article aims to offer an initial assessment of data protection measures using Incident Response management. The key problems in this context are legal and technical barriers. The main factors are the possibility of entering free text in Ticketing Systems and the legal obligations for sharing information under the General Data Protection Regulation (GDPR).

195 Financial Stability Board, "Effective Practices for Cyber Incident Response and Recover: Consultative Document," April 20, 2020, https://www.fsb.org/2020/04/effective-practices-for-cyber-incident-response-and-recovery-consultative-document/.

196 Elise Thomas, Natalie Thompson, and Alicia Wanless, "The Challenges of Countering Influence Operations," Carnegie Endowment for International Peace, June 10, 2020, https://carnegieendowment.org/2020/06/10/challenges-of-countering-influence-operations-pub-82031.

197 Jon Bateman, "Deepfakes and Synthetic Media in the Financial System: Assessing Threat Scenarios," Cybersecurity and the Financial System Working Paper Series, Carnegie Endowment for International Peace, July 2020, https://carnegieendowment.org/2020/07/08/deepfakes-and-synthetic-media-in-financial-system-assessing-threat-scenarios-pub-82237.

198 Jim Edwards, "A False Rumor on WhatsApp Started a Run on a London Bank," Business Insider, May 13, 2019, https://www.businessinsider.com/whatsapp-rumour-started-run-on-metro-bank-2019-5.

199 Patrick Collinson Money, "Metro Bank Shares Crash After Loans Blunder Revealed," *Guardian*, January 23, 2019, https://www.theguardian.com/business/2019/jan/23/metro-bank-shares-crash-after-loans-blunder-revealed.

200 Ariel E. Levite, Scott Kannry, and Wyatt Hoffman, "Addressing the Private Sector Cybersecurity Predicament: The Indispensable Role of Insurance," Carnegie Endowment for International Peace, 2018, https://carnegieendowment.org/files/Cyber_Insurance_Formatted_FINAL_WEB.PDF; Jon Bateman, "War, Terrorism, and Catastrophe in Cyber Insurance: Understanding and Reforming Exclusions," Carnegie Endowment for International Peace, October 5, 2020, https://carnegieendowment.org/2020/10/05/war-terrorism-and-catastrophe-in-cyber-insurance-understanding-and-reforming-exclusions-pub-82819.

## Priority #2: International Norms

201 This section includes text from the previously published, short article by Tim Maurer and Michael Schmitt, "Protecting Financial Data in Cyberspace: Precedent for Further Progress on Cyber Norms?," *Just Security* (blog), August 24, 2017, and the Carnegie white paper "Toward a Global Norm Against Manipulating the Integrity of Financial Data" co-authored by Tim Maurer, Ariel Levite, and George Perkovich, released on March 27, 2017.

202 "It's the Economy, Stupid," Wikipedia, https://en.wikipedia.org/wiki/It%27s_the_economy,_stupid.

203 Group-IB, "Group-IB: Cobalt's Latest Attacks on Banks Confirm Connection to Anunak," www.group-ib.com, May 2018, https://www.group-ib.com/media/group-ib-cobalts-latest-attacks-on-banks-confirms-connection-to-anunak/.

204 Nish and Naumaan, "The Cyber Threat Landscape: Confronting Challenges to the Financial System."

205 European Systemic Risk Board, "Systemic Cyber Risk," February 2020, https://www.esrb.europa.eu/pub/pdf/reports/esrb.report200219_systemiccyberrisk~101a09685e.en.pdf.

206 Michael P. Fischerkeller and Richard J. Harknett, "Persistent Engagement and Tacit Bargaining: A Path Toward Constructing Norms in Cyberspace," *Lawfare* (blog), November 9, 2018, https://www.lawfareblog.com/persistent-engagement-and-tacit-bargaining-path-toward-constructing-norms-cyberspace.

207 For more details, see Carnegie's "Timeline of Cyber Incidents Involving Financial Institutions," developed in association with BAE Systems: https://carnegieendowment.org/specialprojects/protectingfinancialstability/timeline.

208 Tim Maurer et al., "Toward a Global Norm Against Manipulating the Integrity of Financial Data," Carnegie Endowment for International Peace, March 2017, https://carnegieendowment.org/2017/03/27/toward-global-norm-against-manipulating-integrity-of-financial-data-pub-68403.

209 Tim Maurer et al., "Toward a Global Norm Against Manipulating the Integrity of Financial Data," Carnegie Endowment for International Peace, March 2017, https://carnegieendowment.org/2017/03/27/toward-global-norm-against-manipulating-integrity-of-financial-data-pub-68403.

210 Tim Maurer et al., "Toward a Global Norm Against Manipulating the Integrity of Financial Data," Carnegie Endowment for International Peace, March 2017, https://carnegieendowment.org/2017/03/27/toward-global-norm-against-manipulating-integrity-of-financial-data-pub-68403.

211 Richard A. Clarke and Robert K. Knake, *Cyber War: The Next Threat to National Security and What to Do About It*, 1st Ecco pbk. ed (New York: Ecco, 2012), 202–3; John Markoff and Thom Shanker, "Halted '03 Iraq Plan Illustrates U.S. Fear of Cyberwar Risk," *New York Times*, August 1, 2009, https://www.nytimes.com/2009/08/02/us/politics/02cyber.html.

212 The Ministry of Foreign Affairs of the Russian Federation, "Convention on International Information Security," September 2011, https://www.mid.ru/foreign_policy/official_documents/-/asset_publisher/CptICkB6BZ29/content/id/191666.

213 Mark Wells and Nick Fahey, "Charts: Who Loses When the Renminbi Joins the IMF Basket?," CNBC, December 2, 2015, https://www.cnbc.com/2015/12/02/who-loses-when-the-renminbi-joins-the-imf-basket.html.

214 United Nations General Assembly, "Group of Governmental Experts on Developments in the Field of Information and Telecommunications in the Context of International Security," Pub. L. No. A/68/98, A/68/98 (2013), https://www.unidir.org/files/medias/pdfs/developments-in-the-field-of-information-and-telecommunications-in-the-context-of-international-security-2012-2013-a-68-98-eng-0-518.pdf.

215 Michael Schmitt and Tim Maurer, "Protecting Financial Data in Cyberspace: Precedent for Further Progress on Cyber Norms?," *Just Security* (blog), August 24, 2017, https://www.justsecurity.org/44411/protecting-financial-data-cyberspace-precedent-progress-cyber-norms/.

216 Attorney General Jeremy Wright QC MP, "Cyber and International Law in the 21st Century" (Speech, Chatham House, London, May 23, 2018), https://www.gov.uk/government/speeches/cyber-and-international-law-in-the-21st-century.

217 Australian Mission to the United Nations, "Australian Paper - Open Ended Working Group on Developments in the Field of Information and Telecommunications in the Context of International Security," Open Ended Working Group, September 2019, https://unoda-web.s3.amazonaws.com/wp-content/uploads/2019/09/fin-australian-oewg-national-paper-Sept-2019.pdf.

218 Stef Blok, "Letter to the Parliament on the International Legal Order in Cyberspace From the Government of the Kingdom of the Netherlands to Parliament," July 5, 2019, https://www.government.nl/documents/parliamentary-documents/2019/09/26/letter-to-the-parliament-on-the-international-legal-order-in-cyberspace.

219 United Nations General Assembly, "Group of Governmental Experts on Developments in the Field of Information and Telecommunications in the Context of International Security," A/70/174 § (2015), https://undocs.org/A/70/174.

220 Catalin Cimpanu, "All Five Eyes Countries Formally Accuse Russia of Orchestrating NotPetya Attack," *BleepingComputer*, February 18, 2018, https://www.bleepingcomputer.com/news/security/all-five-eyes-countries-formally-accuse-russia-of-orchestrating-notpetya-attack/; Dustin Volz, "U.S. Blames North Korea for 'WannaCry' Cyber Attack," Reuters, December 19, 2017, https://www.reuters.com/article/us-usa-cyber-northkorea-idUSKBN1ED00Q.

221 Open Ended Working Group, "Initial 'Pre-Draft' of the Report of the OEWG on Developments in the Field of Information and Telecommunications in the Context of International Security," 2020, https://www.un.org/disarmament/open-ended-working-group/.

222 Permanent Mission of the Republic of Singapore to the United Nations, "Singapore's Written Comment on the Chair's Pre-Draft of the OEWG Report," Open Ended Working Group, 2020, https://front.un-arm.org/wp-content/uploads/2020/04/singapore-written-comment-on-pre-draft-oewg-report.pdf.

223 David Reid, "New York Stretches Lead Over London as the World's Top Financial Center, Survey Shows," CNBC, September 19, 2019, https://www.cnbc.com/2019/09/19/new-york-beats-london-again-as-the-worlds-top-financial-center.html.

224 Permanent Mission of the Republic of Singapore to the United Nations, "Singapore's Written Comment on the Chair's Pre-Draft of the OEWG Report."

225 Permanent Mission of France to the United Nations, "France's Response to the Pre-Draft Report From the OEWG Chair," Open Ended Working Group, 2020, https://front.un-arm.org/wp-content/uploads/2020/04/contribution-fr-oewg-eng-vf.pdf.

226 U.S. Cyberspace Solarium Commission, "Cyberspace Solarium Commission Final Report," March 2020, https://www.solarium.gov/.

227 Letter by Congressman Royce and Langevin to Secretary Mnuchin, November 5, 2018; Letter by Congressman Royce and Langevin to Secretary Pompeo, November 5, 2018.

228 Letter by the FSSCC to Secretary Mnuchin dated November 19, 2018.

229 Tim Maurer and Arthur Nelson, "COVID-19's Other Virus: Targeting the Financial System," *Strategic Europe* (blog), Carnegie Europe, April 21, 2020, 1, https://carnegieeurope.eu/strategiceurope/81599.

230 Tim Maurer et al., "Toward a Global Norm Against Manipulating the Integrity of Financial Data," Carnegie Endowment for International Peace, March 2017, https://carnegieendowment.org/2017/03/27/toward-global-norm-against-manipulating-integrity-of-financial-data-pub-68403.

231 Tim Maurer et al., "Toward a Global Norm Against Manipulating the Integrity of Financial Data," Carnegie Endowment for International Peace, March 2017, https://carnegieendowment.org/2017/03/27/toward-global-norm-against-manipulating-integrity-of-financial-data-pub-68403.

232 Tim Maurer et al., "Toward a Global Norm Against Manipulating the Integrity of Financial Data," Carnegie Endowment for International Peace, March 2017, https://carnegieendowment.org/2017/03/27/toward-global-norm-against-manipulating-integrity-of-financial-data-pub-68403.

233 Tim Maurer et al., "Toward a Global Norm Against Manipulating the Integrity of Financial Data," Carnegie Endowment for International Peace, March 2017, https://carnegieendowment.org/2017/03/27/toward-global-norm-against-manipulating-integrity-of-financial-data-pub-68403.

234 Tim Maurer et al., "Toward a Global Norm Against Manipulating the Integrity of Financial Data," Carnegie Endowment for International Peace, March 2017, https://carnegieendowment.org/2017/03/27/toward-global-norm-against-manipulating-integrity-of-financial-data-pub-68403.
235 Carnegie Endowment for International Peace, "Launch Event: Toward a Global Norm Against Manipulating the Integrity of Financial Data," June 19, 2017, accessed October 30, 2020, https://carnegieendowment.org/2017/06/19/launch-toward-global-norm-against-manipulating-integrity-of-financial-data-event-5617.
236 Brad Smith, "The Need for a Digital Geneva Convention," https://blogs.microsoft.com/on-the-issues/2017/02/14/need-digital-geneva-convention/.
237 Cyber Security Program of the Inter-American Committee against Terrorism, "State of Cybersecurity in the Banking Sector in Latin America and the Caribbean," Organization of American States, 2018, https://www.oas.org/es/sms/cicte/sectorbancarioeng.pdf.
238 "CyberPeace Institute - Home," CyberPeace Institute, accessed February 28, 2020, https://cyberpeaceinstitute.org/.
239 SWIFT, "Customer Security Programme Terms and Conditions," June 30, 2017, https://www2.swift.com/uhbonline/books/public/en_uk/cst_sec_prog_trm_cond/index.htm.
240 Bill Gates, "Bill Gates: Trustworthy Computing," *Wired*, January 17, 2002, https://www.wired.com/2002/01/bill-gates-trustworthy-computing/.
241 Dennis Fisher, "Era Ends With Break Up of Trustworthy Computing Group at Microsoft," ThreatPost, accessed January 14, 2020, https://threatpost.com/era-ends-with-break-up-of-trustworthy-computing-group-at-microsoft/108404/.
242 Paul Beckett and Rebecca Buckman, "Citigroup, Microsoft Will Allow Users to Send Money Transfers - WSJ," *Wall Street Journal*, accessed January 16, 2020, https://www.wsj.com/articles/SB988669484896586123.
243 Craig Mundie et al., "Trustworthy Computing, Microsoft White Paper," Microsoft Corporation, revised version 2002, http://download.microsoft.com/documents/australia/about/trustworthy_comp.doc. *Emphasis added by author.*

## Priority #3: Collective Response

244 Saul Hansell, "Citibank Fraud Case Raises Computer Security Questions," *New York Times*, August 19, 1995, https://www.nytimes.com/1995/08/19/business/citibank-fraud-case-raises-computer-security-questions.html.
245 U.S. Federal Bureau of Investigation, "A Byte Out of History: $10 Million Hack," accessed July 20, 2020, https://www.fbi.gov/news/stories/a-byte-out-of-history-10-million-hack.
246 Matthew Noyes, "Countering COVID-19 Related Fraud" (panel discussion, Center for Strategic and International Studies, June 5, 2020), https://www.youtube.com/watch?v=Ms-e-4TFsyI&feature=emb_title.
247 U.S. Department of Justice, "Seven Iranians Working for Islamic Revolutionary Guard Corps-Affiliated Entities Charged for Conducting Coordinated Campaign of Cyber Attacks Against U.S. Financial Sector," March 24, 2016, https://www.justice.gov/opa/pr/seven-iranians-working-islamic-revolutionary-guard-corps-affiliated-entities-charged.
248 "Bangladesh Bank Heist Was 'State-Sponsored': U.S. Official," Reuters, March 29, 2017, https://www.reuters.com/article/us-cyber-heist-philippines/bangladesh-bank-heist-was-state-sponsored-u-s-official-idUSKBN1700TI.
249 U.S. Treasury, "Sanctions Related to Significant Malicious Cyber-Enabled Activities," accessed July 20, 2020, https://www.treasury.gov/resource-center/sanctions/Programs/pages/cyber.aspx.
250 Europol, "Law Enforcement Agencies Across the EU Prepare for Major Cross-Border Cyber-Attacks," March 2019, https://www.europol.europa.eu/newsroom/news/law-enforcement-agencies-across-eu-prepare-for-major-cross-border-cyber-attacks.
251 ENISA, "CyLEEx19: Inside a Simulated Cross-Border Cyber-Attack on Critical Infrastructure," October 31, 2019, https://www.enisa.europa.eu/news/enisa-news/test-1.
252 Fabio Panetta, "Protecting the European Financial Sector: The Cyber Information and Intelligence Sharing Initiative," https://www.ecb.europa.eu/press/key/date/2020/html/ecb.sp200227~7aae128657.en.html.

253 FS-ISAC, "FS-ISAC Announces the Formation of the Financial Systemic Analysis & Resilience Center (FSARC)," Press Release, October 24, 2016, https://www.prnewswire.com/news-releases/fs-isac-announces-the-formation-of-the-financial-systemic-analysis--resilience-center-fsarc-300349678.html.

254 Chris Bing, "Project Indigo: The Quiet Info-Sharing Program Between Banks and U.S. Cyber Command," CyberScoop, May 21, 2018, https://www.cyberscoop.com/project-indigo-fs-isac-cyber-command-information-sharing-dhs/.

255 Paul Nakasone, "Statement of General Paul M. Nakasone, Commander, United States Cyber Command, before the Senate Committee on Armed Services" (Hearing on United States Special Operations Command and United States Cyber Command, U.S. Senate, 2019), https://www.armed-services.senate.gov/imo/media/doc/Nakasone_02-14-19.pdf.

256 "Cybercom Media Roundtable," May 7, 2019, https://www.cybercom.mil/Portals/56/Documents/FOIA%20Reading%20Room%20Docs/2019-05-07_CYBERCOM_Media_Roundtable_Transcript.pdf?ver=2020-01-24-095943-620.

257 Hannah McGrath, "UK Banks to Set Up Cyber Security Centre," FStech, October 19, 2018, https://www.fstech.co.uk/fst/UK_Banks_Insurers_To_Set_Up_Cybersecurity_Centre.php.

258 Katherine Griffiths, "Banks Man the Barricades to See Off Cyberattacks," *The Times*, October 2018, https://www.thetimes.co.uk/article/banks-man-the-barricades-to-see-off-cyberattacks-qz63v5wwk.

259 Moody's, "BoE Releases Findings of Cyber Simulation Exercise in Financial Sector," Moody's Analytics, September 2019, https://www.moodysanalytics.com/regulatory-news/sep-27-19-boe-releases-findings-of-cyber-simulation-exercise-in-financial-sector.

260 ANSSI, "Coopération entre l'Agence Nationale de la Sécurité des Systems d'Information (ANSSI) et ;'Autorité de Contôle Prudentiel (ACPR)," https://www.ssi.gouv.fr/actualite/cooperation-entre-lagence-nationale-de-la-securite-des-systemes-dinformation-anssi-et-lautorite-de-controle-prudentiel-acpr/.

261 Anna Isaac, "U.K. Examines if Cyberattack Triggered London Stock Exchange Outage," *Wall Street Journal,* January 5, 2020, https://www.wsj.com/articles/u-k-examines-if-cyberattack-triggered-london-stock-exchange-outage-11578232800.

262 Jeremy Fleming, "Director GCHQ's Speech at CYBERUK 2019", (CYBERUK 2019, Glasgow, April 24, 2019), https://www.gchq.gov.uk/speech/director-s-speech-at-cyberuk-2019.

263 World Economic Forum, "Recommendations for Public-Private Partnership Against Cybercrime," World Economic Forum, January 2016, http://www3.weforum.org/docs/WEF_Cybercrime_Principles.pdf; World Economic Forum, "Partnership Against Cybercrime," accessed July 20, 2020, https://www.weforum.org/projects/partnership-against-cybercime/.

264 Third Way, "Announcing the Third Way Cyber Enforcement Initiative," October 29, 2018, https://www.thirdway.org/memo/announcing-the-third-way-cyber-enforcement-initiative.

265 Juan Zarate and Tim Maurer, "Protecting the Financial System Against the Coming Cyber Storms," *Hill*, May 18, 2020, https://thehill.com/opinion/cybersecurity/498244-protecting-the-financial-system-against-the-coming-cyber-storms.

266 Joyce Hakmeh and Allison Peters, "A New UN Cybercrime Treaty? The Way Forward for Supporters of an Open, Free, and Secure Internet," Council on Foreign Relations, January 13, 2020, https://www.cfr.org/blog/new-un-cybercrime-treaty-way-forward-supporters-open-free-and-secure-internet.

267 U.S. Federal Bureau of Investigation, "A Byte Out of History."

268 Europol, "Joint Cybercrime Action Taskforce (J-CAT)," accessed July 22, 2020, https://www.europol.europa.eu/activities-services/services-support/joint-cybercrime-action-taskforce.

269 Tuesday Reitano, Troels Oerting, and Marcena Hunter, "Innovations in International Cooperation to Counter Cybercrime: The Joint Cybercrime Action Taskforce (J-CAT)," Studying Group on Organised Crime, 2015, https://standinggroups.ecpr.eu/sgoc/innovations-in-international-cooperation-to-counter-cybercrime-the-joint-cybercrime-action-taskforce-j-cat/.

270 Founding institutions include Barclays, Standard Chartered, Deutsche Bank, and Banco Santander. Other members now include Bank of Ireland, Allied Irish Banks, Lloyds Banking Group, and Metro Bank. See, "Banks Join Forces to Crack Down on Fraudsters," *Financial Times*, August 8 2017, https://www.ft.com/content/6c9030ca-7937-11e7-90c0-90a9d1bc9691.

271 Europol, "The Cyber Defence Alliance and Europol Step Up Cooperation in the Fight Against Fraudsters," October 2018, https://www.europol.europa.eu/newsroom/news/cyber-defence-alliance-and-europol-step-cooperation-in-fight-against-fraudsters.
272 Cheri McGuire, A True Risk "Partner," interview by Corporate Counsel Business Journal, March 2, 2018, https://ccbjournal.com/articles/true-risk-partner.
273 Bill Nelson, "FS-ISAC Testimony Before the Committee on Banking, Housing and Urban Affairs" (Hearing on Cybersecurity: Risks to Financial Services Industry and Its Preparedness, U.S. Senate, 2019), https://www.fsisac.com/hubfs/Resources/FS-ISAC-Testimony_BillNelson-2018-FIN.pdf.
274 FS-ISAC, "About FS-ISAC," accessed July 28, 2018, https://www.fsisac.com/about.
275 FS-ISAC, "CERES Forum Marks One-Year Anniversary With 10th Country Addition," July 10, 2019, https://www.fsisac.com/newsroom/ceres_forum_one_year.
276 FS-ISAC and Monetary Authority of Singapore, "FS-ISAC and MAS Establish Asia Pacific (APAC) Intelligence Centre for Sharing and Analysing Cyber Threat Information," Press Release, December 1, 2016, https://www.nas.gov.sg/archivesonline/data/pdf-doc/20161201006/Media%20Release_FS-ISAC%20and%20MAS%20Establish%20Asia%20Pacific%20%28APAC%29%20Intelligence%20Centre%20for%20sharing%20and%20analysing%20cyber%20threat%20information%20%28SGPC%29.pdf.
277 FS-ISAC, "About FS-ISAC," accessed July 28, 2018, https://www.fsisac.com/about.
278 FS-ISAC, "CERES Forum Marks One-Year Anniversary With 10th Country Addition."
279 FS-ISAC, "FS-ISAC and CSA Partner to Enhance Cybersecurity in Singapore," Press Release, July 18, 2018, https://www.fsisac.com/newsroom/fs-isac-and-csa-partner-to-enhance-cybersecurity-in-singapore.
280 FS-ISAC, "FS-ISAC and Europol Partner to Combat Cross-Border Cybercrime," Press Release, September 19, 2019, https://www.fsisac.com/newsroom/fsisac-europol-mou.
281 "About FS-ISAC," FS-ISAC, accessed July 28, 2018, https://www.fsisac.com/about.
282 U.S. Cyber Command, "Achieve and Maintain Cyberspace Superiority: Command Vision for US Cyber Command," April 2018, https://www.cybercom.mil/Portals/56/Documents/USCYBERCOM%20Vision%20April%202018.pdf?ver=2018-06-14-152556-010.
283 Executive Office of the President, "National Cyber Strategy for the United States of America," September 2018, https://www.whitehouse.gov/wp-content/uploads/2018/09/National-Cyber-Strategy.pdf.
284 U.S. Department of State, "Recommendations to the President on Deterring Adversaries and Better Protecting the American People From Cyber Threats," U.S. Department of State, May 31, 2018, https://www.state.gov/s/cyberissues/eo13800/282011.htm.
285 U.S. Department of State, "Recommendations to the President on Deterring Adversaries and Better Protecting the American People From Cyber Threats," U.S. Department of State, May 31, 2018, https://www.state.gov/s/cyberissues/eo13800/282011.htm.
286 U.S. Department of State, "Recommendations to the President on Deterring Adversaries and Better Protecting the American People From Cyber Threats," May 31, 2018, https://www.state.gov/s/cyberissues/eo13800/282011.htm.
287 "Joint Statement on Advancing Responsible State Behavior in Cyberspace," U.S. Department of State, September 23, 2019, https://www.state.gov/joint-statement-on-advancing-responsible-state-behavior-in-cyberspace/.
288 For more details see Uri Friedman, "Smart Sanctions: A Short History," April 23, 2012, https://foreignpolicy.com/2012/04/23/smart-sanctions-a-short-history/; and John Ikenberry, "Smart Sanctions: Targeting Economic Statecraft," September 2002, https://www.foreignaffairs.com/reviews/capsule-review/2002-09-01/smart-sanctions-targeting-economic-statecraft.
289 Juan Zarate, *Treasury's War: The Unleashing of a New Era of Financial Warfare* (Public Affairs, 2013).
290 Barack Obama, "Executive Order 13694 of April 1, 2015, Blocking the Property of Certain Persons Engaging in Significant Malicious Cyber-Enabled Activities," 2015, https://www.treasury.gov/resource-center/sanctions/Programs/Documents/cyber_eo.pdf.
291 U.S. Department of the Treasury, "Treasury Targets Supporters of Iran's Islamic Revolutionary Guard Corps and Networks Responsible for Cyber-Attacks Against the United States," Press Release, September 14, 2017, https://www.treasury.gov/press-center/press-releases/Pages/sm0158.aspx.

292 U.S. Department of the Treasury, "Treasury Sanctions North Korean State-Sponsored Malicious Cyber Groups | U.S. Department of the Treasury," Press Release, September 19, 2019, https://home.treasury.gov/news/press-releases/sm774; U.S. Department of the Treasury, "Treasury Targets North Korea for Multiple Cyber-Attacks," Press Release, September 14, 2017, https://home.treasury.gov/news/press-releases/sm473.

293 U.S. Department of the Treasury, "Treasury Sanctions Evil Corp, the Russia-Based Cybercriminal Group Behind Dridex Malware."

294 Katriina Härmä and Tomáš Minárik, "European Union Equipping Itself Against Cyber Attacks With the Help of Cyber Diplomacy Toolbox," *NATO Cooperative Cyber Defence Centre of Excellence* (blog), accessed July 20, 2020, https://ccdcoe.org/incyder-articles/european-union-equipping-itself-against-cyber-attacks-with-the-help-of-cyber-diplomacy-toolbox/.

295 European Union, "Implementing Regulation (EU) 2019/796 Concerning Restrictive Measures Against Cyber-Attacks Threatening the Union of Its Member States," Official Journal of the European Union, July 30, 2020, https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32020R1125&from=EN.

296 "Cyber-attacks: Council Is Now Able to Impose Sanctions," Council of the European Union, May 17, 2019, https://www.consilium.europa.eu/en/press/press-releases/2019/05/17/cyber-attacks-council-is-now-able-to-impose-sanctions/.

297 "EU Imposes the First Ever Sanctions Against Cyber-Attacks," Council of the European Union, July 30, 2020, https://www.consilium.europa.eu/en/press/press-releases/2020/07/30/eu-imposes-the-first-ever-sanctions-against-cyber-attacks/.

298 In the United States, the U.S. Department of the Treasury has taken aim at Iranian targets engaged in distributed denial of service attacks against financial institutions, North Korean actors targeting cryptocurrency exchanges and ATMs to generate revenue, and Chinese actors engaged in money-laundering on behalf of North Korean groups. The European Union's action targeted a North Korean company for aiding in cyberattacks affecting the Polish Financial Supervision Authority, Bangladesh Bank, and Vietnam Tien Phong Bank. See, "Treasury Targets Supporters of Iran's Islamic Revolutionary Guard Corps and Networks Responsible for Cyber-Attacks Against the United States," U.S. Department of the Treasury, September 14, 2017, https://www.treasury.gov/press-center/press-releases/Pages/sm0158.aspx; "Treasury Sanctions North Korean State-Sponsored Malicious Cyber Groups," U.S. Department of the Treasury, September 13, 2019, https://home.treasury.gov/news/press-releases/sm774; "Treasury Sanctions Individuals Laundering Cryptocurrency for Lazarus Group," U.S. Department of the Treasury, March 2, 2020, https://home.treasury.gov/news/press-releases/sm924; Council Implementing Regulation (EU) 2020/1125 of July 30, 2020, implementing Regulation (EU) 2019/796 concerning restrictive measures against cyber-attacks threatening the Union or its Member States, 2020 O.J. (246) 4, https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32020R1125&from=EN.

299 Dursun Peksen, "When Do Imposed Economic Sanctions Work? A Critical Review of the Sanctions Effectiveness Literature," *Defence and Peace Economics* 30, no. 6 (May 2019): 635–47, https://doi.org/10.1080/10242694.2019.1625250.

300 For a specific overview on the use of sanctions for deterring financial motivated cyber crime, see Zachary K. Goldman and Damon McCoy, "Economic Espionage: Deterring Financially Motivated Cybercrime," *Journal of National Security Law & Policy* 8, no. 3 (July 2016): 595–619, https://jnslp.com/wp-content/uploads/2017/10/Deterring-Financially-Motivated-Cybercrime_2.pdf.

301 This categorization builds upon the scholarship of Garrett Hinck and Tim Maurer regarding the purposes of criminal charges against malicious cyber actors. Garrett Hinck and Tim Maurer, "Persistent Enforcement: Criminal Charges as a Response to Nation-State Malicious Cyber Activity," *Journal of National Security Law and Policy* 10, no. 3 (2020): 531–4, https://jnslp.com/wp-content/uploads/2020/05/Criminal-Charges-as-a-Response-to-Nation-State-Malicious-Cyber-Activity.pdf.

302 Joseph S. Nye, Jr., "Deterrence and Dissuasion in Cyberspace," *International Security* 41, no. 3 (Winter 2016/17): 56, https://www.mitpressjournals.org/doi/pdf/10.1162/ISEC_a_00266; for general background, see also Daniel Drezner, "Targeted Sanctions in a

World of Global Finance," *International Interactions* 41, no. 4 (2015): 760–1, https://doi.org/10.1080/03050629.2015.1041297; Henry Farrell and Abraham L. Newman, "Weaponized Interdependence," *International Security* 44, no. 1 (Summer 2019): 65–70, https://doi.org/10.1162/isec_a_00351.

303 Ibid, 76; Peter D. Feaver and Eric Lorber, "Coercive Diplomacy and the New Financial Levers: Evaluating the Intended and Unintended Consequences of Financial Sanctions," Legatum Institute, November 2010, 46–47, https://lif.blob.core.windows.net/lif/docs/default-source/publications/2010-publications-coercive-diplomacy.pdf?Status=Temp&sfvrsn=2. "Chinese Banks Urged to Switch Away From SWIFT as U.S. Sanctions Loom," Reuters, July 29, 2020, https://www.reuters.com/article/us-china-banks-usa-sanctions/chinese-banks-urged-to-switch-away-from-swift-as-u-s-sanctions-loom-idUSKCN24U0SN.

304 Brian Krebs, "U.S. Secret Service: 'Massive Fraud' Against State Unemployment Insurance Programs — Krebs on Security," *KrebsOnSecurity* (blog), May 16, 2020, https://krebsonsecurity.com/2020/05/u-s-secret-service-massive-fraud-against-state-unemployment-insurance-programs/.

305 BAE Systems, "Follow the Money: Understanding the Money Laundering Techniques That Support Large-Scale Cyber-Heists," 2020, https://www.swift.com/sites/default/files/files/swift_bae_report_Follow-The%20Money.pdf.

306 Shannon Vavra, "Secret Service Merging Electronic and Financial Crime Task Forces to Combat Cybercrime," CyberScoop, July 9, 2020, https://www.cyberscoop.com/secret-service-reorganization-task-force-cybercrime-financial-crime/.

307 United States Secret Service, "Secret Service Announces the Creation of the Cyber Fraud Task Force," Press Release, July 9, 2020, https://www.secretservice.gov/data/press/releases/2020/20-JUL/Secret-Service-Cyber-Fraud-Task-Force-Press-Release.pdf.

308 UK Finance, "Staying Ahead of Cyber Crime," April 2018, https://www.ukfinance.org.uk/system/files/Staying-ahead-of-cyber-crime.pdf.

309 Salim Hasham, Shoan Joshi, and Daniel Mikkelsen, "Financial Crime and Fraud in the Age of Cybersecurity," McKinsey & Company, October 2019.

310 "FinCEN Realigns Division to Increase Strategic Capabilities," Financial Crimes Enforcement Network, November 25, 2019, https://www.fincen.gov/news/news-releases/fincen-realigns-division-increase-strategic-capabilities.

311 "Public Safety Committee on Jan. 28th, 2019," Open Parliament, January 28, 2019, https://openparliament.ca/committees/public-safety/42-1/145/?page=2.

312 Fajar Pebrianto, "PPATK Probes Alleged Money Laundering in Skimming Case," *Dukung Indepensi Tempo,* March 2018, 18, https://en.tempo.co/read/916736/ppatk-probes-alleged-money-laundering-in-bri-skimming-case.

313 Tracfin, "Tracfin Annual Report 2018," Ministère de l'Action et des Comptes Publics, 2018, https://www.economie.gouv.fr/files/files/directions_services/tracfin/Rapport%20Activit%C3%A9%20_2018_Ang.pdf.

314 Financial Intelligence Centre, "Annual Report 2018/19," July 31, 2019, https://www.masthead.co.za/wp-content/uploads/2019/11/FIC-Annual-Report-2018-2019.pdf.

315 U.S. Department of the Treasury, "Treasury Sanctions Evil Corp, the Russia-Based Cybercriminal Group Behind Dridex Malware," Press Release, December 5, 2019, https://home.treasury.gov/news/press-releases/sm845.

316 National Police Agency, "Annual Report 2019," Government of Japan, 2019, https://www.npa.go.jp/sosikihanzai/jafic/en/nenzihokoku_e/data/jafic_2019e.pdf.

317 Anton Moiseienko and Olivier Kraft, "From Money Mules to Chain-Hopping: Targeting the Finances of Cybercrime," Royal United Services Institute, November 2018, https://rusi.org/sites/default/files/20181129_from_money_mules_to_chain-hopping_web.pdf.

318 Anton Moiseienko and Olivier Kraft, "From Money Mules to Chain-Hopping: Targeting the Finances of Cybercrime," Royal United Services Institute, November 2018, https://rusi.org/sites/default/files/20181129_from_money_mules_to_chain-hopping_web.pdf.

319 Directive (EU) 2018/1673 of the European Parliament and of the Council on combating money laundering by criminal law, October 23, 2018, https://eur-lex.europa.eu/eli/dir/2018/1673/oj.

## Priority #4: Cybersecurity Workforce Challenges

320 "Strategies for Building and Growing Strong Cybersecurity Teams: (ISC)2 Cybersecurity Workforce Study 2019," 2019, https://www.isc2.org/-/media/ISC2/Research/2019-Cybersecurity-Workforce-Study/ISC2-Cybersecurity-Workforce-Study-2019.ashx?la=en&hash=D087F6468B4991E0BEFFC017BC1ADF59CD5A2EF7.

321 Sabine Lautenschläger, "Towards a More Cyber Secure Financial System: The Role of Central Banks" (Speech, G7 2019 conference on "Cybersecurity: Coordinating Efforts to Protect the Financial Sector in the Global Economy", Paris, May 10, 2019), https://www.ecb.europa.eu/press/key/date/2019/html/ecb.sp190510_1~5803aca48c.en.html.

322 Financial Stability Board, "Summary Report on Financial Sector Cybersecurity Regulations, Guidance and Supervisory Practices."

323 Financial Services Sector Coordinating Council, "The Financial Services Sector Cybersecurity Profile," October 25, 2018, https://fsscc.org/files/galleries/Financial_Services_Sector_Cybersecurity_Profile_Overview_and_User_Guide_2018-10-25.pdf.

324 For more details, see: "Timeline of Cyber Incidents Involving Financial Institutions," Carnegie Endowment for International Peace, https://carnegieendowment.org/specialprojects/protectingfinancialstability/timeline.

325 Cynet, "2020 Cybersecurity Salary Survey Results," 2020, https://go.cynet.com/hubfs/2020-Salary-Survey-Report.pdf.

326 Aspen Cybersecurity Group, "Principles for Growing and Sustaining the Nation's Cybersecurity Workforce," Aspen Institute, November 2018.

327 ITWeb Africa, "Internships Key to Addressing Cyber Security 'Brain Drain,'" *ITWeb Africa* (blog), July 18, 2019, https://itweb.africa//content/Kjlyr7w1NGAqk6am.

328 Paul Makin, interview by authors, January 2020.

329 Robyn Ziegler, "Zurich Insurance Launches Cyber Security Apprenticeship to Address Growing Demand for Cyber Security Professionals," Zurich Insurance Group, September 18, 2018, https://www.zurichna.com/about/news/news-releases/2018/zurich-insurance-launches-cyber-security-apprenticeship.

330 iQ4 Corp., "IQ4 Corp. Launches Virtual Apprenticeship Challenge With Global Public, Private and Educational Sector Backing to Create Skilled and Qualified Cyber-Savvy Workforce," Press Release, Markets Insider, October 8, 2019, https://markets.businessinsider.com/news/stocks/iq4-corp-launches-virtual-apprenticeship-challenge-with-global-public-private-and-educational-sector-backing-to-create-skilled-and-qualified-cyber-savvy-workforce-1028584152.

331 Melana Carollo, "JPMorgan Chase Donates $150,000 to University of South Florida Cybersecurity Center," *Tampa Bay Times*, February 25, 2019, https://www.tampabay.com/business/jpmorgan-chase-donates-150000-to-university-of-south-florida-cybersecurity-center-20190225/.

332 Capital One, "Capital One Launches $500,000 Grant Program to Build Workforce Technology Skills," Press Release, January 22, 2015, https://www.3blmedia.com/News/Capital-One-Launches-500000-Grant-Program-Build-Workforce-Technology-Skills.

333 "Top Companies Team Up With Federal Agencies and Nonprofit to Launch First-of-its-kind Cyber Talent Initiative to Protect Against Cyberattacks," *Partnership for Public Service* (blog), April 8, 2019, accessed March 9, 2020, https://ourpublicservice.org/publications/cybersecurity-talent-initiative-launch/.

334 US Bank, "U.S. Bank Announces 2018 Cybersecurity Scholarship Recipients," Press Release, November 13, 2018, https://www.usbank.com/newsroom/stories/us-bank-announces-2018-cybersecurity-scholarship-recipients.html.

335 Lauren Weber, "Why Companies Are Failing at Reskilling," *Wall Street Journal,* April 19, 2019, https://www.wsj.com/articles/the-answer-to-your-companys-hiring-problem-might-be-right-under-your-nose-11555689542.

336 Barclays, "Barclays Partners With Cyber Security Challenge UK to Attract Cyber Talent | Barclays," Press Release, July 2018, https://home.barclays/news/press-releases/2018/07/barclays-partners-with-cyber-security-challenge-uk-to-attract-cy/.

337 Eileen Yu, "Singapore Banks Offered $21M in Funds to Boost Cybersecurity Capabilities," ZDNet, accessed January 6, 2020, https://www.zdnet.com/article/singapore-banks-offered-21m-in-funds-to-boost-cybersecurity-capabilities/.

338 This section is based on a memo written by Laura Bate for Carnegie's FinCyber Working Group on Cybersecurity Workforce.
339 Justin Falk, "Comparing the Compensation of Federal and Private-Sector Employees, 2011 to 2015," U.S. Congressional Budget Office, April 2017.
340 Partnership for Public Service and Booz Allen Hamilton, "Cyber In-Security II: Closing the Federal Talent Gap," April 2015, https://ourpublicservice.org/wp-content/uploads/2015/04/5a6ae63596cc99f7039b9e409c70891a-1429280031.pdf#page=26.
341 (ISC)2, "Hiring and Retaining Top Cybersecurity Talent," (ISC)2, 2018, https://www.isc2.org/-/media/Files/Research/ISC2-Hiring-and-Retaining-Top-Cybersecurity-Talent.ashx#page=11.
342 ISACA, "State of Cyber 2020, Part 1: Workforce Efforts and Resources," ISACA, 2020, https://www.isaca.org/bookstore/bookstore-wht_papers-digital/whpsc201.
343 Center for Strategic and International Studies, "Hacking the Skills Shortage Report," McAfee, 2016, https://www.mcafee.com/enterprise/en-us/assets/reports/rp-hacking-skills-shortage.pdf#page=12.
344 Rachel Thomas et al., "Women in the Workplace," McKinsey & Company & LeanIn.org, 2019, 10, https://wiw-report.s3.amazonaws.com/Women_in_the_Workplace_2019.pdf#page=10.
345 Megan Caposell, Chris Paris, and Matt Isnor, "Interagency Federal Cyber Career Pathways Initiative" (NICE 2019 Conference & Expo, Phoenix, Arizona, November 16, 2019), https://niceconference.org/uploads/2019/InteragencyFederalCyberCareerPathwaysInitiative.pdf; NICE, "Cybersecurity Career Pathway," CyberSeek, accessed July 22, 2020, https://www.cyberseek.org/pathway.html.
346 Gary C. Peters, "Federal Rotational Cyber Workforce Program Act of 2019," Pub. L. No. S. 406 (2019), https://www.congress.gov/116/bills/s406/BILLS-116s406rfh.pdf.
347 National Security Agency, "Development Programs," accessed July 22, 2020, https://www.intelligencecareers.gov/nsa/nsadevprograms.html.
348 National Security Agency.
349 Jackson Barnett, "'Rigid' Pay System Blamed for Federal Cyber Reskilling Academy Struggles," FedScoop, January 22, 2020, https://www.fedscoop.com/cyber-reskilling-federal-workers/.
350 CIO Council, "Federal Cyber Reskilling Academy," CIO.gov, accessed July 22, 2020, https://www.cio.gov/programs-and-events/reskilling/.
351 Center for Strategic and International Studies, "Hacking the Skills Shortage Report," McAfee, 2016, https://www.mcafee.com/enterprise/en-us/assets/reports/rp-hacking-skills-shortage.pdf#page=12.
352 North Carolina Department of Information Technology, "Five Veterans Graduate From Cybersecurity Apprenticeship; 10 Vets to Join Program," *NC DIT* (blog), November 15, 2018, https://it.nc.gov/blog/2018/11/15/five-veterans-graduate-cybersecurity-apprenticeship-10-vets-join-program.
353 Jacqueline Thomsen, "Dem Introduces Bill to Create Federal Cybersecurity Apprenticeship Program," *Hill*, September 13, 2018, https://thehill.com/policy/cybersecurity/406577-dem-introduces-bill-to-create-federal-cybersecurity-apprenticeship.
354 Jon Ashton, "Cyber Apprenticeship Scheme: Open for Applications," *Government Security* (blog), May 3, 2018, https://securityprofession.blog.gov.uk/2018/05/03/cyber-apprenticeship-scheme-open-for-applications/.
355 Chief Information Officer of the U.S. Department of Defense, "DoD Cyber Excepted Service (CES) Personnel System," accessed July 22, 2020, https://dodcio.defense.gov/Cyber-Workforce/CES.aspx.
356 Mark Cancian, "Blue-Haired Soldiers? Just Say No," *War on the Rocks* (blog), January 18, 2018, https://warontherocks.com/2018/01/blue-haired-soldiers-just-say-no/.
357 AustCyber, "About Us," accessed July 22, 2020, https://www.austcyber.com/about-us.
358 Cybersecurity Talent Initiative, "About," accessed July 22, 2020, https://cybertalentinitiative.org/about/.
359 Office of the Under Secretary of Defense for Acquisition and Sustainment, "Public-Private Talent Exchange (PPTE) Program," accessed July 22, 2020, http://www.hci.mil/dodcareers.html.

360 U.S. Government Accountability Office, "Substantial Efforts Needed to Achieve Greater Progress on High-Risk Areas," High-Risk Series (U.S. Government Accountability Office, March 6, 2019), https://www.gao.gov/highrisk/govwide_security_clearance_process/why_did_study.

361 National Initiative for Cybersecurity Education (NICE), "The NICE Cybersecurity Workforce Framework," U.S. National Institute for Standards and Technology, August 2017, https://www.nist.gov/itl/applied-cybersecurity/nice/nice-cybersecurity-workforce-framework-resource-center/current.

362 Based on input from senior officials at the Bank of England.

363 Based on input from senior officials at the Bank of England.

364 Based on input from officials at the Monetary Authority of Singapore.

365 Monetary Authority of Singapore, "New S$30 Million Grant to Enhance Cybersecurity Capabilities in Financial Sector," Press Release, December 3, 2018, https://www.mas.gov.sg/news/media-releases/2018/new-30-million-grant-to-enhance-cybersecurity-capabilities-in-financial-sector.

366 Monetary Authority of Singapore, "Landmark Partnership to Level Up Skills for Singaporeans to Seize FinTech Jobs," Press Release, November 16, 2017, https://www.mas.gov.sg/news/media-releases/2017/landmark-partnership-to-level-up-skills-for-singaporeans-to-seize-fintech-jobs.

367 FS-ISAC, "FS-ISAC & MAS to Strengthen Cyber Info Sharing Across Nine Countries."

368 Monetary Authority of Singapore, "Annual Report 2008/2009," Monetary Authority of Singapore, 2009, https://www.mas.gov.sg/annual_reports/annual20082009/56_pro.html.

369 Based on input from Italian financial authorities.

370 Bank for International Settlements (BIS), "Cyber Resilience: Range of Practices."

371 This section is based on conversations with central bank officials, including officials from the Bank of England, the Italian Financial Authorities, and the European Central Bank.

372 Based on conversations with central bank officials, including officials from the Bank of England, the Italian Financial Authorities, and the European Central Bank.

373 Lyndon Nelson (Bank of England), interview by the authors, May 2020.

374 Based on conversations with central bank officials, including officials from the Bank of England, the Italian Financial Authorities, and the European Central Bank.

375 Based on input from officials at the European Central Bank.

376 Based on input from former officials at the Reserve Bank of India.

377 Based on conversations with central bank officials, including officials from the Bank of England, the Italian Financial Authorities, and the European Central Bank.

378 Mirko Hohmann, Alexander Pirang, and Thorsten Benner, "Advancing Cybersecurity Capacity Building," Global Public Policy Institute, March 2017, https://www.gppi.net/media/Hohmann__Pirang__Benner__2017__Advancing_Cybersecurity_Capacity_Building.pdf.

379 Global Cyber Security Capacity Centre, "Cybersecurity Capacity Maturity Model for Nations," University of Oxford, May 31, 2016, https://gcscc.web.ox.ac.uk/files/cmmrevisededition090220171pdf.

380 Mirko Hohmann, Alexander Pirang, and Thorsten Benner, "Advancing Cybersecurity Capacity Building."

381 Global Cybersecurity Capacity Program, "Lessons Learned and Recommendations Towards Strengthening the Program," World Bank Group, 2019, http://documents1.worldbank.org/curated/en/947551561459590661/pdf/Global-Cybersecurity-Capacity-Program-Lessons-Learned-and-Recommendations-towards-Strengthening-the-Program.pdf.

382 Norwegian Institute of International Affairs, "Cybersecurity Capacity Building," 2015, http://nupi_eng/About-NUPI/Projects-centers/Cybersecurity-Capacity-Building.

383 Zine Homburger, "The Necessity and Pitfall of Cybersecurity Capacity Building for Norm Development in Cyberspace," *Global Society* 33, no. 2 (April 3, 2019): 224–42, https://doi.org/10.1080/13600826.2019.1569502.

384 United Nations Office on Drugs and Crime, "Global Programme on Cybercrime," accessed July 22, 2020, http://www.unodc.org/unodc/en/cybercrime/global-programme-cybercrime.html; World Bank Group, "Combatting Cybercrime," accessed July 22, 2020,

http://www.combattingcybercrime.org/; World Bank Group and United Nations and International Bank for Reconstitution and Development, "Combatting Cybercrime: Tools and Capacity Building for Emerging Economies," 2017, http://documents1.worldbank.org/curated/en/355401535144740611/pdf/129637-WP-PUBLIC-worldbank-combating-cybercrime-toolkit.pdf.

385 United Nations Institute for Disarmament Research, "UNIDIR Cyber Policy Portal," Cyber Policy Portal, accessed July 22, 2020, https://cyberpolicyportal.org/en/; "Cybersecurity for Financial Inclusion: Framework & Risk Guide," Alliance for Financial Inclusion, October 2019, https://www.afi-global.org/sites/default/files/publications/2019-11/AFI_GN37_DFS_AW_digital_0.pdf.

386 Amazon Web Services, Inc., "AWS Educate," accessed July 22, 2020, https://aws.amazon.com/education/awseducate/.

387 World Economic Forum, "Partnership Against Cybercrime," accessed July 20, 2020, https://www.weforum.org/projects/partnership-against-cybercime/.

388 Third Way, "Announcing the Third Way Cyber Enforcement Initiative," October 29, 2018, https://www.thirdway.org/memo/announcing-the-third-way-cyber-enforcement-initiative.

389 Committee on Payments and Market Infrastructures and The Board of the International Organization of Securities Commissions, "Guidance on Cyber Resilience for Financial Market Infrastructures. "

390 David Lipton, "Cybersecurity Threats Call for a Global Response," *IMF Blog* (blog), January 13, 2020, https://blogs.imf.org/2020/01/13/cybersecurity-threats-call-for-a-global-response/.

391 Financial Stability Board, "Stocktake of Publicly Released Cybersecurity Regulations, Guidance and Supervisory Practices"; Financial Stability Board, "Cyber Lexicon."

392 Bank for International Settlements (BIS), "Cyber Resilience: Range of Practices."

393 World Bank, "Financial Sector Cyber Resilience Workshop" (Workshop, Mexico City, November 6, 2019), https://www.worldbank.org/en/events/2019/11/06/financial-sector-cyber-resilience-workshop.

394 Cyber Security Program of the Inter-American Committee against Terrorism, "State of Cybersecurity in the Banking Sector in Latin America and the Caribbean."

395 FinCyber Project, "Cyber Resilience and Financial Organizations: A Capacity-Building Tool Box," Carnegie Endowment for International Peace, accessed July 22, 2020, https://carnegieendowment.org/specialprojects/fincyber/guides.

396 Global Cyber Alliance, "Cybersecurity Toolkit for Small Business," accessed July 22, 2020, https://www.globalcyberalliance.org/gca-cybersecurity-toolkit/.

397 "Customer Security Programme (CSP)," SWIFT, accessed July 22, 2020, https://www.swift.com/myswift/customer-security-programme-csp.

398 Cyber Risk Insitute, "About Cyber Risk Institute," accessed July 22, 2020, https://cyberriskinstitute.org/about/.

399 FS-ISAC, "FS-ISAC Summits," accessed July 22, 2020, https://www.fsisac.com/events#summits.

400 Amazon Web Services, Inc., "AWS Education," accessed July 22, 2020, https://aws.amazon.com/education/awseducate/.

401 United Nations Institute for Disarmament Research, "UNIDIR Cyber Policy Portal."

402 UN Office for Disarmament Affairs, "CyberDiplomacy," accessed July 22, 2020, https://cyberdiplomacy.disarmamenteducation.org/home/.

403 United Nations Office for Disarmament Affairs, "Developments in the Field of Information and Telecommunications in the Context of International Security," UN.org, accessed July 22, 2020, https://www.un.org/disarmament/ict-security/.

404 OSCE, "Cyber/ICT Security," accessed July 22, 2020, https://www.osce.org/cyber-ict-security.

405 Organization of American States, "Cyber Security," OAS.org, accessed July 22, 2020, https://www.oas.org/en/topics/cyber_security.asp.

406 NATO Cooperative Cyber Defence Centre of Excellence, "ASEAN Regional Forum Reaffirming the Commitment to Fight Cyber Crime," accessed July 22, 2020, https://ccdcoe.org/incyder-articles/asean-regional-forum-reaffirming-the-commitment-to-fight-cyber-crime/.

407 Global Forum on Cyber Expertise, "Cybil Portal," accessed July 22, 2020, https://cybilportal.org/.
408 Microsoft, "Cyber Crime & Security Content Hub," accessed July 22, 2020, https://www.microsoft.com/en-us/cybersecurity/content-hub; "CyberPeace Institute - Home."
409 DiploFoundation, "Cybersecurity," accessed July 22, 2020, https://www.diplomacy.edu/cybersecurity.
410 ICT4Peace, "Promotion of a Secure and Peaceful Cyberspace," June 1, 2016, https://ict4peace.org/what-we-do/.
411 United Nations Office on Drugs and Crime, "Cybercrime," accessed July 22, 2020, https://www.unodc.org/unodc/en/cybercrime/index.html.
412 World Bank Group, "Combatting Cybercrime."
413 Council of Europe, "Worldwide Capacity Building," accessed July 22, 2020, https://www.coe.int/en/web/cybercrime/capacity-building-programmes.
414 Europol, "Training and Capacity Building," accessed July 22, 2020, https://www.europol.europa.eu/activities-services/services-support/training-and-capacity-building.
415 INTERPOL, "Capacity Building Projects," accessed July 22, 2020, https://www.interpol.int/en/How-we-work/Capacity-building/Capacity-building-projects.
416 African Union, "First African Forum on Cybercrime" (Addis Ababa, October 16, 2018), https://au.int/en/newsevents/20181016/first-african-forum-cybercrime.
417 The National Cyber-Forensics and Training Alliance, "NCFTA," accessed July 22, 2020, https://www.ncfta.net/.
418 Anomali Inc, "Cyber Defence Alliance (CDA) Partners With Anomali to Better Enable Sharing of Threat Intelligence Among Banking Members," GlobeNewswire News Room, March 5, 2020, http://www.globenewswire.com/news-release/2020/03/05/1995533/0/en/Cyber-Defence-Alliance-CDA-partners-with-Anomali-to-better-enable-sharing-of-Threat-Intelligence-among-banking-members.html.
419 Chris Bing, "Project Indigo: The Quiet Info-Sharing Program Between Banks and U.S. Cyber Command," CyberScoop, May 21, 2018, https://www.cyberscoop.com/project-indigo-fs-isac-cyber-command-information-sharing-dhs/.
420 "Cybersecurity for Financial Inclusion: Framework & Risk Guide," Alliance for Financial Inclusion, October 2019, https://www.afi-global.org/sites/default/files/publications/2019-11/AFI_GN37_DFS_AW_digital_0.pdf.
421 UNSGSA Fintech Sub-Group, "Briefing on Cybersecurity," United Nations Secretary-General's Special Advocate for Inclusive Finance for Development, 2017, https://www.unsgsa.org/files/2815/3575/0134/Cybersecurity.pdf.
422 World Economic Forum, "World Economic Forum Convenes New Consortium to Address Fintech Cybersecurity," March 6, 2018, https://www.weforum.org/press/2018/03/world-economic-forum-convenes-new-consortium-to-address-fintech-cybersecurity/.
423 Nicholas Nhede, "Cybersecurity Innovation: Enel, Mastercard Announce a New Lab in Israel," *Smart Energy International* (blog), May 15, 2020, https://www.smart-energy.com/industry-sectors/cybersecurity/enel-mastercard-announce-a-new-cybersecurity-innovation-lab-in-israel/.
424 Citi, "Global Citizenship Report," 2018, https://www.citigroup.com/citi/about/citizenship/download/Global-Citizenship-Report-2018.pdf.
425 Foreign, Commonwealth & Development Office, "UIK Commonwealth Chair-in-Office Report 2018-2020," September 2020, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/916018/UK-Commonwealth-Chair-in-Office-Report-2018-2020.pdf.
426 Monetary and Capital Markets Department, "Technical Assistance Annual Report 2018," International Monetary Fund, 2018, https://www.imf.org/en/Publications/Technical-Assistance-Annual-Reports/Issues/2018/10/12/technical-assistance-annual-report-2018.
427 Monetary and Capital Markets Department, "Technical Assistance Annual Report 2018," International Monetary Fund, 2018, https://www.imf.org/en/Publications/Technical-Assistance-Annual-Reports/Issues/2018/10/12/technical-assistance-annual-report-2018.
428 The ten regional technical assistance centers are: AFRITAC Central (Gabon), AFRITAC South (Mauritius), AFRITAC West (Côte d'Ivoire), AFRITAC West II (Ghana), East AFRITAC

(Tanzania), Pacific Financial Technical Center (Fiji), South Asia Regional Training and Technical Assistance Center (India), Middle East Regional Technical Assistance Center (Lebanon), Caribbean Regional Technical Assistance Center (Barbados), Central America, Panama and the Dominican Republic Regional Technical Assistance Center (Guatemala).

429 Detailed plans for the concept drawn from interviews with senior CGAP leadership and "Regional Cybersecurity Resource Centers for Financial Inclusion," Business Concept, CGAP, June 2020. More details also available at: Silvia Baur-Yazbeck and Jean-Louis Perrier, "Regional Centers Can Help Low-Income Countries Build Cyber Resilience," CGAP (blog), July 8, 2020, https://www.cgap.org/blog/regional-centers-can-help-low-income-countries-build-cyber-resilience.

430 Silvia Baur-Yazbeck, Judith Frickenstein, and David Medine, "Cyber Security in Financial Sector Development: Challenges and Potential Solutions for Financial Inclusion," Consultative Group to Assist the Poor, November 2019, https://www.findevgateway.org/sites/default/files/publications/files/cyber_security_paper_november2019.pdf.

431 Based on input from CGAP representatives.

432 Financial Sector Advisory Center, "Cybersecurity, Cyber Risk and Financial Sector Regulation and Supervision," World Bank, February 24, 2018, https://www.worldbank.org/en/topic/financialsector/brief/cybersecurity-cyber-risk-and-financial-sector-regulation-and-supervision.

433 Finance, Competitiveness & Innovation Global Practice, "Finance, Competitiveness & Innovation," World Bank, accessed July 22, 2020, https://www.worldbank.org/en/about/unit/fci.

434 Aquiles A. Almansi and Yejin Carol Lee, "Financial Sector's Cybersecurity: A Regulatory Digest," World Bank Group, Financial Sector Advisory Center, July 2020, http://pubdocs.worldbank.org/en/361881595872293851/CybersecDigest-v5-Jul2020-FINAL.pdf.

435 World Bank, "Financial Sector Cyber Resilience Workshop."

436 Aquiles Almansi, Yejin Carol Lee, and Emiko Todoroki, "World Bank Crisis Simulation Exercises: What Is at Stake in Coordinating and Making Decisions in a Crisis," World Bank Group, October 2016, https://openknowledge.worldbank.org/bitstream/handle/10986/25192/109243.pdf?sequence=4; Aquiles Almansi and Yejin C. Lee, "Cybersecurity: A Simulation Exercise" (FIGI Symposium 2019: Capacity Building Sessions, Cairo, Egypt, January 22, 2019), https://www.itu.int/en/ITU-T/extcoop/figisymposium/2019/Pages/Programme-2401.aspx.

437 United Nations Office on Drugs and Crime, "Global Programme on Cybercrime"; World Bank Group, "Combatting Cybercrime"; World Bank Group and United Nations and International Bank for Reconstitution and Development, "Combatting Cybercrime: Tools and Capacity Building for Emerging Economies."

438 Financial Services Sector Coordinating Council, "Financial Sector Cybersecurity Profile."

439 Global Financial Markets Association and Institute of International Finance, "Discussion Draft Principles Supporting the Strengthening of Operational Resilience Maturity in Financial Services," October 2019, https://www.gfma.org/wp-content/uploads/2019/10/discussion-draft-iif-gfma-operational-resilience-principles-october-2019.pdf.

440 Cyber Risk Institute, "The Profile," accessed July 22, 2020, https://cyberriskinstitute.org/the-profile/.

441 Cyber Risk Institute, "The Financial Services Cybersecurity Profile: Ongoing Activity and the Road Ahead," May 5, 2020.

442 Cyber Risk Institute, "Press Releases," https://cyberriskinstitute.org/news-events/.

443 Global Forum on Cyber Expertise, "About the GFCE," accessed July 22, 2020, https://thegfce.org/about-the-gfce/.

444 Global Forum on Cyber Expertise, "About the GFCE," accessed July 22, 2020, https://thegfce.org/about-the-gfce/.

445 Global Forum on Cyber Expertise, "About the GFCE," accessed July 22, 2020, https://thegfce.org/about-the-gfce/.

446 Global Forum on Cyber Expertise, "Initiatives Overview," accessed July 22, 2020, https://thegfce.org/initiatives-overview/.

447 Global Forum on Cyber Expertise, "Preventing and Combating Cybercrime in Southeast Asia—Global Forum on Cyber Expertise," accessed July 22, 2020, https://thegfce.org/initiatives/preventing-and-combating-cybercrime-in-southeast-asia/.

448 Global Forum on Cyber Expertise, "Critical Information Infrastructure Protection Initiative," accessed July 22, 2020, https://thegfce.org/initiatives/critical-information-infrastructure-protection-initiative/.
449 Global Forum on Cyber Expertise, "Cybil Portal," https://cybilportal.org/about-the-gfce/.
450 Global Partnership for Financial Inclusion, "GPFI," accessed July 20, 2020, https://www.gpfi.org/; Global Infrastructure Hub, "Funders and Strategic Partners," accessed July 20, 2020, https://www.gihub.org/about/funders-and-strategic-partners/.
451 Global Infrastructure Hub, "Funders and Strategic Partners," accessed July 20, 2020, https://www.gihub.org/about/funders-and-strategic-partners/.
452 Global Partnership for Financial Inclusion, "GPFI," accessed July 20, 2020, https://www.gpfi.org/; William Hague, "Foreign Secretary William Hague Addressed the London Conference on Cyberspace on 1 November" (Speech, London Conference on Cyberspace, London; UK, November 1, 2011), https://www.gov.uk/government/speeches/foreign-secretary-opens-the-london-conference-on-cyberspace.
453 FinCyber Project, "Cyber Resilience and Financial Organizations: A Capacity-building Tool Box," Carnegie Endowment for International Peace, https://carnegieendowment.org/specialprojects/fincyber/guides.

## Priority #6: Digital Transformation and Financial Inclusion

454 "Disruptive Technologies in the Credit Information Sharing Industry: Developments and Implications," Fintech Note, World Bank, 2019, http://documents.worldbank.org/curated/en/587611557814694439/pdf/Disruptive-Technologies-in-the-Credit-Information-Sharing-Industry-Developments-and-Implications.pdf.
455 "Data | GPFI," accessed January 26, 2020, https://www.gpfi.org/data.
456 Nir Kshetri, "Cybercrime and Cybersecurity in Africa," *Journal of Global Information Technology Management* 22, no. 2 (April 3, 2019): 77–81, https://doi.org/10.1080/1097198X.2019.1603527.
457 Kiarie Njoroge, "Treasury Report Reveals Fears Over M-Pesa's Critical Role in Economy," *Business Daily Africa*, November 30, 2016, https://www.businessdailyafrica.com/markets/Treasury-report-reveals-fears-on-M-Pesa-critical-role-in-economy/539552-3469802-2v2gjcz/index.html.
458 John Walubengo, "M-Pesa Is a Critical Resource That Should Never Fail," *Daily Nation* (blog), December 10, 2018, https://www.nation.co.ke/kenya/blogs-opinion/blogs/dot9/walubengo/m-pesa-is-a-critical-resource-that-should-never-fail-117234.
459 Silvia Baur-Yazbeck, Judith Frickenstein, and David Medine, "Cyber Security in Financial Sector Development: Challenges and Potential Solutions for Financial Inclusion," Consultative Group to Assist the Poor, November 2019.
460 Silvia Baur-Yazbeck, Judith Frickenstein, and David Medine, "Cyber Security in Financial Sector Development: Challenges and Potential Solutions for Financial Inclusion," Consultative Group to Assist the Poor, November 2019.
461 Serianu, "Africa Cybersecurity Report 2017: Demystifying Africa's Cyber Security Poverty Line," 2017, https://www.serianu.com/downloads/AfricaCyberSecurityReport2017.pdf.
462 Paul Makin, "Cybersecurity for Mobile Financial Services," CGAP, August 2018, https://www.cgap.org/blog/cybersecurity-mobile-financial-services-growing-problem.
463 Paul Makin, "Cybersecurity for Mobile Financial Services," CGAP, August 2018, https://www.cgap.org/blog/cybersecurity-mobile-financial-services-growing-problem.
464 "Cybersecurity for Financial Inclusion: Framework & Risk Guide," Alliance for Financial Inclusion, October 2019, https://www.afi-global.org/sites/default/files/publications/2019-11/AFI_GN37_DFS_AW_digital_0.pdf.
465 Silvia Baur-Yazbeck, Judith Frickenstein, and David Medine, "Cyber Security in Financial Sector Development: Challenges and Potential Solutions for Financial Inclusion," November 2019.
466 Nir Kshetri and Jeffrey Voas, "Trusting Pirated Software," *Computer* 52, no. 3 (March 2019): 87–90, https://doi.org/10.1109/MC.2019.2898719.
467 "Economic Impact of Cybercrime," accessed January 27, 2020, https://www.csis.org/analysis/economic-impact-cybercrime.

468 "Kaspersky Lab Sees Spike In Mobile Cyberattacks," *PYMNTS.Com* (blog), May 23, 2019, https://www.pymnts.com/news/security-and-risk/2019/kaspersky-lab-malware-mobile-banking/.
469 Nir Kshetri, "Cybercrime and Cybersecurity in Africa," *Journal of Global Information Technology Management* 22, no. 2 (April 3, 2019): 77–81, https://doi.org/10.1080/1097198X.2019.1603527.
470 Symantec, "Cyber Crime and Cyber Security Trends in Africa," November 2016.
471 Serianu, "Africa Cybersecurity Report 2017: Demystifying Africa's Cyber Security Poverty Line."
472 Symantec, "Cyber Crime and Cyber Security Trends in Africa"; "Cybersecurity for Financial Inclusion: Framework & Risk Guide," Alliance for Financial Inclusion, October 2019, https://www.afi-global.org/sites/default/files/publications/2019-11/AFI_GN37_DFS_AW_digital_0.pdf.
473 Paul Makin, "Cybersecurity for Mobile Financial Services," CGAP, August 2018, https://www.cgap.org/blog/cybersecurity-mobile-financial-services-growing-problem.
474 Hildah Nduati, "Cyber Security in Emerging Financial Markets," Consultative Group to Assist the Poor, May 2018, https://www.findevgateway.org/library/cyber-security-emerging-financial-markets.
475 Alliance for Financial Inclusion, "AFI Holds Regulatory Training on Cybersecurity Challenges and Resilience Management," August 2, 2017, https://www.afi-global.org/news/2017/08/afi-holds-regulatory-training-cybersecurity-challenges-and-resilience-management.
476 United Nations Secretary-General's Special Advocate for Inclusive Finance for Development, Fintech Sub-Group on Cybersecurity, "Briefing on Cybersecurity," accessed January 22, 2020, https://www.unsgsa.org/files/2815/3575/0134/Cybersecurity.pdf.
477 Alliance for Financial Inclusion, "Cybersecurity for Financial Inclusion: Framework & Risk Guide," October 2019, https://www.afi-global.org/sites/default/files/publications/2019-11/AFI_GN37_DFS_AW_digital_0.pdf.
478 Silvia Baur-Yazbeck, Judith Frickenstein, and David Medine, "Cyber Security in Financial Sector Development: Challenges and Potential Solutions for Financial Inclusion," November 2019.
479 Gates Foundation, "Grant Awards," accessed July 22, 2020, https://www.gatesfoundation.org/ns/500.html.
480 Digital Financial Services Observatory, "The DFS Observatory at Columbia University," https://dfsobservatory.com/, accessed September 26, 2020.
481 Digital Financial Services Observatory, "The DFS Observatory at Columbia University," https://dfsobservatory.com/, accessed September 26, 2020.
482 Financial Stability Board, "2016 List of Global Systemically Important Insurers (G-SIIs)," November 21, 2016, https://www.fsb.org/wp-content/uploads/2016-list-of-global-systemically-important-insurers-G-SIIs.pdf.
483 Financial Stability Board, "2019 List of Global Systemically Important Banks (G-SIBs)," November 22, 2019, https://www.fsb.org/wp-content/uploads/P221119-1.pdf.
484 Kirstjen M. Nielsen, "National Cybersecurity Summit Keynote Speech" (Speech, National Cybersecurity Summit, New York City, New York, July 31, 2018), https://www.dhs.gov/news/2018/07/31/secretary-kirstjen-m-nielsen-s-national-cybersecurity-summit-keynote-speech.
485 Michael A. Pompeo, "The United States Concerned by Threat of Cyber Attack Against the Czech Republic's Healthcare Sector," Press Statement, April 17, 2020, https://www.state.gov/the-united-states-concerned-by-threat-of-cyber-attack-against-the-czech-republics-healthcare-sector/.
486 "Malicious Cyber Activity Against Healthcare Services and Facilities: Joint OEWG Report Proposal From Australia, Czech Republic, Estonia, Japan, Kazakhstan and United States of America," Open Ended Working Group, Spring 2020, https://www.dfat.gov.au/sites/default/files/joint-oewg-proposal-protection-health-infrastructure.pdf.
487 African Union, "First African Forum on Cybercrime" (Addis Ababa, October 16, 2018), https://au.int/en/newsevents/20181016/first-african-forum-cybercrime.
488 Alliance for Financial Inclusion, "About Us - AFI," accessed July 22, 2020, https://www.afi-global.org/about-us.
489 Alliance for Financial Inclusion, "Global Policy Forum," accessed July 22, 2020, https://www.afi-global.org/global-policy-forum.

490 Alliance for Financial Inclusion, "Cybersecurity for Financial Inclusion: Framework & Risk Guide," October, 2019.
491 Asia Securities Industry & Financial Markets Association, "ASIFMA," accessed July 22, 2020, https://www.asifma.org/.
492 Emmanuel LaMarois, "Cybersecurity Needs to Be a Global and Coordinated Effort," AFME, December 5, 2017, https://www.afme.eu/News/Views-from-AFME/Details/cybersecurity-needs-to-be-a-global-and-coordinated-effort.
493 NATO Cooperative Cyber Defence Centre of Excellence, "ASEAN Regional Forum Reaffirming the Commitment to Fight Cyber Crime."
494 AustCyber, "About Us," accessed July 22, 2020, https://www.austcyber.com/about-us.
495 Australian Signals Directorate, "Cyber Security," accessed July 22, 2020, https://www.asd.gov.au/cyber.
496 Australian Prudential Regulation Authority, "APRA Finalises Updated Guidance on Information Security | APRA," Press Release, June 25, 2019, https://www.apra.gov.au/news-and-publications/apra-finalises-updated-guidance-on-information-security.
497 AUSTRAC, "AUSTRAC Overview," accessed July 22, 2020, https://www.austrac.gov.au/about-us/austrac-overview.
498 Council of Financial Regulators, "Cyber Security—Financial Stability," Australia, accessed July 22, 2020, https://www.cfr.gov.au/financial-stability/cyber-security.html.
499 AUSTRAC, "Fintel Alliance," accessed July 22, 2020, https://www.austrac.gov.au/about-us/fintel-alliance.
500 Reserve Bank of Australia, "Financial Stability Review," October 2018, Australia, https://www.rba.gov.au/publications/fsr/2018/oct/box-d.html.
501 Bank for International Settlements (BIS), "Cyber Resilience: Range of Practices."
502 Committee on Payments and Market Infrastructures, "Payment, Clearing and Settlement Operators Meet on Global Cyber-Resilience."
503 Committee on Payments and Market Infrastructures and The Board of the International Organization of Securities Commissions, "Guidance on Cyber Resilience for Financial Market Infrastructures."
504 Bank for International Settlements (BIS), "Innovation BIS 2025: Shaping the Bank for Tomorrow," June 2019, https://www.bis.org/about/innovation_bis_2025/index.htm.
505 Better Than Cash Alliance, "About the Better Than Cash Alliance," accessed July 22, 2020, https://www.betterthancash.org/about.
506 Better Than Cash Alliance, "Toolkits," accessed July 22, 2020, https://www.betterthancash.org/tools-research/toolkits.
507 Bill and Melinda Gates Foundation, "Financial Services for the Poor Strategy Overview," July 2012, https://docs.gatesfoundation.org/Documents/fsp-strategy-overview.pdf.
508 Bill and Melinda Gates Foundation, "Financial Services for the Poor Strategy Overview," July 2012, https://docs.gatesfoundation.org/Documents/fsp-strategy-overview.pdf.
509 Bank of Canada, "2019-2021 Cyber Security Strategy: Reducing Risk, Promoting Resilience," 2019, https://www.bankofcanada.ca/wp-content/uploads/2019/06/cyber-security-strategy-2019-2021.pdf.
510 Bank of Canada, "2019-2021 Cyber Security Strategy: Reducing Risk, Promoting Resilience," 2019, https://www.bankofcanada.ca/wp-content/uploads/2019/06/cyber-security-strategy-2019-2021.pdf.
511 Siemens, "Siemens and Partners Sign Joint Charter on Cybersecurity," press release, May 17, 2017, https://www.siemens.com/press/en/feature/2018/corporate/2018-02-cybersecurity.php.
512 Samm Sacks, Qiheng Chen, and Graham Webster, "Five Important Takeaways From China's Draft Data Security Law," *DigiChina Project* (blog), July 9, 2020, http://newamerica.org/cybersecurity-initiative/digichina/blog/five-important-take-aways-chinas-draft-data-security-law/.
513 US-China Business Council, "China Banking and Insurance Regulatory Commission," December 19, 2018, https://www.uschina.org/sites/default/files/cbirc_2018.12.19.pdf.
514 China Banking Regulatory Commission, "Guidelines on the Risk Management of Commercial Banks' Information Technology," accessed July 22, 2020, https://wenku.baidu.com/view/71d9dbc48bd63186bcebbc1b.html.

515 Yan Luo and Zhijing Yu, "China Releases Personal Financial Information Protection Technical Specification," *Inside Privacy* (blog), March 2, 2020, https://www.insideprivacy.com/international/china/china-releases-personal-financial-information-protection-technical-specification/.
516 International Organization of Securities Commissions, "About IOSCO," https://www.iosco.org/about/?subsection=about_iosco.
517 Committee on Payments and Market Infrastructures and the Board of the International Organization of Securities Commissions, "Guidance on Cyber Resilience for Financial Market Infrastructures."
518 Detailed plans for the concept drawn from interviews with senior CGAP leadership and "Regional Cybersecurity Resource Centers for Financial Inclusion," Business Concept, CGAP, June 2020.
519 Cybersecurity Tech Accord, "Eleven New Companies Join Pledge to Fight Cyberattacks, Promise Equal Protection for Customers Worldwide," press release, June 20, 2018, https://cybertechaccord.org/eleven-new-companies-join-pledge-to-fight-cyberattacks-promise-equal-protection-for-customers-worldwide/.
520 DFS Observatory, "About the Digital Financial Services Observatory," May 19, 2016, https://dfsobservatory.com/content/about-digital-financial-services-observatory.
521 Sam Meredith, "Microsoft Calls for 'New Digital Geneva Convention' After Spate of High-Profile Cyberattacks," CNBC, January 26, 2018, https://www.cnbc.com/2018/01/26/microsoft-calls-for-new-digital-geneva-convention-after-spate-of-high-profile-cyberattacks.html.
522 Europol, "New Initiative Brings Together Law Enforcement and Europe's Largest Financial Infrastructures," Press Release, February 27, 2020, https://www.europol.europa.eu/newsroom/news/new-initiative-brings-together-law-enforcement-and-europe%E2%80%99s-largest-financial-infrastructures.
523 ENISA, "CyLEEx19: Inside a Simulated Cross-Border Cyber-Attack on Critical Infrastructure," October 31, 2019, https://www.enisa.europa.eu/news/enisa-news/test-1.
524 European Banking Authority, "EBA Guidelines on ICT and Security Risk Management," https://eba.europa.eu/regulation-and-policy/internal-governance/guidelines-on-ict-and-security-risk-management.
525 European Banking Authority, "EBA Guidelines on ICT and Security Risk Management," https://eba.europa.eu/regulation-and-policy/internal-governance/guidelines-on-ict-and-security-risk-management.
526 European Banking Authority, "Guidelines on Outsourcing Arrangements," https://eba.europa.eu/regulation-and-policy/internal-governance/guidelines-on-outsourcing-arrangements.
527 European Banking Federation, "Cybersecurity," accessed July 22, 2020, https://www.ebf.eu/priorities/cybersecurity-innovation/cybersecurity/.
528 European Commission, "Consultation Document: Digital Operational Resilience Framework for Financial Services: Making the EU Financial Sector More Secure."
529 European Union Agency for Cybersecurity, "Financial Fraud in the Digital Space," November 2018, https://www.enisa.europa.eu/publications/enisa-position-papers-and-opinions/financial-fraud-in-the-digital-space.
530 Europol, "EC3 Partners," accessed July 22, 2020, https://www.europol.europa.eu/about-europol/european-cybercrime-centre-ec3/ec3-partners.
531 Council of Europe, "Global Action on Cybercrime Extended (GLACY)+," accessed July 22, 2020, https://www.coe.int/en/web/cybercrime/glacyplus.
532 "First FATF Report on the Extent and Nature of the Money Laundering Process and FATF Recommendations to Combat Money Laundering," Financial Action Task Force, July 2, 1990, http://www.fatf-gafi.org/media/fatf/documents/reports/1990%20ENG.pdf.
533 "About FS-ISAC," FS-ISAC, accessed July 28, 2018, https://www.fsisac.com/about.
534 "FSB Publishes Stocktake on Cybersecurity Regulatory and Supervisory Practices."
535 "FSB Publishes Stocktake on Cybersecurity Regulatory and Supervisory Practices."
536 FINCA Microfinance Global Services LLC, "Products and Services - FINCA Impact Finance," accessed July 22, 2020, https://www.fincaimpact.com/solutions/products-and-services/.

537 FINCA, "Fintech: Innovations and Technology," accessed July 22, 2020, https://www.fincaimpact.com/solutions/fintech-innovations-technology/.
538 Forum of Incident Response and Security Teams, "FIRST - Improving Security Together," accessed July 22, 2020, https://www.first.org/.
539 Banque de France, "French Presidency G7 2019 - « Cybersecurity."
540 Banque de France, "The Banque de France and the Monetary Authority of Singapore Strengthen Financial Cooperation," Press Release, November 12, 2019, https://www.banque-france.fr/en/communique-de-presse/banque-de-france-and-monetary-authority-singapore-strengthen-financial-cooperation.
541 Aquiles A. Almansi and Yejin Carol Lee, "Financial Sector's Cybersecurity: A Regulatory Digest," 92.
542 Chris Ott, "What You Should Know About the 24/7 Cybercrime Network," Davis Wright Tremaine LLP, June 28, 2018, https://www.dwt.com/files/uploads/documents/publications/What%20You%20Should%20Know%20About%20The%2024.pdf.
543 European Central Bank, "Cybersecurity for the Financial Sector," n.d., https://www.ecb.europa.eu/paym/pol/shared/pdf/qa_cybersecurity.pdf.
544 White House Office of the Press Secretary, "G-8 Action on the Deauville Partnership With Arab Countries in Transition," Fact Sheet, May 19, 2012, https://obamawhitehouse.archives.gov/the-press-office/2012/05/19/fact-sheet-g-8-action-deauville-partnership-arab-countries-transition.
545 Deauville Partnership, "Deauville Partnership Action Plan for Financial Inclusion" (G7 Germany 2015), accessed July 22, 2020, https://www.afi-global.org/sites/default/files/publications/2015-04-30-deauville-aktionsplan.pdf.
546 G7 Information Centre, "G7/8 Finance Ministers," accessed July 22, 2020, http://www.g7.utoronto.ca/finance/index.htm.
547 G20 Finance Ministers and Central Bank Governors, "Communiqué," March 17, 2017, Carnegie Endowment for International Peace, https://carnegieendowment.org/files/g20-communique.pdf.
548 Deutsche Bundesbank, "Financial Stability Review 2018" (Frankfurt am Main, Germany, 2018), https://www.bundesbank.de/resource/blob/766586/f9d675a9f6a50562291589f7f3409f5a/mL/2018-finanzstabilitaetsbericht-data.pdf.
549 Aquiles A. Almansi and Yejin Carol Lee, "Financial Sector's Cybersecurity: A Regulatory Digest," World Bank Group, Financial Sector Advisory Center, November 2019, 55, http://pubdocs.worldbank.org/en/940481575300835196/CybersecDIGEST-NOV2019-FINAL.pdf.
550 Global Cyber Alliance, "Cybersecurity Toolkit for Small Business," accessed July 22, 2020, https://www.globalcyberalliance.org/gca-cybersecurity-toolkit/.
551 Global Financial Markets Association, "A Framework for the Regulatory Use of Penetration Testing in the Financial Services Industry"; GFMA and IIF, "Discussion Draft Principles Supporting the Strengthening of Operational Resilience Maturity in Financial Services."
552 Global Forum on Cyber Expertise, "About the GFCE," accessed July 22, 2020, https://thegfce.org/about-the-gfce/.
553 Global Forum on Cyber Expertise, "About the GFCE," accessed July 22, 2020, https://thegfce.org/about-the-gfce/.
554 G20 Leaders, "The G20 Seoul Summit Leaders' Declaration November 11 - 12, 2010," Press Statement, November 12, 2010, http://www.g20.utoronto.ca/2010/g20seoul.pdf.
555 Global Partnership for Financial Inclusion, "GPFI," accessed July 20, 2020, https://www.gpfi.org/.
556 GSMA, "About the GSMA," accessed July 22, 2020, https://www.gsma.com/aboutus/.
557 GSMA, "GSMA Inclusive Tech Lab," accessed July 22, 2020, https://www.gsma.com/mobilefordevelopment/mobile-money/gsma-inclusive-tech-lab/.
558 GSMA, "GSMA Launches Inclusive Tech Lab," Press Release, September 24, 2019, https://www.gsma.com/newsroom/press-release/gsma-launches-inclusive-tech-lab/.
559 Aquiles A. Almansi and Yejin Carol Lee, "Financial Sector's Cybersecurity: A Regulatory Digest," 61.
560 Institute for Development and Research in Banking Technology, "Cyber Security Checklist," Reserve Bank of India, July 2016, https://www.idrbt.ac.in/assets/publications/Best%20Practices/CSCL_Final.pdf.

561 Reserve Bank of India, "Cyber Security Frameworks in Banks" (Notification, June 2, 2016), https://www.rbi.org.in/Scripts/NotificationUser.aspx?Id=10435&Mode=0.
562 Jaime Vazquez and Martin Boer, "Addressing Regulatory Fragmentation to Support a Cyber-Resilience Global Financial Services Industry," n.d., https://www.iif.com/portals/0/Files/private/iif_cyber_reg_04_25_2018_final.pdf.
563 INTERPOL, "INTERPOL-Led Action Takes Aim at Cryptojacking in Southeast Asia," Press Release, January 8, 2020, https://www.interpol.int/en/News-and-Events/News/2020/INTERPOL-led-action-takes-aim-at-cryptojacking-in-Southeast-Asia; Michael Ouma, "INTERPOL Meeting of Cybercrime Unit Chiefs to Develop Response to WannaCry Attack," aptantech, June 7, 2017, http://aptantech.com/2017/06/interpol-meeting-of-cybercrime-unit-chiefs-to-develop-response-to-wannacry-attack/.
564 International Finance Corporation, "The Partnership for Financial Inclusion," accessed July 22, 2020, https://www.ifc.org/wps/wcm/connect/REGION__EXT_Content/IFC_External_Corporate_Site/Sub-Saharan+Africa/Priorities/Financial+Inclusion/za_ifc_partnership_financial_inclusion.
565 Monetary and Capital Markets Department, "Technical Assistance Annual Report 2018," International Monetary Fund, 2018, https://www.imf.org/en/Publications/Technical-Assistance-Annual-Reports/Issues/2018/10/12/technical-assistance-annual-report-2018.
566 Monetary and Capital Markets Department, "Technical Assistance Annual Report 2018," International Monetary Fund, 2018, https://www.imf.org/en/Publications/Technical-Assistance-Annual-Reports/Issues/2018/10/12/technical-assistance-annual-report-2018.
567 International Telecommunication Union, "Digital Financial Inclusion," accessed July 22, 2020, https://www.itu.int/en/mediacentre/backgrounders/Pages/digital-financial-inclusion.aspx.
568 Kevin Butler et al., "Security Aspects of Digital Financial Services (DFS)," Focus Group Technical Report (International Telecommunication Union, January 2017).
569 Supervisor of Banks, "Cyber Defense Management," Proper Conduct of Banking Business Directive, Bank of Israel, March 2015, https://www.boi.org.il/en/BankingSupervision/SupervisorsDirectives/ProperConductOfBankingBusinessRegulations/361_et.pdf.
570 "FC3—Finance and Cyber Continuity Center: Israel's National Financial CERT," Senior officials from the Israeli Ministry of Finance in written correspondence with the authors, April 16, 2020.
571 Banca d'Italia, "Cybersecurity: A Strategy for the G7 Financial Sector," Press Release, October 11, 2016, https://www.bancaditalia.it/media/notizia/cybersecurity-a-strategy-for-the-g7-financial-sector.
572 CONSOB, "Consob and the Bank of Italy Have Agreed a Common Strategy to Strengthen the Cyber Security of the Italian Financial Sector," CONSOB Weekly Newsletter, January 2020, http://www.consob.it/web/consob-and-its-activities/newsletter/documenti/english/en_newsletter/2020/year_26_n-02_20_january_2020.html.
573 CONSOB, "Consob and the Bank of Italy Have Agreed a Common Strategy to Strengthen the Cyber Security of the Italian Financial Sector," CONSOB Weekly Newsletter, January 2020, http://www.consob.it/web/consob-and-its-activities/newsletter/documenti/english/en_newsletter/2020/year_26_n-02_20_january_2020.html.
574 Leika Kihara, "BOJ Warns of Cyber-Attack Vulnerability Ahead of Olympic Games," Reuters, January 31, 2020, https://www.ibtimes.sg/boj-warns-cyber-attack-vulnerability-ahead-olympic-games-38619.
575 Financial Services Agency, "The Policy Approaches to Strengthen Cyber Security in the Financial Sector (Summary)," Presentation, July 2, 2015, https://www.fsa.go.jp/en/news/2015/20151105-1/01.pdf.
576 Japan Cybercrime Control Center, "Establishment of 'Japan Cybercrime Control Center,' a New Organization for Fighting Cybercrime," Press Release, November 13, 2014, https://www.jc3.or.jp/media/pdf/pressreleaseEnglish.pdf.
577 Europol, "Joint Cybercrime Action Taskforce (J-CAT)," accessed July 22, 2020, https://www.europol.europa.eu/activities-services/services-support/joint-cybercrime-action-taskforce.
578 "DNB Publishes Hacking Guide for Cyber Security Exercises," Central Banking, November 20, 2017, https://www.centralbanking.com/node/3322436.

579 G Odinot et al., "Organised Cybercrime in the Netherlands," The Ministry of Justice and Security of the Netherlands, 2017.
580 Government of the Netherlands, "Investigation and Prosecution of Criminals," Ministerie van Algemene Zaken, December 14, 2011, https://www.government.nl/topics/crime-and-crime-prevention/investigation-and-prosecution-of-criminals.
581 G Odinot et al., "Organised Cybercrime in the Netherlands," The Ministry of Justice and Security of the Netherlands, 2017.
582 G Odinot et al., "Organised Cybercrime in the Netherlands," The Ministry of Justice and Security of the Netherlands, 2017.
583 Nigeria Electronic Fraud Forum, "2016 Annual Report," Central Bank of Nigeria, July 5, 2016, https://www.cbn.gov.ng/documents/NeFFar.asp.
584 North Atlantic Treaty Organization, "Collective Defence - Article 5," November 25, 2019, http://www.nato.int/cps/en/natohq/topics_110496.htm.
585 NATO Cooperative Cyber Defence Centre of Excellence, "CCDCOE - About Us," accessed July 22, 2020, https://ccdcoe.org/about-us/.
586 North Atlantic Treaty Organization, "Cyber Defence," accessed July 22, 2020, http://www.nato.int/cps/en/natohq/topics_78170.htm.
587 G20/OECD Task Force on Financial Consumer Protection, "G20/OECD Policy Guidance on Financial Consumer Protection Approaches in the Digital Age," G20/OECD Policy Guidance, OECD, 2018, http://www.oecd.org/daf/fin/financial-education/G20-OECD-Policy-Guidance-Financial-Consumer-Protection-Digital-Age-2018.pdf.
588 OSCE, "Cyber/ICT Security," accessed July 22, 2020, https://www.osce.org/cyber-ict-security.
589 Organization of American States, "Welcome to the Inter-American Cooperation Portal on Cyber-Crime," accessed July 22, 2020, https://www.oas.org/juridico/english/cyber.htm.
590 France Diplomatie, "Cybersecurity: Paris Call of 12 November 2018 for Trust and Security in Cyberspace," https://www.diplomatie.gouv.fr/en/french-foreign-policy/digital-diplomacy/france-and-cyber-security/article/cybersecurity-paris-call-of-12-november-2018-for-trust-and-security-in.
591 Central Bank of Russia, "Guidelines for the Advancement of Information Security in the Financial Sector for 2019-2021," http://www.cbr.ru/Content/Document/File/103460/onrib_2021_e.pdf.
592 Central Bank of Russia, "Guidelines for the Advancement of Information Security in the Financial Sector for 2019-2021," 3, http://www.cbr.ru/Content/Document/File/103460/onrib_2021_e.pdf.
593 Central Bank of Russia, "Financial Cybersecurity: Bank of Russia Report," October 10, 2019, http://www.cbr.ru/eng/press/event/?id=3937.
594 Central Bank of Russia, "Guidelines for the Advancement of Information Security in the Financial Sector for 2019-2021."
595 SANS Institute, "Cyber Workforce Academy Maryland," accessed July 22, 2020, https://www.sans.org/cybertalent/cyber-workforce-academy-maryland.
596 SANS Institute, "Introduction to the Cyber Retraining Academy," accessed July 22, 2020, https://www.sans.org/ukcyberacademy.
597 SIFMA, "Cybersecurity Exercise: Quantum Dawn V."
598 Alex Grigsby, "The United Nations Doubles Its Workload on Cyber Norms, and Not Everyone Is Pleased," *CFRBlog* (blog), November 15, 2018, https://www.cfr.org/blog/united-nations-doubles-its-workload-cyber-norms-and-not-everyone-pleased.
599 FS-ISAC, "FS-ISAC and CSA Partner to Enhance Cybersecurity in Singapore."
600 Aquiles A. Almansi and Yejin Carol Lee, "Financial Sector's Cybersecurity: A Regulatory Digest."
601 "Consultation Paper on Proposed Revisions to Business Continuity Management Guidelines."
602 SWIFT, "Customer Security Programme Terms and Conditions," June 30, 2017, https://www2.swift.com/uhbonline/books/public/en_uk/cst_sec_prog_trm_cond/index.htm.
603 "Huge Data Theft Hits South Korea," BBC News, January 20, 2014, https://www.bbc.com/news/technology-25808189.

604 Korean Institute of Criminology, *Cybercrime in the Republic of Korea II: Criminal Justice and International Coopeeration for Cybercrime Prevention* (Seoul, Republic of Korea: KyungSung Publishing, 2014), https://eucyberdirect.eu/wp-content/uploads/2019/10/cybercrime-in-the-republic-of-korea-ii.pdf.
605 Christine Kim, "North Korea Hacking Increasingly Focused on Making Money More Than Espionage: South Korea Study," Reuters, July 28, 2017, https://www.reuters.com/article/us-northkorea-cybercrime-idUSKBN1AD0BO.
606 GEANT, "TF-CSIRT: Computer Security Incident Response Teams - GÉANT," accessed July 20, 2020, https://www.geant.org:443/People/Community_Programme/Task_Forces/Pages/TF-CSIRT.aspx.
607 Bank of England and Financial Conduct Authority, "Building the UK Financial Sector's Operational Resilience."
608 Bank of England, "CBEST Implementation Guide."
609 Founding institutions include Barclays, Standard Chartered, Deutsche Bank and Banco Santander. Other members now include Bank of Ireland, Allied Irish Banks, Lloyds Banking Group, and Metro Bank. See: "Banks Join Forces to Crack Down on Fraudsters," August 8 2017, https://www.ft.com/content/6c9030ca-7937-11e7-90c0-90a9d1bc9691.
610 Europol, "The Cyber Defence Alliance and Europol Step Up Cooperation in the Fight Against Fraudsters," October 2018, https://www.europol.europa.eu/newsroom/news/cyber-defence-alliance-and-europol-step-cooperation-in-fight-against-fraudsters.
611 Bank of England and Financial Conduct Authority, "Building the UK Financial Sector's Operational Resilience," July 2018, https://www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/discussion-paper/2018/dp118.pdf.
612 Katherine Griffiths, "Banks Man the Barricades to See off Cyberattacks," *The Times*, October 2018, https://www.thetimes.co.uk/article/banks-man-the-barricades-to-see-off-cyberattacks-qz63v5wwk.
613 Robert Hannigan, "Organising a Government for Cyber: The Creation of the UK's National Cyber Security Centre," Occasional Paper, Royal United Services Institute for Defence and Security Studies, February 2019, https://rusi.org/sites/default/files/20190227_hannigan_final_web.pdf.
614 National Cyber Security Centre, "Cyber Security Information Sharing Partnership (CiSP)."
615 Robert Hannigan, "Organising a Government for Cyber: The Creation of the UK's National Cyber Security Centre."
616 Bank of England and Financial Conduct Authority, "Building the UK Financial Sector's Operational Resilience."
617 UK Finance, "About Us | UK Finance," accessed July 22, 2020, https://www.ukfinance.org.uk/about-us.
618 UN Department of Economic and Social Affairs, "Financing for Sustainable Development," accessed July 22, 2020, https://www.un.org/esa/ffd/events/event/high-level-dialogue-on-financing-for-development.html.
619 United Nations Office on Drugs and Crime, "Cybercrime."
620 United Nations Secretary-General's Special Advocate for Inclusive Finance for Development, Fintech Sub-Group on Cybersecurity, "Briefing on Cybersecurity," accessed January 22, 2020, https://www.unsgsa.org/files/2815/3575/0134/Cybersecurity.pdf.
621 United Nations Security Council, "Letter Dated 31 July 2019 From the Panel of Experts Established Pursuant to Resolution 1874 (2009) Addressed to the Chair of the Security Council Committee Established Pursuant to Resolution 1718 (2006)."
622 Financial Services Sector Coordinating Council, "The Financial Services Sector Cybersecurity Profile," October 25, 2018, https://fsscc.org/files/galleries/Financial_Services_Sector_Cybersecurity_Profile_Overview_and_User_Guide_2018-10-25.pdf.
623 Financial Services Sector Coordinating Council, "The Financial Services Sector Cybersecurity Profile," October 25, 2018, https://fsscc.org/files/galleries/Financial_Services_Sector_Cybersecurity_Profile_Overview_and_User_Guide_2018-10-25.pdf.
624 Federal Reserve System, "Enhanced Cyber Risk Management Standards," Advance Notice of Proposed Rulemaking, Fall 2019, 7100-AE61, Office of Information and Regulatory Affairs, OMB, https://www.reginfo.gov/public/do/eAgendaViewRule?pubId=201910&RIN=7100-AE61.

625 United States Secret Service, "Electronic Crimes Task Forces (ECTF)," White House Archived Web Pages, https://obamawhitehouse.archives.gov/files/documents/cyber/United%20States%20Secret%20Service%20-%20Electronic%20Crimes%20Task%20Forces.pdf.
626 United States Secret Service, "United States Secret Service Electronic Crimes Task Forces," U.S. Department of Homeland Security, accessed July 22, 2020, https://www.dhs.gov/sites/default/files/publications/USSS_Electronic-Crimes-TaskForces.pdf.
627 Shannon Vavra, "Secret Service Merging Electronic and Financial Crime Task Forces to Combat Cybercrime."
628 Cyber Readiness Institute, "Our Mission," accessed July 22, 2020, https://www.cyberreadinessinstitute.org/our-mission.
629 Service, "Top Companies Team Up With Federal Agencies and Nonprofit to Launch First-of-its-kind Cyber Talent Initiative to Protect Against Cyberattacks."
630 Frank C. Cicio, Jr., "How America Is Closing the Cybersecurity Skills Gap," *Knowledge@Wharton* (blog), August 16, 2017, https://knowledge.wharton.upenn.edu/article/america-plans-close-skills-gap-cybersecurity/.
631 Frank C. Cicio, Jr.
632 Steven T. Mnuchin, "Statement by Treasury Secretary Steven T. Mnuchin on the Introduction of Legislation to Transfer the Secret Service Back to Its Original Home at the Treasury Department," statement, Washington, DC, May 6, 2020, https://home.treasury.gov/news/press-releases/sm1004.
633 Internet Crime Complaint Center, "2019 Internet Crime Report," U.S. Federal Bureau of Investigation, 2019, https://pdf.ic3.gov/2019_IC3Report.pdf.
634 Financial and Banking Information Infrastructure Committee, "FBIIC: Members," accessed July 22, 2020, https://www.fbiic.gov/fbiic-members.html.
635 FinCEN, "What We Do," accessed July 22, 2020, https://www.fincen.gov/what-we-do.
636 U.S. Department of the Treasury, "FinCEN Realigns Division to Increase Strategic Capabilities."
637 Financial Services Sector Coordinating Council, "Financial Sector Cybersecurity Profile."
638 FS-ISAC, "FS-ISAC Announces the Formation of the Financial Systemic Analysis & Resilience Center (FSARC)."
639 Chris Bing, "Project Indigo: The Quiet Info-Sharing Program Between Banks and U.S. Cyber Command," CyberScoop, May 21, 2018, https://www.cyberscoop.com/project-indigo-fs-isac-cyber-command-information-sharing-dhs/.
640 The National Cyber-Forensics and Training Alliance, "NCFTA," accessed July 22, 2020, https://www.ncfta.net/.
641 The National Cyber-Forensics and Training Alliance, "CyFin Program," accessed July 22, 2020, https://www.ncfta.net/cyfin-program/.
642 National Initiative for Cybersecurity Education (NICE), "The NICE Cybersecurity Workforce Framework," U.S. National Institute for Standards and Technology, August 2017, https://www.nist.gov/itl/applied-cybersecurity/nice/nice-cybersecurity-workforce-framework-resource-center/current.
643 National Initiative for Cybersecurity Education (NICE), "The NICE Cybersecurity Workforce Framework," U.S. National Institute for Standards and Technology, August 2017, https://www.nist.gov/itl/applied-cybersecurity/nice/nice-cybersecurity-workforce-framework-resource-center/current.
644 New York State Department of Financial Services, "NYDFS 23 NYCRR 500," 2017, https://www.dfs.ny.gov/docs/legal/regulations/adoptions/dfsrf500txt.pdf.
645 Sheltered Harbor, "Sheltered Harbor - About," accessed July 20, 2020, https://shelteredharbor.org/index.php/about#who.
646 Stacy Cowley, "Banks Adopt Military-Style Tactics to Fight Cybercrime," *New York Times*, May 20, 2018, https://www.nytimes.com/2018/05/20/business/banks-cyber-security-military.html.
647 United States Secret Service, "Secret Service Announces the Creation of the Cyber Fraud Task Force," press release, July 9, 2020, https://www.secretservice.gov/data/press/releases/2020/20-JUL/Secret-Service-Cyber-Fraud-Task-Force-Press-Release.pdf.

648 Juan Zarate and Tim Maurer, "Protecting the Financial System Against the Coming Cyber Storms," *Hill*, May 18, 2020, https://thehill.com/opinion/cybersecurity/498244-protecting-the-financial-system-against-the-coming-cyber-storms.

649 World Bank and United Nations, "Combatting Cybercrime: Tools and Capacity Building for Emerging Economies," 2017, http://documents.worldbank.org/curated/en/355401535144740611/pdf/129637-WP-PUBLIC-worldbank-combating-cybercrime-toolkit.pdf.

650 Finance, Competitiveness & Innovation Global Practice, "Finance, Competitiveness & Innovation," World Bank, accessed July 22, 2020, https://www.worldbank.org/en/about/unit/fci.

651 Georg Schmitt, "To Prevent a Digital Dark Age: World Economic Forum Launches Global Centre for Cybersecurity," World Economic Forum, December 19, 2019, https://www.weforum.org/press/2018/01/to-prevent-a-digital-dark-age-world-economic-forum-launches-global-centre-for-cybersecurity/.

652 World Economic Forum, "Partnership Against Cybercrime," accessed July 20, 2020, https://www.weforum.org/projects/partnership-against-cybercime/.