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Does the ‘Wirecard AG’ Case Address FinTech Crises?

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Abstract

This paper analyzes the Wirecard AG case from a digital finance perspective. The relatively low pace of digital transformation of financial supervisors and the high speed of advancements in technology increase the technological gaps between supervisors and their responsibility areas and result in a new phenomenon named “asymmetric technology”. This transition period's lagged and foggy atmosphere might be very conducive to potential white-collar fraudsters who plan to abuse their TECHs in Finance advantages. Fueled by inconsistent supervisory approaches, national protectionism in reaction to trade wars, fierce competitions among national economies, and unattractive yields at money markets, potential white-collar fraudsters come up with great opportunities to abuse FinTech related companies at capital markets. Therefore, the Wirecard AG case has multiple aspects and causes, not only one. Nevertheless, many aspects of today’s financial sectors address new FinTech crises and FinTech related scandals, not only in one country but also in every economy, developing or developed ones. Thus, governments and financial supervisors should brace for FinTech crises and financial scandals in the near future unless they meet structural reform and digital transformation requirements.

JEL Classification: G18, G30, G38, H11, H12, K22, M42, M48, N20, O32, Q01.

Keywords: Wirecard AG, FinTech Crisis, Financial Scandal, FinTech, RegTech, SupTech, TEHCs in Finance, Asymmetric Technology, Digitalization, Structural Reform, Audit 4.0, Financial Literacy, Digital Literacy, Sustainable Finance, Prudential Supervisory Disclosure, Germany, BaFin, ESMA, ESRB, Brexit, Covid-19.

Acronyms and Abbreviations

ACFE: Association of Certified Fraud Examiners

AG: “Aktiengesellschaft”, German Public Limited Company

AI: Artificial Intelligence

BaFin: German Federal Financial Supervisory Authority

Big Four: Four audit firms; Deloitte, EY, KPMG, PwC.

BigTechs: Big technology firms; Alibaba, Amazon, Apple, eBay, Facebook, Google, Microsoft, and others

BilKoG: “Bilanzkontrollgesetz”, German Accounting Control Act

BIS: Bank for International Settlements

CFTC: U.S. Commodity Futures Trading Commission

DAX: “Deutscher Aktienindex” in German, the Performance Index of German stock markets

DGAP: “Deutsche Gesellschaft für Ad-hoc-Publizität” in German, the company for publishing German ad-hoc news

DLT: Distributed Ledger Technology

DPR: “Deutsche Prüfstelle für Rechnungslegung”. Financial Reporting Enforcement Panel, or FREP

EBA: European Banking Authority

EBA/GL/2017/11: Final Report Guidelines on internal governance under Directive 2013/36/EU

EBA/GL/2017/12: Final report Joint ESMA and EBA Guidelines on the assessment of the suitability of members of the management body and key function holders under Directive 2013/36/EU and Directive 2014/65/EU

EC: European Commission

ECB: European Central Bank

EIOPA: European Insurance and Occupational Pensions Authority

ESG: Environmental, Social and Governance Criteria

ESMA: European Securities and Markets Authority

ESRB: European Systemic Risk Board

EU: European Union

FCA: Financial Conduct Authority of the U.K.

FinTech: Financial Technology

FREP: Financial Reporting Enforcement Panel, in German; “Deutsche Prüfstelle für Rechnungslegung”, or “DPR”

FSB: Financial Stability Board

G-20: Group of Twenty, the international forum for world’s 19 largest economies and the EU.

GFC: Global Financial Crisis (2008)

IMF: International Monetary Fund

IOSCO: International Organization of Securities Commissions

IPO: Initial Public Offering

IT: Information Technology

LIBOR: London Interbank Offered Rate

ML: Machine Learning

MMoU: Multilateral Memorandum of Understanding

NLP: Natural Language Processing

PSD: Prudential Supervisory Disclosure

RegTech: Regulatory Technology

SEC: U.S. Securities and Exchange Commission

SRO: Self-Regulatory Organization

SupTech: Supervisory Technology

TECHs in Finance: FinTech, RegTech, SupTech, and other “techs” in financial sectors

TUG: “Transparenzrichtlinie-Umsetzungsgesetz”, German Transparency Directive Implementation Act

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Introduction

The Wirecard AG's motto "*Alle Wege führen zum Erfolg – mit unserer intelligenten Financial Commerce Platform*[1]" (*All roads/ways lead to success-with our intelligent Financial Commerce Platform*) might now be interpreted in a different way with some negative implications. Financial supervisors do not need to infer some messages from marketing mottos. The financial supervisory landscape has valuable approaches and tools to capture and cope with financial frauds and scandals experienced for decades around the world. Financial data and reports, information from whistleblowers, complaints by clients or partners, reasonable and supported comments of financial commentators of the media or press, public statements of publicly held companies, audit trails, holistic check of business models, plausibility assessment of business profitability, and many others, are important sources of information for financial supervisors. Moreover, there are internationally accepted red flags. For example, weak corporate governance structure, extraordinary financial or stock performance without supporting fundamentals, problems with audit firms, questionable balance sheet or income statement items, unrealistic rate of returns, and growth rates are some of the significant red flags for both market participants and financial supervisors.

Financial media and press have vital roles in the economy. Therefore, the entire financial media, including sources of finance-related news such as the Financial Times, the Wall Street Journal, and others, should be followed by financial supervisors. Their news or articles should be used with relevant granular data to carry out supervisory responsibilities, such as combatting insider trading, market manipulation, and accounting fraud. However, media feeds and comments about a financial case are not necessarily always objective. Financial media might have a country bias, and attack with aggressive news feeds to one of the competing economies, or a company or an authority. Although our focus is not on the financial media news, another research is worth conducting from the perspective of country biases of economic and financial media towards financial scandals. For example, even though LIBOR manipulation, one of the biggest financial scandals in the history of finance, and the Wirecard AG scandal are not comparable, it is worth analyzing and comparing news feeds of different financial news sources about the infamous LIBOR manipulation case and the Wirecard AG scandal including some other financial scandals around the world.

[1] Please see the web portal, Wirecard AG (2020).

There are some comments on the Wirecard case considering the notorious Enron Scandal. The Enron case forced the governments and legislative organs of many countries to overhaul their financial regulations and develop new rules, committees, and organizations. The Enron case has been one of the destructive financial scandals in the world. After the Enron scandal, the world financial markets were undermined by the Global Financial Crisis (2008). The G-20 countries and many other economies around the world reacted to the crisis with multiple reforms and stricter regulations. Under normal conditions, we should not expect a corporate scandal in these countries. However, economies, financial markets, and governments are not perfect structures or organizations; they might fail and fall into crises, and their actors make mistakes again and again.

After the GFC, the world financial markets have faced a phenomenon, a disruptive trend, financial technology, namely FinTech. The financial world has experienced a lot from financial crises and scandals. Nevertheless, each new trend comes with its unique risks. Today, the scientific world knows a lot about financial and economic crises. However, we know little about FinTech crises. Moreover, whatever we know about past crises may not be fully applicable to the recent financial and economic environment. In other words, Random Walk Theory might also hold for financial crises.

This paper sheds light on multiple aspects of the digital financial world that we live in by driving lessons from a FinTech related financial scandal, namely the Wirecard AG case. The case includes systematic fraud allegations. Understanding motives to commit fraud can improve fraud detection (Hober & Lewis, 2017). More specifically, analyzing causes, motives, and the conjuncture that the Wirecard case took place can help firm managers, compliance professionals, digital finance consultants, financial supervisors, policymakers, academics, and researchers.

In the first section of this working paper, we discover the company's features and the general picture of the Wirecard AG case. In the second section, we analyze the case from the current economic and financial environment and digital finance perspectives. In the third, we explain reform requirements. The last section briefly addresses the implications of the case for audit function, RegTech and SupTech in the digital financial world. Since the Wirecard case is still not fully uncovered with all dimensions, we reserve our comments with the references. There might be some further considerations and updates regarding the case as new information comes out.

I. Dimensions of the Wirecard AG Case

1.1. FinTech Domain, Rise and Fall of Wirecard AG

Founded in 1999, as a Germany based company, Wirecard AG operated in the digital payment segment of the FinTech sector. The company was introducing itself as (Wirecard AG, 2020); "*Wirecard operates one of the world's fastest-growing digital platforms in the realm of financial commerce. We offer both business clients and consumers a full range of innovative added-value services for digital payments: online, mobile, and at the point of sale.*"

The shares of Wirecard AG were included in the DAX and replaced the shares of Commerzbank AG, effectively as of September 24, 2018 (Deutsche Börse Group, 2018). Its market capitalization was €12.6 billion with 123.5 million shares issued on February 15, 2019 (ESMA, 2019).

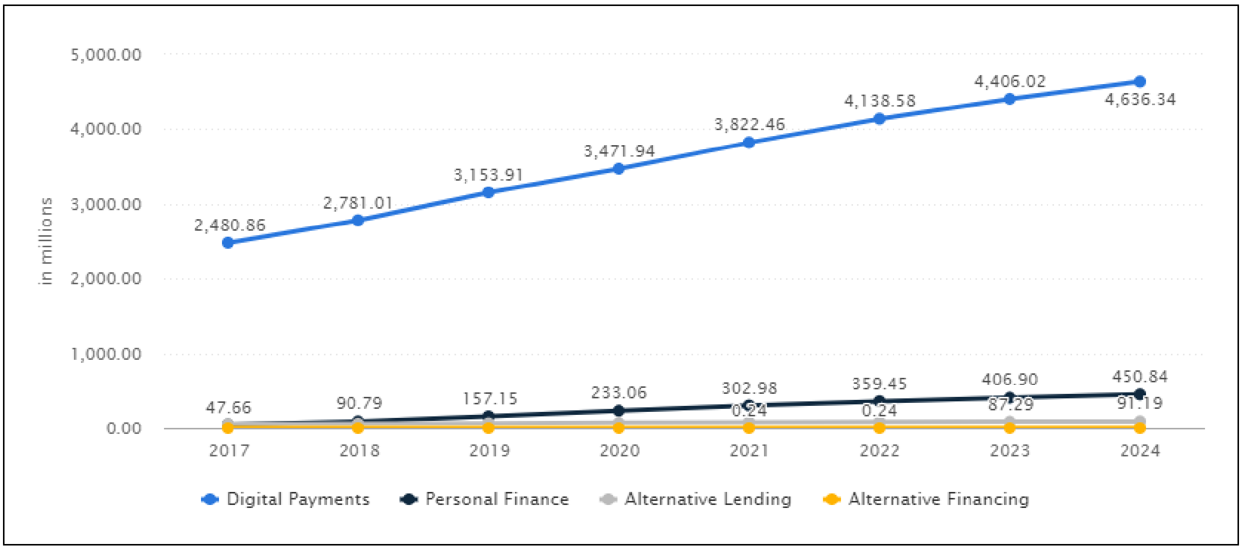
Wirecard AG was offering its customers electronic payment transaction and risk management solutions and issuing and processing of physical and virtual cards. It connected to more than 200 international payment networks (banks, payment solutions, card networks), which resulted in 34,000 customers from various industries, and offered its services in over 100 transaction currencies (ESMA, 2019). Wirecard Bank AG, a subsidiary of Wirecard AG, holds a German banking license. Another subsidiary of Wirecard AG, Wirecard Card Solutions Limited, received permission from the Financial Conduct Authority (FCA) to issue electronic money and provide payment services (ESMA, 2019). In March 2017, Wirecard AG acquired Citi Prepaid Card Services and initiated Wirecard North America in the US market (ESMA, 2019).

Wirecard AG had many features that make the company especially important to watch closely. Wirecard AG was

- a publicly held company,
- a stock exchange company,
- a DAX member company,
- a FinTech company,
- a "blue-chip" company,
- an internationally operating company.

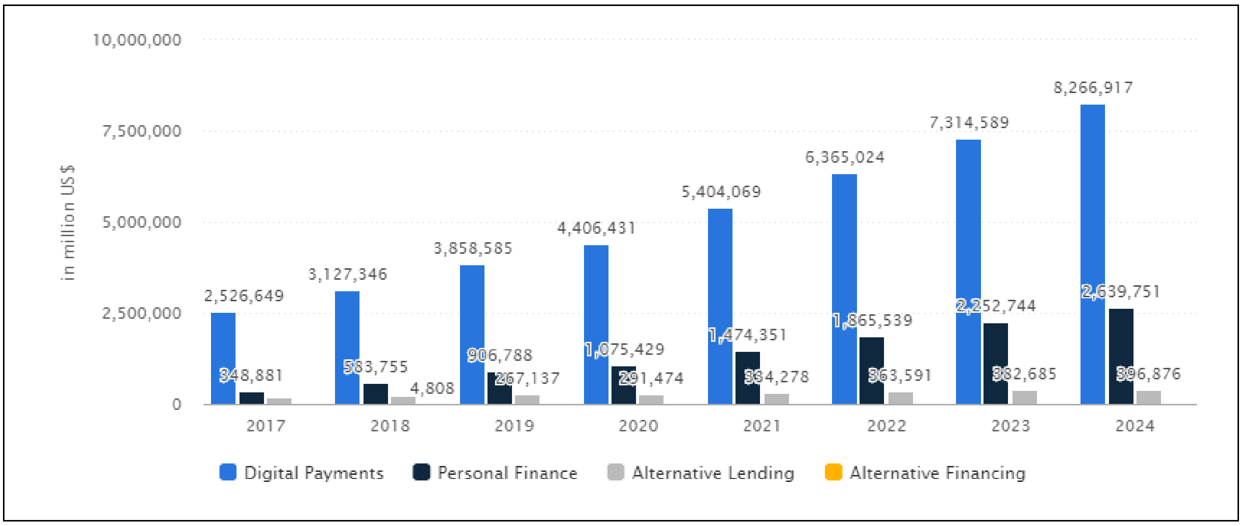
Among all, being a FinTech company is relatively more interesting in terms of the case since FinTech has many implications for expectations and behaviors of the financial consumers, the financial sector participants, financial supervisors as well as politicians.

Wirecard AG was mainly operating in the digital payment segment of the FinTech sector. As indicated below, the digital payment segment has a relatively steeper slope in terms of the number of users and transaction value considering the other segments.



Graph 1: Forecast, Digital Payment Segment of FinTech, Number of Expected Users.

Source: Statista (2020, Forecast, adjusted for the expected impact of Covid-19).



Graph 2: Forecast, Digital Payment Segment of FinTech, Transaction Value.

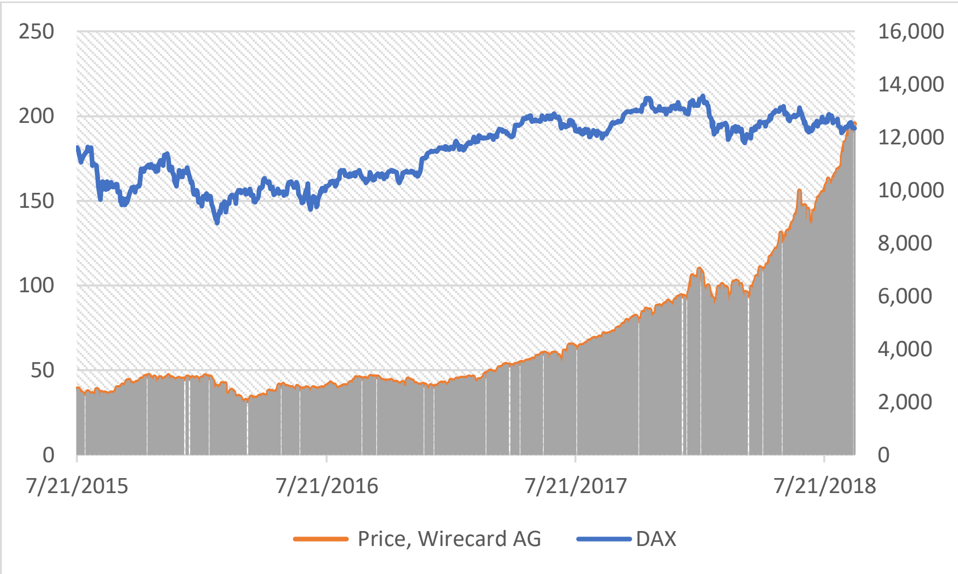
Source: Statista (2020, Forecast, adjusted for the expected impact of Covid-19).

The digital payment segment of FinTech gives a strong signal to financial investors, and this signal points out digital payment companies as one of the best investment areas.

As shown in Graph 3, the company's share price had an upward trend with a steep slope until September 2018. By the beginning of September 2018, the price approaches the level of 200 EUR.

Graph 3: Wirecard AG, Adjusted Price (both for both dividends and splits) (EUR) and Volume, 2015-2020

Data Source: Yahoo Finance (2020).



Graph 4: Wirecard AG Price (adjusted for both dividends and splits) (EUR) and DAX Performance-Index.

Data Source: Yahoo Finance (2020).

Wirecard AG's price movements indicate extraordinary performance and signal a close attention requirement, particularly after 2017 for financial supervisors. However, being a FinTech company in the digital payment segment, which might be considered as a reasonable explanation for soaring prices, might have been a disregarding point for financial supervisors. This hypothesis addresses a dimension of our "white-collar fraud" analysis in the coming sections.

Wirecard AG had been widely regarded as a pioneer and innovator in the digital payment industry (Pell, 2020). Its market capitalization was, at one point, bigger than Deutsche Bank's one, and the company took the place of Commerzbank in the DAX in 2018 (Pell, 2020).

After rocketing prices, Wirecard AG became a member of the DAX, signaling that it is officially one of the 30 most valuable companies listed on the Frankfurt Stock Exchange, as the company announced at the time.

On June 25, 2020, the management board of Wirecard AG decided to apply for the opening of insolvency proceedings on behalf of Wirecard AG at the competent Munich Local Court due to the threat of insolvency and over-indebtedness (Wirecard AG, 25 June 2020). Within the same disclosure statement on the DGAP platform, Wirecard AG declared that "*The Management Board has come to the conclusion that a positive going concern forecast cannot be made in the short time available. Thus, the company's ability to continue as a going concern is not assured.*"

1.2. Audit Opinions, Supervision of Financial Statements, and Disclosure Statements of Wirecard AG

Wirecard AG had positive audit opinions about their financial statements and management reports until 2020 (for the year 2019), as the following table indicates.

Fiscal Year	Auditor Firm	Opinion	Reference
2015	Ernst & Young GmbH	Unqualified[2]	Wirecard AG (April 2016)
2016	Ernst & Young GmbH	Unqualified	Wirecard AG (April 2017)
2017	Ernst & Young GmbH	Unqualified	Wirecard AG (April 2018)
2018	Ernst & Young GmbH	Unqualified	Wirecard AG (April 2019)

Table 1: Audit Opinions for Wirecard AG's Annual Financial Statements and Management Reports, 2015-2018. Source: The Authors, References.

Wirecard AG, as the company, and the Wirecard AG Group submitted audited financial statements and management reports for the fiscal years 2009 up to and including 2018, which were published with an unqualified audit certificate by EY "Wirtschaftsprüfungsgesellschaft" (Bundesministerium der Finanzen, 2020). None of the audits led to any objections

[2] Audit firms might extend four types of opinions for financial statements. One of them is "unqualified opinion". An unqualified opinion is a positive opinion and refers to a clean report. Other types are qualified opinion, disclaimer of opinion, and adverse opinion.

(Bundesministerium der Finanzen, 2020). The auditors neither mentioned nor addressed the issues raised in their unqualified audit opinions about the balance sheet manipulation accusations, which were discussed in press reports (Bundesministerium der Finanzen, 2020).

High-quality financial reporting is core to investor trust in capital markets, and Wirecard AG's collapse has undermined this trust (ESMA, 2020). Therefore, the European Securities and Markets Authority (ESMA) has launched an assessment of the supervisory response in the financial reporting area by the BaFin and the Financial Reporting Enforcement Panel (FREP) to the events leading to the collapse of Wirecard AG[3] (ESMA, 2020).

The FREP is the only review panel approved and recognized by the German Ministry of Justice, and this was done on a contractual basis (ESMA, 2017). The approval or recognition of the contract is not limited in time, but it can be terminated by both parties (ESMA, 2017).

The supervision of financial statements of companies, or financial reporting enforcement has been carried out in two stages by the BaFin and the FREP based on rules came into effect in 2004 with the German Financial Reporting Enforcement Act (*Bilanzkontrollgesetz*–BilKoG), and the supervision is intended to strengthen investors' confidence in the accuracy of financial statements of certain companies, which have access to an organized market (BaFin, 2019). In a two-stage procedure, the BaFin checks the compliance of the most recent annual financial statements or approved consolidated financial statements and the related (group) management report (BaFin, 2019). Since 2007, with the entry into force of the Transparency Directive Implementation Act (*Transparenzrichtlinie-Umsetzungsgesetz*–TUG), the BaFin has also been responsible for examining half-yearly financial reports, but only when there are specific grounds to do so (BaFin, 2019). Companies whose securities are admitted to trading on an organized market, and whose home member state is Germany, are in the realm of the supervision of financial reporting (BaFin, 2019).

The FREP has been examining the financial reporting of publicly listed companies since 2005 (FREP, 2020). The mission statement of the FREP is as follows: *"In the interest of the capital market, we wish to contribute to truthful and transparent accounting of capital market oriented companies. Our actions are based on the purpose of accounting and the related accounting standards, high professional quality, personal integrity and independence, excellence in our work and a reasonable sense of proportion."*

[3] It will be completed by 30 October 2020.

On February 15, 2019, the BaFin commissioned the FREP to audit the condensed financial statements, including the management report (Bundesministerium der Finanzen, 2020). Subsequently, the BaFin repeatedly asked the FREP to include new press releases or research analyses in the ongoing audit of the financial statements (Bundesministerium der Finanzen, 2020).

Several clear warning signs of accounting malpractice had appeared over a long period (Pell, 2020). The Financial Times questioned Wirecard AG's accounting and business practices for more than 18 months[4] (Pell, 2020). For a DAX company or a publicly held company, preparing and publishing financial statements are extremely critical areas. Late disclosure of financial statements has many implications, including an immediate supervisory action by financial supervisors.

As for the audit report for the fiscal year 2019, Wirecard AG made the following statement on May 25, 2020 (Wirecard AG, 2020): *"The audit firm Ernst & Young GmbH Wirtschaftsprüfungsgesellschaft has informed Wirecard AG that all foreign auditors have meanwhile been able to finalize their audit procedures for Group purposes. Within the scope of the completed parts of the audit procedures, Wirecard has not yet been informed of any material findings. However, not all audit procedures have yet been completed. Against this background, the audit of the annual financial statements and consolidated financial statements for 2019 will not be completed by June 4, 2020, as planned. The publication of the consolidated financial statements and the annual press conference will take place on June 18, 2020. The company expects an unqualified audit opinion."*

The following public statement was made by the company on June 18, 2020, at 10:43 AM, CET/CEST (Wirecard AG, June 18, 2020):

*"**Date for publication of annual and consolidated financial statements 2019 delayed due to indications of presentation of spurious balance confirmations***

Wirecard AG's auditor Ernst & Young GmbH Wirtschaftsprüfungsgesellschaft, Munich, informed Wirecard AG that no sufficient audit evidence could be obtained so far of cash balances on trust accounts to be consolidated in the consolidated financial statements in the amount of EUR 1.9 billion (approximately a quarter of the consolidated balance sheet total).

[4] The Financial Times started the Wirecard article series in 2015 (Bundesministerium der Finanzen, 2020).

There are indications that spurious balance confirmations had been provided from the side of the trustee respectively of the trustee's account holding banks to the auditor in order to deceive the auditor and create a wrong perception of the existence of such cash balances or the holding of the accounts for to the benefit of Wirecard group companies. The Wirecard management board is working intensively together with the auditor towards a clarification of the situation.

In light of the above the audit of the annual and the consolidated financial statements 2019 will not be concluded as planned by June 18, 2020. A new date will be announced. If certified annual and consolidated financial statements cannot be made available until June 19, 2020, loans made to Wirecard AG amounting to approximately EUR 2 billion can be terminated."

Another statement was made on June 18, 2020 (Wirecard AG, June 18 (at 11:08), 2020):

"Wirecard AG postpones 2019 annual financial statements

-Sales growth and cash inflows positively reviewed

-Trust accounts for third-party business not confirmed by banks

Wirecard AG has been informed by the auditor EY that an audit certificate for the annual financial statements for the past fiscal year 2019 requires additional audits. This is due to recent communications from the two banks that have been managing the escrow accounts since 2019, according to which the account numbers in question could not be assigned. The responsible trustee is in continuous contact with the banks and Wirecard AG. ..."

Ernst & Young GmbH was the auditor for the fiscal year 2019, but Wirecard AG had hired another audit firm for a special audit, KPMG. In numerous parts of the KPMG report, internal processes and deficiencies in governance, among others, were criticized, particularly regarding previous years (Wirecard AG, May 3, 2020). A KPMG investigation was unable to substantiate all the Wirecard AG's revenues in 2016-2018 (Pell, 2020). The BaFin has been investigating the case, and the agency is considering the content of the KPMG's special audit report, whether the report contradicts Wirecard AG's statements about the report, whether the report shows any evidence that Wirecard AG kept information that had to be published, or provided false information (BaFin, June 2020).

The theme of the public statements made by Wirecard AG against the accusations was mainly an insisting rejection and ignorance of the fraud issues. Interestingly, the following public statement was made on June 5, 2020 (Wirecard AG, June 5, 2020): "*Following the investigations already known in the market in connection with ad hoc news preceding the* *publication of the KPMG report on the special audit, today the company's premises were searched. The investigations are not targeting the company, but the members of its management board. The company is fully cooperating with the investigating authorities.*"

Interestingly, the company's statement was not reflecting the involvement of the relevant public prosecutor. In the original statement, a sentence was "*...wurden heute die Geschäftsräume des Unternehmens von der Staatsanwaltschaft durchsucht.*" The correct translation of this sentence is "*…today the company's premises were searched by the relevant public prosecutor."* However, the translation does not contain "*the relevant public prosecutor"* or any phrase about a public prosecutor in the English version published by the Wirecard AG's "Transparency" section of the web portal[5].

1.3. Responses of the Federal Ministry of Finance and the Financial Supervisor

According to Germany's Federal Ministry of Finance (July 16, 2020), the measures taken by the BaFin included the ongoing supervision of the subsidiary Wirecard Bank AG are in the following areas:

- investigation of probable market manipulation and insider trading by market participants,
- investigation of probable market manipulation by Wirecard AG,
- fine of € 1.52 million imposed on Wirecard AG for the late submission of financial reports in 2019,
- initiation of balance sheet control at Wirecard AG by commissioning the responsible Financial Reporting Enforcement Panel[6] (FREP) in 2019,
- consistent action against Wirecard AG after the detection of balance sheet problems by the KPMG special audit in April 2020.

The Wirecard AG case comes with a critical discussion about the BaFin's supervisory responsibility on Wirecard AG. In February 2017, pursuant to the EU laws, the BaFin and the Deutsche Bundesbank[7] from the supervisory authority perspective examined Wirecard AG, as the parent company, and came up with the result that Wirecard AG is not to be classified as a

[5] For disclosure statements in German, please see DGAP.DE (2020).

[6] Original in German; "Deutsche Prüfstelle für Rechnungslegung", or "DPR".

[7] The Deutsche Bundesbank is the central bank of the Federal Republic of Germany.

financial holding company; therefore, the supervisory authority has no access to the entire Group (Bundesministerium der Finanzen, 2020). The ECB later agrees with this assessment (Bundesministerium der Finanzen, 2020). We derive two results from the given supervisory structure[8]. First, there is a gap within the supervisory structure in terms of supervisory responsibility since there is no evidence that a financial supervisor fully supervised Wirecard AG considering the red flags. Second, financial supervision is effective when supervisors have a consistent focus on the big picture instead of dealing with only several aspects of publicly held companies and financial services providers in the digital world. In an increasingly interconnected global financial marketplace, there is a broader and faster propagation of risk, requiring supervisors to have the tools to keep pace (Soramäki & Straley, 2019).

On the other hand, the Wirecard AG case has an exceedingly difficult component, the involvement of third parties in foreign countries, a situation that all financial supervisors face difficulties in their investigations. Supervisors may require information for some international cases from other countries' supervisors. This requires much more complicated procedures and causes harmful delays (Zeranski & Sancak, 2020). In contrast, this is an advantage and a desirable situation for potential white-collar fraudsters. Wirecard AG's financial statements have items that need to be confirmed with entities in other countries. From a financial supervisor's perspective, this confirmation requires cooperation with foreign agencies. The BaFin has sought cooperation with several foreign authorities, among other things, because of the vast foreign involvement, and has passed on findings and information to the relevant public prosecutor's office or foreign authority (Bundesministerium der Finanzen, 2020).

On April 15, 2019, the BaFin imposed administrative fines amounting to EUR 1.52 million against Wirecard AG[9] (BaFin, 2019). According to the BaFin's statement, "*Wirecard AG had failed to make its half-yearly financial report for the financial year of 2018 publicly available in full within the prescribed period. Furthermore, the company had failed to publish, within*

[8] Since this area is still under discussion from the realm of the applicable laws and regulations, we do not assume that the BaFin has full supervision power over Wirecard AG. However, from an ideal supervisory structure, the case might be dealt with another research paper considering national supervisory systems around the world.

[9] The sanction related to a breach of section 115 (1) sentence 1 in conjunction with section 117 number 2 in conjunction with section 115 (2) no. 3 of the German Securities Trading Act (*Wertpapierhandelsgesetz*–WpHG) and to a breach of section 130 (1) of the German Act of Breaches of Administrative Regulations (*Ordnungswidrigkeitengesetz*–OWiG) in conjunction with section 115 (1) sentence 2 of the WpHG.

the prescribed period, an announcement stating the date and the website on which the half-yearly financial report for the financial year of 2018 is made publicly available, in addition to its availability in the company register." It was interesting that a FinTech and DAX company failed to prepare and publish its financial report timely.

As an administrative action, in February 2019, the BaFin prohibited establishing a net short position and increasing an existing net short position on the shares of Wirecard AG with the ground of short attacks (BaFin, 2019). On February 18, 2019, the ESMA issued an official opinion agreeing to the emergency net short position ban for two months with the BaFin under the Short Selling Regulation (ESMA, 2019). There are comments and discussions about the BaFin's short-selling action regarding the Wirecard AG case. It is a highly technical area in finance whether a financial supervisor should interfere with a publicly held company's share market by imposing short-selling restrictions, especially amid accounting scandal rumors[10].

The FREP acts on a random basis and in the event of concrete indications of a violation of accounting regulations and on the request of the BaFin (Bundesministerium der Finanzen, 2020). The BaFin may only act at the second level if the company does not voluntarily participate in auditing or does not agree with the result of an audit (Bundesministerium der Finanzen, 2020). It may also take action if there are serious doubts about the correctness of the examination results of the FREP or about the proper conduct of the examination by the FREP (Bundesministerium der Finanzen, 2020). On February 15, 2019, the BaFin commissioned the FREP to audit the condensed financial statements, including the management report (Bundesministerium der Finanzen, 2020). Subsequently, the BaFin repeatedly asked the FREP to include new press releases or research analyses in the ongoing audit of the financial statements (Bundesministerium der Finanzen, 2020). At the same time, the BaFin turned to its partner authority in Asia to clarify the specific accusations against a Wirecard subsidiary and addressed further requests for administrative assistance to several foreign supervisory authorities (Bundesministerium der Finanzen, 2020).

Finally, the BaFin issued a notice on July 22, 2020, ordering Wirecard AG to comply with the financial reporting requirements and threatening to impose coercive fines in the amount of EUR 330,000 (BaFin, 29 July 2020).

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10 We might handle this issue in another research paper since it has multiple aspects, both in theory and practice.

With few exceptions, investors, analysts, and regulators ignored the red flags and accepted management's statements that all was fine (Pell, 2020). Overreliance on SROs and audit firms is one of the weaknesses of financial supervisors around the world. In practice, financial supervisors cannot supervise every company or financial services provider every year. Financial supervisors also cannot and should not be active players in every part of the financial sector for good reasons. Therefore, layering supervision with SROs, audit firms, internal control mechanisms, most importantly, corporate governance structures, has been one of the main strategies for financial supervisors. In today's world, financial supervisors must be equipped with SupTech to ensure that the layered system of their supervision is functioning as expected. In other words, stress tests should also be conducted for supervisory systems[11].

With the abundance of data and arrival of data analytics tools, financial supervisors need to reform their supervisory practices and structures and deploy SupTech as we set out with our recent research papers[12].

To ensure that people benefit from digital financial services, governments need to ensure that appropriate regulations and consumer protection safeguards are in place (Demirgüç-Kunt, Klapper, Singer, Ansar, & Hess, 2018). Politicians and financial supervisory communities should know that they cannot serve their country better by disregarding risks of FinTech companies in their country. Instead, they serve their country, hence global economic and financial stability, much better by delivering consistent and robust supervision supported by SupTech, international experience, and scientific approaches.

The Federal Ministry of Finance stated that[13] (Bundesministerium der Finanzen, 2020) "*In the case of Wirecard AG, however, it became apparent that the current control structures,*

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[11] There are some implemented test methods. For example, a fictitious company was used and organized by a financial supervisor, and its shares sold publicly via a fictitious IPO on the Internet to test financial investors whether they can capture fraudulent activities. There are some other methods to test multiple defense mechanisms in the financial sector.

[12] Zeranski & Sancak, *Prudential Supervisory Disclosure (PSD) with Supervisory Technology (SupTech): Lessons from a FinTech Crisis*, July 2020, and Zeranski & Sancak, *Digitalisation of Financial Supervision with Supervisory Technology (SupTech)*, 2020.

[13] Original in German: "*Im Fall der Wirecard AG hat sich allerdings gezeigt, dass die gegenwärtigen Kontrollstrukturen, einschl. der für die Abschlussprüfung, nicht ausreichend waren, um ein mutmaßliches System betrügerischer Strukturen frühzeitig aufzudecken.*"

including those for the audit of the financial statements, were not sufficient to detect a suspected system of fraudulent structures at an early stage." Accepting a problem is the most significant step to solve it. The Federal Ministry of Finance also stated that based on the preliminary findings, initial conclusions could be drawn for better combating balance sheet fraud and strengthening control over capital and financial markets. Furthermore, the Ministry also pointed out that where existing supervisory powers and competences of the supervising authorities are insufficient in practice or no longer appropriate to developments on the financial markets, the corresponding rules and processes must, therefore, be adapted (Bundesministerium der Finanzen, 2020).

Germany also considers to renovate areas the case addressed; the two-stage balance sheet control procedure, the tasks, and role of auditors, the classification of companies and transactions in the payment services sector, but also the organizational structure, resources, and workflows in the BaFin (Bundesministerium der Finanzen, 2020). Moreover, the Federal Ministry of Finance invokes the international aspects of the case, hence, plans to trigger international mechanisms accordingly[14]. Since the case and its implications are not country-specific, standard setters and multinational economic and financial organizations, such as the FSB, the BIS, and the IOSCO should urgently handle the relevant issues.

The Ministry touches on a particularly important issue that the hundred percent protection against criminal actions is not possible in financial markets. Many financial asset classes do not have governmental guarantee mechanisms, like deposit insurance or deposit guarantee schemes. Therefore, the risk valuations of those assets also theoretically include the "*force majeure*" dimension of financial supervision. This is not a national or a regional issue but a global one. Hence, better financial supervisory systems signal lower risks for financial instruments and financial institutions, like banks, ultimately, lower capital requirements.

The Global Financial Crisis (2007-2009) has called into question the role of financial policy in general, especially in banking, revealing major shortcomings in market discipline, regulation, and supervision (The World Bank, 2020). FinTech also increases the importance of totally new financial policies. The pace of technology, as well as some FinTech crashes, address the urgency of supervisory reforms (Zeranski & Sancak, July 2020). The May 6, 2010 market crash occurred almost ten years ago in the U.S. financial markets was one of the most significant

[14] For more details of the Ministry's declarations, please see Bundesministerium der Finanzen (16 July 2020).

alarms for financial supervisors to overhaul their financial supervisory systems. Now, another alarm is sounding in a different tone not only for Germany but also for every country.

The Wirecard case also turns on financial literacy lights in the meaning that financial consumers should develop self-defense mechanisms for risky asset classes. Financially knowledgeable individuals have a higher propensity to detect fraud; one standard deviation increase in financial knowledge increases fraud detection probabilities by three percentage points (Engels, Kumar, & Philip, 2019). The recent findings indicate that fraud tactics are increasingly complex, and better financial knowledge provides the degree of sophistication necessary to detect fraud rather than basic money management skills (Engels, Kumar, & Philip, 2019). Therefore, governments have increasingly important responsibilities to raise financial literacy awareness. Moreover, in the digital world, digital literacy is not less important than financial literacy.

An analysis without regarding the reactions of the Wirecard AG management in the case might result in unprofessional policy decisions. Above all, the management of Wirecard AG has the primary responsibility to manage the company in compliance with rules and regulations as well as professional management practices. Top managers should manage the company prudently and follow the corporate governance rules regarding EBA/GL/2017/11, EBA/GL/2017/12.

Wirecard AG was a FinTech firm that has more technological tools than other companies available to the managers of the company. Interestingly, it is publicly declared that (Wirecard Bank AG, 2020); "*The service portfolio of Wirecard AG comprises more than 85 payment and risk management solutions. The company supports more than 25,000 customers across many different industries worldwide in the implementation of fully automated payment processing. The central Wirecard platform facilitates the outsourcing of all financial processes, including processing electronic payments, transaction and customer verification, support services in the call centre and email management.*

In addition, Wirecard AG offers a wide, comprehensive range of effective fraud prevention tools. Wirecard solutions that are fully integrated in the payment process recognise threats and risks as soon as payment is submitted." This is a statement that might have some more implications in solving the case.

The managers' reactions under the given conditions cannot be considered acceptable under "prudent person rule". Moreover, the following statement of the chairman of the supervisory board of Wirecard AG indicates that how self-confident the chairman amid insisting media speculations in January 2020 (Wirecard AG, January 10, 2020): "*It was a special honour for me to accompany this extraordinary company and its management team over the past 11 years as Chairman of the Supervisory Board. During this time, Wirecard AG has achieved a growth and success story unparalleled in Germany's recent economic history. Today, Wirecard is an internationally operating blue-chip company and has thus entered a new phase of its corporate development. ...*" In Germany, a supervisory board has a higher position than executive bodies; thus, its members have special duties e.g., concerning fit and proper requirements (EBA/GL/2017/12).

Moreover, the company's disclosure statements against rumors and speculations arising from the media coverages and articles, late financial statements, and audit reports imply intentional and tactical resistance instead of solving a significant problem. Professionally designated frauds in delicate economic conditions are the hard-to-capture cases that financial supervisors face around the world.

1.4. Behavioral Bias, Corporate Governance, Financial Literacy, and Other Dimensions

Pell (2020) asserts that the Wirecard AG case shows the behavioral biases that can be major drivers of investment missteps, particularly, "belief perseverance bias" when people stick to their previously held beliefs despite contradictory information. FinTech is often mentioned in the sentences with words such as "innovation" and "disruption" that add allure to FinTech companies (Pell, 2020). FinTech, as a buzz word, might induce financial investors to irrationally invest in FinTech related companies and assume that their performance will always be higher than market returns. Moreover, investors might assume that the country has a well-functioning financial supervisory system, and financial supervisors have perfect supervisory protection capacity.

As a behavioral finance matter, the FinTech frenzy might have also allured national financial supervisors and politicians. Financial supervisors might see a rocketing FinTech company as a national economic success and have a bias towards warning signals. This reality increases the importance of multi-national supervisory organizations and the cooperation between academia and financial supervisors. In this regard, together with other functions, a full-fledged financial supervisor at the EU level might be a remedy against the national protectionism bias. The EU membership structure might be an advantage, particularly right after the Brexit, to form more reliable EU-wide financial supervision, as discussed in the third section.

Moreover, hefty fines from other countries to international companies might trigger national protective policies and increase biases in the origin country of the companies. There are many cases that international companies have been facing aggressive protective policies in other countries. Aggressive policies to discourage international companies from increasing their market share in other countries precipitate national protectionism and increase the risks of national biases. This atmosphere gradually poisons financial supervisors to follow inconsistent supervisory policies, especially towards national but internationally renowned companies.

Additionally, the negative interest rate environment increases the importance of dynamic sectors and fuels the irrational exuberance at capital markets, particularly at stock markets. Inconsistent financial supervision, asymmetric technology conditions, unattractive returns at money markets, national protectionism, and wonderful stories supported with many industry reports even academic papers in favor of FinTech companies all pave the way for potential white-collar fraudsters to set up deceiving plans to collect huge amounts of cash and produce new (fictitious) success stories. This strategy of potential white-collars professionals is neither a new nor a local one; rather, this is a well-known deceiving strategy seen worldwide. The U.S. financial history has many scandals, including the Enron scandal. The U.K.'s financial history has one of the biggest financial scandals, known as LIBOR manipulation, officially revealed by the U.S. and U.K. authorities in June 2012[15].

According to the 2020 Report to the Nations of the Association of Certified Fraud Examiners (ACFE), 2,504 fraud cases from 125 countries, causing a total loss of more than $ 3.6 billion, were reported. The study contains an analysis of 2,504 cases of occupational frauds[16] that were investigated between January 2018 and September 2019 (ACFE, 2020). This is a tiny fraction of the number of frauds committed each year (ACFE, 2020). According to the study, financial statement frauds account for the lowest part, 10 % of these cases with the highest median loss

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[15] Even though LIBOR was calculated based on the quotes given by the limited number of panel banks around the world, the process was under the administration of the British Bankers Association (BBA). The LIBOR manipulation scandal was revealed in 2012. After the scandal, the administration was transferred from the BBA to Intercontinental Exchange Benchmark Administration Ltd. (BBA, 2014). In this regard, among others, the BBA's Chief Executive stated at the time (BBA, 2014): "…*The BBA has strongly stated the need for greater regulatory oversight of LIBOR, and tougher sanctions for those who try to manipulate it. …".*

[16] Occupational fraud is formally defined as the use of one's occupation for personal enrichment through the deliberate misuse or misapplication of the employing organization's resources or assets.

of $ 954,000. The ACFE’s report pictures only a small part of the frauds since their study is mainly based on voluntarily responded surveys.

No country is immune to financial frauds and scandals, considering the capacity of white-collar fraudsters with high criminal energy. Moreover, in the short term, it is hard to change global economic conditions that pave the way for potential white-collar fraudsters.

The Wirecard case also raises questions about corporate governance implementations, one of the ESG components in sustainable finance. Until early 2019, the Wirecard's board did not choose to create dedicated committees for audit, risk, and compliance (Pell, 2020). The size of the compliance team was about 0.4 percent of the workforce in 2019, HSBC, by comparison, had 2.6 percent compliance staff in 2017 (Pell, 2020). This picture was both a corporate governance failure and a red flag for financial supervisors. Financial supervisors have the responsibility of supervising corporate governance structures of supervised entities, particularly systemically important ones. Wirecard AG could be considered a systemically important company from multiple points. For example, the company was a member of the performance index, namely the DAX. Stock indexes are considered the main economic and financial indicators of a sector or a country. Many risk management units and researchers use the historical data of stock market indexes. Therefore, an index member is crucially important for economic and academic actors. Moreover, Wirecard AG was a FinTech company operating in the payment sector, which might be of systemic importance.

Short-termism is an obstacle to adopting sustainable practices (Schoenmaker & Schramade, 2019). We observe that short-termism also forces FinTech companies to adopt improper practices and risk their future, hence the rights of investors, ultimately the financial stability of the country they operate in. The high return expectations of shareholders in the short-term also force publicly held companies to orient their governance issues at the expense of long-term goals. Moreover, the shareholder model, which has a focus to maximize the profit, is holding companies back from sustainable business practices (Schoenmaker & Schramade, 2019). An alternative view is that companies should broaden the corporate objective to optimize the total or integrated value, which combines financial, social, and environmental values (Schoenmaker & Schramade, 2019).

The Wirecard case also addresses financial and digital literacy policies. Financial consumers should be aware of the fact that FinTech might be used as an alluring word to induce investors to invest in a company irrationally. In this regard, protective investment rules should always be promoted by governments, financial supervisors, SROs, and, most importantly, universities. In some countries, financial literacy has been added to primary schools' educational materials. Having financial literate financial consumers in a country is one of the best protection mechanisms against financial frauds.

The convergence of financial services and technology raises the importance of digital literacy. FinTech developments might damage financial well-being by triggering impulsive consumer behavior when interacting with financial technologies and platforms (Panos & Wilson, 2020). For example, mobile apps can lead to individuals making faulty decisions in `hot' states or under sales pressure (Panos & Wilson, 2020). The increasing number of digital financial instruments and financing methods with increasing online advertisements open new doors between financial consumers and financial services providers or digital platforms, a situation that paves the way for potential fraudsters. For example, the development of crowdfunding platforms creates opportunities for fraudsters to hide their identities or funding histories, thereby increasing the incentive to commit fraud (Karpoff, 2020). Therefore, in the digital world, having digital literate financial consumers should also be a national financial policy area.

II. Implications of Digital Transformation for Financial Supervisors and White-Collar Fraudsters

Technological imbalance or asymmetric technology between financial markets or institutions and their supervisors is more dangerous than cyber-attack risks since cyberattacks are well-known risk types; hence there is considerable vigilance to develop shields against them (Zeranski & Sancak, July 2020). However, the lack of a well-functioning and holistic supervisory technology (SupTech) leaves many doors wide-open for detrimental technological transactions, financial scandals, FinTech crises, and their ensuing effects on an economy's financial stability. In other words, asymmetric technology is one of the most significant risks today. Therefore, having a digital financial supervisory system with a well-functioning, consistent, and holistic SupTech is one of the best risk management strategies in this regard (Zeranski & Sancak, July 2020).

It might be interesting, but financial innovations are also the materials, and transformation periods are the perfect time frames for potential financial fraudsters. The typical stories of new industries and technologies reveal the importance of innovation as the context for fraud and scandals in a broader sense (Driel, 2019). Outcomes of innovation are highly uncertain, which may indirectly lead to dubious financial practices (Driel, 2019). New financial instruments and products were a major type of innovation that facilitated or triggered dubious business practices (Driel, 2019). One of the causes of the GFC was the abuse of innovative financial instruments. Recently, we observe that the world has a similar risk. The risk is much more than previous ones in multiple dimensions. While financial institutions are trying to struggle with digital transformation, BigTechs are developing new strategies to increase their roles in the financial sector. Moreover, technologies such as artificial intelligence and blockchain are the main drivers of market dynamics and countless financial innovations such as algorithmic trading, high-frequency trading, robo-advisors, open banking, and crowdfunding. Most finance experts do not have enough background education or experience to work with these new technologies[17]. On the other hand, IT professionals also do not have enough finance background and financial sector experience in general. Two different professional groups

[17] A technology term, "digital native", addresses the strong adaptation ability to the digital world: A person who grew up with digital technology. Digital natives, in general, refer to the generation of the digital age. They have spent their entire lives surrounded by and using computers, videogames, digital music players, video cams, cell phones, and all the other toys and tools of the digital age (Prensky, 2001).

should work together and share their experience to cope with TECHS in Finance matters. This also means new organizational structures for the firms operating in the financial sector.

Digital transformation should be in parallel with organizational transformation and compliance. Transformations are challenging and take time. The transition periods are perfect time frames for potential white-collar fraudsters since financial supervisors, in general, do not keep pace with market developments because of their governmental natures. White-collar fraudsters get the benefit of

- Fragmented and disorganized financial systems,
- Legacy supervisory systems,
- New trends and irrational exuberance,
- Their experience in their area,
- Their international network,
- Weak international cooperation among national financial supervisors,
- A perfect story, true or not true, to lure potential victims,
- Inexperienced entrepreneurs and financial consumers,
- Distorted statistics or data,
- Distorted and manipulated financial statements,
- Positive reports from third parties, including audit firms
- Their convincing ability with extraordinary self-confidence.

The medicine and vaccine for these issues are:

- A well-designed and structured financial system with an up-to-date, consistent, and holistic financial supervisory model,
- An efficient supervisory system equipped with a well-functioning, consistent, and holistic SupTech system,
- Prudential supervisory disclosure,
- A well-functioning SRO system,
- Corporate governance and sustainable finance,
- Globally functioning and integrated, consistent, and holistic SupTech system, multinational supervisory organizations, MMOU,
- Financial literacy, digital literacy, and sustainable finance literacy,
- Scientific reports, trustable financial sources, analytical thinking.

Financial supervisors have their working procedures and internal cultures. Each supervisory staff has a unique experience that one cannot see anywhere else or in the private sector. Therefore, personnel mobility also has limited policy-making capacity in the short term, especially in the critical times of the digital financial world. In some countries, hiring personnel directly from the private sector is almost impossible. Moreover, in some countries, financial data can be seen as a national security matter. Thus, hiring new IT personnel requires lengthy and complicated procedures. Some government organizations hire IT-staff only from other governmental organizations in their country. To put it shortly, the unique nature of in-house organizational parameters increases the gap between two parties, financial supervisors, and their sectors.

On top of the complicated personnel policy, financial supervisors run the risks of asymmetric technology. FinTech moves faster than regulation or internal risk governance (Pell, 2020). Angeloni (2020) asserts that the conditions which permitted the Wirecard scandal to arise are still with us, and they should be removed, not only in Germany but also in Europe. We go further and claim that unless these risks have not been considered interconnected, local, national, or regional solutions will not be efficient enough. In this regard, we propose that multinational organizations should immediately handle risk issues arising from asymmetric technology. Our recent papers, Zeranski & Sancak (July 2020) and Zeranski & Sancak (2020), stemming from the real cases and our industry experience, may help in this regard.

The Wirecard case might be seen as a case to attack the reputation of German or EU financial supervisors, namely the BaFin or the ESMA, and the German economy at large. A financial scandal or crisis should not be used in this way in a global economy since scandals may hurt other similar financial supervisors and interconnected economies. Financial scandals might have spillover effects in terms of reputation and market integrity, apart from their actual detrimental effects. For example, a financial scandal in the U.S. harms not only the reputations of the SEC and the CFTC but also might increase the fear in other countries and hit the reputation of other financial supervisors. Today, neither the U.K. financial authorities nor the U.S. ones guarantee that another scandal will not burst out in the coming weeks in their territory. Particularly, potential white-collar fraudsters might get the benefit of the foggy atmosphere of these times to put in effect their dream plans. Since there is no copyright concern in the fraud world, a successful fraud in one country might occur in other countries one after another with the same tactics but different actors. Thus, frauds are not isolated or country-specific illegal activities and threat every country in the world. The Wirecard case has probably attracted the attention of many potential white-collar fraudsters and increased the fears in many markets, which means the risk has already been priced, or it will be priced soon in other countries, like a virus unless an effective vaccine comes out.

The lagged and foggy atmosphere of the digital transformation period around the world might be very conducive to white-collar fraudsters who abuse their TECHs in Finance advantages. Fueled by inconsistent supervisory approaches, national protectionism in reaction to trade wars, fierce competitions among national economies coupled with the unattractive yields at money markets, potential white-collar fraudsters come up with vast abusive opportunities of their FinTech related companies at capital markets.

The policy letter of Krahnen and Langenbucher (July 2020) asserts that the Wirecard scandal is a wake-up call alerting German politics to the importance of securities market integrity. However, Wirecard's shockwaves are unlikely to remain within German borders (Angeloni, 2020). We believe that the Wirecard scandal is an alarm not only for Germany or the EU but also for the rest of the world. Technologies are often portable, and FinTech companies look for ways to exploit economies of scale by selling their services internationally, which increases the need for international coordination and cooperation between supervisors on the regulatory treatment of cross-border technology companies (Taylor, Almansi, & Ferrari, 2020). Therefore, developed and developing countries have no choice other than to act together to cope with financial scandals and crises. In this regard, biased media news and comments on financial scandals and crises take place initially only in one country undermine many economies, hence the world economy, particularly in the very sensitive times as the world faces with the Covid-19.

To sum up, the Wirecard AG case has multiple aspects and causes, not just one cause. However, many aspects of today's financial markets address new FinTech crises and FinTech related scandals, not only in one country but also in every economy, developing or developed ones.

The Wirecard case is the realization of only a few risks in the FinTech environment and seems to be an abuse of TECH-trends in the financial sector. The Wirecard case is per se not a FinTech crisis, but it seems to be a typical accounting fraud based on our initial considerations[18].

[18] It is another issue that the collapse of Wirecard AG might trigger the risks arising from operations, products and services of the company. In this case, a FinTech crisis might arise.

However, we contemplate that the risks of asymmetric technology between financial supervisors and their supervised areas, coupled with the expected adverse effects of the Covid-19, address FinTech crises in the near future. The Covid-19 might cause domino effects and force many companies into financial collapse. A key concern about a long-lasting impact of the virus on the world economy is the risk of a wave of bankruptcies (Georgieva, 2020). More pessimistically, the Covid-19 is creating an insolvency time bomb (Lemerle, July 2020). The Covid-19 environment might also induce white-collar fraudsters to hide financial statement losses and use the positive TECHs in Finance news for window-dressing.

A recent survey of financial sector executives conducted by the Center for Financial Studies (CFS) on the impacts of the Wirecard AG scandal shows that over 85% of participants see it necessary to reform financial regulation in Germany (Center for Financial Studies, July 2020). However, our findings in this work address structural financial supervision reform and digital transformation requirements rather than a financial regulation reform[19]. Moreover, the managing directors of the Center for Financial Studies and Frankfurt Main Finance e.V. point out the requirements of deploying technological resources and digitalization (Center for Financial Studies, July 2020). Without a structural reform equipped with SupTech, financial regulation will be destined to fail.

[19] In some cases, authors refer to regulation in the meaning of regulatory and supervisory activities. However, regulation and supervision are connected, but one of them does not include the other one. In this regard, RegTech differs from SupTech. For more details, please see Zeranski & Sancak, *Digitalisation of Financial Supervision with Supervisory Technology (SupTech)*, (2020).

III. Reform Requirements for the European System of Financial Supervision

The European System of Financial Supervision (ESFS) was introduced in 2010 (European Commission, 2020).

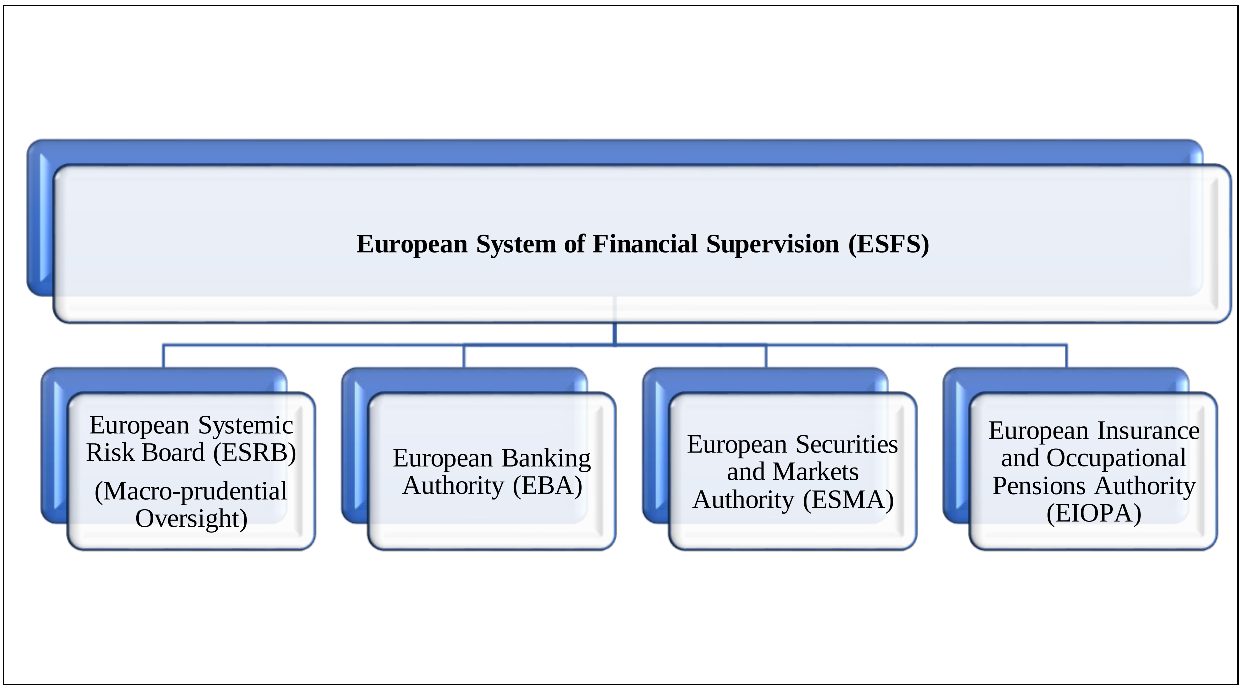

Figure 1: European System of Financial Supervision (ESFS)
Source: European Commission (2020)

The regulatory and supervisory framework in the EU does not directly address the RegTech or SupTech paradigms, and the approach taken by firms and supervisors to pilot and adopt RegTech and SupTech frameworks is currently ad-hoc and uncoordinated (European Commission, 2019). This was seen as an important issue and handled by a report, *Expert Group on Regulatory Obstacles to Financial Innovation (ROFIEG):30 Recommendations on Regulation, Innovation and Finance -Final Report to the European Commission.* The Group recommends that the EU develops and implements a comprehensive and ambitious agenda for the establishment of advanced RegTech and SupTech capabilities, in coordination with relevant authorities in and beyond the EU and international standard setters. It is obvious that financial reforms without the TECHs in Finance perspective will not be functional anymore in the digital world. Furthermore, sustainable finance must be in the center of financial reforms.

Angeloni (2020) suggests that since Brexit redesigns the continent's financial landscape and the European Commission renews its effort to build a capital market union, and the Wirecard calamity has been seen as a case for European-wide, the response should also be European-wide. We support this idea with the digitalization of the financial supervision perspective and a larger extent. With their recent papers, Krahnen and Langenbucher offer a new market supervisor for the supervision of securities markets in Europe. We believe that partial solutions are not any more effective solutions for known and unknown financial risks in the digital world. We are also convinced that without digital supervisory transformation, reform efforts are doomed to failure. Market supervision in the digital finance world should cover all markets together, capital markets, and others. As pointed out with a research paper (Sancak, 2015), financial supervisory bodies should monitor the whole financial system. The real cases about the banking crises in Turkey in the years of 1999-2001 – partly a result of the arbitrary design of the financial system and deficient regulations from the organizational structure of the Turkish financial system, and about the GFC– partly a result of the lack of efficient regulation and supervision in the U.S. for some new markets and products address the problems arising mainly from organizational structure, coordination, and fragmentation (Sancak, 2015). He et al. (2017) argue that regulators or supervisors may need to complement their focus on entities with increasing attention to activities, as financial services are increasingly provided by a diverse group of firms and market platforms. Frisell et al. (2018) also point out the same view by stating that since the financial industry is modularizing, and its boundaries are becoming blurred, as non-bank firms enter the market, competing at selected points along the value chain, supervisors will need to respond by shifting their focus from entities towards activities – for example, supervising payments rather than payment institutions. The market analyses indicated that new players are emerging as a result of big data and artificial intelligence-based innovations (BaFin, 2018). Regarding the May 6, 2010 flash crash in the U.S. markets, the SEC and the CFTC failed to timely respond to the market crash, since supervisory agencies did not have real-time data collection capacity and some other SupTech components at the time.

Some regulatory and supervisory agencies have defined their SupTech strategies, formally or informally in the following areas (EIOPA, 2020):

a) Organizational changes to prepare the authorities to SupTech,
b) Enhancing internal supervisory processes and facilitating digital interaction with financial institutions,
c) Improving supervisory processes and the use of data, both quantitative and qualitative.

To sum up, in the digital world, we should consider financial reforms from TECHs in Finance perspectives as we set up the digital pillars with our recent research papers[20].

Germany has a single financial supervisor, namely BaFin. We observe that some countries have the problem of multiple (equal) responsible authorities for the same cases. As we pointed out with our recent research papers, the strategic solution is to reorganize the financial structure to minimize this risk. However, reorganization might require new supervisory perspectives with TECHs in Finance and operational capacity with a dedicated unit. For example, Sancak (2015) offers a financial stability institution with operational capacity for Turkey. Moreover, Angeloni (2020) states that designing a clear mandate for a European financial markets authority, covering all listed companies and securities markets, is the bullet-proof way to remove ambiguity and fragmentation from the regulatory base, thereby creating the conditions for strong supervision. Furthermore, Angeloni (2020) suggests that the ESMA be restructured and empowered with a new statute and legal basis. Krahnen and Langenbucher (2020) are convinced that a full harmonization of enforcement policy will be able to give enhanced credibility to Europe’s securities law.

The ESMA is for capital markets, the EBA is for the banking sector, and the EIOPA is for the EU's insurance sector. Each industry has different working rules, hence, dedicated experts or professionals. Similarly, a specialized agency should be able to monitor all areas together technologically. In the digital world, this is possible, doable, and easier with a well-functioning SupTech system and a strong focus on TECHs in Finance developments.

In many countries, there are financial stability committees or boards to carry out macro-prudential supervision. However, these committees or boards do not have deep operational focus; instead, they carry out their roles by setting up expert groups or working groups, mainly working part-time or not permanently. Some financial stability organizations (under the names of committee or board in general) even do not have an administrative structure; an agency handles their administrative works. For example, in the EU, the ECB provides analytical, statistical, administrative, and logistical support to the European Systemic Risk Board (European Parliament, 2020). The temporary working style and committee or board style organizations might not be very helpful in developing ad-hoc deep professional expertise in

20 Zeranski & Sancak, *Prudential Supervisory Disclosure (PSD) with Supervisory Technology (SupTech): Lessons from a FinTech Crisis*, July 2020, and Zeranski & Sancak, *Digitalisation of Financial Supervision with Supervisory Technology (SupTech)*, 2020.

the macro-prudential area. The financial supervisory landscape needs more new experts with broader perspectives and strong macro-prudential analytical skills for financial markets and a deep understanding of the digital world. Moreover, financial stability committees or boards also need these experts permanently to deliver their missions. The following figure shows the European Systemic Risk Board (ESRB).

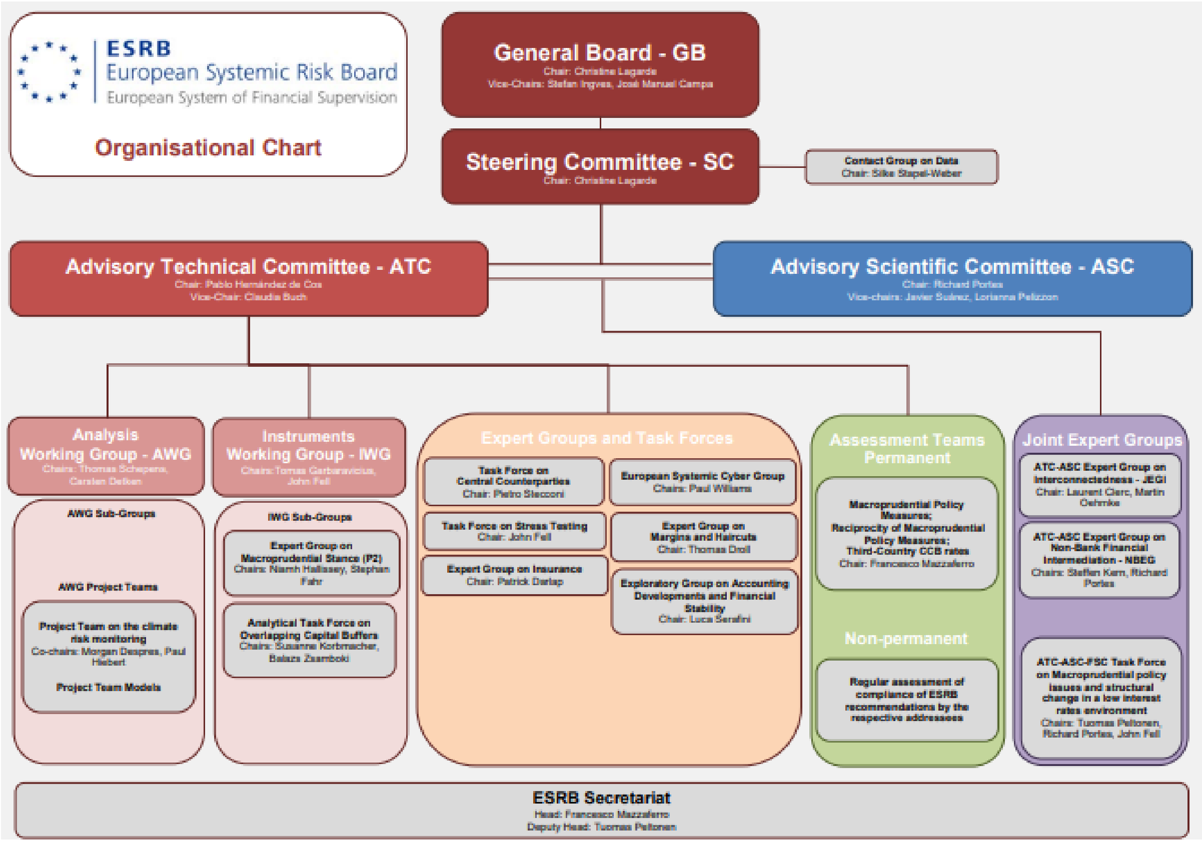

Figure 2: ESRB, Organizational Chart

Source: ESRB (2020).

We believe that, regarding the EU, the European Systemic Risk Board (ESRB) might be equipped with more SupTech and dedicated operational staff to carry out effective and EU-wide financial supervision. Promoting the EU-wide financial supervision might eliminate country biases, hence inconsistent supervisory perspectives of national financial supervisors.

Even though financial supervisors are independent in their responsible areas, their budgets are tied to political decisions (Zeranski & Sancak, July 2020). In many countries, budget allocations to independent financial agencies take place only once a year. If an agency cannot get a budget increase for technology investments or reform requirements for a fiscal year, then the agency has the chance to get it only in the next fiscal year. Assuming success in the second fiscal year, a two-years delay without technology investment makes supervisory agencies oldfashioned in the digital world. This picture leaves supervisory agencies relatively unarmed against the fast-growing FinTech world (Zeranski & Sancak, July 2020). In this regard, the EU should allocate special funds to member states for their immediate reform requirements in the financial supervision area.

We observe that the significant financial reforms have been initiated and shaped mostly by crises or scandals. Unless politicians do not get pressure from lobbying channels, they are less inclined to increase the budget for financial supervisors. This situation also seems to be a kind of vicious circle or dilemma for the stability of the financial industry and the global economy at large. In the digital world, we do not have such a comfortable reforming approach anymore. Thus, before another crisis or scandal comes out, countries and the EU should start to reform their supervisory systems. A full-fledged supervisory system should have the following features (Zeranski & Sancak, 2020):

- a well-organized and structured financial system,
- a well-functioning, consistent, and holistic SupTech system,
- SupTech oriented financial infrastructure with high budget flexibility,
- dematerialized financial instruments,
- a supervisory model in line with the FinTech nature,
- in-house digitalization,
- real-time data, automated data collection, and data analytics tools,
- experienced and dedicated supervisory personnel and IT staff,
- prudential supervisory disclosure policy,

  as well as other features that help supervisors carry out their responsibilities efficiently and effectively.

IV. Audit 4.0, RegTech and SupTech

Speed has always been of the essence in financial markets (Ait-Sahalia & Saglam, 2013). It is estimated that finance goes real-time, and periodic reporting no longer drives operations and decisions in the near future (Deloitte, 2020). In the digital financial world, periodic financial statements and their audit reports are not functional enough anymore. For example, some traders use real-time data, and trades and transactions at capital markets occur in microseconds. Still, audited financial statements on which traders make decisions take place only yearly or twice a year.

On the other hand, it might not overtly be stated, but financial supervisors rely on SROs and audit firms, and investors rely on the supervisory system at large. Financial supervisors cannot guarantee the correctness of the financial statements, and audit firms repeatedly have material problems to focus on probable financial frauds to protect financial investors' rights. Moreover, getting an audit service is a relatively high cost for some companies and requires coordination and time from the client firm perspective. Most importantly, even though after the Enron scandal, the relationship between an audit firm and its clients is always open to negotiation and manipulation in practice. In the worst-case scenario, an audit firm operates as if it is a department of its client.

To sum up, auditing time-interval, cost of audit service, and audit firm-client firm relationships are all cumbersome aspects of today's financial world. We think that solution proposals should not be made considering the last century's financial structures and concepts. Instead, we need a completely new design for today's and future's real-time and high-speed financial world by not extrapolating the past too far into the future for technological developments.

Some market rules and structures are seen as unchangeable and untouchable. However, the financial sector needs an entirely new designation of the roles, functions, and positions of audit firms. So are the credit rating agencies. These financial sector components were designed when no one has an idea and vision about the real-time data collection capacity, AI, ML, NLP, DLT, cloud computing, data silos, and other technology tools that are available today.

The legacy audit structures

1) pose risks instead of protecting market integrity,
2) increase the operational costs of regulated entities,
3) signal the information that they can function their roles, but they are not fully capable in the digital world[21].

The system is significantly outdated concerning digital technologies, such as real-time data collection capacity, big data analytics, AI and ML, NLP, DLT, and others. RegTech solutions involve technologies that aim to ease regulatory compliance and substitute for manual labor in standard regulatory and compliance processes (Gomber, Kauffman, Parker, & Weber, 2018).

[21] However, we should point out that these financial sector components have vast experience, and their expertise should be transformed into the digital world.

RegTech and SupTech have the potential to change the current system entirely into "Audit 4.0". RegTech also may force audit firms to become technology firms. RegTech has similar perspectives and might use the same technology tools with SupTech.

According to a recent survey (July 2020) of financial sector executives conducted by the Center for Financial Studies (CFS), House of Finance of the Goethe University Frankfurt on the impacts of the Wirecard AG scandal, 58% of the survey participants would welcome a move by the BaFin to build up its auditing capacities, thus becoming less dependent on the Big Four accounting firms.

As we pointed out, financial supervisors should not be active market participants; instead, they should be everywhere with their data outreach capacity and their SupTech system. Similar to the Know-Your-Customer (KYC) concept, financial supervisors should have the concepts of Know-Your-Markets and Know-Your-Data. Moreover, by deploying RegTech and SupTech with a new auditing system design, financial regulators might have higher confirmation confidence for financial statements accounts, not in six months intervals but minutes.

FinTech signals significant reforms for audit firms and financial supervisors. That means, FinTech forces audit firms to deploy RegTech and financial supervisors to utilize SupTech. We see this transformation unavoidable. The alternative picture is doomed to Wirecard type scandals, especially in the near future due to the accelerating factor of the Covid-19. The Covid-19 intensified existing trends, widening the gap between those at the top and bottom of the power curve of economic profit (Bradley, Hirt, Hudson, Northcote, & Smit, 2020). Given the speed at which this crisis has been unfolding, and the great acceleration of trends accompanying it, economic and financial actors need to be faster, bolder, and more agile than ever before to succeed (Bradley, Hirt, Hudson, Northcote, & Smit, 2020). Therefore, financial supervisors should accelerate the digital transformation of supervision to close the gap without wasting a minute.

Conclusion

The relatively low pace of digital transformation of financial supervisors and the high speed of advancements in technology increase the technological gaps between supervisors and their responsibility areas and result in a new phenomenon named "asymmetric technology". This transition period's lagged and foggy atmosphere might be very conducive to potential white-collar fraudsters who plan to abuse their TECHs in Finance advantages. Fueled by inconsistent supervisory approaches, national protectionism in reaction to trade wars, fierce competitions among national economies, and unattractive yields at money markets, potential white-collar fraudsters come up with great opportunities to abuse FinTech related companies at capital markets. Therefore, the Wirecard AG case has multiple aspects and causes, not only one. Nevertheless, many aspects of today's financial sectors address new FinTech crises and FinTech related scandals, not only in one country but also in every economy, developing or developed ones.

Initial findings, which are subject to change based on the new sources, indicate that the Wirecard AG case is more a typical fraud than a FinTech crisis. However, the company's FinTech nature had a significant role in alluring market participants and convincing the financial markets community and politicians that the company was a new success story in Germany. Even though there are many discussions around the case and accusations concerning financial supervisors, we think that the case addresses system-wide severe problems, more importantly, new catastrophic cases, both financial scandals and FinTech crises. Therefore, governments and financial supervisors should brace for FinTech crises and financial scandals in the near future unless they meet structural reform and digital transformation requirements.

The markets are aware that financial supervisors are not in the perfect capacity to supervise FinTech related activities with their legacy systems. The asymmetric technology between the private and the public sectors paves the way for potential fraudsters. As opposed to some controversial views, the risk of asymmetric technology might be higher in developed countries. Moreover, the Covid-19 might deepen and accelerate the realization of asymmetric technology risks.

The Wirecard AG case is an alarm, still "on", to wake up responsible parties not only in the EU but also in the rest of the world. The Wirecard AG case should urge politicians to reform their financial systems regarding TECHs in Finance features. Transforming financial systems in parallel with the TECHs in Finance nature and sustainable finance dynamics is an urgent and sheer requirement.

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