DOCTOR OF PHILOSOPHY

The Impact of Transactional Website Adoption on Banks' Performance

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Award date:
2022

Awarding institution:
Bangor University

The Impact of Transactional Website Adoption on Banks' Performance

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Ph.D. Thesis

Bangor Business School

Bangor University

26th January 2022

DECLARATION

I hereby declare that this thesis is the results of my own investigations, except where otherwise stated. All other sources are acknowledged by bibliographic references. This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree unless, as agreed by the University, for approved dual awards.

Yr wyf drwy hyn yn datgan mai canlyniad fy ymchwil fy hun yw'r thesis hwn, ac eithrio lle nodir yn wahanol. Caiff ffynonellau eraill eu cydnabod gan droednodiadau yn rhoi cyfeiriadau eglur. Nid yw sylwedd y gwaith hwn wedi cael ei dderbyn o'r blaen ar gyfer unrhyw radd, ac nid yw'n cael ei gyflwyno ar yr un pryd mewn ymgeisiaeth am unrhyw radd oni bai ei fod, fel y cytunwyd gan y Brifysgol, am gymwysterau deuol cymeradwy.

ABSTRACT

The aim of this thesis is to examine the value that the adoption of the transactional website has added to banks' financial performance and market value, over both the short run and long run. Following the literature, this thesis defines the transactional website as a banking website that allows customers to (i) access information and (ii) conduct the most basic transactions via the site, at least bill payments and funds transfer.

This thesis begins with a novel data including 307 fully listed commercial banks in the US that launched their transactional website between 1996 and 2010. Following this, conceptual models are proposed based on the *resource-based view*. This combination allows the consideration of the impact of transactional website adoption based on its internal strengths and the reaction of the market and investors.

Subsequently, event study and financial measures are the principal methodologies applied. It is the first time that the two metrics of Cumulative Abnormal Return and Buy-and-Hold Abnormal Return are incorporated into digital banking literature, allowing the exploitation of market responses and investor behaviour. Furthermore, this thesis employs financial measures, along with a series of regressions, to examine the strategic role of transactional website adoption, via its strategic attributes. Strategic attributes, under the ground of *resource-based view*, will be the root of the sustainability of firms' strategy. It is because they can (i) *deliver superior performance and competitive edge*, and (ii) *preserve value and limit competition*. In the banking literature so far, the adoption of the transactional website is only verified to be profitable, efficient, and innovative but not strategic and sustainable.

The results bring new stories about transactional website adoption. Most importantly, the activation of transactional websites delivers value to both banks' financial performance and their market value in both the short- and long-term intervals, complying with the value mindset and sustainability mindset. Furthermore, it satisfies the conditions of the resource-based view by virtue of its six features, namely *value, appropriability, durability, inimitability, embeddedness, and interconnectedness*. These features are proved via the way transactional website adoption strengthens the profitability and efficiency as well as generates isolated mechanisms to limit competition (e.g., cumulative experiences, the interconnectedness between transactional website adoption and mobile website adoption). Additionally, this thesis provides new findings of the impact of the *size factor, timing factor* and *vicarious learning behaviour*. Of which,

small banks and latecomers tends to achieve more superior performance from their activation of transactional websites. Furthermore, public information on the previous transactional website adoptions becomes an important mechanism for investors' enhancement in evaluating of other website events afterward.

Such evidence suggests that it is time for banks to pay more attention to the value delivered by their transactional website enablement. At the same time, investor behaviour, market response, and multi-channel combination are also what banks should focus on to drive their success in implementing transactional website initiatives.

ACKNOWLEDGEMENT

In this section, I would like to express my sincere thanks to those who have accompanied and helped me during my doctoral program.

First of all, I would like to thank Bangor University and the collective academic staff in general for their support. Thanks to a full scholarship from Bangor University for helping me fulfil my dream of researching a doctorate.

Following this, I would like to extend my sincere and special thanks to my three supervisors.

I would like to express my deepest thanks to Prof Santiago Carbo-Valverde. He is the person who most deeply inspired me to research in the banking and finance discipline. He is also a person who has supported me a lot since my master's degree. Santiago has accompanied me through many difficulties during my PhD program. He is also my teaching advisor, helping me to achieve my FHEA degree in the process of implementing my PhD program. With all my gratitude, I want to thank Santiago for his wisdom, understanding, and support throughout the years.

I would like to express my deep gratitude to Dr Saverio Stentella Lopes who has been of great help in my PhD thesis. The ideas of the URL data, the long-term buy-and-hold abnormal returns as well as the statistic parts were greatly supported by Saverio. He also gave me great creative inspiration and encouraged me a lot during difficult times of mine.It can be said that Saverio's ideas are the inspiration for the development of my knowledge base later. Even when Saverio left Bangor University, he never stopped helping and caring about my PhD. All I can say is I'm really grateful for this!

One of the people who had the biggest influence on me during the last years of my PhD was Gwion. I would like to extend my gratitude to Gwion for his help, which has even exceeded my expectations. His help is not only professional but also spiritual, which helps me a lot to overcome difficulties. He has accompanied me through many ups and downs and is a person who calmly solves problems that arise. I can only say that Gwion's support has greatly influenced the success of this PhD thesis. I hope he understands I cannot express my gratitude for his help by words.

I know that the above words for my supervisors are not never enough. With all my respect, I thank and admire Santiago, Saverio, and Gwion for their great expertise, understanding, sincerity, and support over the years. I am forever grateful for that. You guys are the best teachers of my life.

I would also like to thank Prof. Rasha Alsakka for her concern for PhD students' well-being. Additionally, I would like to thank Prof. Owain, Prof Owain ap Gwilym, Prof Jonathan Williams, Prof Aziz Jaafar, Prof Edward Shiu, Prof Lynn Hodgkinson, Prof Andrew Hiscock, Dr Danial Hemmings, Dr Alan Thomas, Dr Noemi Mantovan, Nia Wyn Weatherley for their professional assistance. I would like to thank Bangor University's academic staff and other staff for their dedication to students (especially Julie Bolton). I would like to thank the International Student Team, Visa & Immigration team (especially Alan Edwards), and the counselling service team of Bangor University. Thank you to Dr Rosanna Robison and PGCert team for organizing useful programs for us.

Thank you to my family who has been with me through many ups and downs. Thank you for placing your trust in me. Through many ups and downs, I realize that family is the best thing and I would like to thank my parents (Van Nghiep and Minh Suong) and my little sister (Anh Dang). Please forgive the times that upset the family. But the way from now on will be bright for me. Thank you to my grandmother, aunts (Di Ba, Di Bon, co Hoa), uncles (cau Hai, cau Bay), cousins (anh Tin, anh Son, chi Diem, Chieu, Be), nephews (Ti, Chuot), nieces for caring and loving me. The PhD period was so busy that I didn't pay much attention to you guys. But surely my love for family and relatives never changes. Love you forever, mom, dad, little sister, grandma, aunties, uncles, cousins, nephews, nieces.

I would like to thank my best friends. Thank you Phu Dat, Van Dai, Ngoc Thuy, Tan Loc, Hana Nhi, Thai Ngoc (and his family and friends), Thu Sang, Ngoc Diep (and her friends), Rachel, Wang, Dong, Tien Lee (and his family and friends) who have been by my side. Thanks to Victoria, my best friend, a Dr. in Law, for accompanying and helping me over the years. Thanks to Josef for his great help in PhD proofreading. Thanks to my PhD colleagues (Summer, Alessio, Tolope, Weifei, Taniyang, Reida, Susan) for their helpful suggestions and support. Thank you to all the other friends in Vietnam (especially Thich Le, Tuan Anh, Bao Anh, Minh Khue, Dieu Minh, Dai Duyen and Thien Phuc, Lana, Tra, Minh Quan), in the UK (especially Joe and Jessica, Stephan, Cecil, Waleed, IoIo, Zelda, Baboo, Azhar,) and other countries for their understanding and sharing.

Last but not least, I extend my gratitude to the exminers of this thesis- Dr Tim King (external examiner) and Professor Rasha Alsakka (internal examiner). Their feedback did help to improve this PhD thesis positively and it was absolutely valuable feedback for me. I firmly believe that my academic expertise in the future will be partly improved thanks to the feedback from the examiners. Please allow me to be grateful for their attention and support. Special thanks also go to Dr Danial Hemming (chair), Dr Noemi Mantovan (as PGR Lead), Professor Andrew Hiscock (Dear of PGR), Prof Owain ap Gwilym, and Julie Bolton for all the support throughout.

With all my gratitude, I would like to thank and remember the help in this heart forever after.

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1.1 Background

Global spending on digital transformation is estimated to amount to $2.3 trillion by 2023, as reported by IDC (2019). 95% of customer interactions will be controlled by Artificial Intelligence systems by 2025, as reported by Servion (2018). 59% of enterprises are afraid that they are late in their digital transformation efforts, and only 7% of businesses believe they have fully set their digital transformations in motion, as reported by Forbes (2019). These are only a few out of the many statistics depicting the current state of digitalization and the enormous and evolving expansion of digital activities into every corner of society and industry. Indeed, nowadays, digitalization integrates into almost all corporate strategies as well as alters the scale and scope of various aspects of organizations (Bharadwaj et al., 2013; Birgit and Elsa, 2019; Grover and Kohli, 2012; Hess et al., 2016; Ngai et al., 2011; Pagani, 2013).

The banking industry is certainly not on the sidelines of this digital transformation. Indeed, the financial sector is among the top three industries for digital transformation, with 93% of businesses already implementing a digital-first business strategy according to IDG (2018). By 2024, mobile and online banking are anticipated to have grown by 54% compared to 2020, with more than 3.6 billion customers using these services (Juniper Research, 2020). Academic studies also provide evidence that the re-configuration of financial institutions take into account these massive digital disruptions is proceeding vigorously and diversely, with omnichannel integration and diversification in digital products/services more streamlined processes, and better service delivery with fewer mistakes and more agile employees (Carbó-Valverde et al., 2020; Kelly, 2014; Sia et al., 2016).

The digital transformation of the banking industry, however, has provoked a number of concerns. As of today, banks are facing a number of pressures, such as: (i) the threat from digital disruption generated by the FinTech and BigTech industries; (ii) niche new market entrants with innovative business models; (iii) further legal regulations; (iv) the perils of Blockchain; and (v) the rising demand of digitally savvy customers who are increasingly aware of banking capabilities to offer them digital financial services (Carbó-Valverde et al., 2020; Nätti and Lähteenmäki, 2016; Sia et al., 2016; Swacha-Lech, 2017). For example, banks around the world lose more than $1 trillion to cybercrimes each year, as reported by Accenture (2019). Data breaches increased by 480% in 2018 (compared to 2017), equating to a loss of about $3.86 billion according to Financial Times (2018). The threat from the digital disruption of FinTechs and BigTechs is estimated to destroy significant value for banks at least 30-50% of the net profit of banks (Sia et al., 2016). The recent global survey of Deloitte in 2018 shows that 56% of surveyed customers leave their primary bank in the next two years as they find better pricing, lower fees, or/and more personalized services as well as more attractive loyalty and reward/program at other banks.

Under a variety of pressures such as costs, traditional and interdisciplinary competitors, as well as cybersecurity risks, banks are now having problems with where their key digital priorities should be. "*Banks struggle to deliver innovative functionalities and are still hesitating about key priorities to pursue*" as described by Deloitte (2019). Moreover, the pressure is now coming from investors, analysts, and management teams who may raise questions about the lack of progress coming from their investments. "*Financial institutions are struggling to make and deliver on the investments they need to be successful in 10 years' time while delivering value for shareholders in the short-term",* said Wyman (2020, p. 4). Considering this, for the present time, it is essential to find the preferred digital direction for financial institutions.

Most recently, a number of research papers specifically emphasize the role of a web-based banking channel. These documents show that web-based banking is indeed still playing an integral role in the banking delivery system, despite the dominance of mobile banking and banking applications. More specifically, the report of Deloitte (2018) concerning its global survey taking in May 2018 reveals that 94% of surveyed customers using mobile banking services use their PC/laptop to access their online banking platforms at least once a month.[1] Among them, up to 38% prefer to use their laptops to make transfers, only 10% lower than those who prefer to use a mobile phone for the same transactions. More notably, up to 53% of customers will use their computers to make

[1] Please access to the report via https://www2.deloitte.com/us/en/insights/industry/financial-services/online-banking-usage-in-mobile-centric-world.html. Also, for further information concerning the survey of Deloitte (2018), please access to https://www2.deloitte.com/us/en/insights/industry/financial-services/digital-transformation-in-banking-global-customer-survey.html. In which, 17,100 banking consumers across 17 countries in May 2018 were surveyed by the Deloitte Centre for Financial Services to estimate the current state of banks' digital engagement.

international transactions, compared with 24% of customers who will do it on their phones. The survey of Deloitte also figures out several reasons why web-based online banking still plays a vital role in the mobile-centric era which are security and convenience. These findings are in line with the recent academic study of Carbó-Valverde et al. (2020) which reveals that perceived safety influences consumers' adoption decisions when they go to digital banking. More interestingly, the results reveal that an average of 58.97% of customers feels safe or very safe with online banking while that percentage is only 44.29% for mobile banking. Meanwhile, customers feel that it is easier to use online banking over mobile banking (66.86 versus 63.59).[2]

These mentioned documents suggest that website-based banking has an irreplaceable role despite the advent and dominance of mobile banking apps. As Deloitte (2018) states "*There are potential challenges if banks allow mobile banking to eclipse online banking fully*", a question was raised as to whether the transactional website initiative is exactly what investors and theorists expected, which will potentially generate both short and long-term returns for financial institutions on their path of digitalization? In the academic world so far, however, there are still some gaps as follow:

Firstly, there are three main literature lines in the field of digital banking as follows. The first stream focuses on the features of digital adoptions which may significantly influence customer behaviour, such as usefulness, ease of use and safety (Aliyu et al., 2014; Gerrard and Barton, 2003; Lee, 2009; Liu et al., 2011; Mann and Sahni, 2011; Roy et al., 2017). The second stream focuses on the impact of a digital adoption added to customer outcomes, such as higher customer revenue and lower customer costs (Gensler et al., 2012), increased engagement in online activities (Hitt and Frei, 2002; Strader and Hendrickson, 2001; Xue et al., 2011), and superior customer experience (Mbama and Ezepue, 2018). The third stream focuses on the financial benefits of a digital adoption added to banks. More specifically, via a digital adoption banks can benefit in terms of: (i) *new revenue streams;* (ii) *non-interest activities diversification;* and (iii) *effectiveness and efficiency*

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[2] Concisely put, the research of Carbó-Valverde et al. (2020) is also in line with other studies that found that online/Internet banking brings some advantages (e.g. ease of use, usefulness, safety), which significantly increase customer outcomes (e.g. higher customer revenue and lower customer costs, increased engagement in online activities, superior customer experience, customer satisfaction and trust and customer efficiency). (Ahmad and Al-Zu'bi, 2011; Buell et al., 2010; Dabholkar, 1996; Firdous and Farooqi, 2017; Hitt and Frei, 2002; Mann and Sahni, 2011; Mbama and Ezepue, 2018; Xu et al., 2013; Xue et al., 2011). Please refer Chapter 2, Section 2.3.1 for further discussion.

(Al-Hawari and Ward, 2006; Ciciretti et al., 2009; Delgado et al., 2007; DeYoung, 2005; DeYoung et al., 2007; Furst et al., 2002; Goh and Kauffman, 2015; Hernando and Nieto, 2007; Mbama and Ezepue, 2018; Momparler et al., 2013; Pigni et al., 2002; Scott et al., 2017; Sullivan, 2000; Xue et al., 2007).

Nevertheless, these above literature streams face some challenges. Firstly, from the angle of some theories that take into account firms' capabilities and competencies (e.g., resource-based theory or knowledge-based theory), customer value is necessary but not sufficient to spell out all the mechanisms determining the performance of firms.[3] Secondly, the financial metrics are in low frequency by reason of being reported periodically. Besides, it has been emphasized that there exists intangible strategic resources and capabilities which are underlying much of the success of the firm but are virtually invisible on financial statements and thereby, tortuous to be tracked and evaluated.[4]

So far, very little attention paid to the market value of a digital adoption which is evaluated by the market and investors. According to both theoretical and empirical work, investors have the role of detecting, evaluating and predicting (Balasubramanian et al., 2005; Benbunan-Fich and Fich, 2004; Deane et al., 2019; Sabherwal and Sabherwal, 2005; Xia et al., 2016). Market reactions and investors' actions are perceived as superior as they can offer evaluations in the most comprehensive manner and at the earliest opportunity (Fama, 1970, 1998, 2021; Malkiel, 1989). Moreover, the visionary capability is a merit of market judgment, potentially bringing to light the intangible values of events that are latent behind the accounting figures. Market evaluation and investor participation, however, are still mostly inaccessible to digital banking literature in both the short-run and long-run.

In terms of transactional website adoption, in particular, there has been little quantitative analysis of more extended up-to-date examinations concerning the impact of transactional website adoption on banks' performance. The value that transactional

[3] Coyne (1986) and Hall (1993) suggest that not only do the product and/or delivery system attributes to customers need to be significant, but they also need to be the result of a capability differential which will endure.

[4] Itami and Roehl (1991) point out that there are some intangible assets are less readily and hardly to measure especially some incremental values added to employee's skills and knowledge. For example, it is hard to reflect in financial statement the enhancing experience of customer service department after dealing with a bundle of non-standardized problems of customers.

websites have added to financial institutions has been so far mostly scoped within the early stage of Internet banking and/or over the short or medium term (Delgado et al., 2007; DeYoung et al., 2007; Furst et al., 2000a; Sullivan, 2000). Furthermore, there is a lack of emphasis on the strategic attributes of transactional website adoption through clarification of its sustainable values. More specifically, previous studies consider the transactional website as an additional channel that complements traditional branching channels rather than a strategic banking delivery channel (Ciciretti et al., 2009). Several other studies focus on some particular features of transactional website adoption, such as *innovation* (DeYoung et al., 2007; Pigni et al., 2002), *efficiency and effectiveness* (Furst et al., 2002), *diversification* (DeYoung et al., 2007; Pigni et al., 2002). So far, little paid attention to the strategic attributes of transactional websites which could be the root of banks' economic benefits over time, as suggested by the perspective of resource-based view.

1.2 Motivations and Aims

Based on the background in digital banking discipline as discussed above, this thesis aims at examining the value of transactional website adoption in both the market perspective and financial perspective, in both the short run and long run. This thesis is primarily motivated by: (i) *The important and unreplaceable role of transactional websites, as suggested by the literature*; (ii) *Some gaps in digital banking literature*; and (iii) *The importance of examination in both the short and long run.*

Firstly, the advent of the transactional website is an important mark in the digital transformation route of the banking industry. Before the advent of transactional websites, financial transactions were conducted through face-to-face interactions. Since the activation of transactional websites, banks can start offering their services at any time and anywhere geographically more effectively (Nath et al., 2001). Therefore, since the activation of banking websites, the bank would have gradually formed the first digital capabilities and resources of its own.[5] Over time, digital capabilities and resources from the transactional website can also be transferred and interconnected with other digital

[5] Some digital capabilities and resources of Internet banking are information quality, system's integration, as suggested by Oliveira et al. (2016).

banking delivery channels.[6] Furthermore, recent documents also highlight that website-based banking has an irreplaceable role despite the advent and dominance of mobile banking apps (Carbó-Valverde et al., 2020; Deloitte, 2018).

Secondly, there is some lack in digital banking literature in general and in the scope of transactional website adoption: (i) There is little attention paid to market participants in evaluating the value of digital banking adoption which are suggested more immediate, comprehensive and predictive; (ii) Literature so far only focuses on early stage of transactional website adoption as well as the short to medium-term impact of this adoption on bank's performance; and (iii) Relatively little is known about the strategic attributes of digital adoption and transactional website adoption which are suggested by the resource-based view as the root of the superior performance of firms.

Thirdly, the perspective of resource-based view emphasises the importance of both short- and long-term examination of the impact of an initiative. Also suggested by some studies, without short-term wealth delivered, coupled with a lack of vision or discipline, neither managers nor investors would want to waste their resources on further strategies.[7] In this case, the evaluation of market and investors in the short run is important as it simultaneously reflects a most timely intrinsic value as well as indicates the predictions of the future benefits of that portfolio (such as sustainability, potential growth, transformative benefits). By contrast, as the financial ratios are reported periodically, the short-term intrinsic value of a portfolio is hard to be captured immediately. Furthermore, by improving the market value in the short run, banks can satisfy their current shareholders and gain their confidence.[8] From that, banks can better plan their capital strategy to pursue longer-term goals. But certainly, all business entities expect value creation and sustainable growth of the business over time. Therefore, the proof in short-term value is vital but not adequate to convince managers and stakeholders to keep focusing on a particular portfolio. It is the case of transactional

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[6] For example, Oliveira et al. (2002) states that Internet banking plays an important role in forming the combinative capabilities of service quality, delivery, the flexibility of banking e-services.

[7] According to recent reports, what investors expect to be forthcoming is a well-funded orientation into small but sustainable digital initiatives which can create economic rents in the short run and preserve sustainable earnings and competitive advantages in the long run (Accenture, 2019; Wyman, 2020). Furthermore, as claimed by Wyman (2020, p. 5), "*Current values will bring transparency, controllability, and continuous elimination of failing investments*".

[8] For example, empirical findings of Switzer and Cao (2011) show that high shareholder confidence value is associated with higher firms' economic value added.

website adoption as a concern may be raised as to if the transactional website still adds value to banks over the long run. For example, nowadays, the digital banking delivery system tends to be dominated by digital mobile banking and mobile applications, the managers may be concerned if the value of transactional websites may gradually erode, which might give an indication of the impact that digital mobile initiatives have in the long run.

Following previous studies (Dandapani et al., 2018; DeYoung et al., 2007; Egland et al., 1998; Furst et al., 2000a; OCC, 2000, 2019), this thesis defines a transactional website as a site which allows customers to access information and perform the most basic transactions, including paying the bill and transferring funds. [9],[10] This thesis then seeks to address the following research questions which are in turn presented in empirical Chapters 4, 5 and 6:

(i) "*Whether or not the transactional website events gained a significant response from the market in the short term. If applicable, what story about the implementation of a transactional website would be revealed*?"

(ii) "*Does the transactional website strategically deliver value to a bank's financial performance over time? If that is the case, where does the value come from?*" and

(iii) "*Do transactional website initiatives create value for financial institutions in the long run? What will be revealed about the transactional website adoption behind the investor's buy-and-hold strategy?"*

More concretely, Chapter 4 intends to address how the market reacts to transactional website-enabled events in the short run, reflected through excess returns earned by banks surrounding their transactional website-enabled events. In addition, Chapter 4 aims to examine some moderating effects that possibly differentiate performance among banks as well as alter the way the market reacts to transactional website launch events, including the magnitude effect and timing effect. Thereafter, Chapter 5 is devoted to the impact of transactional website adoption on the financial performance of banks over time. Six attributes of transactional website adoption based on the resource-based view

[9] This definition is the basis for the validation of transactional website event dates of the sample banks. More detail is discussed in Chapter 3, Section 3.2.2.

[10] More discussion on the definition of transactional website is provided in Chapter 3, especially Section 3.1.1. Also please refer to Sections 3.1.1 and 3.1.2 for further discussions on the reason of choosing transactional website adoption as the unit of analysis as well as more literature review on transactional website adoption in particular.

are then examined, namely value, appropriability, durability, embeddedness, inimitability, and interconnectedness. Such attributes clarify the strategic role of the transactional website. The heterogeneity among banks is also tested which is potentially attributed to the size effect and timing order effect. Finally, Chapter 6 aims to examine how the investors evaluate transactional website adoption through their buy-and-hold strategy in relation to the above benchmarks. This chapter also strives to answer the question of to what extent the transactional website adoption impacts the buy-and-hold abnormal returns (BHAR) which are treated as a proxy for banks' long-term market performance. Learning-by-observing, size effect and timing order effect are also objectives of that chapter.

1.3 Methodology

The following methodology is applied based on the data of 307 fully listed commercial banks in the US market.

Firstly, Chapter 4 applies event study methodology to estimate Cumulative Abnormal Returns earned by banks surrounding their launch events. More characteristically, the market model has been constructed upon several short-run windows [including (-1, +1); (-2, +2); (-3, +3)] and different estimation periods (including -120 days, -180 days, -200 days, -300 days). On the foundation of the efficient market hypothesis (Fama, 1998), event study is a great tool to recognize the added value of a specific corporate event thanks to its ability to react immediately, precisely, and predicatively to the market. Today, event study has become one of the most well-liked approaches, and is widely applied in many disciplines (e.g., IT investments, e-commerce, security breach, M&A, innovation, R&D, corporate awards).

Secondly, Chapter 5 employs a series of regression analysis to measure the direct relationship between transactional website adoption and the financial performance of banks over years. Regression analysis is a reliable method to confidently determine if a transactional website is a strategic digital initiative by estimating the effect of its six attributes: value, appropriation, durability, embeddedness, inimitability, and interconnectedness. These six features are tested to satisfy the resource-based view: (i) *competitive advantage and superior performance,* and (ii) *limit competition and preserve the value.*

Finally, the event-time approach with the Buy-and-Hold Abnormal Return (BHAR) metric, accompanied by regression analysis is the foundation of Chapter 6. To measure BHAR, five different benchmarks are applied, including three market indices, an ex-ante buy-and-hold portfolio and a non-event size-matched control firm portfolio. BHAR is also treated as the proxy of banks' long-term performance to facilitate further examination of the direct effects of transactional website adoption, information spillover effect, timing effect, and size effect on banks' long-term performance.

1.4 Contribution

(i) Firstly, in terms of data, this thesis provides exclusive data from 307 fully listed commercial banks in the US market, concerning their transactional website launch announcements from 1996-2010. Based on this data, this thesis becomes the first to enable the participation of markets and investors in evaluating transactional website events as the first digital initiative of financial institutions. Also, based on this data set, the most up-to-date accounting data is provided for the sample banks from 1993-2018, accordingly authenticating the impacts of transactional websites on the performance of banks in a more systematic and updated manner in banking literature.

(ii) Secondly, in terms of methodology, this thesis is the first in digital banking literature put the event-time approach accompanied by two metrics Cumulative Abnormal Return (CAR) (for the short-term horizon) and Buy-and-Hold Anormal Return (BHAR) (for the long-term horizon) into practice. CAR and BHAR are widely known as two robust metrics for tracking down market evaluation and investor actions as well as offering an evaluation of the value of events in a timely, relevant, accurate, and forward-looking way. Unfortunately, both metrics are still untapped in digital banking due to data constraints and the rigour of benchmark selection. Furthermore, this thesis applies some non-parametric benchmarks which are well-suited to situations where the assumptions of parametric statistics are not met, which is typically the case for small sample sizes.

(iii) Thirdly, in terms of findings, this thesis provides empirical results which:

- Confirm that transactional websites improve market performance and financial performance of banks in both the short-term and long-term perspectives. The rewarding features of the adoption of digital transactional websites are confirmed by the positive market reaction in the short run with positive cumulative abnormal returns, positive financial performance throughout the years and positive investor evaluation in the long run through their buy-and-hold strategy.

- Confirm the impact and strategic role of transactional website adoption via providing empirical results for six strategic attributes of the transactional websites' adoption including value, appropriability, durability, embeddedness, inimitability, and interconnectedness. Through possession of the six above-mentioned attributes, the transactional website deserves appreciation as a strategic digital initiative of banks that can generate and preserve wealth over the long-term. Besides this, the empirical findings provide a new understanding of the intangible attributes of transactional website adoption, which are beyond the two standard attributes detected by previous studies- innovativeness and profitability.

- Prove the rationality of the market and investors in evaluating transactional website portfolio. The verifying evidence includes (i) the existence of learning-by-observing behaviour of investors through the information spillover mechanism, (ii) the existence of efficient or semi-efficient markets as the information spillover effect becomes a learning mechanism of investors (iii) consistency between investors' predictions in the short run and investors' actions in the long run and (iv) consistency between the evaluation of investors and actual financial performance of banks.

(iv) Finally, this thesis brings some implications in terms of conceptual analysis. More specifically, this thesis provides conceptual models on (i) the role of investors and (ii) on how the internal components (e.g., resources and capabilities of digital initiative) and external components (market and investors) interact. A list of resources and capabilities of transactional websites (e.g., digital culture, tacit digital knowledge, digital network, digital human) is also suggested by this thesis to support the rationality of market. In short, the conceptual analyses of this thesis have applied the crossover between the resource-based view, the efficient market hypothesis and market signalling hypothesis to explain how the internal factors and external factors can interact together in the case of transactional website adoption. These concepts have so far received little attention in the literature.

1.5 Structure

The overall structure of this thesis takes the form of seven chapters, including this introductory chapter. Chapter 2 provides the review on key concepts and implications of resource-based view as the main theoretical framework of this thesis. Afterwards, that chapter discusses on the most recent literature streams relevant to the value of digital adoption in general and transactional website adoption in particular as well as the landscape of US banking industry during the research period. Subsequently, Chapter 3 discusses in detail the formulation and the descriptive statistics of the research sample and event dates. Chapters 4, 5 and 6, in turn, provide empirical results to achieve research questions and objectives. More pointedly, Chapter 4 examines the short-term market reaction towards the bank's transactional website events surrounding the time they are announced to the market. Subsequently, Chapters 5 and 6 investigate the impact of transactional website adoption on banks' performance in the long run, in turn through accounting measures (Chapter 5) and BHARs metric (Chapter 6). Finally, Chapter 7 gives a summary of the main findings of each of the previous chapters, main contributions, managerial implications, research limitations and some suggestions for further research in the future.

2 Chapter 2: Literature Review and Theoretical Framework

2.1 Theoretical Framework - Resource-based View

The resource-based view is the main theoretical framework in this research. This section firstly discusses some key concepts of the resource-based view. After that, it will be followed by the discussion on why the resource-based view is important in the digital banking literature and how do the concepts relate to the aims and objectives of the thesis.

2.1.1 The General Concept of the Resource-Based View

At the heart of the resource-based view, the underlying source of firms' competitive advantages and sustainable success is their idiosyncratic competencies (Amit and Schoemaker, 1993; Barney, 1991; Petoeraf, 1993). Organizations are strongly believed to gain economic rents only in the case that they are able to efficiently leverage their own resources and capabilities which possess strategic features, such as value, firm-specificity, inimitability, durability, appropriability, limited substitutability (Amit and Schoemaker, 1993; Barney, 1991; Collis and Montgomery, 1995; Dierickx and Cool, 1989; Grant, 1991b; Lippman and Rumelt, 1982; Peteraf, 1993; Rumelt and Lamb, 1997).

The resource-based literature also considers the importance of the market, e.g., Rumelt and Lamb (1997, p. 141) say that the opportunities for firms to earn superior rent might "*jump behind*" if firms do not or are slow to react to unexpected changes in the market, such as the changes in technology, regulation, consumer behaviour and so forth. In another study, Amit and Schoemaker (1993) suggest "*strategic industry factors*" significantly influence the path of firms' success, including involvement of market participants (e.g. customers, stakeholders) as well as the dynamic of the economy.

2.1.2 Resources and Capabilities

"Resources are crown jewels and need to be protected as they play a pivotal role in the competitive strategy which the firm pursues" (Grant, 1991b, p. 129).

At first, resources are the prime mover of superior performance. It is widely admitted by both theorists and empirical advocates of the resource-based view that resources, due to the features specific to firms and their idiosyncrasies, have the ability to create differentiation among firms and accordingly endow firms with a competitive advantage (Barney, 1991; Porter, 1990) and inter-firm profit differentiations (Grant, 1991b; Winter, 1995). Therefore, in the language of the resource-based view, by focusing on the exploitation of such undertaking-specific factors and distinctive competencies as inner strengths, firms are putting themselves on a successful path with superior performance (Barney, 1991; Peteraf, 1993; Porter, 1990). For illustration, a substantial amount of attention has been paid to the concept of knowledge as one of the most valuable and fundamental resources of the firm. Knowledge is believed to be the basis of a firm's superior performance not only because they are the guide for any action and any strategy of the firm, but also because they are implicit, casually ambiguous, unique to firms, socially involved and challenging for any external observation. Thereby, the rewards firms obtain from their knowledge are differential economic rents and competitive position (Hall, 1993; Olavarrieta and Friedmann, 1999; Spender and Grant, 1996; Teece, 1988). Conversely, firms are found to quite possibly lose their competitive edge if they emphasize investment without cautiously considering their tacit knowledge (Johannessen et al., 2001; Nonaka and Takeuchi, 1995).

As a second point, resources are a competitive barrier to protect the value of the firm sustained over time. This then suggests there are three features enabling resources operating through this mechanism. Firstly, it is emphasized by Grant (1991a) that resources, along with capabilities, give direction to the firm to define itself, identify its mission, strategy, targeted customers, and market.[11] Similarly, Grant (1991b, p. 543) asserts that "*the competitive advantage is primarily concerned with exploiting superior resources and capabilities*". It means that by understanding and deploying resources efficiently as inner strength, firms are able to direct themselves to cope with the uncertainty of the market as well as the threat from their rivals. Secondly, resources have the power to limit competition thanks to the features of specificity, tacitness, complexity, and stickiness to the firm with time, thereby being a stumbling block to imitation or substitution (Wernerfelt, 1984).

Moreover, some authors call attention to the interconnectedness of resources as an essential feature in limiting the competition (Barney, 1991; Black and Boal, 1994;

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[11] Grant (1991a) reinforces this point by recalling Theodore Levitt's suggestion that enterprises should re-define their served markets more broadly to manage the risk of market change. Theodore Levit suggests that railroads should not be merely aware of them as railroad businesses but transportation businesses which allow them to diversify their business and regulate themselves in the dynamic of external market. Grant (1991a) has argued against this idea by questioning whether it is reasonable for a railroad business to develop successfully in rail, air or car businesses. He points out that the line enterprise is still appropriate in the construction and management of oil and gas pipelines as this somehow is compatible with the resources and capabilities of railroads enterprise.

Dierickx and Cool, 1989; Winter, 1995). It is claimed by Winter (1995, p. 14) that "*the value of idiosyncratic resources to the firm -- i.e., the present value of their future rent streams are affected by the fact that their possible uses include the development of more idiosyncratic resources*". The implication is that the interconnectedness among specific resources within firms offers an additional advantage: an increase in the structural complexity and ambiguous causality with the firm's performance. In this manner, the interconnectedness of resources would be considered as an isolating mechanism to protect the firm's rents from unfavourable imitation or replication of moves from others (Barney, 1991).

Finally, resources are found to be an instrument for facilitating diversification. Wernerfelt (1984) created the resource-product matrix, which indicates the dynamicity of resources in allocating products/services preferable to each particular market. It thereby shows the role of resources in rewarding firms with growth opportunities as well as the dynamic capability to adapt to different markets.

In terms of capabilities, they are generally defined as firms' ability to employ, combine, and deploy their appropriate resources with the pursuit of an efficient and effective ending. Put differently, "*the capabilities of a firm are what it can do as a result of teams of resources working together*" (Grant, 1991b, p. 120). Amit and Schoemaker (1993) distinguish capabilities from resources by proposing the role of capabilities towards organizational systems and the responsiveness to the market. They put forward that these capabilities assist the organization in shortening the development cycle, facilitating innovation, and activating flexibilities for repeated processes. Also, capabilities enable firms to identify, acknowledge, comprehend and predict the market; accordingly, firms gain better responsiveness toward the market. Grant (1991a) defines capabilities as the means through which a firm's resources are coordinated. Resources enhance capabilities in long-run advantage (Winter, 1995). Therefore, it is worth highlighting that there is no separating operation between organizational resources and capabilities. Instead, they are in an intertwined and mutually supportive relationship.

2.1.3 Attributes of Strategic Resources

Theorists of the resource-based view have identified sets of resource attributes that might conceptually influence a firm's competitive advantages. In general, the authors believe that resources and capabilities become strategically important only when they possess a full set of relevant characteristics. For instance, it is proposed by Barney (1991) that there are a set of four conditions that a resource should completely fulfil to become strategic, namely *value, rareness, inimitability, and none-substitutability*. Even further, Amit and Schoemaker (1993) suggest eight attributes for a strategic resource, including *complementary, scarcity, low tradability, inimitability, durability, appropriability, limited substitutability, complementarity* and *overlap with strategic industry factors*.

Overall, a great number of attributes has been proposed as necessary conditions for strategic resources. Notably, those attributes are diverse in both substance and terminology. As an example, mobility is of interest to both Amit and Schoemaker (1993) and Grant (1991b) in considering the strategic attributes of resources and capabilities, albeit it is named with different terms: *tradability* and *transferability*, respectively. Based on the depictions of each terminology proposed by authors, this chapter categorizes them into several headings where they are likely to possess similar features. More details pertaining to the strategic attributes of resources and capabilities are presented in Table 2.1.

The details of Table 2.1. highlight a set of six attributes that potentially make the resources/capabilities to become strategically important. Value and appropriation, on the ground of quite a number of resource-based view theorists and empirical advocates, are fundamental for firms to enhance efficiency (Barney, 1991) as well as capture the value in the most feasible way (Collis and Montgomery, 1995). Rarity, which is also called by other terminologies, such as scarcity (Amit and Schoemaker, 1993), heterogeneity (Peteraf, 1993), or idiosyncratic assets (Williamson, 1979) is the factor differentiating a firm from others to prevent a substantial number of strategies/actions implemented in a similar way and at the same time. Inspired by the depictions from some theorists (e.g. Barney, 1991; Peteraf, 1993; Wade and Hulland, 2004), it suggests that the three abovementioned resources possess the ability to limit competition and gain rents in the *ex-ante* stage.

If the *ex-ante* stage is the window of opportunity for seeking prime rents and efficiency, the *ex-post* stage is the time for the firm to protect and sustain those values. Peteraf (1993) describes the picture of value in the ex-ante stage as being short-lived, uncertain, and fleeting due to the potential existence of imitation and substitution from other rivals. Thereby, regardless of the discussion brought up that the resources which possess the feature of value, appropriability and firm-specialty are at the heart of a firm's values, they are not sufficient for the sustainability of those values over time. In the long run, resources and capabilities must be capable of preserving values and protecting a firm from competitive imitation or resource substitution. In the long run, the profitability, growth, and survival of a firm depend on how it establishes "*relatively impregnable*" bases. From this, the firm is able to adapt and extend its operations in an uncertain, changing, and competitive world (Penrose, 1955, p. 121, 2009). In order to limit such competition, there is a necessity for resources to be time-consuming, costly, and beyond possibility for other firms who do not possess those resources to comprehend their nature; capture similar ones or produce equivalent outcomes. Imitability, limited substitutability, and immobility are ideal attributes proposed to give the possibility to resources to address the core of the matter. It is described more precisely in Table 2.1 why resources that hold those attributes have the power to prevent other firms from taking a perfect imitation or substitution to produce similar products in similar areas.

Table 2.1 Strategic Attributes of Resources and Capabilities

Resource Attribute	Definition	Terminology	Examples
Ex-ante strategic to firms			
Value	A resource/capability is perceived as being valuable if it makes the possibility for a firm to evolve and implement strategies in the manner of efficiency and effectiveness (Barney, 1991),	Value (Barney, 1991; Dierickx and Cool, 1989).	Organizational culture could bring value to firms. Firms without a nurturing culture generally could not achieve their aims in maximizing their employee productivity (Barney, 1986a).
Rarity	A resource/capability comes to know as being rare in the event that it is not concurrently implemented by a large number of other firms (Barney, 1991).	- *Rarity* (Barney, 1991) - *Scarcity* (Amit and Schoemaker, 1993) - *Idiosyncratic assets* (Williamson, 1979) - *Heterogeneity* (Peteraf, 1993)	An ATM network might have significant value to a bank. However, since it is not rare, it is unlikely to confer a strategic benefit (Wade and Hulland, 2004).
Appropriability	The appropriability of a resource/capability is verified, given that it offers a high probability for a firm to capture sustained profit. By contrast, the resource/capability is unlikely to be appropriate if it is not intricately bound to the company and makes it hard to gain profit (Collis and Montgomery, 1995).	Appropriability (Amit and Schoemaker, 1993; Collis and Montgomery, 1995; Grant, 1991b).	Not all profits from a resource automatically flow to the company that owns the resources. In fact, the value is always subject to bargaining among a host of players, including customers, distributors, suppliers, and employers (Collis and Montgomery, 1995). Human capital is a firm's resource, but not all the specific skills of employees are appropriate for a firm to gain sustained competitive advantage. Instead, a highly

			trained and highly mobile key employee is more strategic for firms (Grant, 1991b).
Ex post strategic to firms			
Imitability	Resources/Capabilities are at low imitability if other firms that do not possess those resources/capabilities, not in any way is able to obtain them (Dierickx and Cool, 1989). The imitability of resources/capabilities might be due to the reasons that: They are at the mercy of a firm's unique historical conditions and other idiosyncratic features of firms (Barney, 1991; Porter, 1981; Scherer and Ross, 1990). There exists the ambiguous causality between resources/capabilities owned by firms and their privileged competitive advantage which are poorly comprehended by others (Barney, 1986a; Dierickx and Cool, 1989; Lippman and Rumelt, 1982; Reed and DeFillippi, 1990; Rumelt and Lamb, 1997). The resources/capabilities that leverage firms' competitive advantages are in the fashion of social complexities, such as	- *Imperfect Imitability* (Barney, 1986a, 1986b, 1991; Lippman and Rumelt, 1982). - *Replicability* (Grant, 1991b; Teece et al., 1997). - *Inimitability* (Collis and Montgomery, 1995; Dierickx and Cool, 1989). - *Uncertain imitability* (Lippman and Rumelt, 1982; Rumelt and Lamb, 1997). - *Low transparency* (Grant, 1991b).	Theorists suggest that organizational culture could not be perfectly imitated (Barley, 1983; Barney, 1986a; Gregory, 1983; Lippman and Rumelt, 1982). Firstly, it is supposedly impracticable for people to keep watch on culture and capture which part of the culture (e.g., values; symbols; beliefs) add value to firms. Secondly, the organizational cultures can potentially be tied up with firms' unique history and heritage, thus being complex and challenging for reproduction.

	interpersonal relations; brand reputation; idiosyncratic culture (Barney, 1986a; Dierickx and Cool, 1989). They are formed via isolated mechanisms (Rumelt and Lamb, 1984).		
Low Substitutability	Resources/Capabilities are hard to replace/substitute if there are no alternative resources/capabilities being able to strategically offer the equivalent impact on firms' competitive advantage and sustained performance (Collis and Montgomery, 1995). Low substitutability of resources/capabilities might be possibly due to the fact that those resources/capabilities are in an intricate pattern of coordination including many resources/capabilities which are mutually intertwined and supported by each other (Grant, 1991b).	- *Non-substitutability* (Barney, 1991; Collis and Montgomery, 1995). - *Limited substitutability* (Amit and Schoemaker, 1993).	Tacit knowledge cannot be traded or easily replicated by competitors since it is deeply rooted in the organization's history (Amit and Schoemaker, 1993).

Immobility	Resources/Capabilities are low mobile only when they are not freely transferable between firms. Competitors are unable to acquire those resources/capabilities due to some barriers of: - *Geographical immobility; Imperfect information; Firm specificity capabilities immobility* (Grant, 1991b). - *Complexity and Tacitness* (Reed and DeFillippi, 1990). - *Time Accumulation* (Dierickx and Cool, 1989). - *Differentials in Culture, Regulatory, Functions, and Positions* (Hall, 1992, 1993). *Exceedingly high transactions costs of transferring* (Peteraf, 1993; Rumelt and Lamb, 1997).	- *Imperfect mobility* (Barney, 1991). - *Transferability* (Grant, 1991b). - *Low tradability* (Amit and Schoemaker, 1993). - *Non-tradability* (Dierickx and Cool, 1989). - *Immobility* (Barney, 1991; Lippman and Rumelt, 1982). - *Perfect immobility* (Peteraf, 1993). - *Not readily tradable* (Teece et al., 1997).	Accumulating required resources and skills that are non-tradable: brand loyalty, technological expertise, firm-specific human capital (Dierickx and Cool, 1989).

2.1.4 Implications of the Resource-Based View for Digital Banking Adoption.

The importance of resources and capabilities in determining firms' better market position and superior performance has been discussed earlier in Section 2.1.1. That section has provided an understanding of the mechanisms to deploy these resources and capabilities in a way in which competitive advantages can be strategically obtained and sustained over time. Therefore, from a theoretical perspective, the resource-based view is a strong foundation for the investigation into the impact of digital adoptions contributing to the performance of banks, with reference to its four main implications following.

Firstly, the resource-based view is a suitable mechanism for solving the dilemma of "*is digital adoption strategic to banks?*" by figuring out the root of a firm's competitive edge and economic rent. In the context of digitalization, it seems impossible for banks to hold the monopoly power in digital adoption as it is likely to be duplicated or substituted by agile rivals. In this manner, no matter how valuable this digital adoption is, the evaluations that are relied on the final product/service could not figure out the root of abnormal returns achieved. It is because this digital product/service could be similar among numerous bank providers. Furthermore, even in the case that companies are gaining monopoly rents from being technological first movers, nothing can guarantee that those competitive edges can be preserved since other competitors may try to imitate or substitute with other optimal products/services not long afterwards. On the other hand, an insight into firms' resources and capabilities is preferable at the point that it endorses inter-firm inner differences, which should be the source of competitive position and profitability. Put differently, the resource/capability mechanism can argue that although a digital adoption might be similar among suppliers, the underlying power inside the firm is what other rivals find impossible to comprehend or substitute for the equivalent outcomes. It is also the key to solving the doubt concerning if digital adoption is strategic, depending upon the critical resources and capabilities this digital adoption endows to the bank.

Secondly, the resource-based view allows the assessment of the value of digital adoptions in a comprehensive manner. In which, digital adoptions are expected to add more value to banks' performance which goes beyond the value delivered to customers. Indeed, the resource-based view can validate this assumption. The focus on the potential resources/capabilities that a digital adoption endows banks can approach the impacts of digital adoption on any aspect it involves. For instance, the launching of the digital transactional website may not only enhance the bank's capability of serving its customers but also enrich its digital knowledge relevant to customer tastes, technological trends, potential risk, et cetera. This digital knowledge base afterwards dramatically facilitates the bank in strengthening its strategic partnerships by exchanging win-win knowledge in platforms or supply chains it is involved in. It is evident in such a case that the benefits of digital transactional website adoption do not stop at the customer value only but also at other aspects and the entire system of the bank. Therefore, the resource-based view could be a wide-ranging approach to evaluate the impact of not only transactional website adoption but also other digital adoptions on banks' performance.

Thirdly, the resource-based view is the basis for observing the role of digital adoption in the long term. As mentioned in the first point, the strategic attributes of a digital adoption depend not only on the value contributed to firms in the early phase but also on the ability to protect the value over time. Resource-based theorists emphasize that the value of a strategy is likely to be short-lived and fleeting if this strategy has no capacity to prevent the perfect imitation and substitution of other competitors in the future. In contrast, firms can put themselves into a sustainable success path with inviolable differentials if they implement their strategies in a strategic and unique way (such as by effectively exploiting and leveraging idiosyncratic and inimitable resources, being agile in recognizing and capturing the value of market transformation). Such inter-firm discrepancies are the basis for the firm to preserve its sustained competitive edge and superior performance over time, even in the scenario of the highly competitive market where other companies are also endeavouring to implement the same strategy or find better alternatives to defeat.

However, it should also be noted that the resource-based view theory tends to not indicate strategic resources for any particular discipline or any specific strategy of businesses. Therefore, empirical researchers tend to apply the concept of the resource-based view to propose a set of strategic resources and capabilities related to specific disciplines. In the field of digital banking, the resource-based view has been applied but almost in IT-related investment and general e-business context. For example, based on the ground of resource-based view, Lüneborg and Nielsen (2003) point to internal knowledge as a strategic resource of IT adoption and prove that IT-related internal knowledge has a positive impact on Internet adoption as well as customer-related performance. Fahy and Hooley (2002) apply the resource-based view to offer several resources that are likely to hold the most value in an e-business. However, the research of Fahy and Hooley (2002) only points to a number of banking cases and does not focus on the banking industry in particular. Ferguson et al. (2005) when researching the value of e-commerce adoption also applied the resource-based view to argue that e-commerce investments bring significant value to businesses thanks to their resources and capabilities. However, the research does not point out what are the strategic resource-capabilities of e-commerce initiatives.

In terms of transactional website adoption, a few studies point out the resources and capabilities of this digital adoption. The most detailed research should be of Oliveira et al. (2016) which examines the impact of Internet banking capabilities on banks' performance. The research focuses on some capabilities of Internet banking, such as information quality, information security, system's integration and examines whether those capabilities have any significant impact on banks' processes (financial process, financial transactions...). What has not been told from that research is the direct impact of Internet banking resources/capabilities on financial performance as well as the market performance of banks.

In a nutshell, the resource-based view does not provide a specific list of resources and capabilities for any individual discipline. Also, the impact of resources and capabilities on the performance of organizations may be varied and depends on each individual discipline. Therefore, although the resource-based view can show us the root of a firm's superior performance, strategic resources and capabilities need to be proposed and tested separately for each specific case. As for transactional website adoption, so far, the resource-based view has not been widely adopted. Chapters 4, 5, 6 of the theses will suggest resources/capabilities of transactional websites and empirical tests on some resources/capabilities of transactional website adoption.

2.2 The General Context of Digitalization

2.2.1 Digitalization in the Banking Industry

The digital banking literature has discussed how the digital era is developing the banking industry. Firstly, the digital banking roadmap is shown through several massive digital disruptions (see Sia et al., 2016) and multi-channel integration of digital products and services diversification (see Carbó-Valverde et al., 2020). For example, banks are investing heavily in digital banking technologies to magnify their omni-channel banking strategy, including the integration of mobile, web or digital platforms. Additionally, artificial intelligence solutions on the front end are constantly enabled in order to facilitate customer identification and authentication, supplant live employees through flexible chatbots and voice assistants, strengthen customer relationships, and offer personalized insights and recommendations. Secondly, nowadays customers are more conscious of the potential capabilities of banks in offering them a variety of favourable and new-fashioned banking services (Carbó-Valverde et al., 2020).

Recently, Tanda and Schena (2019) proposed a systematic approach to digital banking strategy. Firstly, through the sample data of thirty-two incumbent banks, which includes twenty-four banks from Europe, the authors report on some digital banking strategies implemented in reality. Four main strategies categorized by Tanda and Schena (2019) include *(i) Shareholding-orientated* (the acquisitions of FinTech or Tech firms); *(ii) Partnership-orientated* (the establishment of partnerships for the development of technologically advanced products and services); *(iii) In-house developer* (the investment into IT infrastructure) and (iv) *Mixed strategy* (the combination of the various strategic approaches listed above). The report indicates that banks are inclined to adopt a mixed strategy when embracing digital developments. Secondly, Tanda and Schena (2019) outline the key areas of banks involved in digital strategies. These are *financial intermediation activities* (e.g., lending and financing personal financing corporate banking services, payment); *technological, functional or instrumental activities* (e.g., Blockchain, data analytics, security, and RegTech) as well as the various types of *digital strategic solutions* (e.g., artificial intelligence). The study of Tanda and Schena (2019) systematically reaffirmed the picture of digitalization in the banking industry. To be more specific, banks show a tendency of implementing a mixed strategy that favours banks with comprehensive digital transformation. Also, banks are diversifying their relationships with shareholders and external partnerships as well as financial activities and technological innovations.

2.2.2 Opportunities and Challenges in Banking Digitalization

Evidence in recent years suggests that the enthusiastic embrace of digitalization brings patterns of benefits to banks. Tanda and Schena (2019) highlight two typical processes of digitalization (digital transformation and digital disruption) that potentially offer banks the best chance of realizing new competitive advantages. *Firstly*, digital transformation improves the efficiency and effectiveness of business operations. More concretely, digital solutions have replaced high-cost manual processes with automated systems which deliver better results with fewer mistakes and at lower costs. As a result, a radical cost reduction and a streamlining of processes would be part of the benefits for banks when they embrace digitalization. Furthermore, banks could also gain an agile and productive enhancement of their corporate culture and employee competencies thanks to digital transformation, as suggested by Kelly (2014). *Secondly*, going beyond digital transformation into the domain of disruption, banks are increasingly venturing into massive digital innovations for the sake of seeking new business growth opportunities as well as elevating customer experiences to a new level (e.g., customers can enjoy the highly diversified engagement and lower cost of transactions). Simply put, the key benefits of digitalization could be recapitulated by the claim of (Tanda and Schena (2019 p. 51):

"Digital allows banks to operate successfully in the market through innovative business models and offering highly digitalization content and services, which meet customer expectations".

Nevertheless, going digital poses many challenges to banks. It has been claimed that "*it has never been this hard to be a successful bank*" (Harvey, 2016, p. 136) to depict the pressure that banks are feeling in the age of digitalization. The first pressure, as mentioned earlier, may come from the rising demand of digitally savvy customers who are increasingly cognizant of the capabilities of banks to offer them digital financial services (Carbó-Valverde et al., 2020). It is also the threat from the digital disruption of FinTech companies and BigTech companies which are predicted to destroy significant value for banks, taking at least 30-50% of the net profit of banks (Sia et al., 2016). Moreover, banks are now facing the growing foreshadowing of niche new entrants with innovative business models to take market share from them (Nätti and Lähteenmäki, 2016) and also new legal regulations (e.g. Payment Services Directive or Payment Accounts Directive) (Swacha-Lech, 2017). Finally, the perils of Blockchain and digital securities are also what bring pressure to bear on banks (Drigă and Isac, 2014; Swacha-Lech, 2017). To deal with such challenges, banks are advised to set up the right strategic capabilities, such as (i) the leadership competency to possess a strong technology roadmap and business direction, (ii) the agile capability to integrate IT infrastructure with new technologies, (iii) the customer service capability to intensify customer values and (iv) the entrepreneurial capability to facilitate innovation and diversification (see Sia et al., 2016).

2.3 Value of Digitalization

2.3.1 Value of Digitalization Delivered to Customers

In this study, the centre of interest is three key attributes that are perceived in literature as the most common ones of digital banking services: *ease of use; usefulness and safety*. These are what is covered in the review by Shaikh and Karjaluoto (2015) in the context of mobile banking as well as other reviews in the context of Internet banking (Hanafizadeh et al., 2014) or digital banking adoption (Carbó-Valverde et al., 2020).

A host of attributes of digital offers have been identified in banking literature, including *interactivity* (Aliyu et al., 2014; Dauda and Lee, 2015; Gerrard and Barton, 2003; Mann and Sahni, 2011), *flexibility* (Alalwan et al., 2016; Aliyu and Tasmin, 2012; Chau and Lai, 2003; Dauda and Lee, 2015), *convenience* (Cruz et al., 2010), *effectiveness* (Chau and Lai, 2003; Munoz-Leiva et al., 2017; Nor et al., 2010), *customizability* (Chau and Lai, 2003; Munoz-Leiva et al., 2017; Nor et al., 2010), *familiarity* (Chau and Lai, 2003), *collaboratives* (Chau and Lai, 2003), *innovation* (Thakur and Srivastava, 2014), *safety* (Ahmad and Al-Zu'bi, 2011; Das and Debbarma, 2011; Dauda and Lee, 2015) and so on. These attributes are categorised into three main determinant groups, including ease of use, usefulness, and safety on the basis of the definitions pertaining to their basic features (see Table 2.2).

Firstly, previous research has indicated that digital banking services offer customers the function of ease of use. Theoretically, the *Technology Acceptance Model* (TAM model - Davis *et al*., 1989) defines ease of use as "*the degree to which a person believes that using a particular system would be free of effort within an organizational context"* (Davis et al., 1989, p. 985). Concerning the empirical work, Cheng et al. (2006) stress that online banking possesses the ease of use as the customer finds it easy, interactive, learner-friendly and flexible. That depiction harmonizes with the illustrations of a host of authors concerning digital banking services. For example, it is widely understood that bank websites offer a variety of tools that facilitate and improve the interactions between customers and bank providers, such as interactive loan calculators, exchange rate converters, and/or mortgage calculators (Aliyu et al., 2014; Gerrard and Barton, 2003;

Mann and Sahni, 2011). Furthermore, it is also documented that banks are immensely supported by digital technologies that enable them to serve customers without the constraints of geographic distance. Nowadays, thanks to the integration of digital infrastructure and other information and communication technologies, there is a vast choice of places for customers to perform their financial transactions via a myriad of channels, ranging from physical places like bank branches, domiciles, workplaces, shop stores to their own digital connections like transactional website, mobile and digital apps (Aliyu and Tasmin, 2012). Real-time interaction and virtual communities (e.g. video-enabled mobile phones, web conferencing, online chat, TV banking, 3D banking, and video teller) are also distinctive features of digital banking services that alleviate the complexity of use (Dauda and Lee, 2015).

Secondly, it is proven that usefulness is also something that digital banking services deliver to customers. There is a host of representations of usefulness in digital banking which is commonly given by literature, such as effectiveness, convenience, customizability, familiarity, allegiance to service and innovation. Customization is defined as the degree to which the firm's offering is customized to meet heterogeneous customer needs (Fornell et al., 1996). Furthermore, customization, based on a customer-oriented perspective, is believed to be one of the most important variables in determining customer satisfaction (The American Customer Satisfaction Index (ACSI)).[12] It is also what Fung (2008, p. 296) emphasizes to describe the role of customization: *"Enormous industry faith has been put in customization as a panacea, no matter what sorts of customization are offered, because the individual needs of each consumer can be satisfied"*.

With reference to the banking context, experts classify the customization function of banking service as the degree to which the bank understands specific needs and is aware of customers' best interests (Considine and Cormican, 2016). In fact, this function is commonly illustrated via transactional websites that are designed to enable customers to personalize content and fit their preferences (Liu et al., 2011). Regarding non-

[12] The American Customer Satisfaction Index (ACSI) is the national cross-industry measure of customer satisfaction in the in the United States. The American Customer Satisfaction Index represents a significant step forward in the evolution of national satisfaction indicators. For managers and investors, ACSI provides an important measure of the firm's past and current performance, as well as future financial health. The ACSI provides a means of measuring one of a firm's most fundamental revenue-generating assets: its customers (Center et al., 1995; Fornell et al., 1996).

transactional services, websites are found to truly bring customers a personalized experience, such as greeting users by name when they revisit the websites, making personal recommendations, or sending an e-mail to alert a user about the latest exclusive offers based on completed online questionnaires (Fung, 2008). It is also known that banks are constantly making efforts to offer customers empathy and understanding via their digital solutions, such as giving them particular and useful financial consultants or tag-based interactions to retrieve past online banking activities. It explains that due to the applications of digital data analytic solutions for the sake of identifying different preferences of customers (Dauda and Lee, 2015). Lately, banks are also embracing technologically customized solutions by providing their core financial services via digital platforms (e.g. Application Programming Interfaces) (Cortet et al., 2016; Dapp and Slomka, 2015) where financial data is securely and reliably created, shared and accessed in an ecosystem. In this manner, it brings banks the best chance to meet each user's needs in the most cost-effective way (Zachariadis and Ozcan, 2017).

Thirdly, safety is also widely accepted as a vital factor in determining acceptance and intention in the use of banking customers (Strader and Hendrickson, 2001). It is asserted by Munoz-Leiva et al. (2017) that in the poverty of security, customers are highly reluctant to use online banking and mobile applications. The reason for this reluctance lies in the fact that the scarcity of practical guarantees tends to raise the worry of customers if the provider resorts to any undesirable behaviours, such as violation of privacy, data breach, or unauthorized access to transactions (Frederick and Sasser, 1990; Munoz-Leiva et al., 2017). On the other hand, it is known that "if individuals viewed e-banking as secure, they would be more likely to use them" (Hoehle et al., 2012, p. 128). A perception of safety, foremost, is proved to positively influence customers' perceived trust and thereby, their traffic and sales (Aliyu et al., 2014; Laforet and Li, 2005; Lu et al., 2011). Furthermore, customers are likely to diversify their activities and engagements via digital banking channels if they find high-security guarantees (Carbó-Valverde et al., 2020).

In terms of transactional website adoption and Internet banking, in particular, safety is also perceived as one important factor influencing customers behaviours as well as bank's performance. More specifically, previous studies point out some potential issues that make the customers feel unsafe and then feel reluctant to use transactional websites and Internet banking services. For example, privacy risk may happen in the case the information provided by customers via their online banking transaction is misused or disclosed to a third party (Lee, 2009). This risk is proved to have a negative impact on customers' attitudes and intentions in using Internet banking services (Kuisma et al., 2007; Lee, 2009; Roy et al., 2017). Social risk can also come about in the case it creates a possible loss of self-image or status during the purchase of specific products or services (Lee, 2009). In the case of Internet banking, Kassim and Ramayah (2015) point out that some consumers are afraid and feel unsafe that if something went wrong with online transactions, their friends, family, and colleagues would think less of them. Financial risk refers to the possibility of monetary loss because of transaction errors or bank account misapplication (Suganthi, 2001). Previous studies indicate that many consumers are reluctant to use online banking since they fear financial losses (Kuisma et al., 2007). Lee (2009) argues that traditional offline service would be financially safer. It is because the traditional banking service provides clerical personnel to verify the transaction while online banking may provide artificial technology. This innovation at the beginning can generate feelings of insecurity and uncertainty.

The safety of transactional website banking is also a concern for regulators. For example, the interpretive letter number 928 in of OCC highlighted: "*In connection with these Internet-related web services, the Bank will advise and advise the Customer on how the website should be designed and operated so that the website hosted by the Bank and related information is protected confidentiality from unauthorized access while accessing the Bank's Facilities, in transit to and from the Bank, and while in the Customer's possession*." (OCC, 2001, p. 2). Recently, OCC provided guidance on the E-banking risk and highlighted that when offering digital delivery channels, banks should be aware that the risks associated with third-party relationships, cybersecurity, interconnectivity, and electronic banking (OCC, 2019, p. 31). Clearly, over time, the safety of online banking in general and of the transactional website is always the concern of regulators.

As can be seen, there are potential risks that occur during the process of Internet banking which lead to potential insecurity and uncertainty of customers. Chang (2002) argues that, as the consumers are still cautious about the safety of Internet banking, the first movers do not necessarily earn any early advantage. The study of Chang (2002) also finds no significant advantages for the first movers in adopting Internet banking. This is consistent with some other studies that claim that the quality of services delivered via a website is much more important for firms' success than low prices or being the first mover in the market (Mahajan et al., 2002; Reibstein, 2002; Shankar et al., 2003). Therefore, when it comes to the implications, one might counsel stakeholders to concentrate on promoting a healthy financial and business environment. In which, financial cybersecurity issues via web-based payments or/and via other digital payment channels should be particularly paid attention to. Besides, good measures and security protocols are some suggestions for the establishment of appropriate financial security. It is also so an implication for first movers in adopting transactional websites or/and other digital innovations. Besides the benefits of being a pioneer, the managers should also consider the risk factors. When the adoption of digital banking is still quite new, risk-reducing strategies and safety guarantees should be considered to enhance customer intention in use and perceived safety. Following the regulatory guidance is also a suggestion to improve the confidence of regulators and other parties.

To summarise, there is evidence in the banking literature that digital banking has vital attributes that can add value to customers and influence customers' behaviours, through usefulness, ease of use and safety. These attributes are reflected via the enhancement of *customer experience* (e.g., faster and convenient transactions, compatibility among digital channels, personalized online access to financial information), *lower economic cost* (e.g., reduced commuting, checking, and postage expenses), *high level of security* (mobile wallet, website firewalls, encryption, biometrics, integrated IT). It is therefore fashionable to say that although banks have digitalized their services nowadays to keep up with the development of high technology, the heart of digital banking strategy is not about frequency or quantity of contacts with customers nor the launch of a new banking app or new digital software, but it is about quality and personal relevance to customers.

Table 2.2 below is going to give more details concerning some typical functions of digital adoption and their influence on customers' behaviour, documented by literature.

Table 2.2 Strategic Attributes of Digital Adoption and Influence on Customer Behaviour in Use

Determinants	Definition	Impacts	Critical Attributes of Digital Adoption
Perceive ease of use	*"The degree to which a person believes that using a particular system would be free of effort within an organizational context"* (Davis et al., 1989, p. 985).	**Ease of use** has a positive impact on attitude, intention in use, adoption readiness in terms of *Internet banking*; *mobile banking* (Alalwan et al., 2016; Krishanan et al., 2016; Munoz-Leiva et al., 2017; Püschel et al., 2010; Thakur and Srivastava, 2014; Yang et al., 2014) or *electronic banking* in general (Jahangir and Begum, 2008).	**Interaction** Bank offers digital services allowing real-time interaction and virtual communities (e.g. video-enabled mobile phones, web conferencing, online chat, TV banking, 3D banking, video teller) (Dauda and Lee, 2015). The provision of interactive loan calculators, exchange rate converters, and mortgage calculators on the web sites draw the attention of both users and non-users into the bank's web site (Aliyu et al., 2014; Gerrard and Barton, 2003) The navigational functions of the website, aligned with the speed of online systems, improves the interactivity of customers and bank providers (Mann and Sahni, 2011). **Flexibility** Customers are enabled to independently produce financial transactions (i.e. balance, inquiries, fund transfers, payment of bills) through the website; mobile devices, smart-phones, or Personal Digital Assistants (PDA) at the time and place that suit them (Alalwan et al., 2016, 2017; Chau and Lai, 2003). The mobile payment system allows the customer to make the payment with various options, such as smartphones, store loyalty card information, tokens, and digital couples (Dauda and Lee, 2015). Information and communication technology enable banks to service customers not only in branches and other dedicated servicing sites but also in domiciles, workplaces and stop and shop stores, as well as in a myriad of other channels (Aliyu and Tasmin, 2012).

Perceived usefulness	*"The degree to which a person believes that using a specific system will increase his or her job performance"* (Davis et al., 1989, p. 985).	**Usefulness** has a positive impact on customer acceptance, intention in use in terms of online banking (Chong et al., 2010; Pikkarainen et al., 2004); mobile payment (Thakur and Srivastava, 2014); social media (Dootson et al., 2016), mobile banking (Aboelmaged and Gebba, 2013). **Personal Innovativeness** has a significant positive effect on behavioural intention to use mobile payments (Thakur and Srivastava, 2014). **Compatible** impacts attitude in terms of Internet banking (Nor et al., 2010) or mobile banking (Lu et al., 2011; Püschel et al., 2010).	**Effectiveness** Digital solutions induce faster execution of financial transactions, lower economic cost (reduced commuting, checking, and postage expenses), and more convenient and efficient access to online financial information (Chau and Lai, 2003; Munoz-Leiva et al., 2017; Nor et al., 2010). During the transaction, online banking allows customers to monitor contractual performance at any time, or to confirm delivery automatically. In other words, the more relevant information is immediately available and transparent to customers (Lee, 2009). **Convenience** Mobile banking has the tremendous potentiality to provide reliable services to people living in remote areas where internet facility is limited (Cruz et al., 2010). **Customization/Personalization** Web-based technologies enable banks to provide customized content based on their particular desires (Dauda and Lee, 2015). Consumer-tracking technology allows the identification of individual buyers and provides information-rich products to lead themselves to cost-effective personalization (Chau and Lai, 2003). Online banking understands specific needs, has the best interests at heart and personalized for customers (Amin, 2016; Considine and Cormican, 2016). **Task familiar**

			Internet banking is compatible with conventional banking systems, whereby users are able to perform customary transactional tasks in a manner of harmony with brick-and-mortar practices and less time translating task activities between the two systems. (Chau and Lai, 2003). **Alliance Services** The advantage of the Internet is that it enables interactions in inter-organizational system platforms that can offer additional value to customers. With these alliance services, customers are able to complete a whole task in one-stop, in contrast with visiting multiple organizations in the past (Chau and Lai, 2003). **Personal Innovativeness and Usefulness** (Thakur and Srivastava, 2014).
Safety	Opposite to **perceived risk** which has formally been defined as *"a combination of uncertainty plus seriousness of outcome involved"* (Bauer, 1960, p. 391) and "*the expectation of losses associated with the purchase and, as such, acts as an inhibitor to purchase behaviour"* (Peter and Ryan, 1976, p. 185).	**Perceived risk** has a negative effect on user intention on m-banking, remote mobile payment adoption (Alalwan et al., 2016; Cruz et al., 2010; Lu et al., 2011; Munoz-Leiva et al., 2017; Slade et al., 2015; Thakur and Srivastava, 2014); online banking (Pikkarainen et al., 2004). In contrast, security and safety enormously increase the intention to use such services (Aliyu et al., 2014; Laforet and	A mobile wallet is a system that securely stores users' payment information and passwords (Dauda and Lee, 2015). Banks are offering high digital security with complex combinations among technologies, such as biometrics sensors, ATM integrated with smartphones, occupation certification (Das and Debbarma, 2011; Dauda and Lee, 2015; Venkatraman and Delpachitra, 2008). Encryption technology allows banks to secure information privacy, supplemented by a combination of different unique identifiers (e.g. password, mother's maiden name, a memorable date, or a few minutes of inactivity automatically logs users off the account- see Ahmad and Al-Zu'bi, 2011). The Secure Socket Layer, a widely-used protocol use for online credit card payment, is designed to provide a private and reliable channel between two communicating entities; the use

	Li, 2005; Lu et al., 2011) or diversify the use of banking services (Carbó-Valverde et al., 2020).	of Java Applets that run within the user's browser; the use of personal identification (Ahmad and Al-Zu'bi, 2011). Number, as well as an integrated digital signature and the digital certificate associated with a smart card system, is another digital security solution (Hutchinson and Warren, 2003).

2.3.2 Value of Digitalization Added to Banks' Performance

2.3.2.1 Customer Outcomes and Banks' Performance

By raising customer value, the firm is increasing its tendency to gain higher customer participation, satisfaction, retention, and, thereby achieving better profits and performance. In fact, a good deal of studies has clearly shown evidence of customer outcomes after digital adoption. In greater depth, when firms come to digitalization, it has been found that there is an increase in *customer participation* (Dabholkar, 1996; Hitt and Frei, 2002; Xue et al., 2011); *customer retention* (Campbell and Frei, 2010; Xue et al., 2011); *customer experience* (Mbama and Ezepue, 2018); *customer satisfaction* (Ahmad and Al-Zu'bi, 2011; Firdous and Farooqi, 2017; Mann and Sahni, 2011); *customer efficiency* (Xue et al., 2007).

Customer outcomes are well documented by both the preceding theoretical and empirical studies as rewards for firms. More precisely, customer outcomes are found to connect with each other and subsequently deepen the relationship between customers and firms, thereby inducing an increase in profit and growth. For example, customer experience is found to induce higher customer satisfaction (Setia et al., 2013), whereas customer satisfaction is capable of remarkably increasing loyalty (Neill et al., 2007). By contrast, when dissatisfied, customers have the option of exiting (e.g., going to a competitor) or voicing their complaints in an attempt to receive retribution. Accordingly, firms are likely to lose opportunities to more competent rivals through lack of satisfaction (Johnson et al., 1996). Meanwhile, a deep relationship between customers and firms resulting from a high level of satisfaction is found to induce a lower cost of servicing, reducing marketing expenditures and increased business and greater profits (Heskett et al., 1994; Reichheld and Sasser, 1990). Simply put, customer outcome is one of the most fundamental revenue-generating assets of firms (Johnson et al., 1996). It is also verified in the context of banking literature that customer outcomes and bank performance have a significant relationship (Fathollahzadeh et al., 2011; Hallowell, 1996; Keisidou et al., 2013).

The study of Al-Hawari and Ward (2006) examines the connection between the customer and the performance of banks in the realm of automated services (including ATM, telephone banking and Internet banking). Unique attributes of automated services are given, such as the availability of website content, ease of use, the accuracy of online transactions, the speed of delivery and security. Such attributes are shown to make contributions to the quality of banking services, thereby elevating customer value and inspiring a high level of customer satisfaction. Subsequently, customer satisfaction is found to play a mediating role that critically influences the financial performance of banks. Put briefly, the finding of Al-Hawari and Ward (2006) is that automated banking services have a significant impact on banks' performance, and one vital mechanism considerably promoting this impact is attributed to customer satisfaction.

In the same spirit, the centre of the investigation of Mbama and Ezepue (2018) is the influence of customers on the financial performance of banks. Notably, it is put in a more expanded and comprehensive context: *digitalization*. Similar to a variety of other digital-related studies, this study reveals the foremost implication attributed to digital banking, which is the production of significant additional value to customers. In this fashion, a key takeaway from this study is that the bank is giving itself an increase in customer satisfaction and the strengthening of a customer-provider relationship (e.g., word-of-mouth, retention, loyalty) when going digital. Ultimately, banks' profitability and financial performance are found to be improved substantially.

The focal point of Campbell and Frei (2010); Gensler et al. (2012); Hitt and Frei (2002); Xue et al. (2007, 2011) is the relationship between customer efficiency and banks' performance in the context of digitalization. It is depicted in these studies that digitalization starts the wave of self-service where customers have the best chance to utilize fewer resources to yield more or the same amount of output in their engagement with the service process. In general, two notable findings brought to light are (i) *increased customer efficiency* and (ii) *better firm performance*. Firstly, in the age of digitalization, customers are found to be more efficient in executing financial activities. This is explained by virtue of the integration among banking delivering channels (e.g. branch, ATM, website, mobile banking) coupled with the customized design of each channel in order to fit the diversity of user demographics (e.g. age, marriage status, education, income and so on- see Xue et al., 2007). Gensler et al. (2012) explain the greater customer efficiency is because online channels offer (i) more useful information (ii) greater convenience and (iii) more interactive tools. Consequently, an increase in customer efficiency, which is induced by digital developments, is detected to drive more significant profit to banks. For example, it was discovered by Xue et al. (2007) that one customer with a standard deviation above the mean of efficiency approximately contributes $4.76 of additional profit per month.

Table 2.3 Digital Banking Adoption and the Impact on Customer Outcomes

Authors	Data sample	Main findings
Hitt and Frei (2002)	The data collection includes interviews with more than 60 individuals in a variety of functions related to PC banking and a data extract of customer account records from each of seven banks as of the second quarter of 1998.	PC banking customers are more valuable than regular banking customers. PC customers use more products and maintain higher asset and liability balances than regular banking customers.
Al-Hawari and Ward (2006)	A qualitative study consisting of two stages. Stage one involved 35 interviewers and stage two involved 600 surveys to a random sample of people from the public. Bank data: ten different banks, credit unions and building societies in Queensland, Australia.	Each banking channel has unique attributes which shape customer perception. An enhancement in automated banking channels, therefore, has a significant impact on customer perception, eventually leading to customer satisfaction and retention.
Xue et al. (2007)	The data includes a random sample of about 25.000 households extracted from the database of one of the largest retail banks in the United States. Those customers are required to have monthly transaction records for each month from July 2002 to June 2003	Banks with multi-digital channels increase customer efficiency and higher customer efficiency and are associated with greater profitability.
Campbell and Frei (2010)	The primary data for this study consist of a random sample of 100.000 customers who enrolled in an online banking channel during 2006 in the United States.	There is a substantial increase in total transaction volume in online banking. Online banking, therefore, is associated with higher customer retention rates over one-year, two-year, and three-year horizons.
Ahmad and Al-Zu'bi (2011)	A purposive sampling technique was employed to recruit 179 customers representing the desired range of demographic characteristics (e.g., gender, age, and computer use), previous internet experience levels and product-related knowledge within Jordanian Commercial Banks.	Adoption of e-banking (with accessibility, convenience, security, privacy, content, design, speed, fees) had a positive effect on Jordanian Commercial Bank customers' satisfaction, loyalty, and positive word of mouth.
Mann and Sahni (2011)	Three hundred and fifty active users of Internet Banking using its products and services. The survey was conducted in three cities in the state of Punjab and Chandigarh.	Website design factors (e.g., *navigation structure and information content*) are essential antecedents to customer service quality, which further influences customer satisfaction and trust.

	Nine banks provided the complete lists of their customers using Internet Banking.	
Xue et al. (2011)	Nine thousand three hundred fifty-nine customers adopted the bank's Internet banking during the 57-month study period starting from January 1999 to September 2003.	Internet banking adoption is associated with increased total transaction activity, lower likelihood of customer departure from the bank and greater product use.
Gensler et al. (2012)	A random sample of approximately 87.000 private clients of a large European retail bank over a three-month period.	Online use increases customer revenue and lowers the cost to serve customers due to its strategic attributes (e.g., interactive, assessable, useful).
Aliyu et al. (2014)	Data were collected through an online questionnaire from several universities on the West Coast of Malaysia. Respondents were randomly chosen from the list of both undergraduate and postgraduate students.	Two constructs, namely *convenience* and *security,* have strong evidence of customer satisfaction via online banking. They are also the mediators influencing the relationship between online banking and customer service delivery.
Firdous and Farooqi (2017)	An exploratory survey (with the help of a Likert-based questionnaire) was conducted to investigate the impact of Internet Banking service quality on customer satisfaction in New Delhi. Data was collected from a sample of 194 Internet banking customers.	The Internet banking service quality dimensions have a significant impact on the satisfaction of Internet banking customers. Each of the dimensions, namely efficiency, system availability, fulfillment, privacy, contact, responsiveness, and contact individually contribute 70% to the overall customer satisfaction in Internet banking.
Mbama and Ezepue (2018)	Customers sample: a 49-question online survey of 680 participants, including 50 lecturers and 200 students from Sheffield Hallam University; 180 staff members from two large UK companies and 250 candidates from professional LinkedIn. Bank sample: six UK banks with public access to their financial status and financial reports.	Customer experience is significantly enhanced by virtue of attributes of digital banking, such as convenient, functional, useful, trustable, and interactive. This increase in customer experience, subsequently, drive customer satisfaction and loyalty.

2.3.2.2 The Direct Relationship between Digital Adoption and Financial Performance of Banks

It is the acknowledgment of a number of studies that digital service adoptions potentially improve the performance of banks, especially in terms of profitability and efficiency (Al-Hawari and Ward, 2006; Ciciretti et al., 2009; Delgado et al., 2007; DeYoung, 2005; DeYoung et al., 2007; Furst et al., 2002; Goh and Kauffman, 2015; Hernando and Nieto, 2007; Mbama and Ezepue, 2018; Momparler et al., 2013; Pigni et al., 2002; Scott et al., 2017; Sullivan, 2000; Xue et al., 2007). Many explanations have been proposed and/or empirically examined, mainly attributed to an increase in *customer participation and outcomes* (Al-Hawari and Ward, 2006; Campbell and Frei, 2010; Mbama and Ezepue, 2018; Xue et al., 2007); *the advancement in service quality* (Pigni et al., 2002; Scott et al., 2017); as well as *the amplification in revenue streams thanks to new online service*s and *mixed products/services* (Ciciretti et al., 2009; DeYoung et al., 2007; Hernando and Nieto, 2007).

For example, it is discovered by Hernando and Nieto (2007) that business interaction is greater among customers and banks who offer banking services via both traditional and Internet channels, especially in terms of Loans, Deposits, Off-Balance sheets and Trading Portfolio activities. As a result, the adoption of an Internet platform strengthens banks' profitability by 8.5% in terms of ROE and 2% in terms of ROA after three years of the initial adoption. In the same sense, the breakdown of Internet bank activities in the study by Ciciretti et al. (2009) reveals that the Internet offers banks a wide range of online banking activities such as Trading and Investment Activities, Commercial Loan-To-Asset, Off-Balance Sheet. By doing so, Internet banks dominate their non-Internet rivals in earning ROA (0.993% relative to 0.842%) and stock return (14.981% compared to 7.861%).

Another example is the study of Scott et al. (2017) who examine the influence of SWIFT (a network-based technological infrastructure) on banks' profitability and risk. The study is based on a lengthwise dataset consisting of 6.848 banks in 29 countries in Europe and the Americas. Generally, a superior performance achieved by banks attributed to the SWIFT adoption is the main finding of this study. More concretely, the enablement of SWIFT is found to significantly support banks in achieving cost efficiency, enhanced product quality, high customer value and external network value. It is also worth noting that the effect of SWIFT activation on firms' profit is found to be long-lasting and able to maintain up to ten years after implementation.

Concerning the cost of digital adoption, this is still somewhat ambiguous. Conventionally, cost-effectiveness is perceived as a driver to induce banks to venture into the digital world. Indeed, some authors show that banks reduce their overhead costs thanks to their digital adoption (DeYoung, 2001; Hernando and Nieto, 2007). In the same vein, Scott et al. (2017) also find that after three years, SWIFT adoption benefits banks with cost reductions due to automation and an increase in efficiency in the production process. Nevertheless, it appears in anecdotal evidence that digital banking enablement is likely to lead to higher costs, especially in terms of staff salary and marketing expenditure (Ciciretti et al., 2009; DeYoung, 2001, 2005; Hernando and Nieto, 2007). For example, it is noted by Ciciretti et al. (2009) that the employee expenses ratio for Internet banks is higher compared to that of traditional banks (1.98 compared to 1.73). This finding is in line with the study of Dandapani et al. (2018) in terms of the standpoint that any firm that develops a website, including financial institutions, must also incur an initial cost (e.g. set-up cost, IT support, connecting support, data encryption). Such ambiguity in the sort of the cost side of digital adoption is also admitted by DeYoung et al. (2007) as they claim that there is no academic study that has proven that Internet adoption has helped institutions in systematically lowering their fixed costs. Indicatively, the adoption of digital platforms is possibly a cost burden for banks, especially in the early phase of the adoption. Although overhead expenditures are visually associated with a reduction in physical branch construction, the activation of a new innovative product/service may also entail a host of other costly expenditures as mentioned above.

Table 2.4 below provides the summary of previous studies which examine the impact of digital banking adoption on banks' performance. Please note that, as transactional website adoption is the unit of analysis of this thesis, the table is divided into two panels. Panel A presents the studies that focus on particular transactional website adoption while Panel B discusses the studies which focus on other digital adoptions. In this thesis, as followed by banking literature (Dandapani et al., 2018; DeYoung et al., 2007; Egland et al., 1998; Furst et al., 2000a; OCC, 2000, 2019), a transactional website is defined as a banking website which allows customers to access to information relevant to their private accounts and bank's published information as well as perform the most basic transactions through this website, including pay bill and transfer funds.[13] More pointedly, a transactional website is composed of two elements: (i) a website that allows customers to access banking information via that site and (ii) a website that enables customers to make transactions via its sites, at least the most basic transactions related to pay the bill and cash transfer. A more thorough definition of a transactional website is provided in Chapter 3 in Section 3.1.

[13] Please note that some previous studies define banks who adopt transactional websites as Internet banks. For example, Sullivan (2000, p.3) defines an Internet bank as a bank that offers a transactional Web site. DeYoung et al. (2007) define the Internet variable as 1 since the banks offer their transactional websites. Ciciretti et al. (2009, p84) define the term "Internet" as the ability of banks to offer their websites as an additional delivery channel for banking services and transactions. Goh and Kauffman (2015, p.8) state that a bank is verified as an Internet bank if its website offers financial services between the bank and customers. For example, Sullivan (2000). To be consistent with the term used in the thesis, in Table 2.4, the term "banks who adopt transactional websites" is used rather than "Internet banks" as used by some studies.

Table 2.4 Digital Banking Adoption and the Impact on Financial Performance

Authors	Data sample	Aims	Main findings
Panel A: The impact of transactional website adoption on banks' performance			
Sullivan (2000)	504 adopting or non-adopting web-based banks in the Tenth District in the first quarter of 2000	Examine and compare risks and performances of banks who adopt and who do not adopt transactional websites, under different types of banks: Community Bank, Large Community Bank, Regional Bank, Large Regional Bank	- Banks who adopt transactional websites have higher non-interest income than their non- Internet peers. - The average returns of banks who adopt transactional websites are sometimes found higher and sometimes lower. However, higher non-interest expenses can be offset by higher non-interest income. - Banks who adopt transactional websites seem to take more risk in their lending activities (lower noncurrent ratio).
DeYoung (2001)	6 web-based-only banks and thrifts and 522 benchmark banks and thrifts in 1997; 1998 and 1999	Investigate the performances of banks who offer their services via their websites only	- Evidence of poor financial performance at web-based-only banks and thrifts. - Web-based-only banks tend to have relatively low physical overhead, chiefly due to not operating brick and mortar branches. However, transactional website adoption induces high levels of other noninterest expenses, chiefly related to labour costs.
Furst et al. (2002)	2517 US national bank, including 464 Internet banks with websites, in Quarter 3, 1999	Compare the difference in performance between the banks who adopt and those who do not adopt transactional websites.	- Banks who adopt transactional websites, except banks with assets of less than $100m, have better accounting efficiency ratios and higher returns on equity than their bank rivals who have not adopted transactional websites. - *De novo* institutions that rely heavily on an online-based business strategy and the full costs of offering transactional websites (e.g., investment, training, learning by doing) are unprofitable.
Pigni et al. (2002)	95 Italian banks from 2000 to 2002	Examine the impact of adoption of the transactional website on banks' performance	- Transactional website adoption is associated with an increase in customer deposits; a decrease in loans and ROE.

			- The benefit of transactional website adoption is the improvement in overall product service quality perceived by the clients, rather than economic value.
DeYoung (2005)	12 web-based-only banks and thrifts and 644 traditional banks and thrifts chartered in the US during the 1997-2000 period	Investigate the performance of de novo web-based-only banks and thrifts compared to de novo traditional banks.	- Banks who adopt transactional websites as their main business model have underperformed newly chartered traditional banks, mainly because of their higher overhead costs. - However, this is a temporary phenomenon, and start-up transactional website banks can learn to perform better (general experience effects) and access deeper scale economies (technology scale effects).
Delgado et al. (2007)	3 samples of banks chartered in the EU: primarily Internet (15), small traditional (335) and newly chartered banks during the 1997-2001 period	Estimate the magnitude of technology-based scale and technology-based learning economies of European Internet banks.	- Compared to traditional banks that do not offer transactional websites, Internet banks with transactional websites available show strong evidence of scale economies in terms of ROA and ROE. 1.5 %-point increase in terms of ROA and 4.85% increase in ROE for transactional website adopted banks - Over time, banks with transactional websites can capture technology base scale effects to control their operational expenses better than new traditional banks.
DeYoung et al. (2007)	424 community banks in the US adopt banking websites and 5175 branching-only community banks during 1999-2001	Compare the changes in the performance of banks that offer transactional websites and traditional banks	- Adopting transactional websites significantly improves banks' profitability, especially in terms of non-interest income and deposit service charges. More specifically, transactional website adoption can increase the revenue from service charges by from 4 to 6 percent, improve from 5% to 8% in asset side growth, increase from 7% to 11% in terms of ROE. - Banks who adopt transactional websites also tend to alter their deposit strategy of banks from core deposit accounts to money market deposit accounts.

Hernando and Nieto (2007)	72 Spanish commercial banks from 1994 to 2002	Examine the impact of the transactional website adoption on the banks' performance	- The adoption of the transactional website as a delivery channel has a positive impact on banks' profitability in terms of ROA and ROE after one and a half years, mainly explained by the increase in online brokerage commission income. - Regarding the cost side, the overhead expenses decrease after 18 months of the adoption of transactional websites, especially in staff costs. The transactional website adoption also increases the IT expense during the first year. - In the short term, the adoption of the transactional website increases marketing expenses and information technology costs.
Ciciretti et al. (2009)	A panel data includes 105 banks which represent over 80% of the banking assets of the Italian banking industry during the 1993-2002 period	Examine the impact of transactional website adoption on the banks' financial performance	- Banks who adopt transactional websites outperform banks who have not adopted transactional websites (0.993% relative to 0.842% in terms of ROA). - Banks who adopt transactional websites are less risky than banks who have not adopted transactional websites (3.45 relative to 4.03 in terms of non-performing loan ratios). - Banks who adopt transactional websites have a higher employee expenses ratio than banks who have not adopted transactional websites (1.98 compared to 1.73). - There is a strong positive relationship between offerings of transactional website services and bank performance, especially in Loan, Trading and Investment, and Off-balance sheet activities.
Goh and Kauffman (2015)	Banks that were members of the United States Federal Deposit Insurance	Examine the business outcomes of web-based innovation in financial services	- By investing in transactional websites, banks can decrease their transactional cost by 7.3%, increase their deposits by 29.3%, increase their revenue by 14.5% and

	Corporation (FDIC) during the 2003 to 2005 period			increase their net operating income by 18.1%, in relation to banks who did not invest in transactional websites.
Panel B: The impact of other digital banking adoptions on banks' performance				
Al-Hawari and Ward (2006)	Customer data: 35 interviewers and 600 survey attendants Bank data: 10 different banks, credit unions and building societies in Queensland, Australia	Examine the impact of automated service quality (Internet bank, ATM) on bank financial performance where customer retention plays the role as mediating variable.	-	Customer retention is the mediating mechanism through which automated service quality dimensions have a positive impact on the bank's financial performance.
Campbell and Frei (2010)	A random sample of 100000 customers enrolled in the online banking channel during 2006. Monthly panel data set for the 30-month period from December 2004 to May 2007	Investigate the outcome of using online banking as self-service channels to alter customer interactions with the firm.	-	There is an increase in the market share of the banks due to the higher rates of use of online banking.
Scott et al. (2017)	Entire SWIFT adopters worldwide from 1977 to 2006 including 3380 banks in 29 countries	Examine the impact on bank performance of the adoption of SWIFT, a network-based technological infrastructure	-	The adoption of SWIFT as digital innovation has large effects on profitability in the long term (up to 9 years) as well as exhibits significant network effects on performance.
Mbama and Ezepue (2018)	Customers sample: A 49-question online survey of 680 participants, including 50 lecturers and 200 students from Sheffield Hallam University; 180 staff members from two large UK companies and 250	Examine customer perceptions of digital banking, customer experience, loyalty, and financial performance.	-	Banks can improve their financial performance (ROA, cost-to-income ratio, net interest margin) by offering a good digital banking experience.

	candidates from professional LinkedIn. Bank sample: 6 UK banks with public access to their financial status and financial reports.		
Wadesango and Magaya (2020)	Sample of 25 managers and staff who interface with digital banking services and installation	Examine the impact of a range of digital banking services - (Internet banking, mobile banking, electronic wallet) on banks' performance.	Digital banking significantly increases banks' ROA (from 0.016 in 2015 to 0.019 in 2018), customer transactions (0.117 in 2015 to 0.215 in 2018).

2.4 The US banking evolution and digitalization in the US banking industry

2.4.1 The deregulation since the 1990s

In the 1990s, a series of new legislative and regulatory introduced has remarkably altered the banking environment. The Federal Deposit Insurance Corporation Improvement Act (FDICIA) of 1991 was introduced to respond to the crisis in the 1980s. According to Barth et al. (2010), this Act has encouraged banks to be more cautious in measuring and managing risk exposures. The Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994 eliminated many of the restrictions on the acquisition of interstate banks and permitted the creation of "interstate branches". It authorized the creation of bank holding companies that could acquire banks anywhere in the United States and diversify their assets.

In 1999, the Gramm-Leach-Billey Act (GLBA) widened the range of activities in which banks and their holding companies can engage. Barth et al. (2010) claim that the GLBA was a capstone to a decades-long process to counter restrictive laws. In fact, GLBA repealed significant parts of the Glass-Steagall Act which separates commercial banking from the securities business, as well as parts of the Bank Holding Company Act of 1956 which separates commercial banking from the insurance business (Barth et al., 2000). The changes in laws and regulations in the 1990s led to a dramatic change in the banking industry. Most particularly, a wave of M&A occurred right after the Riegle-Neal Act (Berger, 2003; Calzada et al., 2019; DeYoung, 2010; Rhoades, 2000; Vives, 2016).

Data collected from the FDIC (see Table 2.5) shows the high number of annual standard merger transactions starting in 1990 (excluding mergers to resolve failing/failed banks). If considering 1990 as a starting point, in 1994, the number of transactions increased by 38.79% (548 compared with 392). The number of mergers transactions continued to hold at a record high from 1994-1998 with between 550-600 transactions per year. In the following years, M&A has started to cool down, and by the middle of the 2000s, the number of M&A transactions has dropped to an average of 250-300 transactions annually.[14] It is also worth noting that the number of merger transactions to resolve failing banks was very small during this period. According to the data from Table 2.5, on

[14] The figure of this section is consistent with the claim of DeYoung (2010) highlighting that there were approximately more 5000 bank mergers in the 1990s, and above 2000 bank mergers from 2000 to 2006 (see DeYoung, 2010, p. 11).

average per year from 1994-2007, there were less than ten merger transactions related to failing banks.

The fact that the standard merger transactions kept at a record high while the merger deals involving failing/failed banks remained at a very low level to some extent demonstrated a specific M&A strategy of US banks during this period. In which, since the US banking system is opened up by the deregulation, banks tend to acquire well-run banks to pursue geographic diversification and extend their activities, then potentially putting high competitive pressure on the remaining poor performers (Calzada et al., 2019; Elfakhani et al., 2003; Jones and Critchfield, 2005; Stiroh and Strahan, 2003). This point is also to some extent supported by the data of Rhoades (2000, p.8) which shows that during the 1990s, relatively large bank mergers took place (Table 2.6). In which, 177 large banks with assets greater than $1billion were acquired during this period, compared with 71 similar deals in the 1980s. This number increased continuously from 1996 to 1998 with from 25-35 larger merger activities each year.

The data of Rhoades (2000, p.8) also shows that the number of large inter-state merge deals increases significantly since the 1990s (Table 2.6). There were from 10-15 large inter-state merger transactions each year from 1991-1995 and from 20 to 30 large interstate merger transactions has processed annually from 1996-1998. Meanwhile, no large interstate merge in the early 1980s and only from 5-11 large interstate merger deals occurred each year from 1984-1989. These figures support the argument of many authors that the removal of various restrictions on geographic expansion stimulated merger activity, especially larger mergers across states (Jones and Critchfield, 2005; Stiroh and Strahan, 2003).

This strong M&A movement since the 1990s has significantly changed the structure of the US banking system, especially the number of banks (Calzada et al., 2019; DeYoung, 2010; Jones and Critchfield, 2005; Tregenna, 2009; Vives, 2016). Indeed, according to the data of FIDC (Table 2.5), the number of banks continuously decrease during the 1990s. On average, each year the US industry has witnessed a decline of 400-500 banks from 1990-1998 (Table 2.5). The number of banks continued to decrease in the following years but at a slower rate, from 150 to 300 banks per year from 1999-2002 and from 100 to 150 banks from 2003-2006. Although the number of banks has decreased quite significantly during this period, the number of failed banks was quite low during 1994-2006. Most of each year during 1994-2006, there were less than 15 failed banks, approximately 135% decrease compared to 1990. Especially, in 2005 and 2006, no bank failures were recorded. Thus, it can be seen that, in the same period, the number of banks decreased sharply but the number of failed banks was insignificant, indicating that M&A is a major factor leading to the decline of banks since the 1990s.

Table 2.5 US Banking Structure from 1990-2018[15]

Year	Failure: Assisted merger	Unassisted merger	New charter	Bank failure	Total of banks	Change in banks (compared to the last year)
1990	151	392	138	382	12347	.
1991	101	447	77	271	11927	-420
1992	87	429	40	181	11467	-460
1993	56	481	47	50	10961	-506
1994	12	548	46	15	10453	-508
1995	6	608	97	8	9943	-510
1996	5	554	139	6	9530	-413
1997	1	601	182	1	9144	-386
1998	3	560	187	3	8775	-369
1999	7	419	228	8	8582	-193
2000	6	456	188	7	8315	-267
2001	3	359	125	4	8082	-233
2002	6	276	90	11	7887	-195
2003	2	225	110	3	7767	-120
2004	3	263	120	4	7628	-139
2005	0	271	167	0	7523	-105
2006	0	309	178	0	7397	-126
2007	1	293	175	3	7279	-118
2008	19	260	90	25	7077	-202
2009	114	157	24	140	6829	-248
2010	130	183	5	157	6519	-310
2011	84	166	0	92	6275	-244
2012	39	172	0	51	6072	-203
2013	22	203	1	24	5847	-225
2014	14	238	0	18	5607	-240
2015	8	264	1	8	5340	-267
2016	5	223	0	5	5112	-228
2017	6	196	5	8	4918	-194
2018	0	226	7	0	4717	-201

Source: FDIC

[15] The structure data of US banks was collected via FDIC platform at the following link: https://banks.data.fdic.gov/explore/historical?displayFields=STNAME%2CTOTAL%2CBRANCHES%2CNew_Char&selectedEndDate=2020&selectedReport=CBS&selectedStartDate=1934&selectedStates=0&sortField=YEAR&sortOrder=desc.

Table 2.6 The number of large merger transactions from 1980 to 1998

Year	Large merger[16]	Large interstate merger
1980	0	0
1981	1	0
1982	2	0
1983	5	0
1984	7	0
1985	12	7
1986	9	5
1987	19	11
1988	14	8
1989	2	0
1990	6	1
1991	16	12
1992	22	15
1993	17	11
1994	15	10
1995	14	11
1996	28	21
1997	25	24
1998	34	32

Source: Rhoades (2000, p. 8)

[16] Rhoades (2000) defines larger mergers as ones when the acquiring and target banks have 1$ billion in assets.

2.4.2 Financial crisis (2007-2009)

The financial crisis caused the number of bank failures in the US to skyrocket after more than a decade of modest failure activity. As could be seen from Table 2.5, the number of failed banks increased approximately tenfold in 2008 and approximately 50 times in 2009 and 2010, compared to 2007. The crisis has led to a change in the number and nature of M&A activities of the banking industry. In which, there has been a shift in the merger form from traditional M&A to acquisitions of failed or distressed institutions (Adams, 2012). More specific, from 2008 to 2010 there is a significant increase in the number of transactions that involved failed or failing institutions (see Table 2.5). More pointedly, more than 100 mergers involved failed banks each year from 2009-2010, compared to below 10 transactions with the same type from 1994-2007. Meanwhile, the number of standard acquisitions decreased significantly. From 150 to 200 standard mergers each year from 2009-2010, compared to 250-300 standard mergers each year in the 2000s and 400-600 transactions in the 1990s (see Table 2.5). Adams (2012) points out a number of reasons for the decrease in the number of non-failing mergers during the crisis period. More specifically, potential bank acquirers could not reliably ascertain the quality and value of target bank portfolios. Furthermore, publicly traded bank stocks fell during this period, making stock-based transactions more difficult to complete.

2.4.3 Post-crisis reforms (2010-2016)

Since 2010, regulators have implemented a series of mechanisms to prevent further crises in the banking industry. Most particularly, the Dodd-Frank Act (2010) was passed with the aims to protect consumers, discipline banks, avoid bank bailouts and create banks that were "too big to fail". The literature points out some significant implications of the regulations since post-crisis. Most significantly, many authors believe that there was a marked decrease in the number of new banks joining the industry (Calzada et al., 2019). As could be seen from Table 2.5, since 2011, below five new banks joining the US banking system each year. More specially, in four years 2011, 2012, 2014, and 2016, there are no banks joining. This matter is explained by the implementation of new banking regulations which has increased banking costs and also keep the industry profitability at a lower level (Mendenhall, 2019; Wilson, 2018).

M&A also took place in the post-crisis period but at a flat level (MCKinsey, 2019). As could be seen from Table 2.5, from 150-250 standard mergers each year from 2011-2018.

Unlike the wave of M&A aimed at expansion and development in the previous period, M&A in this period aims to help the bank cut costs and lead to the closure of many branches (MCKinsey, 2019). In the same vein, Kowalik et al. (2015) also find that from 2011 to 2014, acquired banks tend to perform worse than non-acquired banks. More specifically, acquired banks tend to be smaller in assets, less profitable, have lower net interest income, and higher non-interest expenses than non-acquired banks. Additionally, the acquired banks are also worse than their non-acquired peers in terms of capital, loan, and asset quality. Therefore, Kowalik et al. (2015) argue that the merger activities in the post-crisis period are aimed at achieving greater scale advantages and improving efficiency.

2.4.4 The competitive landscape in US banking industry

2.4.4.1 Concentration and consolidation

Many authors agree that since the deregulation, the US banking industry has an observable level of consolidation (Adams, 2012; Berger, 2003; Rhoades, 2000; Vives, 2016, 2019). In order to analyse the concentration in the US industry from the 1990s to the end of 2018, the k bank concentration ratios have been calculated. According to the definition of Galetić and Obradović (2018), the k bank concentration ratio is estimated by summing over the market shares (s_i) of the k largest banks in the market:

$$CR_k = \sum_{i=1}^{k} s_i$$

Following some previous authors who also investigate the concentration and competition in the US banking industry in some relevant periods, the top 10, top 25, top 50, and top 100 largest bank concentration ratios are estimated in this section (Adams, 2012; Rhoades, 2000). An annual market share of each bank is based on the asset or deposit it holds in relation to the total asset or total deposit of the whole market. Data on US banking assets and deposits were collected annually from the FDIC database.[17]

Table 2.7 and Figure 2.1 show the level and trend of concentration in the US banking industry from 1994 to 2018. Similar to the estimation of Rhoades (2000, p.174) and

[17] The data is collected via the FDIC database at https://www.fdic.gov/bank/statistical.

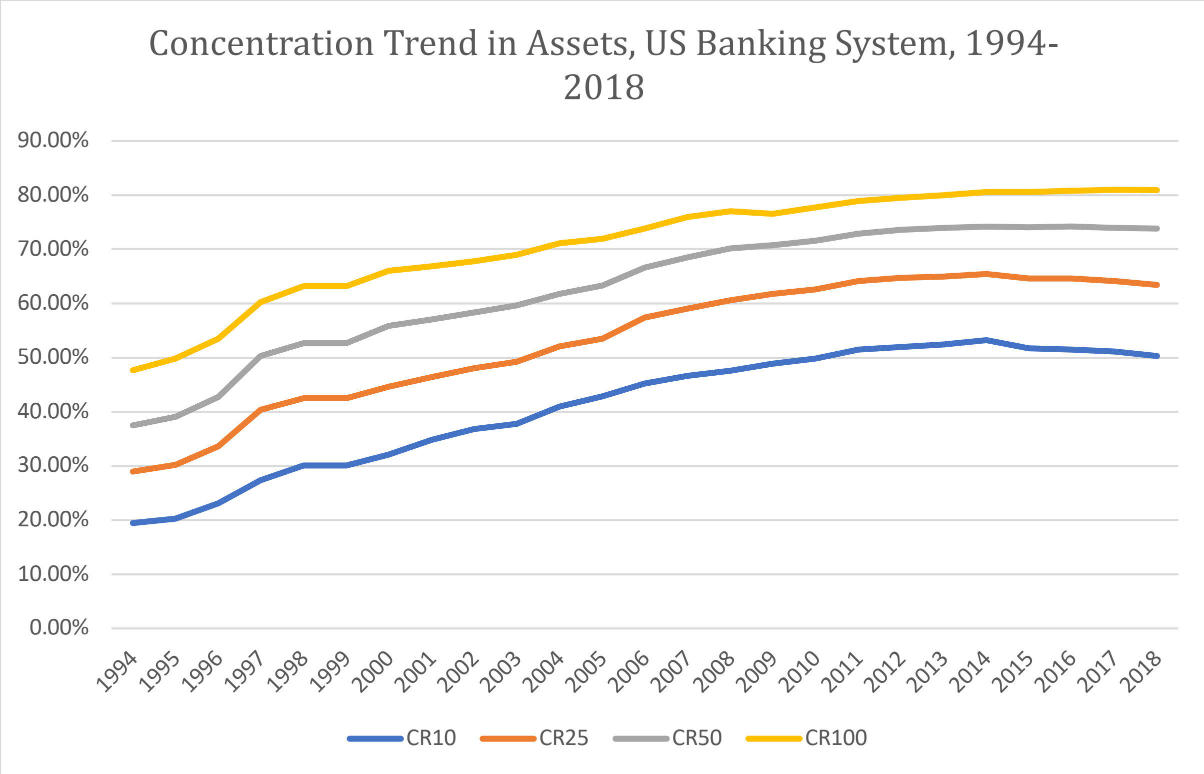
(Adams, 2012, p. 22), it can be seen from Table 2.7 and Figure 2.1 that, since 1994, the concentration ratios have always been in an uptrend for the top 10, top 25, top 50 and top 100 largest US banks. Since the enablement of the Riegle-Neal Act in 1994, the concentration ratio level especially grew strongly. To be more specific, in 1998, the assets held by the top 10, 25, 50, 100 largest US banks accounted for 30.10%, 42.76%, 52.65%, and 63.18%, respectively, of the total assets of the US banking industry. If comparing these figures with those of 1994, asset holdings of the top 10, 25, 50, 100 largest banks at the end of 1998 increased by 54.66%, 46.63%, 40.41%, and 32.55% respectively. The growth rate of deposit concentration of the largest group of banks increased even more strongly after 1994. Specifically, at the end of 1998, the deposits held by the top 10, 25, 50, and 100 largest banks accounted for 27.13%, 38.96%, 48.58%, 58.35% of the total deposit of the whole industry. If compared with the year 1994, the deposit shares grew by 62.66%, 50.01%, 42.97%, 32.39% for top 10, top 25, top 50, and top 100 respectively. The consolidation process in the US banking industry continued to be extremely strong until 2010. The concentration of both assets and deposits increased especially strongly in the top 10 largest banks. In 2003, the total assets held by the top 10 banks accounted for more than a third of the total assets and deposits of the industry (37.75% and 36.59%, respectively). By 2010, the group of 10 largest banks accounted for nearly 50% of the total assets of the entire US industry. The concentration levels in the top 25, 50, and 100 groups are still increasing every year, but at a slower rate.

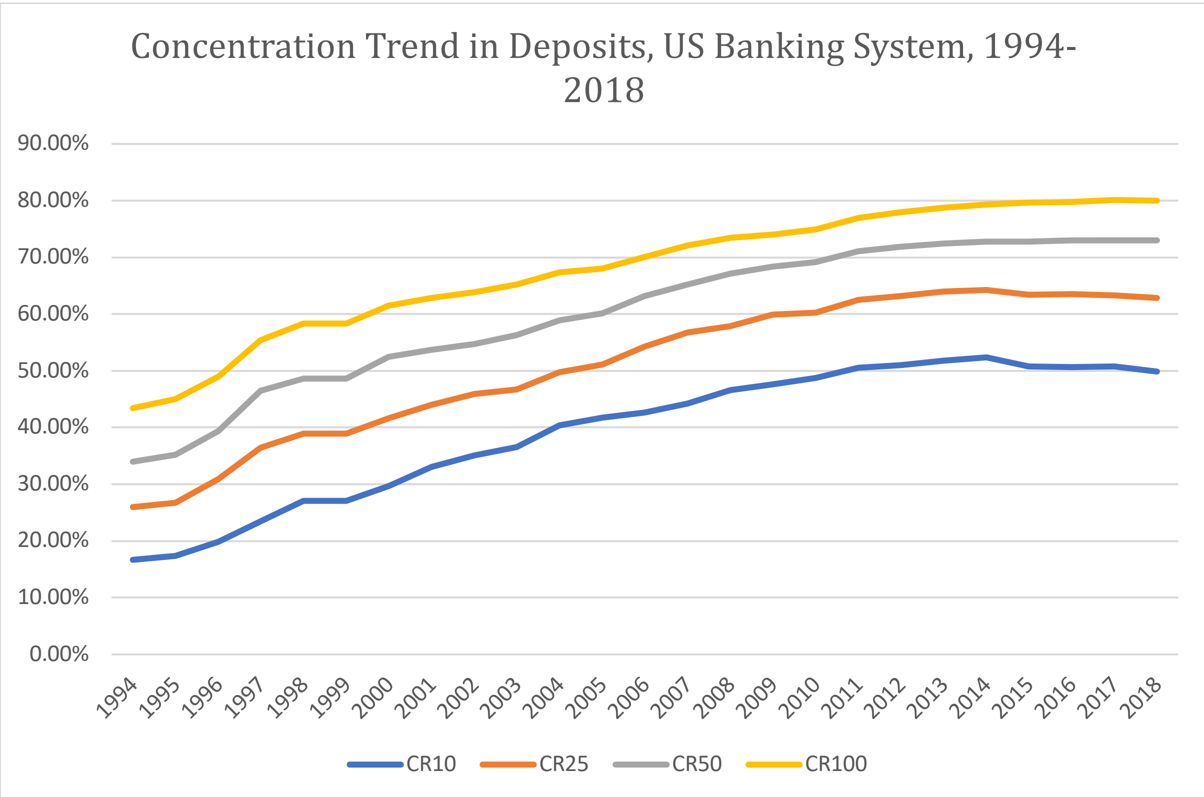
Table 2.7 Concentration in Assets and Deposits in US Banking Market from 1994-2018

	Concentration in Asset				Concentration in Deposit			
Year	CR10	CR25	CR50	CR100	CR10	CR25	CR50	CR100
1994	19.47%	28.97%	37.50%	47.67%	16.68%	25.97%	33.98%	43.42%
1995	20.23%	30.26%	39.07%	49.81%	17.36%	26.78%	35.23%	45.02%
1996	23.10%	33.68%	42.79%	53.52%	19.88%	30.91%	39.41%	49.00%
1997	27.39%	40.33%	50.33%	60.27%	23.51%	36.44%	46.44%	55.40%
1998	30.11%	42.48%	52.65%	63.19%	27.13%	38.96%	48.58%	58.35%
1999	30.11%	42.48%	52.65%	63.19%	27.13%	38.96%	48.58%	58.35%
2000	32.10%	44.66%	55.85%	66.00%	29.66%	41.65%	52.42%	61.53%
2001	34.78%	46.47%	57.11%	66.82%	33.00%	44.05%	53.67%	62.89%
2002	36.85%	48.10%	58.30%	67.86%	35.11%	45.90%	54.69%	63.88%
2003	37.75%	49.27%	59.60%	69.00%	36.59%	46.74%	56.34%	65.19%
2004	40.97%	52.12%	61.77%	71.08%	40.36%	49.79%	58.85%	67.33%
2005	42.86%	53.53%	63.32%	71.97%	41.79%	51.10%	60.12%	68.08%
2006	45.21%	57.38%	66.57%	73.90%	42.65%	54.29%	63.15%	70.08%
2007	46.62%	59.04%	68.48%	75.94%	44.19%	56.76%	65.19%	72.04%
2008	47.60%	60.65%	70.22%	76.99%	46.62%	57.89%	67.17%	73.44%
2009	48.85%	61.77%	70.74%	76.57%	47.55%	59.91%	68.42%	74.02%
2010	49.87%	62.64%	71.62%	77.73%	48.74%	60.23%	69.14%	74.90%
2011	51.50%	64.13%	72.85%	78.90%	50.57%	62.51%	71.10%	77.00%
2012	52.01%	64.69%	73.55%	79.50%	51.00%	63.21%	71.89%	77.97%
2013	52.48%	65.02%	73.91%	80.05%	51.83%	63.95%	72.42%	78.79%
2014	53.24%	65.45%	74.21%	80.53%	52.37%	64.25%	72.80%	79.37%
2015	51.70%	64.61%	74.05%	80.64%	50.75%	63.44%	72.76%	79.64%
2016	51.48%	64.60%	74.22%	80.79%	50.66%	63.56%	73.00%	79.79%
2017	51.20%	64.16%	73.96%	80.99%	50.76%	63.25%	72.96%	80.12%
2018	50.26%	63.50%	73.79%	80.89%	49.86%	62.86%	72.94%	80.00%

Source: Author's calculation, based on the data of FDIC.

Figure 2.1 Trend in Concentration in Assets and Deposits in US Banking System from 1994-2018





Source: Author's calculation, based on the data of FDIC.

2.4.4.2 Competitive pressure

Competitive pressure in the US banking industry increases sharply since the deregulation. Vives (2016) points out that, in the pre-deregulation period (from the 1940s to 1970s), competition among banks was tremendously limited due to regulations of rates, activities as well as clear separation among commercial banks, insurance and investment banks. Furthermore, restrictions on the activities of saving banks and the geographical separation were also factors that limited competition in the US banking industry from the 1940s to 1970s. Since the controls on rates, banking investment activities and geographical barriers have been lifted (especially since the Riegle-Neal Act of 1994 has been passed), the competition in US banking industry has been promoted.

The increased competition in the post-deregulation has relocated the market share of the US banking industry. The study of Stiroh and Strahan (2003) shows that, after the deregulation, only banks with above-median ROE gain market share through M&A activities, while banks with low ROE lose market share. Put differently, the increased competition post-deregulation has imposed pressure on weaker banks and redistributed market share into better performing banks. This process, therefore, underpinned the performance of the US banking industry post-deregulation.

It is also worth noting that, since financial deregulation, US banks have also begun to face competition from other non-traditional competitors. Data from Vives (2019) shows that the market share held by depository institutions in the US has fallen sharply, from 63% in 1950 to less than 30% between 2000 and 2007. Meanwhile, there is a significant rise in shadow banks since 2000 which steadily gained ground in the traditional banking sector—and actually surpassed the banking sector for a brief time after the 2000s (Financial Crisis Inquiry Commission, 2011). Furthermore, in the post-crisis, as mentioned, the Dodd-Frank Act passed includes over 400 post-crisis rules which put significant pressure on traditional banks and their regulators (Buchak et al., 2018; Stulz, 2019; Tarullo, 2019; Vives, 2017). The rigour of post-crisis regulations is also a barrier to entry of de novo traditional banks (Calzada et al., 2019). At this time, Fintech companies are seen as new competitors that continue to threaten the market share of traditional banks in the US (Stulz, 2019; Thakor, 2020; Vives, 2016, 2017). For example, Buchak et al. (2018) show that, in the residential mortgage sector, the number of fintech lenders increased dramatically in the 2007-2015 period. If the market share of shadow banks in residential mortgage doubled from 2007 to 2015, fintech firms also accounted for roughly a quarter of shadow bank loan originations in 2015.

2.4.5 The importance of digitalization in the US banking industry

In the context of increased competitive pressures, digitalization has become an important and indispensable process in the banking industry to remain competitive and retain customers (Berger, 2003, p. 149). In fact, in the post-deregulation, US banks are constantly seeking innovations to increase their competitive advantage and fulfil their growth aspiration. Many authors admit that, besides financial engineering, information technologies are the most obvious innovation of the US banking industry since the 1990s (DeYoung, 2007; DeYoung et al., 2004; Vives, 2019). DeYoung (2007) stress that since the 1990s, information technology, with the advent of the Internet, has shaped the way banks deliver their products and services as well as re-structured the banking industry because information is the nature of banking. Triplett and Bosworth (2003) also state that the banking industry is the most IT-intensive industry in the US as measured by the ratio of computing equipment and software to value-added. In addition, the improvement in computer power and technology information in this period is given as an effective support tool for banks in managing customer information and cross-selling financial services.

Digitalization plays an important role in bank management and communication, especially since 1994 when the geographical expansion started to increase (Berger, 2003; Berger and DeYoung, 2006; DeYoung, 2010). More pointedly, technological progress (including Internet transactional websites) would help banks manage subsidiaries more efficiently over time. With the improvements of information technology, banks could reduce agency costs in monitoring and communicating with staff at distant subsidiaries. Also, the information via digital platforms tends to be quantifiable and verifiable therefore it helps banks track and manage the whole system (Berger, 2003).

Furthermore, going digital is also of great significance for banks in reaching long-distant customers. As the customers do not need to be geographically close to receiving services, customer experience and performance should be enhanced. Also, digital channels are great ways for banks to interact with their customers over long distances. Consequently, banks can promote consumer, mortgage, credit card, and even some small business loans to borrowers via their digital channels without face-to-face meetings (Petersen and

Rajan, 2002). This point is consistent with the findings of a number of recent empirical studies which find that US banks are increasing the distance at which they make small business loans and the interactions between firms and their lenders become more impersonal (DeYoung et al., 2011; Petersen and Rajan, 2002).

Embracing digital technologies could facilities banks in achieving cost savings and efficiency enhancements, according to a number of studies (Berger, 2003; Calzada et al., 2019; Frame and White, 2014). More specifically, the digital channels can help banks reduce distance-related diseconomies. Berger (2003) claims that the cost of providing services via the Internet does not vary much with distance, in comparison to traditional cash management and relationship-based services. Other authors also find that over time, the negative effects of distance on the efficiency of banks have diminished (Berger and DeYoung, 2006). Berger (2003) that the gradual reduction of the negative effects of distance on the efficiency of banks is due to the improvements of technical progress, including Internet banking.

Stulz (2019) claims that, in order to compete in the post-crisis period, traditional banks need to understand their competitive advantages and uniqueness. More specifically, traditional banks have large established consumer bases and a broader set of product offerings. In this manner, digitalization should be considered as a matter of urgency to help banks leverage their competitive advantages (Cuesta et al., 2015). Digitalization helps banks to satisfy the ever-changing demand of customers who are increasingly knowledgeable about the advancement of technological and digital innovations (Carbó-Valverde et al., 2020). At the same time, digitalization also facilitates banks in bringing various services/products to customers over the distance with fewer costs (Vives, 2016, p. 13).

3 Chapter 3: Data Collection and Description

3.1 Sampling

3.1.1 The definition of transactional website adoption

Transactional website adoption has been defined quite specifically and in detail in previous studies. Egland et al. (1998), who are ones of the early authors in the field of Internet banking, defined transactional Internet banking as providing customers with the ability to access their account and at minimum transfer funds between accounts. In 2000, based on the OCC handbook, Furst et al. (2000a) gave a basic definition of transactional website adoption in order to differentiate from the pure informational websites. Accordingly, the transactional website is a website that allows customers to make online transactions. The study extends the definition by showing the transactional activities offered through the transaction website, including electronic bill presentment and payment, receiving and paying bills. Similar to Furst et al. (2000a), DeYoung et al. (2007) discuss that a transactional website is adopted when it "permits customers to perform actual banking transactions over the website, for example, moving funds *between accounts, paying bills, making investment allocations, or applying for loans*". Dandapani et al., 2018 (p. 244) distinguish transactional websites from two other types of banking websites, which are informative and interactive websites. In which, an informative website only provides some information of the bank (e.g., bank's history, bank's products and services, bank's location, bank 's mission and so forth). An interactive website enables members to access to their personal account and statements. A transactional website is defined as "*the most extensive*" which allows customers to "*pay their credit cards, deposit money, transfer funds, and manage their credit more efficiently*" (see Dandapani et al. (2018, p. 244)). Recently, the booklet "*Licensing Manual: Charters" of* OCC (2019, p. 61) *has re-affirmed the Internet banking platforms, which should* "*allow bank customers to access information and systems directly, including those that enable funds transfers*". As could be seen, the most intuitive commonality in the literature is that a transactional website is composed of two basic elements:

1. Informative site allows access to bank's information.
2. Transactional site allows banking transactions online.

In this thesis, based on the literature, one consistent definition for transactional websites is applied. It is the site which:

- Allow customers to access information via that site.
- Allows customers to perform the most basic transactions (including pay bills and bank transfers).

Notably, the functions of transactional websites could be well extended and upgraded across years thanks to the continuous improvement of science and technology. Some of the most basic functions of a transactional website can be referenced via the report by OCC (2000). OCC divides the website's transaction activities into three main areas, including personal products (including interest-bearing activities such as deposits, saving accounts, commercial loans, credit loans), personal services (such as is balance inquiry on deposit accounts, bill payment, bill presentation for retail customers, customer electronic mail), and business activities and services. The report of OCC shows that most banks have provided personal services to customers through their websites as of July 2000, especially bill inquiry, bill payment, fund transfers. The report also shows that banks intend to continue to expand interest-based services for both personal and business accounts via their transactional websites in later 2000 and as early as 2001. Some advanced functions of a transactional website in the context of digitalization could be the enhancements in the online consultation, settlement, account specialization, simulation of investment activities, pension saving accounts and so forth, as suggested by Deloitte (2017).

3.1.2 The motivation of choosing the transactional website

Firstly, the launch of the transactional website is a milestone in banking digitalization. It is accepted that the adoption of transactional websites marks the first step towards the digital embracement of financial institutions, and it involves both digital disruption and digital transformation. The launching of transactional websites fundamentally and comprehensively reshapes the bank in both in-house and front-end operations. It is also a disruption that enables banks to capture new value from digitalization such as customer experience, finance, human resources, and other corporate functions. Moreover, based on the resource-based view, the establishment of transactional websites endows banks with a grass-roots foundation of ongoing digital resources and capabilities which have the capacity for interconnectedness and synergy. Therefore, in the long-run, the transactional website offers banks the ability to optimize other digital strategies; cohere into further digital transformation and innovation; enhance seamless customer experience via omni-digital integration and streamline processes.

Secondly, the transactional website is an appropriate and meaningful unit of analysis for the market-based approach and the research methodology of this study. More precisely, the transactional website launch has the three features of detection, evaluation, and prediction from the market towards the announcement from a firm released to the public. At the time of the Internet revolution, transactional website launches were still a novel phenomenon in the banking industry, therefore, it is news that may provoke a market reaction. Once the market becomes aware of unexpected news from the company, it is likely to immediately evaluate the new value appropriate for the company. The evaluation tends to depend on the potential to generate wealth and a competitive edge in both the short and long term released from the news. As mentioned before, the launch of a transactional website certainly deserves interest and evaluation from the market due to it being a signal of a lucrative prospect. Furthermore, it is also worth noting that there is a lack of data in terms of digital banking launch announcement dates. In these circumstances, the manual collection of the data in terms of the transactional website launching date makes sense for approaching market evaluation as well as serving the event study methodology.

The transactional website is one of a host of digital initiatives undertaken by banks. However, based on the resource-based view and market signalling perspective, it is argued that the assessment of the transactional website still makes sense for addressing the doubt pertaining to the value of digitalization that is added to the bank. This is because the value of a digital adoption via its core strategic digital-related competencies conferred on banks and signalled to the market, rather than via its particular operating functionalities. On the one hand, the focus on the functional features may reflect the similarity among numerous bank providers, and it is challenging to figure out the differences in economic rents and competitive edges among banks. On the other hand, an insight into banks' digital resources and capabilities is preferable in that it endorses inner differences, which are the fundamental source of a competitive position and sustained superior performance. Therefore, given the constraints of banking digital adoption data, the transactional website is an ideal representative for observing the value of digitalization added to the bank.

3.2 Data Collection

3.2.1 Constructing the sample of banks

The first step in this process was to build a preliminary list of commercial banks in the US market. As Chapter 4 and 6 examine the market impact of transactional website adoption in the short-run and long-run, respectively, the sample banks are required to be listed on the stock exchange. Therefore, the source to get the sample bank list was the SNL Financial platform (SNL Financial is now a part of S&P Global Market Intelligence). Using the SNL platform, a list of commercial banks in the US that are listed on the stock exchange (as of the end of 2018) was collected.

The SNL platform portal mainly provides banking financial data rather than market data (such as stock prices), the list of banks from SNL was merged with the list of banks available on the Thompson Reuters Datastream. Afterwards, for serving the collection of other accounting data, banks that were coded with SNL and Thompson are checked and then the FDIC identification codes were collected. The FDIC platform provides comprehensive financial and demographic database. In short, the sample banks in this thesis all have three identification codes: SNL, Thompson, and FDIC.

3.2.2 The Transactional Website Adoption Date

3.2.2.1 Obtaining the URL

To set up a database related to transactional website adoption events of the sample list, URL of each sample bank was collected. As discussed, the sample banks are coded with the SNL, Thompson, and FDIC. URL addresses are mainly collected from SNL and FDIC. The URLs are also tested or added from Bloomberg, banks' website, and banks' annual reports.

3.2.2.2 The source of event dates

The database of transactional website launch events is created via the Wayback Machine. This is a digital archive maintained by the Internet Archive, via the link http://web.archive.org. The Wayback Machine periodically crawls and stores snapshots of nearly all existing websites. When the users enter a URL into the Wayback Machine, the archive returns snapshots at different points in time (“vertical surfing”) or follow links to other pages if these have been archived (“horizontal surfing”). Figure 3.1 depicts the user interface of the Wayback Machine after searching a URL.

Since the 2000s, the Wayback Machine has been widely perceived as a tool for historiographical research, especially in involving the evolution of websites (Chu et al., 2007; Curty and Zhang, 2013; Hackett and Parmanto, 2005; Holzmann et al., 2016; Kraft et al., 2003), hyperlink structures (Jalal, 2019; Kraft et al., 2003). Among them, some studies are particularly interested in the lifetime (birth, death, and life) of the websites. For example, Curty and Zhang (2013); Harmanen (2019); Koford (2009) apply Internet Archive to track the launch year of digital websites. Holzmann et al. (2016) examine the evolution of German websites by tracking their time life from the first date they appeared in the Web archive until they were last seen online.[18] De-Aguilera-Moyano et al. (2019) track the quarterly evolution of the YouTube Spain homepage from 2009 to 2018. Corsini et al. (2020) also use the Internet Archive and Wayback Machine to track the first dates the Marker projects launched.

Some studies use the Wayback Machine to collect event data. For example, Card and DellaVigna (2012) collect the event dates relevant to the policy changes of two journals in order to investigate the impact of the policies on the response of authors. By using the Wayback Machine, the authors track the dates when page limit policies were introduced as well as the dates the page limit policies were removed. After that, the impacts of the 15-month pre-policy, the 3-month period since the policy has been introduced and 9-month post-policy are investigated (see Card and DellaVigna, 2012, p. 8). Via Wayback Machine, Rakowski et al. (2021) identify 86 individual days where a documented Twitter outage occurs. Afterwards, the authors used those event dates to investigate the impact of the Twitter outage on the retail investors trading activities.

Thus, it can be seen over the past two decades, the Wayback Machine via Internet Archive has been widely used to serve research related to digitized information and website evolution. By storing important and valuable information which the organizations add or leave on their websites, the Wayback Machine allows researchers to retrieve the exact date a specific action occurred (e.g., Twitter outages), the time range of a policy since it was introduced till it was removed (page limit policy of a journal), the birthdate/death

[18] To be more specific, Holzmann et al. (2016) use Internet Archive to track the first date a website appears to estimate the domain statistics (e.g., for a domain that appears first in t_0= 04.05.2000 10:30:45, age i = 0 spans from t_0 to 04.05.2001 10:30:44)- see Holzmann et al. (2016, p. 76).

date of a website, the date a website published headline news. This thesis follows the footsteps of previous studies, using the Wayback machine to:

- Collect the date when the first snapshot of each URL appeared.[19]
- Check the archive website at the time the first snapshot appeared to check if the archived information matches the criteria about transactional website adoption.[20]

3.2.2.3 Collecting the event dates

To collect the event dates, the following steps were taken:

Firstly, URL addresses are individually typed into the Wayback Machine. For each time an URL is entered in the Wayback, the system returns a timeline of website history since the date it was activated and the list of snapshots of the URL. The first snapshot was taken as the date the website has been activated.

Secondly, the historical website at the time the first snapshot appeared to check if the archived information matches the criteria about transactional website adoption from the Wayback Machine. As discussed in Section 3.1.1, a banking website is defined as a transactional website once it allows customers to perform the most basic transactions through this website, including cash inquiry and transfer of funds. As such, for each website URL imported into the Wayback, the history page of this website is verified against its first snapshot date. The event date is considered valid only if the historical website on the snapshot date shows that the bank offered transactional services, at least funds transfer services, via its website.

To illustrate, the process taken to collect the transactional website launch of Wells Fargo is discussed. The URL website of this bank is https://www.wellsfargo.com. When entering this address into the Wayback system, the system will return the first snapshot date as December 26, 1996 (see Figure 3.1). By clicking on this snapshot date, the system will navigate to the history page of the Wells Fargo website on December 26, 1996. As can be seen in Figure 3.2, Wells Fargo's homepage shows that they have offered online banking to their customers at that date. Continuing through to Wells Fargo's online

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[19] As mentioned, Holzmann et al. (2016) defines the launch of a sample website is at the date the first snapshot appears on Internet Archive (Wayback machine).

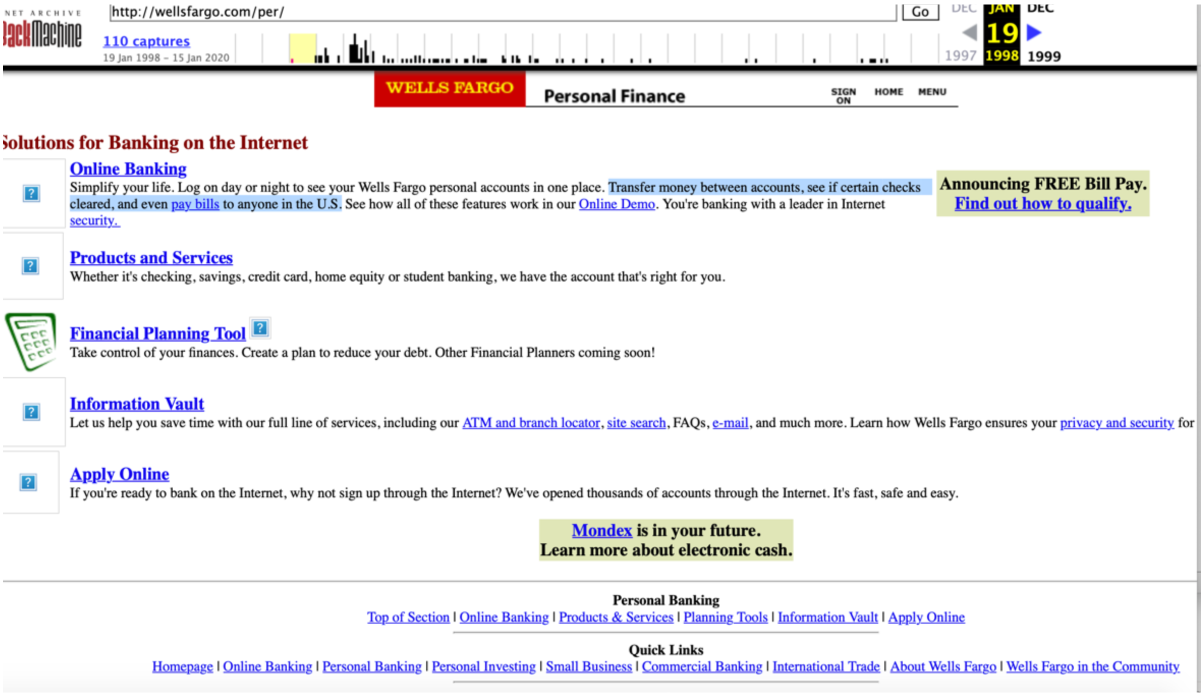
[20] Authors in Internet banking literature notice the differences between the transactional websites and the informational websites of banks (Furst et al., 2002). Therefore, I need to check the historical banking website to make sure it is a transactional website.

banking (see Figure 3.3), it shows that Wells Fargo bank has allowed their customers to transfer money between accounts, and even pay bills to anyone in the U.S. As the website of Well Fargo on December 26, 1996, matches the definition of a transactional website, December 26, 1996, is a valid event date.

Figure 3.1 Snapshots of Well Fargo website on Wayback Machine

Figure 3.2 Historical Well Fargo website page via its first snapshot on Wayback Machine (Part 1)

Figure 3.3 Historical Well Fargo website page via its first snapshot on Wayback Machine (Part 2)



3.2.2.4 The data availability

After the event dates are collected and validated, the availability of each individual sample bank is checked around its event date. In particular, this thesis focuses on the value of the transactional websites added to banks in the short-term and the long-term, and both in terms of financial and market performance. Therefore, to satisfy the conditions of the research, the banks must have:

(i) sufficient daily return observations during event windows and estimation period to estimate cumulative abnormal returns (in Chapter 4).

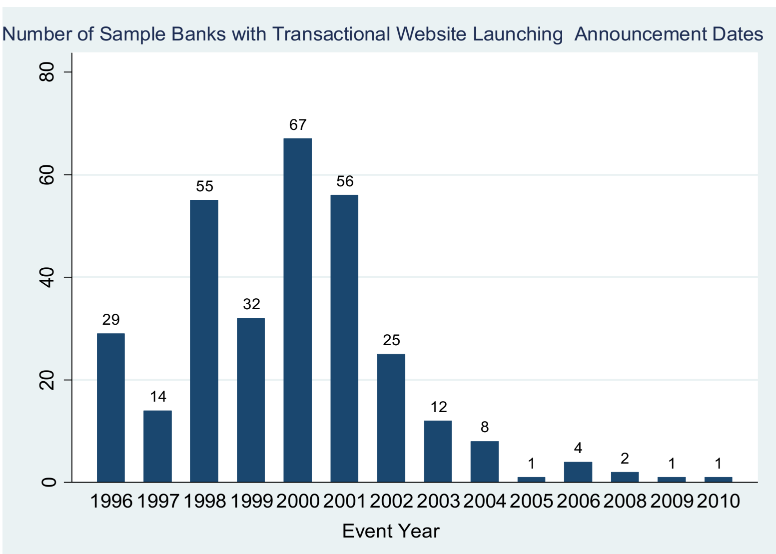
(ii) available monthly market capitalization data during the holding period (at least 12 months, 24 months, and 36 months since its event month). This condition is for the estimation of buy-and-hold abnormal returns which requires the market capitalization to rank banks into the same size portfolios (in Chapter 6).

(iii) annual accounting data, at least since the event year. It is for the examination of the impact of transactional website adoption on banks 'performance (in Chapter 5).

3.2.2.5 The final sample

The final realized sample consists of transactional website launch announcement dates for 307 US commercial banks during the 1996-2010 period. Figure 3.4 provides the characteristic profile for the sample. The sample is dominated by the 1996-1998 and 1999-2001 periods, with most financial institutions adopting transactional websites during these years (31.92% and 50.4%, respectively).

Figure 3.4 Distribution of Sample Banks by their Event Year



3.3 Data Description

Table 3.1, Table 3.2, Table 3.3 and Table 3.4 describe the characteristics as well as reveal several facts about the sample. Table 3.1 shows the size distribution of the sample banks at the time they announced their enablement of transactional websites. More precisely, sample banks are categorized into three equally distributed size portfolios. The MV1 portfolio includes 103 sample banks with the smallest capitalization, whereas the 102 largest-capitalized banks are listed in the MV3 portfolio. MV2 consists of 102 sample banks whose market size is ranked in the middle range. It brings forward from Table 3.3 that the third quantile outperformed the first and second quantiles in market capitalization values. The ratio between the average bank size in the first and second quantile is about 4.08 times, while the ratio between the first quantile and third quantile is 131 times. The third quantile is also averagely 32 times more than the second quantile in terms of market capitalization values.

Regarding the demographics of the sample banks, it is shown in Table 3.2 that more than half of the banks are state-chartered and supervised by the FDIC (50.81%). In comparison, the remaining sample banks are monitored fairly evenly by OCC (25.41%) and FRB (23.78%). Regarding the demographic characteristics of the sample banks based on their market values, it is detected that small banks are mainly managed by the FDIC (58 out of 103 banks). It is similar to the situation of the medium-sized banks in that they are also mainly managed by the FDIC (60 out of 102). Meanwhile, the charter type of largest banks has been relatively evenly allocated to national and state charter and the three regulators OCC, FIDC, and FRB. In terms of the market value of each bank charter group, due to the superiority of the market value of the largest-scaled banks, national banks have an average value of 1869.708, which is about 2.59 times the average market value of the whole sample (721.302). Although 50.81% of banks are managed by the FDIC, the market value of this group is relatively modest (206.510) and is approximately 3.49 times smaller than the average market value (721.302) as this group consists mainly of small-scale banks. The market value of the SM group is slightly less than the average value of the whole sample (594.341 compared to 721.302) and thereby indicates a cluster of medium and small-scaled banks.

The average market value and the number of banks regarding the transactional website launch time stages are depicted in Table 3.3. Definitions to describe the banking groups are consistent with prior studies. Furst et al. (2002) describe banks that launched transactional websites by 1998 as "first movers". Therefore, banks with events from 1996 to 1998, are treated in the "*first-mover*" group. "*Second-movers*" are classed if the event occurs in the year 1999 or 2000. Previous studies report that from the latter part of 1999 to spring 2000, the market experienced an extraordinary surge in the stock market caused by excessive investment into Internet-related and website-related events (Lee, 1998; Ofek and Richardson, 2003; Singhania and Girish, 2015; Walden and Browne, 2008). In this stage, stock prices reached a peak in the Autumn of 2000 before they plummeted back to the ground in late 2000 (see Figure 3.5). The "*laggards*" are banks that have adopted websites from 2001 onwards.

Table 3.3 reveals that the largest banks are most likely to be the first movers (55 out of 102), whereas the number of medium-scaled banks in all three phases is relatively even (29, 36, and 37 out of 102, respectively). Small banks tend to be the second and late adopters as they have enabled their transactional websites mostly upon the two following phases (40 and 49 out of 102, respectively).

Table 3.4 provides details on the distribution of the sample bank by state. In which, sample banks appear in a total of 48 states. The sample banks are most concentrated in the state of Pennsylvania (accounting for 11.4%) and California (accounting for 11.1%). A smaller number of banks are concentrated in Ohio (7.5%) and New York (6.8%). There are about 10-18 (3%-6% of the total sample) banks concentrated in each of Virginia, Indiana, Michigan, Georgia, Illinois, and New Jersey. Notably, there are 38/48 states where there are less than 10 banks in each state (less than 3% of the total sample). According to data from the Census (2021) from the 1990s to 2020, the state of California has always been the state with the highest population, falling approximately between 29,700,000 (1990s) – 39,500,000 (2020). Pennsylvania is also among the top 5 states with the highest population from the 1990s to the present. Several other states, such as New York, Virginia, Indiana, Michigan, Georgia, Illinois, and New Jersey are also regions with high populations (top 15 in the 1990s-2010). Some states with a low number of sample banks, such as Wyoming, Vermont, and Utah, are among the least populated.

Table 3.1 Sample Size Distribution

Table 3.1 shows the size distribution of the 307 sample banks based on their market value at the time they launch the website (within -1, +1 event window). Sample banks fall in the three same size quantiles based on their market values. Smallest-sized banks include banks with the smallest market value, and Largest-sized banks include banks with the largest market value. The values are expressed as million $ and collected monthly via Thompson Securities Data. Mean = the average value of the market value of each size-based group. % Adopter = the number of banks in each size-based group as a per cent of the total number of sample banks.

Size-based portfolio	Mean	Std	Min	Max	N	%N
Smallest banks	15.950	7.473	3.520	29.140	103	33.55%
Medium banks	65.174	25.926	29.370	123.240	102	33.22%
Largest banks	2089.697	5343.389	130.810	37354.070	102	33.22%
Mean	721.302	3218.592	3.520	37354.070	307	100%

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Table 3.2 Bank Charter and Size Distribution

Table 3.2 shows the distribution of the 307 sample banks based on their size-based group and charter type. Sample banks are categorized into three different size portfolios and three different bank charter types. Sample banks fall in the three same size quantiles based on their market values. Smallest-sized banks include banks with the smallest market value, and largest-sized banks include banks with the largest market value. Banks are classified into group N if they are nationally chartered and supervised by OCC. NM is a group of banks that are state-chartered and supervised by FDIC. State charter banks that are supervised by FRB are classified into the SM group. The data of market value is expressed as million $ and collected monthly via Thompson Securities Data. The data of banks' charter type is collected via FIDC. The size distribution is based on the average market value of sample banks within the three-day event window (-1+1). N= Number of adopters, %N = % of adopters. FIDC- Federal Deposit Insurance Corporation, OCC-The Office of the Comptroller of the Currency, FRB-Federal Reserve Bank.

	Bank Charter								
Size-based portfolio	**N**			**NM**			**SM**		
	Mean	N	%N	Mean	N	%N	Mean	N	%N
Smallest banks	17.559	21	6.84%	15.691	58	18.89%	15.167	24	7.82%
Medium banks	68.427	20	6.51%	61.581	60	19.54%	72.015	22	7.17%
Largest banks	3894.593	37	12.05%	726.595	38	12.38%	1534.762	27	8.79%
N	1869.708	78	25.41%	206.510	156	50.81%	594.341	73	23.78%

Table 3.3 Event date and Bank size Distribution

Table 3.3 shows the size-based distribution sample bank size over the 1996-2010 period. Sample banks are categorized into three different size portfolios and three different event periods. Sample banks fall in the three same size quantiles based on their market values. The smallest-sized group includes banks with the smallest market value, and the largest-sized group includes banks with the most massive market value. Sample banks are also categorized into three different event year periods: 1996-1998, 1999-2000, and after 2000. The size distribution is based on the average market value of sample banks within the 3-day event window (-1, +1). The data is express as million $ and collected monthly via Thompson Securities Data. The cut-off years are also inspired by the arguments of Furst et al. (2002) who describes the banks who launched transactional website by 1998 as "first movers", by authors who describe the period of 1999- 2000 as hot bubble period (Lee, 1998; Ofek and Richardson, 2003; Singhania and Girish, 2015; Walden and Browne, 2008) and authors who describe the period after 2000 as information avalanche (Dehning et al., 2004; Lee, 1998).

	First movers			**Second movers**			**Laggards**		
Event year	(1996-1998)			(1999-2000)			(After 2000)		
	Mean	**N**	**%**	**Mean**	**N**	**%**	**Mean**	**N**	**%**
Smallest banks	18.084	14	4.56%	14.643	40	13.03%	16.407	49	15.96%
Medium banks	73.494	29	9.45%	65.399	36	11.73%	58.434	37	12.05%
Largest banks	3265.607	55	17.92%	998.909	23	7.49%	440.242	24	7.82%
N	1857.071	98	31.92%	261.768	99	32.25%	123.017	110	35.83%

Table 3.4 Count of financial institutions by state, as of March 31, 2020

Table 3.4 shows the distribution of sample banks based on their state location. The state information of sample banks was collected via FDIC and Market Intelligence. The last check was as of March 31, 2020.

State code	State name	Number of banks	State code	State name	Number of banks
CO	Colorado	1	WI	Wisconsin	3
DC	District of Columbia	1	CT	Connecticut	4
ID	Idaho	1	KY	Kentucky	4
KS	Kansas	1	OR	Oregon	4
MN	Minnesota	1	WA	Washington	4
ND	North Dakota	1	AL	Alabama	5
NE	Nebraska	1	LA	Louisiana	5
NH	New Hampshire	1	MS	Mississippi	5
RI	Rhode Island	1	TX	Texas	5
SD	South Dakota	1	SC	South Carolina	6
UT	Utah	1	NC	North Carolina	7
VT	Vermont	1	MD	Maryland	8
WY	Wyoming	1	MO	Missouri	8
AK	Alaska	2	WV	West Virginia	8
AR	Arkansas	2	IL	Illinois	10
HI	Hawaii	2	NJ	New Jersey	10
MT	Montana	2	GA	Georgia	11
OK	Oklahoma	2	MI	Michigan	13
FL	Florida	3	IN	Indiana	15
IA	Iowa	3	VA	Virginia	18
MA	Massachusetts	3	NY	New York	21
ME	Maine	3	OH	Ohio	23
PR	Puerto Rico	3	CA	California	34
TN	Tennessee	3	PA	Pennsylvania	35

Figure 3.5 Returns on equally weighted Internet index, S&P500, and Nasdaq composite

Figure 1. Returns on equally weighted Internet index, S&P 500 and Nasdaq composite. Comparison of index levels of the equally weighted Internet index, the S&P 500 index, and the Nasdaq composite index for the period 1/1/1998–12/31/2000. All three indexes are scaled to be 100 on 12/31/1997.

Source: Ofek and Richardson (2003, p. 1116)

3.4 Some Important Considerations

3.4.1 Market reaction to the transactional website adoption

In Chapter 4, a short-term event study is conducted to examine the impact of transactional website adoption on the share prices of the banks. According to Efficient Market Hypothesis (EMH, Fama, 1970) when new information comes to the market, prices will reflect this new information very quickly. If the information is previously unknown (i.e., the information is new) and reflects either an increase or decrease in firm value, then prices will react accordingly with immediate effect. In terms of the objectives of Chapter 4, according to EMH if the market value of the banks reacts to the transactional website adoption (either positively or negatively), then this is signalling that market participants are tracking the adoption and evaluating this information as being important and that it this information is new, as it wasn't previously priced.

It's possible that there have been prior announcements from all or some of the sample banks on their intention to adopt the transactional website, and according to EMH, this information will already be reflected in the banks' market value. The data collection for the event date is explained in Section 3.2.2.3, and unfortunately, it hasn't been possible to collect information on whether there have been any pre-event announcements. The results of the short-term event study analysis in Chapter 4 will show whether there are abnormal returns immediately surrounding the transactional website adoption date. Some possible results from the event study are as follows: (a) if significant abnormal returns are found in the short-term event windows, then according to EMH this indicates that the transactional website adoption is releasing new and valuable information to the market; (b) the abnormal returns are insignificant, therefore it may be because the transactional website adoption is already reflected in market prices due to pre-adoption announcements and/or anticipation; and (c) it may be the case that there have been pre-adoption announcements and/or anticipation of the transactional website adoption, and significant abnormal returns are still found. A limitation of the short-term event study methodology employed in Chapter 4 is that it won't be possible to distinguish between conclusion (a) or (c), assuming significant abnormal returns are found. But if (a) or (c) is the conclusion, then it will yield an important insight into the informational content of transactional website adoption and will be evidence that market participants are actively observing/tracking the implementation of this technology in the banking sector.

Another important consideration is that the banks' transactional websites will be in constant development over time, i.e., after the initial adoption it's likely that the website will be subject to updating, with new features and layouts being implemented. This thesis is focused on the initial adoption date and does not consider any specific developments to the transactional website that follows. In Chapter 4, this is of little concern, as the aim is to examine the immediate impact of the website adoption. According to Benbunan-Fich and Fich (2005), the market doesn't react to website redesigns, and so I wouldn't expect to see any immediate market reaction to any developments to the existing transactional website. The long-term impact of the transactional website adoption is examined in Chapters 5 and 6, and it is acknowledged the lack of data and analysis on any further development in the transactional websites following the initial adoption is a limitation.

3.4.2 Banks's pre-announcements

Before banks launch the transactional websites, they may have already put in place advertising strategies to announce their upcoming transactional website launch. Mishra and Bhabra (2001) argue that the pre/intended announcement is an independent action and can be distinguished from the actual announcement. More specifically, they state: "*While the existing literature focuses on actual product launch announcements, relatively little research attention has been directed toward understanding the economic impact of intended product launches*" (Mishra and Bhabra, 2001, p.74). Mishra and Bhabra (2001) also claim that the pre-announcement tend to be taken from a few weeks to a few months before the actual announcement. In the same vein, Eliashberg and Robertson (1988, p.282) emphasize that pre-announcement is a "*formal, deliberate communication*" before a firm actually launches into a particular action.

The pre-announcement action, on the one hand, can achieve its desired effects. For example, Farrell (1987) shows that pre-announcements tend to negatively affect the decisions of entering the market of other competitors. Furthermore, preannouncing may also give the first-mover firm the positive benefit by positioning its product in the most profitable segment and to re-allocate less lucrative segments to later market entrants (Eliashberg and Robertson, 1988). The pre-announcing action may also grab positive attention from the market if it contains convincing information (Mishra and Bhabra, 2001). By contrast, if the pre-event announcement did not contain much information, it is likely to be ignored by the stock market (Mishra and Bhabra, 2001). Also, the pre-announcement may also affect stock price negatively if it was deliberately designed to mislead the market (Mishra and Bhabra, 2001). In short, the pre-announcement action may have mixed impacts on firms' prices, as shown by literature.

In the case of the transactional website adoption, as discussed, the banks may have a "pre-launch announcement" to get the notice from the market or earn some competitive advantages. The information of "*pre-launch announcement*" would be about the bank's "*upcoming transactional website*" or "*intended transactional website*". Therefore, any pricing on "*pre-launch announcement*", if any, is based on the "intended transactional website" information rather than "actual transactional website" information. Indeed, according to the efficient market hypothesis, any information that is put on the market will be immediately and accurately evaluated. Therefore, the pricing on two different pieces of information: "*an intended transactional website*" and "*an actual transactional website*" could be well separated. Furthermore, the pre-event announcement is admitted as a deliberate event and the pricing on a pre-event announcement is also studied independently in literature (Eliashberg and Robertson, 1988; Mishra and Bhabra, 2001).

Within some certain limits, this thesis only focuses on the pricing (if any) on the "*actual transactional website launch"*, as followed by numerous studies. The examination is also extended to a couple of days prior to the event date (-1 day, -3 days, -5 days) in order to cover any information leak prior to the actual event, as following literature. More discussion on this construction is provided in Chapter 4, especially Section 4.3.2-Methodology.

3.4.3 Survivorship bias

Another issue considered in this thesis is the survivor bias. It is well established in financial research that ignoring delisted companies when conducting historical research leads to survivorship bias in results (Gilbert and Strugnell, 2010; Rohleder et al., 2011). This bias results from the use of a data set that consists of the survivors over a period, not the full set of companies that were listed over this period. As the characteristics of the survivors are likely to differ systematically from those who have delisted, the results of such a study will be biased. It can lead to overly optimistic beliefs as the failures are ignored (such as when companies that no longer exist are excluded from the analyses of financial performance). It can also lead to the false belief that the successes in a group have some special property, rather than just coincidence (Rohleder et al., 2011).

However, collecting data for delisted companies is a time-consuming and expensive process (Gilbert and Strugnell, 2010). Due to the limitation of the database as well as the rigours of the methodology, this thesis focuses only on the sample banks which survive during the full research period from 1996 to 2018. The banks which delisted before 2018 or/and banks with insufficient data are excluded from the final sample. Thus, it's acknowledged that survivorship bias is a limitation within the sample.

3.4.4 M&A activities

It's possible that M&A activities are present in the sample of banks in this thesis. Due to the different methodologies applied in Chapters 4, 5 and 6, the potential issue of M&A activities is addressed as follows:

1. Mainly related to the short-run event study in Chapter 4, a manual check of whether any M&A events occur during the event window has been conducted. In this thesis, short-term event windows (3 days, 5 days, and 7 days) are applied. Therefore, for each sample bank, seven days (-3, +3) surrounding the transactional website launching event have been checked.

The historical event data relevant to M&A of sample banks has been tracked at the FDIC platform via the link https://banks.data.fdic.gov/bankfind-suite/bankfind. For each FDIC cert that is inserted, the FDIC system will return the specific dates of the events related to the M&A activities of each bank.

Following the manual check, it is confirmed that none of the banks in the sample had any M&A activity within the 7 days (-3, +3) surrounding its event. As such, in the short term, transactional website adoption events of the sample banks are not affected by any M&A activity.

2. Related to the study conducted in Chapter 5, I have been unable to collect the data required to check for M&A activity for the sample banks. Therefore, I acknowledge that there is a limitation with regards to this.

3. In the long run event study in Chapter 6, various benchmark portfolios are tested for in the buy-and-hold abnormal returns. One of the portfolios is constructed using a matched portfolio approach (following Barber and Lyon, 1997a; Ikenberry et al., 1995), therefore, each bank's performance (treated bank) is compared with banks of similar characteristics (control banks). In this methodology both the treated bank and the control bank should have an equal probability of other events occurring within the

holding period. Therefore, the concerns surrounding M&A related events are minimised with this approach. Barber and Lyon (1997a) show that matching to a control firm based on similar characteristics can eliminate many biases that may be in the sample.

With respect to the presence of Bank Holding Companies (BHCs) having an effect in the sample, I acknowledge that it's been beyond the scope of this thesis to examine this and therefore is a limitation.

4 Chapter 4: Do Transactional Website Initiatives Add Value to Banks?

4.1 Introduction

The impact of transactional website adoption on banks is not a new topic. Since the first transactional websites were adopted, research of their influence on financial performances and customer outcomes of bank enterprises has been undertaken. What is mainly found in literature is the actual improvement of banks' performance attributed to their transactional website adoption, especially the increment in *profitability and efficiency* (Al-Hawari and Ward, 2006; Ciciretti et al., 2009; DeYoung, 2005; Furst et al., 2002; Goh and Kauffman, 2015; Mbama and Ezepue, 2018; Momparler et al., 2013; Pigni et al., 2002; Scott et al., 2017; Sullivan, 2000; Xue et al., 2007) and enhancement in *customer outcomes* (Dabholkar, 1996; Hitt and Frei, 2002; Xue et al., 2007, 2011).

Unfortunately, up to this point, how investors and the market react towards digital-related events in the banking industry in general and transactional website launching events, in particular, is still untapped in the literature. The aim of this chapter is to examine the market impact of transactional website adoption on banks' share prices.

This chapter, therefore, has been developed on the basis of two vital motivations:

- The essentials of getting insights into the wealth of digital-based initiatives conferred on financial institutions' performance, especially in short run, and
- The lack of studies on the role of market evaluations in assessing the value of transactional website enablement added to institutions.

The aim of this chapter is to answer the research question "*Do the transactional website launching events gain a significant response from the market in the short term? If applicable, what story about the transactional website adoption would be revealed*?"

More specifically, this chapter aims to achieve the following specific research objectives:

- Investigate the cumulative excess returns immediately gained by banks around their transactional website-enabled announcements.
- Inquire into the moderating effects that possibly differentiate performances among banks as well as alter the way the market reacts to the transactional website announcements, including the *magnitude effect* (or *size effect*) and *timing order effect*.

To facilitate the research objectives, this chapter firstly looks for a positive market-based reaction that is significantly beneficial to the institutions following their transactional website launch. The main hypothesis in this chapter is based on the interaction of several theoretical perspectives, including *the resource-based view* (Amit and Schoemaker, 1993; Barney, 1991; Grant, 1991b; Peteraf, 1993), *efficient market hypothesis* (see Fama, 1970, 1995; Fama et al., 1969; Malkiel, 2003; Samuelson, 2016), and *market signalling perspective* (Arthurs et al., 2009; Campbel and Kracaw, 1980; Connelly et al., 2011; Fama et al., 1969; Herbig, 1996; Park and Mezias, 2005; Spence, 1978, 2002).

It is also worth noting the argument that there are alternative factors that need to be considered as they possibly impact the innovation-performance nexus (e*.g., the type of innovation, the intensity of competition, or/and the timing of the innovation* -Koellinger (2008)). This chapter expects heterogeneity in the market reaction in different periods attributing to the *differentiated competitive advantages of the first movers* from their followers (Alpert and Kamins, 1995; Chatterjee and Pacini, 2002; Dehning et al., 2003; Dos Santos and Peffers, 1995; Jarvenpaa and Todd, 1996; Kalyanaram and Urban, 1992; Lieberman and Montgomery, 1988; Lilien and Yoon, 1990; Mascarenhas, 1992a, 1992b; Tufano, 1989). This chapter also pays special attention to market conditions, i.e. *bubble period* (Cipriani and Guarino, 2013; Lee, 1998; Ofek and Richardson, 2003) and *informational avalanche* (Dehning et al., 2004; Lee, 1998) as they are perceived to significantly influence investors' behaviour (Docking and Koch, 2005; Veronesi, 1999). Concerning *size effect*, in a short-run horizon investigation, this chapter is based on the perspective of *information asymmetry* (Atiase, 1985; Bamber, 1987; Freeman, 1987; Llorente et al., 2002), *heterogeneity and specificity in inter-firm competitive advantages* (Barney, 1996; Cainelli and Ganau, 2019; Jin et al., 2019; Rosen, 1991). These perspectives enable this chapter to expect the cross-sectional variation in market response to website-enabled announcements of different firm size classifications.

To achieve the research objectives, event study methodology is employed to estimate the Cumulative Abnormal Return (CAR) metric, based on the original data of 307 fully listed commercial banks in the US. The event study methodology is widely used in many business disciplines to facilitate investigations of the impact of managerial decision-making, shareholder initiatives, and other economic factors on the basis of the creation or destruction of firm value.

The event study method is widely accepted as a powerful tool because it enables the ability to predict future benefit streams occurring from initiatives announced by firms. The event study is operated by summing up the incremental future cash flows expected from the firm's announcement, which are discounted to the current period. Thus, for the sake of forward-looking objectives, this approach is appropriate for predicting the influence of a particular event on organizational performance.

To the best of my knowledge, there are several important areas where this study makes an original contribution.

Firstly, in terms of data, this chapter provides original manually collected data on transactional website launch event dates of 307 commercial banks listed on the US market (see Chapter 3 for further details on the data collection). As discussed in Chapter 2, Section 2.3, so far there are three main streams of literature relating to the digital banking discipline: (i) *the features of digital adoption which significantly influence customers' behaviour*, (ii) *the impact of digital adoption on the general performance of banks, especially on customer outcomes*, and (iii) *the impact of digital adoption on the financial performance of banks*. Little attention has been paid in the literature to the market value of digital-related initiatives added to banks which are evaluated by market and investors. According to the efficient market hypothesis and relevant empirical work, market and investors can detect and evaluate the intrinsic value of a certain investment added to a corporation, in the most immediately and accurately manner (Fama, 1970, 1998, 2021; Malkiel, 1989). Furthermore, the evaluation of market and investors can also transmit the information of firm's future earning prospect (Brav and Gompers, 1997a; Cole, 1980; Fama, 1995; Timmermann and Granger, 2004). However, to date, there has been no official database providing data of digital banking adoption events, making the evaluation of digital adoptions under the market perspective difficult and scarce in digital banking literature. The event data of this chapter, therefore, makes the original contribution to enabling the evaluation of the market and investors towards a digital-related banking adoption.

Secondly, in terms of research methodology, on the strength of event data, this chapter is one of the first studies that apply the event study methodology to assess a digital-related activity in the banking sector. It is challenging for accounting measures to immediately reflect the value of the transactional website adoption. It is because accounting-based metrics suffer the low frequencies as reported periodically (Ball and Gallo, 2018). By contrast, capital markets are featured of a round-the-clock flow of information and therefore, the economic data is observed at relatively high frequencies (e.g., daily stock returns) (Ball and Gallo, 2018). Therefore, the market-based approach can capture the value of any information available to market in a timely manner. Furthermore, event study methodology can isolate the value-added of a particular event from other activities (MacKinlay, 1997; Weekenborg, 2018). Some theories argue that intangible value may be invisible in financial indicators (Itami and Roehl, 1991). Meanwhile, market-based performance measures integrate all relevant information and therefore, unlike accounting-based measures, they are not restricted in any single scope of firm performance (Lubatkin and Shrieves, 1986, p. 499). Additionally, market participants can be better positioned than insiders to analyse what issues are relevant to the firm's actions (e.g., international, macro-economic- see Luo, 2005).

Thirdly, in terms of findings and implications, this chapter provides new evidence about the value of transactional website adoption conferred on banks, especially for banks' shareholders. To be more specific, the results show that banks immediately earn significant excess returns by launching their websites, and thereby, enhancing their market performance and shareholder value. Previous studies prove that the transactional website adoption significantly delivers value to customers and financial performance of banks. However, the evidence does not explicitly and directly prove if the shareholders' value can be gained by transactional website investment. For example, providing customer satisfaction does not automatically convert into shareholder value, as suggested by Rappaport (1999, p. 8). Furthermore, Johnson et al. (1985, p. 52) argue that financial ratios are not perfect proxies for shareholder wealth creation. The results remain consistent when testing for the *magnitude effect* and *timing order* effect.

Furthermore, as prior to this study the banking literature lacks evidence of any immediate market value added from transactional website adoption, it is hard for banks and their managers to set up their capital strategy in following the adoption. The banks and managers might need to know if it is easy to raise capital to pursue their long-term goal relevant to transactional websites. By proving that transactional website has immediate benefits in terms of market valuation, banks can understand that they can be freed-up from the mandatory spending and improve access to capital to maintain their long-term goal.[21]

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[21] For example, according to DeYoung (2007), small banks since the advent of Internet tend to focus on high-value-added transactions (e.g. person-to-person services). Compared to the large banks, it seems to be harder for small Internet banks to gain the economics of scale advantages. Small banks, therefore, need a healthy capital budget to pursue their strategy. The enhancement in market value of transactional website

Finally, this chapter provides an original conceptual model which combines three theoretical linkages: resource-based view, efficient market hypothesis and market signalling perspective in digital banking discipline. Based on the theory of resource-based view and market signalling, firstly, the model suggests that resources from the digital-related adoptions are positive signals for the market. Potential signals proposed are superior performance, potential growth and sustainability and competitive advantages, which are based on numerous studies on digital adoption in other disciplines. Subsequently, the efficient market hypothesis and market signalling perspective allow the explanations of the mechanisms by which investors react to the signals of the digital banking adoption events.

The remainder of this chapter is organized as follows. Section 4.2 provides a brief overview of the relevant theoretical perspectives and empirical findings. This is followed by the research methodology, data collection design, description, empirical findings, and discussions. Section 4.6 is the conclusion, which includes a summary of the findings, discussions of theoretical and managerial implications, and the directions for further research.

4.2 Literature review and hypothesis development

4.2.1 The impact of digital initiatives on the market value of banks

There are three main literature streams relating to digitalization that support the hypotheses, namely, the banking literature, resource-based literature, and market-based literature.

Firstly, regarding the scope of digitalization in the banking industry, numerous studies have attempted to estimate the role of digital adoption in influencing the performance of financial institutions. In general, it's found that the launch of digital initiatives and diffusion improve banks' performance significantly, especially in terms of (i) *customer outcomes* (Ahmad and Al-Zu'bi, 2011; Buell et al., 2010; Dabholkar, 1996; Firdous and Farooqi, 2017; Hitt and Frei, 2002; Mann and Sahni, 2011; Mbama and Ezepue, 2018; Xu et al., 2013; Xue et al., 2011), (ii) *profitability* and (iii) *efficiency and effectiveness* (Al-Hawari and Ward, 2006; Ciciretti et al., 2009; Delgado et al., 2007; DeYoung, 2005;

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investment in the short term can help small banks maintain their capital and have opportunity to raise capital for their long-term goals.

DeYoung et al., 2007; Furst et al., 2002; Goh and Kauffman, 2015; Hernando and Nieto, 2007; Mbama and Ezepue, 2018; Momparler et al., 2013; Pigni et al., 2002; Scott et al., 2017; Sullivan, 2000; Xue et al., 2007). It is thereby indicated by the banking literature that there are two critical determinants of the level of banks' performance when going digital; those are (i) *new value creation and capture* and (ii) *effectiveness and efficiency synergy*.

As an example, the embracement of digital transformation potentially rewards banks with an enhancement in customer value. It is most likely because digital technologies and solutions possess strategic characteristics that can satisfy the expectations and perceptions of customers (e.g., ease of use, usefulness, safety, and so forth).[22] Accordingly, digital transformations are highly likely to exert a positive influence on consumer behaviour in using and diversifying their digital banking activities, increasing customer retention rate, and deepening the relationship between customers and their banking service providers. Regarding banks themselves, going digital enables banks to capture new value by diversifying their revenue streams through a broader range of services offered in both offline and online channels (e.g., deposits, borrowing, investment, and trading), via mixed business strategies (cross-selling, non-financial partners), and through the integration of delivery channels (e.g., smart ATM, web-based banking, mobile banking; digital application, contact centres). The digital revolution also has significant implications for banks in the endowment of a preferred streamlined process, "*learning by experience*" capability, as well as lessening human errors.

Secondly, it is supported by resource-based literature that digital enablement significantly endows firms with strategic resources and capabilities. Put in the language of traditional theorists, strategic resources and capabilities are the fundamental sources of sustainable competitive advantage and superior performance (Amit and Schoemaker, 1993; Dierickx and Cool, 1989; Grant, 1991b; Hansen and Wernerfelt, 1989; Prahalad and Hamel, 1997; Wernerfelt, 1984). Re-affirmed in recent empirical studies, digital adoption is found to be positively linked with firms' superior performance, such as in terms of *customer service performance* (Rai et al., 2006; Setia et al., 2013)*, operational efficiency, and effectiveness* (Rai et al., 2006)*, financial performance* (Alexandru et al., 2019;

[22] Please refer to Section 2.3.1 for further discussions about strategic attributes of digital adoption.

Homburg et al., 2019; Mbama and Ezepue, 2018), *market return performance* (McAlister et al., 2012). The resource-based view suggests that by embracing digitalization, banks are given rewards in strategic resources and capabilities (*e.g., digital culture; digital knowledge-based; sense-making capabilities, dynamic capabilities; integration and agility capability*) which is always of great value to improve the likelihood of success. Finally, regarding the impact of digital adoption on the market value of banks, despite the scarcity of relevant research in banking literature, this hypothesis is still supported by studies from other fields. In general, convincing evidence shows that by launching digital solutions or implementing innovations, firms are likely to gain the positive evaluation of the market and earn positive abnormal returns (Andoh-Baidoo et al., 2012; Chatterjee et al., 2001; Drechsler et al., 2019; Im et al., 2001; Li and Huang, 2012; Sears and Hoetker, 2014; Sternal and Schiereck, 2019). To explain the value of digital activities conferred on banks as well as the rationality of market evaluation, scholars tend to favour an approach independent or parallel to the basis of the market signalling perspective and resource-based view. Put concisely, on the one hand, the studies strongly believe that digital-related activities actually possess strategic resources and capabilities. Therefore, the value of the digital-related activities is likely to be accurately and immediately to be incorporated into market prices. On the other hand, scholars are convinced that digital embracement has given attractive signals to investors as a potential portfolio, and thus tend to gain positive reactions from the market. Such standpoints suggest three benefits of digital adoption that potentially induce an enhancement of the market value of banks by promoting internal performance as well as attracting investors. Those are (i) *superior performance,* (ii) *competitive advantage*, and (iii) *potential growth and sustainability*, as illustrated in Figure 4.1.

Hypothesis 4.1: Wealth creation of transactional website launch events over the short term

Banks earn significant positive abnormal returns immediately upon their transactional website events.

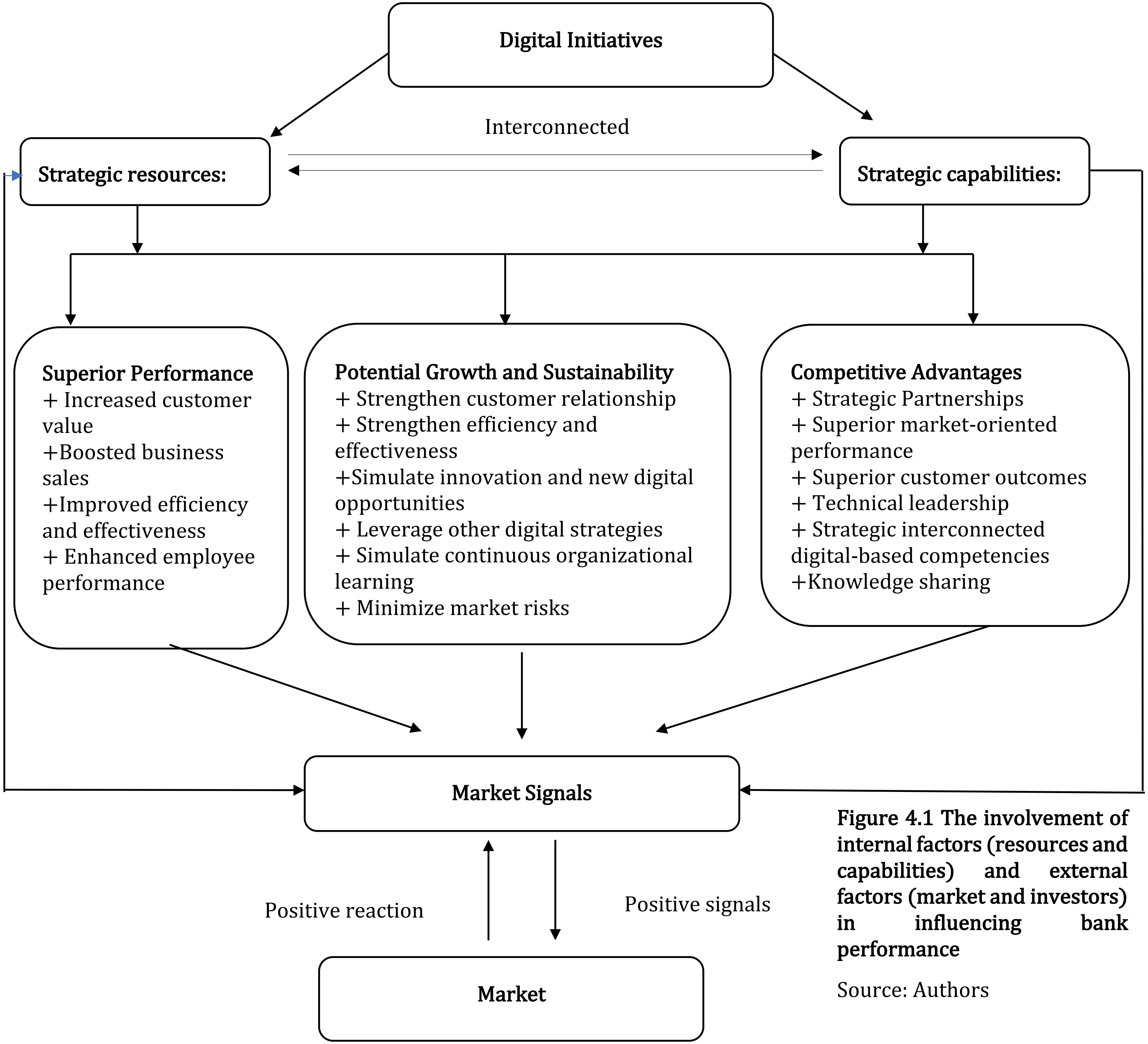

Figure 4.1 The involvement of internal factors (resources and capabilities) and external factors (market and investors) in influencing bank performance

Source: Authors

4.2.2 The Magnitude Effect

A substantial body of research has noted that returns are affected by several compounding effects (such as *industry, timing, company size, dividend yield, the maturity of the company*) as well as a wide variety of other factors depending on the particular research discipline. Regarding the company size, from the viewpoint of financial economists, efficient market models are found to be incorrect when the size effect is ignored (Dimson and Marsh, 1986; Reinganum, 1981). The first evidence of the existence of the size effect is probably given by Banz (1981) and Reinganum (1981). They show that common stocks of small-capitalization firms are likely to produce considerably higher returns than common stocks of large peers after taking risk into account. The research of Banz (1981) and Reinganum (1981) has caught the attention of numerous scholars afterwards. They have attempted to show further evidence of size-related anomalies (Basu, 1983; Brown et al., 1983; Keim, 1983) or propose an economic explanation for this phenomenon (Reinganum, 1983; Roll, 1983; Schultz, 1983; Stoll and Whaley, 1983). Collectively, these studies highlight the need for taking size factors into account when evaluating firms' market performance.

To explain the heterogeneity of market reaction to the announcements of firms in different size groups, scholars tend to advocate the information asymmetry hypothesis which uses firm size as a proxy of information available to the public (Atiase, 1985; Bamber, 1987; Freeman, 1987; Llorente et al., 2002). More specifically, large firms are perceived as more visible, whereas smaller firms seem to be less visible to the market. Therefore, inter-firm heterogeneity in earning excess returns may prevail because the amount of time used to evaluate the true nature of the signals sent by small banks and large banks might be different. As the small banks are less visible, it may take more time for the market to fully react to their events. Empirically, a lot of evidence has shown differentiation in market reaction among the events of small firms and larger firms due to asymmetries in information (Chaney et al., 1991; Filbeck and Webb, 2001; Im et al., 2001; Slovin et al., 1992; Sternal and Schiereck, 2019; Xia et al., 2016).

Nevertheless, the differential information effect may only partly reflect the difference in earnings gained by differently sized firms (Barry and Brown, 1984). Given that the market ability to assess and predict the value-enhancing prospects of news, the heterogeneity of the reaction is likely to be induced from firm-specific advantages. The resource-based view, innovation theory, and other relevant literature suggest that firms

have both advantages and challenges in implementing their strategies. For example, large firms might benefit from economies of scale, predominance in R&D, and the profusion of resources and capabilities (Nooteboom, 1994; Rothwell and Dodgson, 1994) whereas small enterprises are better positioned in opportunity-seeking skills (Ketchen et al., 2007) and agile and dynamic capabilities (Chen and Hambrick, 1995; Dean et al., 1998; Nooteboom, 1994). Therefore, the way investors react to events may build upon how they envisage the future cash flows and potential benefits of the idiosyncratic advantage of each firm's size, rather than merely because the firms are large or small.
In this manner, this hypothesis proposes that:

Hypothesis 4.2: The magnitude effect in the short-term upon a transactional website launch event.

There exists heterogeneity in cumulative abnormal returns among banks of different sizes.

4.2.3 The Influence of the Timing Effect

As was analysed in Hypothesis 4.1: Wealth creation of transactional website launch events over the short term, the academic world has witnessed an enormous amount of research that documents good evidence for the existence of a market reaction towards disclosures of enterprises. These findings, generally in favour of the efficient market hypothesis, spotlight the power of the market in assessing the worth of firms involving their proclamations, when conveyed unexpectedly to the public. Nevertheless, studies from the market-based perspective have also underscored a lack of stability in market reaction metrics to firms' announcements over different periods (Konchitchki and O'Leary, 2011). This non-stability has sparked the interest of scholars in discovering the potential explanatory power of the time factor during the return yielding process. This research, accordingly, is also motivated to examine whether the time factor critically varies the market values of firms added from their digital initiatives.
In order to justify market discrepancies in reacting and evaluating digital banking initiatives, several theories that explain the financial behaviour and motives of investors are applied, such as *first-mover advantage, hot bubble, market turbulence,* and *information avalanche.*

What is considered first is whether investors show any significant attentiveness towards first movers. First movers in this study are banks that are among the first to adopt the transactional websites. In literature, scholars have expressed enormous regard for the potential reward of being the first mover in an innovative strategy. Some distinct first-mover advantages are *learning-by-doing* differentiation (Lieberman and Montgomery, 1988), *market share enhancement* (Mascarenhas, 1992a, 1992b; Tufano, 1989), *customer satisfaction and purchase retention* (Alpert and Kamins, 1995; Kalyanaram and Urban, 1992), *cost savings* (Jarvenpaa and Todd, 1996). Therefore, the first adopters may gain a significantly positive evaluation from the market. Some of the authors have demonstrated positive abnormal returns earned by first movers around their announcements in the high-tech industry (Zantout and Chaganti, 1996), new/ innovative products (Lee et al., 2000), R&D expenditure plan (Zantout and Tsetsekos, 1994), corporate capital investment (Chen and Su, 2010).

Although there is a lot of explicit evidence in support of the first-mover advantage theory, there also is a good deal of confirmation for a reversal that significantly advocates the outperformance of followers. More concretely, such evidence argues that it's the followers and not the first movers that get higher appreciation in the market. This is due to a number of advantages that the following entrants can achieve, especially learning from their predecessors or rivals in order to reduce or avoid mistakes, innovating and seeking out unconventional solutions (Baldwin and Childs, 1969; Drucker, 1985; Hege and Hennessy, 2010; Zach et al., 2020). The followers may also benefit by waiting until critical technological and market difficulties have been resolved (Lieberman, 1987; Lieberman and Montgomery, 1988; Utterback, 1994).[23]

Moreover, during the period of information shifting from cascade to avalanche, investors tend to have access to more widely available information from the recent past which may influence how they evaluate the value of same-content announcements in the present.[24] Therefore, the followers can completely overpower first movers and earn greater excess returns if investors are aware of the superior performance attributed to the

[23] Some theorists define this advantage of following movers as free-rider advantage.

[24] Dehning et al. (2004) claimed that the more complete information was available since 2000 and was represented as an informational avalanche after the Dotcom bubble.

announcement.[25] Conversely, in the scenario of a cascade of information where the first movers are still held as new phenomena, investment in first-mover firms may be fraught with reservations.[26] Some empirical studies that support followers' advantage are relevant to the announcements of the *food and drug administration* (Sarkar and de Jong, 2006), *social media adoption* (Cummings et al., 2018).[27]

It's important to mention that the 1999- 2000 period witnessed catastrophic volatility in prices due to the dot-com bubble phenomenon (Lee, 1998; Ofek and Richardson, 2003; Singhania and Girish, 2015; Walden and Browne, 2008). A good amount of evidence has also shown that market volatility can significantly influence investor preferences and decision-making (Dehning et al., 2004; Docking and Koch, 2005; Veronesi, 1999).

Therefore, this hypothesis proposes that the reaction of the market and investors towards transactional website events during this period would be more volatile and complex.

Hypothesis 4.3: Timing Effect *The market reacts differently towards website-launch events depending on the time the events are announced.*

4.3 Data and Methodology

4.3.1 Data

As mentioned in Chapter 3, the final sample includes 307 US banks listed on the stock exchange as of December 2018. Please refer to Chapter 3, especially in Sections 3.2 and 3.3 for more information on collecting and screening the data as well as the statistic description of the sample banks.

In this chapter, the market model is applied to estimate short-run abnormal returns the banks may earn from their transactional website launch event. Therefore, the daily closing price index of 307 banks, as well as the daily closing prices of a market index are

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[25] Some authors (DeLong and DeYoung, 2007; Francis et al., 2014; Liang et al., 2021) found that there exist the "learning-by-observing" behaviour of the investors. More specially, the past event information can help the investors better learn and identify the value of the same current events.

[26] For instance, Sarkar and de Jong (2006) found negative abnormal returns surrounding food and drug administration of first-mover firms as investors are reluctant to invest in pioneers.

[27] Additionally, Poletti et al. (2008) detected that the first-mover advantage are dismissed over time.

also collected in the research period. The time scope of data is presented later in Table 4.1, after discussing the event window and estimation period. The main index is Nasdaq which was collected via the Datastream system (now Thompson Reuters Eikon).[28] In addition, in order to serve the examination of size effect, the market capitalization points of sample banks at the event time are also collected.

4.3.2 Event study methodology

To carry out an event study, researchers must define the estimation period and the event window. The estimation period is the period over which no event has occurred. It is used to establish how the returns on the stock should behave in the absence of the analysed event. According to Kritzman (1994), the estimation period should range from 100 to 300 days. Following several previous studies, the time chosen is of 120 days (-20, -139) and 180 days (-20, -199) before the event.[29,30] Furthermore, an event study that is over a 200-day estimation period and a 300-day estimation period is also estimated in the robustness test section. Following Amici et al. (2013), all of the estimation periods in this chapter end 20 days before the announcement.

Choosing an event window is also crucial since it is defined as the time when the market first learns about the relevant new information. If the window size is too long, it may be affected by other events thus reducing the reliability of an event analysis (Brown and Warner, 1980; 1985).[31] By contrast, if the window size is too short, it may miss critical information and cause the problem of conditional heteroskedasticity. Put simply, McWilliams and Siegel (1997) suggest that the event window should be long enough to comprehend the significance of the event, but short enough to rule out disturbing effects. Adopting the style of many studies that carry out Internet-related event studies (Benbunan-Fich and Fich, 2004; Cooper et al., 2001; Lee, 2001; Telang and Wattal, 2005), short event windows are adopted. Although some studies suggest choosing a one-day event period (the day of the announcement or day "0"), Im et al. (2001) propose that the one-day period can cause misleading results as we cannot access the exact time of

[28] Please note the S&P500 index was tested for robustness and showed the consistent results. Also, a US banking index was tested and returned the similar findings.

[29] The chosen 120-day estimation period was followed some studies in the following parentheses (Campbell et al., 2003; Cheng et al., 2007).

[30] The chosen 180-day estimation period was follow the study of Andrew et al. (1997).

[31] These events are also called confounding events.

announcements. More concretely, if the market were informed about an event earlier or slightly after the event announcement date, any valuation would be probably reflected on the day before the announcement. By contrast, if the information is revealed after the close of trading on the previous day, the valuation will be reflected on the date of the announcement. In the same vein, Konchitchki and O'Leary (2011) assert that the three-day window is optimal as it examines the informative content of the event in a more complete way. More pointedly, the three-day window allows observing both leakages of information prior to event announcements as well as slightly belated responses after the event dates. Following plenty of previous studies, this chapter opts for a three-day event window, including one day before and one day after (-1, +1). Also, two additional event windows (-2, +2) and (-3, +3) are tested for following the suggestion of Konchitchki and O'Leary (2011).

4.3.2.1 Modelling Expected Returns

Expected returns are defined as the normal returns earned by a company without experiencing an event. The normal returns of an event over an event window are estimated, based on coefficients from the regression of returns of the firm over an estimation period. Therefore, it is necessary to identify a model that is well suited to capture as completely as possible the price impact from the event. For example, Kothari and Warner (2007) indicate that it's not possible to measure the abnormal/unexpected returns without modelling the normal/expected returns.

The measurement of a standard return can be classified into three groups: models that capture the significant risks and characteristics of event firms, reference portfolios matched with event firms with similar characteristics, and lastly, the control firm approach. The five popular models are the *constant-mean-return* model, *market* model, *market-adjusted* model, *capital asset pricing* model (CAPM), and *multi-factor* models (such as the Fama-French three-factor model or Carhart four-factor model).

Regarding the choice of expected return model, some econometricians suggest that any differences between their performance is less significant in a short-run event study compared to a long-run event study. It may be due to the fact that daily abnormal return is about 0.05% (Konchitchki and O'Leary, 2011). Thereby, even in a state where the risk factor (i.e. betas) have been stringently estimated, the error of calculating abnormal returns is negligible when they are between 0.5% and 1.0%. Konchitchki and O'Leary

(2011) suggest that in the short run, researchers can use either market, Fama-French, or Carhart models because the metric used to estimate abnormal returns is straightforward and less restrictive. Following previous authors, the market model is applied because of its simplicity and efficiency. It represents a potential improvement over the constant-mean-return model by controlling market risk (see Campbell et al., 1997; MacKinlay, 1997).

In more detail, the market model is a statistical model that relates the return of any given security to the return of the market portfolio. For any security, the market model is:

$$E(R_{it}) = \alpha_i + \beta_i R_{mt} + \epsilon_{it}$$
$$\in_{i,t} \sim N(0, \sigma^2_{\varepsilon,i}) \quad \text{(Equation 4.1)}$$

Where R_{mt} is the market return, while ϵ_{it} captures the unsystematic risk that is endogenous to individual stocks. The parameters of the market model are estimated by running regression over the estimation period, which end 20 days before day 0, which limits the possibility of the event date influencing returns in the estimation period.

4.3.2.2 Estimation of Abnormal Return

The abnormal return is simply the difference between actual stock returns and standard returns. Due to the different definitions of the expected return, as previously discussed, results could vary.

$$AR_{i,t} = R_{i,t} - E(R_{i,t}) \quad \text{(Equation 4.2)}$$

Once abnormal returns for $asset_i$ during the event windows are calculated, the cumulation method needs to be carefully chosen since researchers are more interested in the performance of the stock or a portfolio of stocks over the given period. Abnormal returns can be cumulated either by stocks or over time. For each event window, CARs are obtained as follow:

$$CAR_{i(t_1,t_2)} = \sum_{t=t_1}^{t_2} AR_{i(t_1,t_2)} \quad \text{(Equation 4.3)}$$

Where t_1 and t_2 are the starting and the end dates of the considered window. $AR_{i(t_1 t_2)}$ is aggregated over the event window period for each firm.

4.3.2.3 Hypothesis Testing

After the calculation of CARs, what is tested is the hypothesis of whether a market reaction is significantly different from zero. As noted in Cummins and Weiss (2004), various studies have documented a variance increase in AR during the day near to an event, with respect to the estimation period, as an effect of the announcement. Also, Amici et al. (2013) highlight that if the increase in variance is not considered in the hypothesis test, the results can be biased to overly represent the rejection of a null hypothesis. In order to overcome this limitation, the approach of Amici et al. (2013) is adopted to carry out the Z-statistics as follows:

$$Z = \frac{\frac{1}{N}\sum_{i=1}^{N} SR_i}{\sqrt{\frac{1}{N(N-1)}\sum_{i=1}^{N}(SR_i - \sum_{i=1}^{N}\frac{SR_i}{N})^2}} \qquad \text{(Equation 4.4)}$$

Where SR_i is calculated as:

$$SR_i = \frac{CAR_i(t_1, t_2)}{\sigma_{\varepsilon i}\sqrt{T_s + \frac{T_s^2}{T} + \frac{\sum_{t=t_1}^{t_2}(R_{mt} - T_s(\overline{R_m}))^2}{\sum_{t=t_1}^{T}(R_{mt} - \overline{R_m})^2}}}$$

In which

$\sigma_{\varepsilon i}$: the standard deviation of abnormal returns estimated with the market model.

Ts: the number of days in the considered event window (t1, t2).

T: the numbers of days in the estimation period (T_1, T_2).

R_m: the market portfolio return.

$\bar{R}_m$: the average market portfolio returns during the estimation period.

Table 4.1 Summary of Event Dates and Test Periods for Abnormal Returns

Methodology	**Event window**	**First event date**	**Last event date**	**Test period (180 days)**	**Test period (120 days)**	**Conditions**
Market model	(-1+1) window	17 Oct 1996	15 Jul 2010	7 Feb 1996 to 16 Jul 2010	1 May 1996 to 16 Jul 2010	Price Index availability in all event windows must reach 100%
	(-2+2) window	17 Oct, 1996	15 Jul, 2010	6 Feb 1996 to 19 Jul, 2010	30 April 1996 to 19 Jul, 2010	
	(-3+3) window	17 Oct, 1996	15 Jul, 2010	5 Feb 1996 to 20 Jul, 2010	29 April 1996 to 20 Jul, 2010	

4.4 Empirical Results and Discussions

4.4.1 Empirical Results for Hypothesis 4.1: Wealth creation of transactional website launch events over the short term.

Table 4.2 presents a summary of the statistics for cumulative average returns for three different event windows and two different estimation periods, along with the z-scores for the significance test. The results have revealed the following:

Firstly, the values of CAR are found to be positive across all windows but statistically most robust in the three-day window (-1, +1). More specifically, over the three days (day -1, day 0, and day+1) surrounding the website launch announcements, banks are likely to earn positive cumulative excess returns in the range of 0.125%- 0.132% which are statistically significant at a 5% level (Z- score equals 1.704 and 1.855 in the 120-day and 180-day estimation periods, respectively). In terms of five-day and seven-day windows, the values of CAR keep reflecting the positive response from the market, ranging from 0.169% to 0.175% during these five days and from 0.144% to 0.178% over seven days. Nonetheless, CAR points are seemingly less statistically significant upon five-day and seven-day intervals in comparison to three-day intervals.

Secondly, CAR points appear to be proportional to the length of the windows. When the window length is widened, especially from the three-day window to the five-day window, CAR values are most likely to follow an increasing tendency. For example, over the 120-day estimation period, CAR values increase from 0.125% to 0.175% and 0.178% over three days, five days, and seven days, respectively. This excess is equivalent to growth of 40% and 42.4% of CARs upon five-day and seven-day terms, compared to three-day intervals.

The evidence in Table 4.2 suggests that the transactional website launch events gained a reasonably immediate and remarkable response from the market at the time of the adoption. An intuitive interpretation of this result is that the investors and market feel less uncertainty about future cash flows surrounding transactional website adoption, leading them to react promptly to website-launch events. Therefore, banks tend to earn excess returns very close to their announcement, rather than seeing a lag in evaluation from the market. Some or all banks in the sample may have announced their intention to adopt the transactional website prior to the actual adoption date. If so, it’s possible that market prices would already reflect this information, and hence market reactions would not occur immediately surrounding the event. However, the positive and significant CARs found immediately around the adoption date is evidence that new and valuable information is added to the market regardless of any market impact from prior announcements.

It should also be noted that, during the five and seven days surrounding the events, the CAR values are still positive and enlarged. As such, it suggests that ex-post and ex-ante trading activities may still occur. However, these activities may depend on the nature of the business or the time that the events have been released. To further clarify that, the next sections will look at how the market reacts towards banks that possess different sizes and different time announcements.

4.4.2 Empirical results for Hypothesis 4.2: The magnitude effect in the short-term upon a transactional website launch event.

Table 4.3 presents the results obtained from the investigation into whether firm size factors significantly alter the abnormal returns gained from banking transactional website launch events. To be more specific, sample banks were categorized into three equally distributed quantiles. The MV1 portfolio includes 103 sample banks with the smallest capitalization, whereas the 102 largest-capitalized banks are listed in the MV3 portfolio. MV2 consists of 102 sample banks whose market size is ranked in the middle range. As predicted from Hypothesis 4.2, what is presented in Table 4.3 shows a marked heterogeneity in cumulative excess returns earned by each size group surrounding their events.

The events of the largest banks tend to grab the most enthusiasm from the market within three days nearest to the event, with the CAR value at 0.312% and significant at the 1% level. Over longer periods (five days and seven days), the market reaction towards the largest banks' events appears to be lower and less robust. Specifically, the CAR (-2, +2) value is approximately twice as low (0.132%) whereas the CAR (-3, +3) value is negative (-0.48%) and insignificant, compared to CAR (-1, +1). In contrast to the largest-scaled banks, the smallest-scaled banks have attracted the strongest attention from the market from five to seven days surrounding the events. More concretely, within the first three days, if large banks grab more robust CAR points, the smallest counterparts tend to gain a fairly modest and insignificant CAR (0.035%). The market reaction to the group of small banks only appears to be robust in longer intervals, where the CAR value increased strongly to 0.476% within five days and 0.584% within seven days. Notably, CAR values in the five-day and seven-day intervals are both statistically robust at the 1% level (Z-score = 4.791 and 4.277). Regarding the events of medium-scaled banks, the response from the market shows more complicated volatility. In the three-day interval and five-day interval, the market seems to be less interested in the website-launch events of medium banks, compared to the two other groups. The market's reaction to the events of the medium bank group is only genuinely remarkable in the seven-day window. In which, medium banks could earn CAR of 0.427%, approximately equivalent to the CAR value earned by small banks.

Together, these results provide the following insights:

Firstly, as set out in Hypothesis 4.2, the reactions of the market vary across size-related groups. In which, the market demonstrates the most immediate and significant preference for website-adoption events of the largest banks. One explanation is because the market considers that the value of the transactional website, when attributed to large-scaled banks, is remarkable, clear, and feasible. Therefore, the value of transactional website events was immediately incorporated into the stock prices of such banks. Indeed, large-scaled banks possess possible sources that allow them to be successful in adopting their digital initiatives (e.g., instance economies of scale and scope, more abundant financial resources, or/and greater capacity for specialization and diversification).

Meanwhile, there are more ex-ante and ex-post activities involving smaller scale banks. There are some explanations for that. Firstly, if size factor is considered as an inverse variable of the amount of information leaked in the pre-announcement period (Atiase, 1985; Bamber, 1987; Freeman, 1987; Llorente et al., 2002), then information from small banks could be more limited in the market. As a result, ex-post activities may have taken place more for the small group of banks since it potentially takes more time for the market to react and fully predict the potential that transactional website adoption will bring to small banks. However, the information effect might only explain parts of the small firm effect (Barry and Brown, 1984). It is also very likely that investors find that high rewards could be added to small-scaled banks thanks to their website adoption, leading to more trading activities relevant to small banks' events. In fact, small banks are found to be nimbler, less hierarchal, and make decisions quicker (Chen and Hambrick, 1995; Dean et al., 1998). Also, they have a propensity to position themselves differently from their larger rivals to grab new opportunities from niche markets (Dean et al., 1998).

Accordingly, it is totally feasible that small banks' website-launch events turn out to be attractive to the market.

In general, the results support Hypothesis 4.2 in that there is heterogeneity in the market reaction towards the events of different sized banks. Most notably, in the short run, most of the banks would benefit from their website launch events by gaining positive cumulative excess returns. The heterogeneity in earnings thereby might not only be attributable to size, but also to the amount of pre-information disclosure, the signals delivered to the market or the specified potential of each bank group.

Please note that, in addition to firm size, book-to-market is also a firm characteristic favoured by studies to explain cross-sectional variation in expected returns (Barber and Lyon, 1997a; Brav and Gompers, 1997b; Ikenberry et al., 1995; Liu et al., 2013; Savor and Lu, 2009). Barber and Lyon (1997b , p. 883) argue that, along with bank size, the book-to-market ratios also "explain in an economically meaningful way cross-sectional variation in security returns". One assumption is that the book-to-market ratio is a proxy for priced risk (Bartram et al., 2020). For example, high-risk firms tend to discount future cash flows at higher rates. Therefore, these firms are likely to have low market prices and high book-to-market ratios (Berk, 1995). In the same vein, Fama and French (1992, 1993) assume book-to-market ratio and capitalization stock as compensation for risk. The higher returns found in Fama and French (1992, 1993) are attributed to high book-to-market stocks and low capitalization stocks. It means that these stocks are expected to earn higher rates of return because they are riskier. However, other asset pricing literature emphasize that, although book-to-market and size-related factors could well capture the variation in expected returns, there has been no strong theoretical justification that the common variation in returns is systematically driven by these factors (Dempsey, 2010). For example, Fama and French (1995, p. 164) state: "*We do find that the market and size factors in earning help explain the market and size factors in returns. But we find no evidence that return respond to the book-to-market factor in earnings*". Focusing on the size effect only and not the book-to-market ratio is a limitation of this chapter.

4.4.3 Empirical Results for Hypothesis 4.3: Timing effect

Table 4.4 shows the empirical results for Hypothesis 4.3, which analyses if there are remarkable differences in CAR values produced at different website-launch times. As discussed in the section on descriptive statistics, event years are divided into three equally distributed groups. The first-mover group consists of ninety-eight banks that launched their transactional website between 1996 and 1998. The subsequent ninety-nine banks which enabled their websites from 1999 to 2000 are categorized into the second-mover group. The remaining banks that have adopted websites after 2000 are treated as laggards. The sample definition is inspired by the discussion of Furst et al. (2002) who describes the banks who launched transactional websites by 1998 as "first movers", by several authors who describe the period of 1999- 2000 as a hot bubble period (Lee, 1998; Ofek and Richardson, 2003; Singhania and Girish, 2015; Walden and Browne, 2008), and authors who describe the period after 2000 as an information avalanche period (Dehning et al., 2004; Lee, 1998).

Firstly, the market response was found to be very strong towards early events (1996-1998) and later events (after 2000). Specifically, first movers and laggards both keep positive and significant CAR in three-, five- and seven-day periods around their events. On the contrary, the market reaction seemingly showed a more volatile trend against the events of second comers. More concretely, within three days proximate to the website-initiated bulletins, the CAR attributed to the second-runner group are negative (-0.452%). When the examined window was enlarged to five-day and seven-day, the CAR values changed positively (0.071% and 0.054%), but they were still negligible and much lower than the CAR points gained by first runners and late adopters.

Secondly, first adopters were the ones who harvested the highest value of CAR while late adoption banks were the ones who get the steadiest CAR values. More specifically, during the three-day event, the CAR values achieved by first-mover firms are at the greatest and most full extent (0.465% with Z-score = 7.446). In the circumstances when the monitored intervals were extended, the CAR values of first movers halves over five days and drops to approximately ten times upon seven days. In another entirely different story, laggards evidently have maintained preferable stability in their excess earnings compared to their predecessor counterparts. More concretely, CAR values earned by laggards run within the range of 0.241% to 0.408% over the three examined windows, and they are all statistically significant at the 1% level.

The above results show that the website-launch events in the first three years (1996-1998) attracted the most attention from the market. This is in line with theoretical and empirical evidence of "*first-mover advantage*". As first adopters are supposed to benefit more from their technological initiatives (such as market share intensification, customer satisfaction, customer retention, customer awareness), it is feasible for them to gain a favourable reaction from the market, at least in the short term.[32]

Even though the first movers are the ones who gained the highest excess returns, the laggards are the ones who experienced more stable and durable excess returns. This is possible because after five years since the first transactional website has adopted in 1996, the information concerning website-launch events as well as the value the websites added to banks, are more transparent. Therefore, the market has more justification to evaluate the website-adoption events in the later stages. More interesting, the positive and stable excess returns could suggest that the transactional website actually adds excellent value to banks as the transactional website launch events still grab the attention of the market at different times, regardless they are pioneers or latecomers.

It also could not be ignored the period between 1999 and 2000 as there is more volatility from the market towards the website-launch announcements during this period. Historically, the economy witnessed the Dotcom bubble period in 1999-2000 that exhibited extreme volatility in the stock price as price indices skyrocketed and would reach a peak in 2000 before it plummeted back to the ground. Therefore, this period might witness investor panic and their hesitation in investing in website-related launch events (Dehning et al., 2004; Docking and Koch, 2005; Veronesi, 1999).

In general, the results support Hypothesis 4.3 when they demonstrate differentiation in the market evaluation of transactional website events at different time stages. Nevertheless, it should be highlighted that all banks still gained positive rewards from the market, showing that transactional websites indeed possess value-enhancing potential, no matter if they are adopted early or late. Potentially, the earnings vary with specific growth opportunities of the firm groups as well as the market conditions.

[32] Key authors are in the following parenthese (Alpert and Kamins, 1995; Chatterjee and Pacini, 2002; Dehning et al., 2003; Dos Santos and Peffers, 1995; Jarvenpaa and Todd, 1996; Kalyanaram and Urban, 1992; Lieberman and Montgomery, 1988; Lilien and Yoon, 1990; Mascarenhas, 1992a, 1992b; Tufano, 1989).

Table 4.2 Cumulative Abnormal Return upon Website-Launch Announcements

This table reports Cumulative Abnormal Returns to stockholders upon the website launching announcements. The sample consists of website launch announcements of 307 US commercial banks between 1996 and 2010. Daily Abnormal Return is obtained using the market model with different estimation periods (120 days and 180 days) and different event windows (-1+1 window; -2+2 window; -3+3 window). The market index used is the Nasdaq Index. All data of Market Index and Price Indices of 307 banks are collected daily in 3238 days (about 9 years) from 05/02/1996 to 20/7/2010 for the 180-day estimation period and seven-day event window. The number of daily stocks index will differ slightly between the different lengths of windows and estimation. The source of market index and price indices is at the source Thompson Securities Data. The statistical significance of CAR is tested by using the formula of Amici et al. (2013) and Boehmer et al. (1991), which is produced to capture the event-induced increase in return volatility. The values of significant tests are displayed in the sixth column with the heading Z-stat. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests.

	Mean (%)	Std.	Min (%)	Max (%)	Z-score
120-day Estimation Period: (-20; -139)					
CAR (-1; +1)	0.125%**	0.030	-11.55%	10.88%	1.704
CAR (-2; +2)	0.175%*	0.032	-13.28%	12.05%	1.497
CAR (-3; +3)	0.178%	0.038	-14.29%	14.45%	1.062
180-day Estimation Period: (-20; -199)					
CAR (-1; +1)	0.132%**	0.030	-11.12%	11.17%	1.855
CAR (-2; +2)	0.169%**	0.031	-13.25%	12.24%	1.677
CAR (-3; +3)	0.144%	0.038	-14.24%	15.64%	1.177

Table 4.3 CAR (%) of firms, which are subsampled using market size around the date of announcement

This table reports the values of Cumulative Abnormal Returns (displayed in percentage) and their descriptive statistical characteristics to stockholders upon the website launch announcement of sample banks classified into three size-based portfolios. The sample consists of website launch announcements of 307 US banks between 1996 and 2010. Daily Abnormal Return is obtained using the market model with the 120-day estimation period (-20; -219) and different event windows *(-1+1 window; -2+2 window; -3+3 window*). Sample banks fall in the three same size quantiles based on their market values. MV1 includes banks with the smallest market value, and MV3 includes banks with the largest market value. The market index used is the Nasdaq Index. All data of Market Index and Price Indices of 307 banks are collected daily during 3238 days (about 9 years) from 05/02/1996 to 20/7/2010 for the 120-day estimation period and seven-day event window. The number of daily stocks index will differ slightly between the different lengths of windows and estimation. The source of market index and price indices is at the source Thompson Securities Data. The statistical significance of CAR is tested by using the formula of Amici et al. (2013) and Boehmer et al. (1991), which is produced to capture the event-induced increase in return volatility. Three significant tests have proceeded individually for three size-based portfolios. The values of significant tests are displayed in the sixth column with the heading Z-stat. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests.

Event window	120-day	Mean	Std.	Min	Max	Z-test
(-1; +1)	Small Bank	0.035%	0.031	-11.55%	8.84%	1.051
	Medium Bank	0.029%***	0.032	-9.94%	10.88%	2.349
	Large Bank	0.312%***	0.026	-6.12%	6.96%	5.888
(-2; +2)	Small Bank	0.476%***	0.032	-8.45%	8.84%	4.791
	Medium Bank	-0.085%	0.032	-13.28%	12.05%	0.397
	Large Bank	0.132%***	0.031	-7.81%	8.02%	3.381
(-3; +3)	Small Bank	0.584%***	0.042	-12.71%	14.45%	4.277
	Medium Bank	0.427%***	0.035	-14.29%	8.83%	3.825
	Large Bank	-0.480%**	0.036	-10.03%	9.40%	-1.658

Table 4.4 CAR (%) of firms around their announcement dates, over different event periods

This table reports the values of Cumulative Abnormal Returns (displayed in percentage) and their descriptive statistical characteristics to stockholders upon the website launching announcement of sample banks over three different periods. The sample consists of website launching announcements of 307 US banks between 1996 and 2010. Daily Abnormal Return is obtained using the market model with the 120-day estimation period (-20; -219) and different event windows *(-1+1 window; -2+2 window; -3+3 window*). The market index used is the Nasdaq Index. All data of Market Index and Price Indices of 307 banks are collected daily for 3238 days (about 9 years) from 05/02/1996 to 20/7/2010 for the 120-day estimation period and seven-day event window. The number of daily stocks index will differ slightly between different lengths of windows and estimation. The source of market index and price indices is at the source Thompson Securities Data. The cut-off years are also inspired by the arguments of Furst et al. (2002) who describes the banks who launched transactional website by 1998 as "first movers"; by authors who describe the period of 1999- 2000 as hot bubble period (Lee, 1998; Ofek and Richardson, 2003; Singhania and Girish, 2015; Walden and Browne, 2008) and authors who describe the period after 2000 as information avalanche (Dehning et al., 2004; Lee, 1998). The statistical significance of CAR is tested by using the formula of Amici et al. (2013) and Boehmer et al. (1991), which is produced to capture the event-induced increase in return volatility. Significant tests have proceeded individually for three different bank groups. The value of significant tests is displayed in the sixth column with the heading Z-stat. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests.

Event window	120-day	Mean	Std.	Min	Max	Z-test
(-1; +1)	First-mover	0.465%**	0.025	-4.64%	8.62%	7.446
	Second-mover	-0.452%***	0.031	-11.55%	6.96%	-2.493
	Laggard	0.342%***	0.032	-8.36%	10.88%	2.912
(-2; +2)	First-mover	0.207%***	0.029	-7.81%	7.32%	3.779
	Second-mover	0.071%	0.034	-13.28%	8.84%	0.800
	Laggard	0.241%***	0.032	-7.20%	12.05%	2.904
(-3; +3)	First-mover	0.045%**	0.033	-9.30%	8.83%	1.729
	Second-mover	0.054%	0.046	-14.29%	14.45%	0.124
	Laggard	0.408%***	0.035	-9.75%	11.22%	3.419

4.5 Robustness Testing

4.5.1 Alternative estimation periods

In this section, two alternative estimation periods are applied, which are (-20, -219) and (-20, -319), to estimate the CAR values gained by the whole sample and by sub-samples (size and timing orders). The 200-day estimation and 300-day estimation have also been used by many authors, especially in the IT adoption discipline (Im et al., 2001; Loh and Venkatraman, 1992; Mei and Sun, 2007; Meng and Lee, 2007; Peak et al., 2002). The results concerning CAR values of the whole 307-bank sample, size groups, and timing order groups are presented in Table A.4.5 and A.4.6 in the Appendix, respectively. Put shortly, the results using alternate estimation periods are strongly consistent with the critical outcomes reported in Table 4.2, Table 4.3 and Table 4.4. In which, the CAR points across the whole sample are most buoyant and robust within three days and five days in the vicinity of transactional website events. The CAR points are more statistically significant among sub-samples. The most stable and durable CAR points are achieved by the smallest-scaled banks and laggards, while pioneering and massive-scaled banks get hold of the most immediate favourable CAR points.

4.5.2 Alternative market index

In the robustness section, an equally-weighted US banking market index has been used instead of Nasdaq portfolio. According to Haleblian et al. (2006) using industry-specific benchmarks to measure abnormal returns would eliminate extraneous noise resulting from companies of other industries.

To serve this purpose, firstly, the daily prices and estimated daily returns of all US banks from 5 Feb 1996 to 20 Jul 2010 is collected via Thompson Reuters Eikon platform. All the banks collected are treated as benchmark banks. Afterwards, each sample $bank_i$, will be excluded from the benchmark banks. Daily market returns, accordingly, were estimated as equally-weighted daily returns of all remaining banks in the benchmark portfolio after excluding the treated bank from the portfolio.

New results regarding CAR value of the whole sample, sub-samples divided by size and sub-samples divided by time of adoption are presented in Appendix, Table A.4.7, A.4.8 and A.4.9, respectively. In general, the new results using the alternative market index are consistent with the original findings presented in Table 4.2, 4.3 and 4.4. The findings then support the claim of previous econometrists that the metric used to estimate abnormal return in the short run is less restrictive and more straightforward. Even in a state where the risk factors (i.e., betas) have been stringently estimated, the error of calculating abnormal returns is negligible when they are between 0.5% and 1.0% (Konchitchki and O'Leary, 2011).

4.6 Conclusion

What has been investigated in this study is how the market reacts to the transactional website launch announcements of 307 banks in the US market from 1996 to 2010, accordingly, indicating the wealth-creating capability of transactional website initiatives. To the best of my knowledge, this is the first study that applies the market-based approach in digital banking literature which allows the testing of market reaction and investor behaviour. Efficient Market Hypothesis and relevant empirical works have been so far proved that the evaluation of market and investors is quick as thought, accurate and predative, therefore market-based approach can overcome some challenges of accounting-based measures. Furthermore, by verifying if there is any value enhancement in the market performance of financial institutions attributed to their transactional website launch events, this chapter makes an original contribution in terms of shareholder value perspective and digital information value which have not been conclusively analysed in digital banking literature so far. Moreover, this chapter provides manually collected exclusive data of announcement dates of a full list of available banks listed on the US stock markets as of December 2018. Therefore, this chapter is the first to provide systematic evidence concerning the market value-enhancing capability of a banking digital initiative, the transactional website adoption. This chapter is also the first to take into account some critical moderating effects, including the *size effect* and *timing order effect*, which adds further insight into market and investors behaviour in the digital banking discipline. Finally, an original conceptual model is provided to build the research hypothesis on how the transactional websites (and other digital adoptions) might create market value and how the investors might react to such digital-related events.

4.6.1 Summary of Findings

Overall, this chapter provides the following findings:

Firstly, transactional websites possess a value-enhancing capability that awards banks with cumulative excess returns at least over short time periods. In this manner, the findings strongly support numerous studies advocating the market-based approach in investigating the impact of digital-related activities on organizational performance, such as in terms of *digital initiatives and M&A* (Sternal and Schiereck, 2019); *digital-related* organizational management (Drechsler et al., 2019); IT investment (Chatterjee et al., 2001; Im et al., 2001; Li and Huang, 2012); technological transformation (Sears and Hoetker, 2014); e-commerce initiatives (Andoh-Baidoo et al., 2012). The positive CAR values would suggest two crucial implications concerning transactional websites. Firstly, investors perceive transactional website events to be valuable, and therefore wealth is created for shareholders. Secondly, the positive reaction from the market has shown expectations towards the value-enhancing potential of transactional website adoption in the future.

Secondly, the results show that banks of any size and at any time of adoption can successfully enter the playing field. The adoption of transactional websites brings significant positive excess returns to most types of banks. If interpreted from the resource-based view perspective, all groups of banks have different resources and capabilities, hence they are all likely to receive positive evaluations from the market. For example, if the large-scale banks have advantages in terms of economic scale and scope, abundant resources, R&D, their smaller peers appear to be incredibly nimble, flexible, opportunistic, and adept at significant innovation (Cohen and Klepper, 1996; Rosen, 1991; Vossen, 1998). Likewise, if first-mover banks potentially have the advantages of reputation, customer awareness, market share (Alpert and Kamins, 1995; Chatterjee and Pacini, 2002; Dehning et al., 2003; Dos Santos and Peffers, 1995; Jarvenpaa and Todd, 1996; Kalyanaram and Urban, 1992; Lieberman and Montgomery, 1988; Lilien and Yoon, 1990; Mascarenhas, 1992a, 1992b; Tufano, 1989), the later-comers still gain the benefits of free-riders, learning by observing (Levin et al., 1992; Lieberman, 1987; Lieberman and Montgomery, 1988; Utterback, 1994). The results then favour studies that support the idea that the market expects firms with different sizes all benefit from innovation(Neill et al., 2001), and/or a positive return for large-scaled firms (Chhaochharia and Grinstein, 2007), small firms (Chaney et al., 1991; Im et al., 2001; Sternal and Schiereck, 2019; Xia et al., 2016), first movers (Chen and Su, 2010; Lee, et al., 2000; Zantout and Chaganti, 1996; Zantout and Tsetsekos, 1994) and latecomers (Cooper et al., 2005; Cummings et al., 2018; Sarkar and de Jong, 2006).

It is also worth noting that the size effect and timing order effect significantly differentiate the excess earnings among banks surrounding their website-launch announcements.

Small banks and latecomers seem to have more durable and stable abnormal returns. It is also very likely that investors predict higher potentials from the website-adoption events of small-banks and latecomers. Indeed, small banks tend to link with high risk-adjusted returns (Banz, 1981; Reinganum and Smith, 1983) and they are widely perceived to be more successful in major innovations (Cohen and Klepper, 1996; Rosen, 1991). Concerning banks at a later stage, the findings also support the *information avalanche* (Dehning et al., 2004; Lee, 1998) when the impact of the transactional website is more visible, leading to more confidence from investors to evaluate. Also, laggards may be attractive to investors due to the potential benefits of learning from the success/failure of the previous adopters, getting to leapfrog the progress (Baldwin and Childs, 1969; Drucker, 1985; Hege and Hennessy, 2010; Lieberman, 1987; Lieberman and Montgomery, 1988; Utterback, 1994; Zach et al., 2020). At this point, the results also support authors who found higher market value added by laggards (Cooper et al., 2005; Cummings et al., 2018; Lee et al., 2000; Sarkar and de Jong, 2006).

Lastly, the results show that the economic and market conditions may have a bearing on the extent to which the investors respond to website-launch events. More specifically, the results show the volatility in CAR values over the period of 1999-2000 which is historically perceived as the period of the "*dot-com bubble*" (Lee, 1998; Ofek and Richardson, 2003; Singhania and Girish, 2015; Walden and Browne, 2008). Therefore, it is very likely that the investors are reluctant to invest in website-related portfolios at that time as they are more uncertain about the real state of the world. The findings also suggest that investors' confidence might only really come back after 2001 when the market has regained balance or/and information about the impact of transactional website adoption has been more clearly reflected. The findings are then in line with authors who suggest (i) the underreaction of investors to good news in the bad times (Veronesi, 1999), (ii) the more significant uncertainty of investors during the highly volatile market (Docking and Koch, 2005), (iii) the decrease in CAR values surrounding e-commerce and website-related announcements in the period of 1999-2000 (Dehning et al., 2004).

4.6.2 Managerial Implications

This chapter offers some critical managerial implications as follows:

Firstly, this chapter provides authentication of the value-enhancing capability of transactional website adoptions. As the information on transactional website launch events was immediately capitalized in the stock price, it is suggested that transactional website adoption is valuable to a company. Banks should take advantage of this evaluation and prediction of the market to analyse the potential of transactional website initiatives (e.g., it may strengthen the customer relationship, improve efficiency and effectiveness, as well as simulate innovations and continuous organizational learning). As discussed, the reactions of market participants contain a lot of information and in a forward-looking manner. The prosperousness of an initiative, therefore, also depends on to what extent managers understand the nature of the problem.

Secondly, this investigation finds significant roles of the market and investors in detecting, evaluating, and predicting the value of a strategy/adoption added to firms. This chapter recommends that managers should consider the financial behaviour of the market as well as factors influencing market reactions and decisions. By understanding the nature of the market, managers can give the most accurate signals to the market.

Thirdly, the findings highlight the heterogeneity of the market across different groups of banks, depending on their size and the time they have launched transactional websites. Accordingly, what is recommended is that banks should understand their organizational characteristics to give the clearest and most accurate signals to investors. Banks all have their own unique advantages; thus, it is of importance that they come up with the most relevant and engaging signals to show their idiosyncratic competitive advantages and prospects. More significantly, in volatile stages when investor behaviour is more sensitive, banks should give the most appropriate and transparent signals to build trust from investors. *"To make real money in an evolving market, you need to analyze the kind of environment that surrounds the new category; to assess the character and depth of your resources. Remember, once you have gone into the water, you have no choice but to swim"* (Suarez and Lanzolla, 2005, p. 127).

4.6.3 Limitations and Directions for Future Research

The findings of this study are subject to some limitations as follows.

Firstly, due to the constraints of data availability, only the launch of transactional websites in unit analysis is applied. Although some critical implications of the transactional website in banking digitalization have been proposed, this unit could not fully reflect the impact of digital transformation on the performance of financial institutions. In order to facilitate further investigation into the effects of digitalization upon banks, especially by both accounting-based and market-based approaches, more availability of data for digital-related announcement dates is required. It would also be the perfect way to investigate the connections between transactional websites and other digital initiatives to better reflect the impact of digitalization in influencing the banking landscape.

Furthermore, the reliance on short-term examination has met the challenge from the literature on long-run return anomalies. This viewpoint argues that the stock price does not fully and immediately reflect the new information in the short run, and there exist abnormal returns in the long term. For example, in the overreaction camp, there is a growing body of studies focusing on finding evidence for "anomalies" in long-term post-event returns, such as IPO (Carter et al., 1998; Levis, 1993; Loughran, 1993; Loughran and Ritter, 1995; Rajan and Servaes, 1997), SEOs (Jegadeesh, 2000; Loughran and Ritter, 1995; Smith, 1977; Spiess and Affleck-Graves, 1995). Therefore, the limitation of this study opens opportunities for further investigation in the long run reaction of the market towards transactional website launch announcements. The long-run response of the market is also an ideal approach to observe if the transactional website adoption is genuinely beneficial for banks in the long term.

Finally, during the examination of heterogeneity among bank enterprises attributed to their size and adoption time, this chapter has not delved into the principles behind those differences. This chapter draws inferences on why small banks and laggards reap more stable and durable excess returns in comparison to their other rivals (e.g., due to information asymmetry, information avalanche, unique advantages). Nevertheless, it is necessary to study further the underlying basis, which genuinely differentiates the performance among banking groups. A further limitation of this chapter is that it didn't examine the impact of the book-to-market ratio on the abnormal returns. Following Barber and Lyon (1997b), it is possible for future research in digital bank technology adoption to explore this impact.

5 Chapter 5: Does the Adoption of Transactional Websites Improve Banks' Financial Performance?

5.1 Introduction

Previous studies have found that transactional website adoption can improve banks' financial performance, especially in terms of profitability and efficiency (Al-Hawari and Ward, 2006; Ciciretti et al., 2009; DeYoung, 2005; Furst et al., 2002; Goh and Kauffman, 2015; Mbama and Ezepue, 2018; Momparler et al., 2013; Pigni et al., 2002; Scott et al., 2017; Sullivan, 2000; Xue et al., 2007). The literature also clarifies some particular features of transactional website adoption, such as innovation (DeYoung et al., 2007; Pigni et al., 2002), efficiency and effectiveness (Furst et al., 2002), diversification (DeYoung et al., 2007; Pigni et al., 2002). However, those studies have only focused on the short-to-medium impact of transactional website adoption, rather than its long-term impact, on banks' financial performance. From which, the strategic role of transactional website adoption in the long run also have not been validated.

Meanwhile, many studies in other disciplines state that it takes time to conclude the rewards of a business practice added to firms' performance (Brynjolfsson, 1991; Brynjolfsson and Hitt, 1996; Campbell, 2012; DeLong and DeYoung, 2007; Hitt et al., 2002; Kohli and Devaraj, 2003; Thanos and Papadakis, 2012). The resource-based view also argues that "*The short-term window is easily faded away*" and the profitability, growth, and survival of firms depend on how they establish "*relatively impregnable*" bases to adapt and extend their operations in an uncertain, changing, and competitive world in the long run (Penrose, 1955, p. 121, 2009). Therefore, it is also important to consider the strategic role of a business practice by validating if this activity can protect the advantages and sustainable benefits of businesses over time (Peteraf, 1993; Rumelt and Lamb, 1997; Wernerfelt, 1984). Nevertheless, as the studies in banking literature tend to focus on the short and medium term of transactional website adoption, systematic evidence on the strategic role of transactional website adoption in protecting the bank's financial benefits in the long term is still scarce and unclear.

To shed light on the new value of transactional websites that has not been clarified in the literature, this chapter aims to address the central question:

"Does the transactional website strategically deliver value to a bank's financial performance over time? If that is the case, where does the value come from?"

Surrounding the central research question there are three main themes in this study. Firstly, this chapter aims to examine the existence of any significant value to a bank's financial performance directly added by the presence of transactional websites in the long run. This objective is the basis for making findings on three features of the transactional website: value, appropriability, and durability. Secondly, this chapter considers if the adoption of transactional websites is capable of preserving the value and the competitive advantage of banks in the long term. Following that, this chapter will examine to what extent financial performance has changed, which is caused separately by: i) Cumulative transactional website experiences; ii) The combinative capability between transactional website adoption and mobile website adoption; and iii) The "learning-by-observing" behaviour. Finally, this chapter aims to find out if there exists any heterogeneity among enterprises based on their asset scale and the event time. If inter-heterogeneity does exist, the ability to create a distinct competitive advantage among business groups of transactional website adoption will be reinforced.

This chapter utilises the transactional website adoption of 307 listed US commercial banks over the 1993-2018 period (see Chapter 3). The year 1993 marks the three-year ex-ante stage of banks that have activated websites earliest in 1996. 2018 is the most recent time the accounting data of the US banks is updated in the FDIC platform. In order to test the attributes of value and appropriability of transactional website adoption, accounting-based measures and regression analysis have been employed. Seven accounting metrics, representing profitability and efficiency, have been tested to see if they are significantly impacted by the transactional website adoption. In the next step, three separate proxies have been created, in turn, representing the attributes of embeddedness, interconnectedness, and imitation. These proxies will be defined in more detail in the methodology section. Notably, the second data for this stage is the mobile website adoption which was generated to gauge the combinative capability between it and transactional website adoption.

To the best of my knowledge, this chapter provides the following contributions. Firstly, in terms of data, this chapter provides original data on the time transactional websites were launched by fully listed US commercial banks. Therefore, this is the first study to provide systematic evidence of how the financial performance of listed banks in the US market has been impacted by their transactional website adoption.

Secondly, in terms of the theoretical framework, for the first time in the digital banking discipline, the resource-based view has been applied in terms of both an analytic perspective and empirical examination. More specifically, resource-based theorists have pointed out that the underlying basis of corporations' prosperity and sustainability comes from strategic resources and capabilities. These resources and capabilities need to satisfy two conditions in two phases:

(i) Stage one: Generating competitive advantage and superior performance.

(ii) Stage two: Limiting competition and protecting value created during stage one.

This foundation opens a novel approach in digital banking literature to study the role and strategic value of digital adoption. This is the first study that applies this basis to set up the hypotheses and construct empirical examinations concerning the impact of transactional website initiatives.

Thirdly, in terms of research methodology, at least within the framework of the digital banking discipline, I would like to argue two more outstanding features of accounting measures. Accounting measures are seemingly unable to reflect explicitly invisible value, as argued by some studies.[33] Moreover, authors of the event-based approach rarely use accounting measures as a reliable method of validating how the market reacts and predicts in the short term. In this chapter, apart from the examination of transactional websites, I also apply this method to compare and validate the predictions and evaluation of the market (as what was found in Chapter 4 about market reactions to transactional website events over short-term windows). The findings in this chapter will clarify these views, with the desire to somehow inspire further synthesis between the accounting-based approach and market-based approach in digital banking studies.

Fourthly, in terms of main findings, transactional website adoption is proven to provide new value, which has not been covered before in previous literature. The findings reveal that transactional website value does not stop at two standard features: profitability and efficiency over the short and medium-term, as proved by previous studies. Further to this, transactional websites can retain value and limit competition from others over

[33] For example, Itami and Roehl (1991) point out that there are some intangible assets are less readily and hardly to measure especially some incremental values added to employee's skills and knowledge. They argue that it is hard to reflect in financial statements some intangible assets, such as the enhancing experience of customer service department after dealing with a bundle of non-standardized problems of customers.

the long-term. These findings then are original in claiming that transactional website adoption is strategically valuable and sustainable for the long-term wealth of banks.

Finally, the transition between two digital adoptions and the existence of their combinative capability has been shown for the first time. Previous studies have examined the research on the relationship between the branch and Internet banking or between ATM and Internet banking. Nevertheless, there are no studies that set the activation of transactional websites as a starting point. For the first time, in this chapter, the adoption of the transactional website is treated as a new point of departure for analysing the transformation and development of digital banking.

The remainder of this chapter is organized as follows. The first section provides a brief outline pertaining to some relevant theoretical perspectives and empirical findings. This section is followed by research methodology, data collection design, description, empirical findings, and discussions. The last part is the conclusion, which includes the summary of findings, discussions of theoretical and managerial implications, and the directions for further research.

5.2 Literature Review

5.2.1 The accounting-based approach and its superiority

The first advantage of the accounting method is that it allows researchers to consider organizational performance in multiple aspects. As an illustration, some of the preferred accounting ratios are *profitability ratios* (e.g., ROA, ROE), *efficiency ratios* (e.g., non-interest expenses by net income), and *leverage ratios* (e.g., total debt divided by total assets). It could be viewed that such ratios have specified interpretations regarding firms' performance. Therefore, the application of accounting methods allows a remarkably diverse and extensive view of organizational health, efficiency level, profitability, as well as the performance of particular business activities. With this advantage from accounting-based measures, many researchers have applied a series of financial indicators to study the firm's performance concerning M&A (Huian, 2012; Mat-Nor et al., 2006; Singh and Zollo, 1999), IT adoption (Dehning et al., 2007; Galy and Sauceda, 2014; Lunardi et al., 2014; Masli et al., 2011; Wang et al., 2018), environmental performance (Haninun et al., 2018; Song et al., 2017; Sudha, 2020; Trinks et al., 2020) and so forth.

Secondly, another superiority of the accounting approach is that it gives permission to long-term corporate performance tracking. A good number of studies have argued that some activities, especially those with highly complex structures or synergies, require a sufficient length of time for the value of such activities to be thoroughly reflected (Brynjolfsson, 1991; Brynjolfsson and Hitt, 1996; Campbell, 2012; DeLong and DeYoung, 2007; Hitt et al., 2002; Kohli and Devaraj, 2003; Thanos and Papadakis, 2012).[34] Thus, the accounting approach is an appropriate way to investigate the actual influence of business practices on organizational performance over the long term. Some long-term time intervals empirically executed by previous studies are 3-5 years (DeLong and DeYoung, 2007; Hsu and Jang, 2007; Hunton et al., 2003), 6-8 years (Hopkins, 1987; Schneider et al., 2003; Wardhani, 2019), 10 years or over (Quah and Young, 2005; Rhyne, 1986; Simmonds, 1990; Vithessonthi and Racela, 2016).

Finally, the third merit of the accounting method is that it enables a comparison to be drawn between current performance and previous records of enterprises. By comparing the performance before and after an activity has been set in motion, the researchers are able to track the added value of such activities to the enterprise. Besides this, the scholars also put the accounting method into practice to facilitate the comparison between the firm's performance and similar non-event competitors. This advantageousness of the accounting method has been taken by many researchers to clarify the value-enhancing capability of innovation (Clarkson et al., 2011; Putri et al., 2019), managerial improvements (Galy and Sauceda, 2014; Nicolaou, 2004; Song et al., 2017), initiatives (Lunardi et al., 2014; Masli et al., 2011) and so forth.

5.2.2 The accounting-based approach in digital banking literature

The accounting-based approach has been featured in many disciplines, and the banking industry is no exception. Broadly speaking, the accounting approach has been applied commonly in the banking sector, for example in terms such as corporate governance (Basuony et al., 2014; Fanta et al., 2013; Simpson and Kohers, 2002), environmental management (Finger et al., 2018). This method, in general, has a great deal of use in evaluating the benefits of business practices added to returns, non-interest activities (Goddard et al., 2008), efficiency (Akhigbe, 2002; Bonin et al., 2005), and so forth.

[34] For example, some activities argued to take a long time to track their influence are M&A activities (Thanos and Papadakis, 2012), IT adoption (Brynjolfsson and Hitt, 1996), R&D investment (Vithessonthi and Racela, 2016).

The digital banking literature also shows a preference for accounting methods in analysing the influence of digital adoptions, such as in terms of Internet banking (Al-Hawari and Ward, 2006; Ciciretti et al., 2009; DeYoung, 2001; DeYoung et al., 2004; DeYoung, 2005; DeYoung et al., 2007; Egland et al., 1998; Furst et al., 2000a, 2002; Gutu, 2014; Pigni et al., 2002; Sullivan, 2000; Sullivan and Wang, 2013), digital banking (Mbama and Ezepue, 2018), digital innovation (Scott et al., 2017).

In general, one of the most outstanding contributions of digital banking literature when it comes to the accounting approach is that it provides evidence of actual banking performance relevant to the adoption of digital initiatives. Such evidence suggests that the enthusiastic embrace of digitalization brings benefits to banks themselves, such as offering them new business growth opportunities, improving operating activities as well as elevating the customer experience to a new level with a highly diversified engagement and lower cost of transactions. One of the most significant challenges is operating costs as banks will have to pay more for new installation costs or/and salaries for high-tech staff. Besides this, the emergence of hybrid models combining online, and offline delivery channels suggests that banks must cover new management costs.

5.2.3 Literature Gaps

5.2.3.1 The lack of an update on the time period of research and sampling

Firstly, most studies look at the impact of digital adoption on banks' performance over short-term or medium-term intervals. More pointedly, standard windows that have been applied are one year (Furst et al., 2002; Sullivan, 2000), three years (DeYoung et al., 2007), four years (DeYoung, 2005), five years (Delgado et al., 2007). A small number of other studies have investigated the relationship between digital adoption and banks' performance over the long term (Ciciretti et al., 2009; Momparler et al., 2013; Scott et al., 2017) but those studies also have some limitations in terms of data sampling and time period updates.[35] Momparler et al. (2013) study Internet banking over the nine years from 2002 to 2010 but with a modest amount of data sampled (22 US financial institutions) which may not be enough to make a systematic conclusion about the effects of digital adoption. The research period of Hernando and Nieto (2007) is nine years from

[35] Please also refer to Chapter 6, Section 6.2.1, and Table 6.1 for further literature review on the impact of digital adoptions on banks' performance.

1994 to 2002 for 72 Spanish banks whereas Ciciretti et al. (2009) examine the performance of 105 Internet banks in Italy during a 10-year interval from 1993 to 2002. However, both study research times are in the initial stages of the Internet revolution, which thereby leads to a lack of monitoring of the value of Internet banking in later stages. It is the same situation for the study of Scott et al. (2017) which studies the impact of network-based technological infrastructure on banks' performance. In that study, although the examination period is extended (from 1977 to 2006) and applied widely for 29 countries, the endpoint of the study period is 2006, which is relatively far from the present time.

As discussed previously, many studies believe that it requires a long time to conclude the rewards of a business practice added to firms' performance (Brynjolfsson, 1991; Brynjolfsson and Hitt, 1996; Campbell, 2012; DeLong and DeYoung, 2007; Hitt et al., 2002; Kohli and Devaraj, 2003; Thanos and Papadakis, 2012). According to the resource-based view, an activity that is considered strategic is not only about how many short-term benefits it delivers to firms but also about whether such activities protect the advantages and sustainable benefits of businesses over time (Peteraf, 1993; Rumelt and Lamb, 1997; Wernerfelt, 1984).[36] Therefore, a systematic and up-to-date empirical examination is essential to provide evidence of the long-term impact of a technological initiative on organizational performance.

5.2.3.2 The lack of evidence in clarifying the strategic role of transactional website adoption.

Most studies focus on the initial period of Internet banking and do not precisely state the strategic role of transactional website adoption. More specifically, previous studies consider the transactional website as an additional channel that complements traditional branching channels (Ciciretti et al., 2009) rather than a strategic banking delivery channel. Several other studies focus on some particular features of transactional website adoption, such as innovation (DeYoung et al., 2007; Pigni et al., 2002), efficiency and effectiveness (Furst et al., 2002), diversification (DeYoung et al., 2007; Pigni et al., 2002).

[36] More specially, as discussed previously, Peteraf (1993) describes value in the ex-ante stage as being temporary, precarious, and easy to fleet away due to the potential existence of imitation and substitution from other rivals. Resources and capabilities must be capable of preserving value and protecting a firm from competitive imitation or resource substitution over the long run.

To the best of my knowledge, the literature so far has not delved into the strategic role of transactional website adoption via its specified attributes, such as *value, durability, and idiosyncrasy* over the long term.[37] Meanwhile, as suggested by the resource-based view, such attributes are the root of a firm's sustainable outstanding performance over the long run.

5.2.3.3 The lack of consideration into transactional website adoption in the context of digitalization

The adoption of transactional websites has been in progress for more than 20 years (since 1996). That makes many scholars focus on the adoption of the transactional website in the preliminary stages of Internet banking or consider it as a complementary channel. Besides this, banks are now embracing massive digital disruptions (Sia et al., 2016), multi-channel integration as well as digital products and services diversification (Carbó-Valverde et al., 2020). On that account, the impact of the transactional website is no longer paid attention to. To my knowledge, very few research papers put transactional website activation in the banking digitalization context.

As the transactional website enablement involves both digital disruption and digital transformation, it would be a milestone in banking digitalization. The influence of transactional website initiatives does not stop at the initial stages of Internet banking. Instead, the establishment of transactional websites endows banks with the grass-roots foundation of ongoing digital resources and capabilities which have the capacity of interconnectedness. In the long term, the transactional website could offer banks the ability to optimize other digital strategies, cohering them into further digital transformation and innovation. Accordingly, considering the adoption of transactional websites separately or only in the preliminary stages of Internet banking may ignore many of its strategic features and capabilities in the digital banking roadmap.

Given these gaps in the literature, this chapter will be the first to:

(i) Provide the latest updates on the impact of transactional website adoption on banking performance in the long term.

(ii) Confirm that the financial value delivered by transactional website adoption is strategic and sustainable.

[37] Please refer to Table 2.1 for the definition and examples of these attributes.

(iii) Provide some features and mechanisms that make transactional website adoption strategic and sustainable.

(iv) Testify the combined capabilities of transactional website adoption with another digital disruption in the digital transformation context.

(v) Bear witness to the existence of inter-firm heterogeneity, attributed to the size effect and timing order effect.

5.3 Hypotheses Proposal

5.3.1 The Features of Value, Appropriability and Durability in Transactional Website Adoption

This hypothesis proposes that transactional website adoption has a positive impact on banks' financial performance in the long run. Resulting from that, three critical features of transactional website adoption can be verified, which are *value, appropriability, and durability.* Value and appropriability, on the basis of quite a number of resource-based view theorists and empirical advocators, are fundamental for firms to enhance efficiency (Barney, 1991) as well as capture sustained profit (Collis and Montgomery, 1995). Meanwhile, durability is the ability by which a business can retain its competitive advantage and value over time (Black and Boal, 1994; Dagnino, 1996; Grant, 1991b). Re-affirmed in recent empirical studies, digital adoption is found to be valuable and appropriate as it is positively linked with a firm's superior performance, e.g., customer service performance (Rai et al., 2006; Setia et al., 2013), operational efficiency, and effectiveness (Rai et al., 2006), financial performance (Alexandru et al., 2019; Homburg et al., 2019; Mbama and Ezepue, 2018), market return performance (McAlister et al., 2012).

In term of the banking discipline, the literature has shown that the launch of banking digital initiatives significantly improves banks performance, especially in terms of (i) customer outcomes (Ahmad and Al-Zu'bi, 2011; Campbell and Frei, 2010; Dabholkar, 1996; Firdous and Farooqi, 2017; Hitt and Frei, 2002; Mann and Sahni, 2011; Mbama and Ezepue, 2018; Xu et al., 2013; Xue et al., 2011); (ii) profitability and efficiency (Al-Hawari and Ward, 2006; Ciciretti et al., 2009; Delgado et al., 2007; DeYoung, 2005; DeYoung et al., 2007; Furst et al., 2002; Goh and Kauffman, 2015; Hernando and Nieto, 2007; Mbama and Ezepue, 2018; Momparler et al., 2013; Pigni et al., 2002; Scott et al., 2017; Sullivan, 2000; Xue et al., 2007).

Such evidence from the literature suggests that the enablement of a transactional website significantly rewards banks with superior financial performance, especially in terms of profitability and efficiency. As discussed in detail previously, transactional website adoption (i) has changed the face of the bank-client relationship and (ii) enables banks to capture new value by diversifying their revenue streams via a broader range of services offered both offline and online channels.[38] Therefore, this hypothesis expects that:

Hypothesis 5.1: The long-term impact of transactional website adoption on banks' financial performance *Transactional website adoption positively impacts the financial performance of banks over time.*

5.3.2 The Features of Embeddedness, Interconnectedness, and Inimitability of Transactional Website Adoption

5.3.2.1 The Feature of Embeddedness

The term embeddedness is used to describe the competencies, skills, and habits that are deeply ingrained into intra-firm relationships and knowledge base of the firms, influences how the firms operate and become a starting point for new knowledge-creation processes (Kogut and Zander, 1992; Rumelt and Lamb, 1984). Some well-known resources and capabilities which possess the embeddedness feature are *tacit knowledge* and *cumulative experiences and practices* (Grant, 1991a; Hart, 1995; Itami and Roehl, 1991; Nielsen, 2005; Polanyi, 1966). In terms of Information and Communication Technology (ITC) and digital adoption particularly, authors also point out some resources that are embedded into firms as an integral part of systems over time, such as *human* resources, business resources, technology resources, expertise, knowledge, and solutions (Bharadwaj, 2000; Bi et al., 2014; Lin, 2007; Popa et al., 2018; Powell and Dent-Micallef, 1997; Setia et al., 2011).

According to theorists of the resource-based view, embeddedness is perceived as an isolating mechanism of "time compression diseconomies" that limits competition (Rumelt, 1984). More concretely, the embeddedness of resources and capabilities creates complexity for each organization which is tough for other firms to imitate or transfer between firms (Barney, 1991; Grewal and Slotegraaf, 2007; Hsueh et al., 2010; Reed and DeFillippi, 1990).

[38] Please refer to Section 2.3 for further details about the value of transactional website and other initiatives add value to customers.

Concerning the impact of embeddedness on corporate performance, a number of studies have proved that embeddedness *improves efficiency* (Gieskes and Heijden, 2004), *simulate innovation* (Dasgupta and Gupta, 2009), determines competitiveness and sustainable development (Dayasindhu, 2002; Hart, 1995). In the discipline of ITC and digital adoption, embeddedness is the determinant of inter-diffusion (Andrews et al., 2018). Furthermore, it can also create value (Lin, 2007), enhance effective governance structure and stakeholder commitment (Setia et al., 2011), and explain significant performance variance among firms (Powell and Dent-Micallef, 1997).

5.3.2.2 The Interconnectedness of Transactional Website Adoption

The interconnectedness of resources/capabilities is understood as a limit to competition. (Barney, 1991; Black and Boal, 1994; Dierickx and Cool, 1989; Hart, 1995; Winter, 1995). It is claimed by Winter (1995, p. 14) that "*the value of idiosyncratic resources to the firm -- i.e., the present value of their future rent streams are affected by the fact that their possible uses include the development of more idiosyncratic resources*". The implication is that the interconnectedness among specific resources within firms offers an additional advantage: an increase in structural complexity and ambiguous causality in the firm's performance due to the development of new sets of resources and capabilities (Kunc and Morecroft, 2010). By this means, the interconnectedness of resources is deemed as an isolating mechanism to protect the firm's rents from unfavourable imitation or substitutability of others (Barney, 1991; Grant, 1991b). "*Resources may potentially impact higher on firm success when examined as part of an interconnected system rather than when examined individually*" (Galbreath, 2005, p. 985). Furthermore, interconnectedness is also incorporated into the creative manner, which is one of the organizational strategic mannerisms suggested by theorists to optimize firms' strategies and limit competition. More precisely, the creative manner is a procedure in which resources are interconnected in a novel way, and new activities are initiated (Winter, 1995).

Regarding the discipline of digital and ITC adoption, empirical scholars have proved that the interconnectedness of resources/capabilities is the root of innovation (Chou et al., 2017; Oliveira and Martins, 2011) and firms' performance (Cohen and Olsen, 2013; Lin, 2007). Besides this, some other authors also point out the benefits arising when resources are brought together and mutually supported, such as added-value information system (Ruivo et al., 2014), competitive sustainability (April, 2004), enhanced customer service outcomes (Powell and Dent-Micallef, 1997). Significantly, the intersection among resources and capabilities is described by Kogut and Zander (1992, p. 391) as "*technological opportunity*".

5.3.2.3 The Feature of Inimitability

Defined by theorists, the resources/capabilities of a firm are at low imitability if they are not possessed or obtained perfectly by others (Dierickx and Cool, 1989). Some special mechanisms which make resources/capabilities inimitable are *unique historical conditions* and *idiosyncratic features of firms* (Barney, 1991; Porter, 1981; Scherer and Ross, 1990), *ambiguous causality* between resources/capabilities owned by firms (Barney, 1986a; Dierickx and Cool, 1989; Lippman and Rumelt, 1982; Reed and DeFillippi, 1990; Rumelt and Lamb, 1997), *social complexities* (e.g. interpersonal relations, brand reputation, idiosyncratic culture) (Barney, 1986a; Dierickx and Cool, 1989)[39].

In the long run, profitability, growth, and survival are contingent on if firms can establish the comparatively immune capability to help them preserve their economic rents and competitive edge (Penrose, 1955, 2009). In order to accomplish these aims, resources/capabilities are asked to be undetectable, equivocal, time-consuming, costly for other firms who do not possess those resources to get to the bottom of their nature, duplicate similar ones and reap the same benefits.

Following in the footsteps of theorists, scholars of digital and ITC disciplines have clarified a respectable number of resources/capabilities that are hard to be observed and imitated, such as knowledge (Bloodgood and Salisbury, 2001), IT integration, causal ambiguity (Oh et al., 2007), core competencies, complementary resources (Arslan and Ozturan, 2011), IT partnerships (Tian et al., 2010). These resources and capabilities are detected to strengthen firms' competitive advantages (Oh et al., 2007), bring on profitability and superior performance (Arslan and Ozturan, 2011; Dibrell et al., 2008; Tian et al., 2010).

[39] Please refer to Chapter 2, Section 2.1.3- Attributes of Strategic Resources for further details.

5.3.2.4 The Attributes of Embeddedness, Interconnectedness, and Inimitability of Transactional website Adoption

Firstly, this hypothesis expects that transactional website adoption endows banks with tacit and unique experiences that are cumulated and embedded in banks over years. For example, during dealing with transactional website adoption, banks have their own experiences concerning their leadership, customers, partnerships, employees, or the market. Based on that, they can set up their own standard criteria for their organizational mannerisms, strategic partnerships, customer perceptions, customer tastes, the speeds of market turbulence, digital trends, digital problems, solutions, et cetera. Over time, these experiences would enrich banks' digital-related knowledge, solutions, competence, and flexibility to optimize their digital business strategy, eventually incorporating them to produce superior financial performance.

Secondly, this hypothesis suggests that the establishment of transactional websites favours banks with digital resources and capabilities which have the capacity to be cross-connected and supplementary. For example, the transactional website could promote other digital initiatives to enhance the capability of discovering and exploiting digital-related opportunities (e.g., awareness of customer trends, new scientific discovery, the optimal product design, optimization of functionality cost, and reliability). As a result, banks are far better at understanding the nature and commercial potential of digital adoption, predicting turbulence from the market, improving customer service quality, stimulating continuous innovation, generating new knowledge, and exploiting the unexplored potential of the technology. In the end, superior financial performance is expected from the interconnectedness of transactional website adoption and another adoption.

Finally, it is a strong possibility that the adoption of the transactional website produces unique resources and capabilities, which are invisible and ambiguous for any external observation and imitation. Some potential mechanisms could be (i) the distinctive experiences of individual banks resulting from providing services to their customers, (ii) cognitive solutions proposed by departments, (iii) the learning by doing process, (iv) embedded tacit digital-related knowledge. Besides this, in the long term, the adoption of the transactional website creates ambiguous causality due to the complexity of integrated infrastructure, unique digital knowledge, strategic partnerships, idiosyncratic culture, and personnel. All the above cases could create inconspicuousness, complexity, and differentiation, which thereby make it hard for opponents to capture and gain the benefits entirely.

Hypothesis 5.2: The Features of Embeddedness, Interconnectedness, and Inimitability of Transactional Website Adoption
Over time, transactional website adoption positively impacts the financial performance of banks due to the attributes of embeddedness, interconnectedness, and inimitability.

5.3.3 Inter-Firm Heterogeneity due to the Size Effect

Regarding banking literature, there have been several comparisons of performance among banks of varied sizes when they adopt digital initiatives (Furst et al., 2000b, 2002; Sullivan, 2000; Sullivan and Wang, 2013). In more detail, Sullivan and Wang (2013) claim that large banks tend to enjoy a cost advantage when adopting digital initiatives. Furst et al. (2000b, 2002) find that non-interest expenses are higher for small Internet banks (under $100 million in assets), compared to non-Internet banks. However, little emphasis is placed on the influence of the size effect on the strength of digital adoption and the long-term performance of banks.

The prediction concerning the influence of the size effect is based on several studies that suggest that more substantial returns and higher growth opportunities are associated with smaller size firms. Firstly, from the standpoint of resources and capabilities, it is likely that small banks gain better value from the website adoption due to (i) their dynamic and absorptive capability, (ii) their less sophisticated organizational structures, and (iii) their more opportunistic behaviour. To be more specific, previous studies prove that small banks are nimbler, less hierarchal, and make decisions more quickly (Chen and Hambrick, 1995; Dean et al., 1998). Therefore, it is suggested that small-scale firms tend to react more quickly to new opportunities as well as are more adaptive to the rapid pace of market change (Carson and McCartan-Quinn, 1995; Chen and Hambrick, 1995); are closer to customers and can successfully deepen their customer contacts (Meziou, 1991); are more efficient in operation and communication (Hamilton et al., 2009); are more proficient at exploiting knowledge spill-overs than larger businesses (MacPherson, 1998).

Furthermore, as small banks have more limited resources and capabilities, they have a propensity to position themselves differently from their larger rivals to grab new opportunities from niche markets (Dean et al., 1998). For example, Regehr and Sengupta (2016) state that small banks tend to target more remote geographic areas. Therefore, small banks can access unique information that facilitates them in setting better contract terms and making better decisions in credit underwriting. Not only that, but some authors also argue that small banks are more aggressive than big banks in looking for opportunities. "*They have a greater need than their larger rivals to act aggressively in the market and challenge the status quo by initiating competitive actions*" stressed Chen and Hambrick (1995, p. 459). As a result, such competitive actions and responses should matter to the performance of small banks, as in line with some theorists (Chen and Hambrick, 1995; Smith et al., 1991).

One question to consider is whether small banks can afford to invest in Internet banking to satisfy their ambitious strategies (e.g., targeting more remote geographic areas). For example, when examining the impact of transactional website banking on community banks, DeYoung et al. (2007) find a significant increase in bank expenditure, especially wages for skilled labour to run Internet delivery systems. To be more specific, DeYoung (2007) asserts that with the advent of the Internet, small banks that are well managed can earn satisfactory profit to offset the high-cost structure. It is because after the deregulation, along with the advent of Internet banking, small banks tend to focus on low volume but high-value-added transactions, such as local market and person-to-person services, therefore their service quality is enhanced. As suggested by the banking literature (Carter and McNulty, 2005; DeYoung, 2007), the strategy of small banks is completely different from their larger rivals. In which, large banks tend to focus on high volume but low-value-added transactions (e.g., home mortgages, credit card loans, online brokerage), taking advantage of economies of scale. The clear divergence between large and small banks partly reflects that, even in the case that the investment in Internet banking is costly, small banks can still earn satisfactory profit and offset the expenditure of Internet banking. For example, DeYoung et al. (2007) find a significant increase in profitability of community banks that adopt Internet banking thanks to an increase in noninterest income from service charges on deposit accounts. The study explains that as Internet banks bring convenience, the depositors are happy to pay extra for the services they previously transacted at bank branches. To sum, "*Internet has the potential to add value for both large banks and small banks*", as stated by DeYoung and Hunter (2001, p.1). De Young and Hunter (2003, p.170) emphasise that well-managed small banks can "*turn competitive threats into their opportunities*". For example, small banks can combine Internet distribution and alliances with other banks to make them better in exploiting existing information advantages of their local branching networks. Small banks can also fully opt for cost-optimized strategies which still fit their market development goals. For example, Mols (1998) suggests that small banks can find the most suitable parties in their Internet banking strategy with the aim of fastest-growing customer's segment. In the same vein, as suggested by DeYoung and Hunter (2001), small banks still partially reduce their cost disadvantages compared to large banks if they distribute their budgets reasonably.

Another question is if M&A activities have any impact on the potential value that Internet banking adds to the bank? What happens if a large bank can merely acquire a small successful bank and grab the existing benefits from that bank. The literature suggests that Internet banking has driven a wedge in the strategies of small banks and large banks (Carter and McNulty, 2005; DeYoung, 2007). However, the strategies of both small and large banks are potentially profitable for them (DeYoung and Hunter, 2001, 2003). Thus, whether M&A activities among banks are successful could firstly depend on their strategies and management.

Numerous studies have demonstrated that, in some cases, the acquisition of small successful banks by larger banks are not certain to yield benefits to the large banks. For example, Doz (1987, p.31) argues that "acquisitions of smaller firms by larger ones have rarely been a success, as the often-anticipated synergies most have not materialized". In the same vein, Christensen (2006) claims that it is easily failed for a large mature company to manage a small, acquired subsidiary as well as access to its innovative way of operating. Obviously, small banks focus on personal-to-personal services with large scale services. Within the limits of this thesis, it is argued that M&A activities do not necessarily bring success. However, future empirical tests should be put into consideration to be better involved in the issue. Please see Section 3.4.4 for further discussion of M&A activity within the dataset.

Based on the above theoretical and empirical studies, this hypothesis expects a more considerable impact of the transactional website adoption on small-sized banks, compared to on larger-sized banks.[40]

Hypothesis 5.3: The Inter-Firm Heterogeneity Attributed to Size Effect
Small scale banks are likely to enjoy superior performance when adopting transactional websites compared to their larger-sized peers.

5.3.4 Inter-Firm Heterogeneity due to the Timing Order Effect

Whether or not a firm should be a leader in its field is a controversial issue. As stated by Suarez and Lanzolla (2005), it is widely believed by executives that the first company in a new product/service category will obtain an important "head start" and achieve enduring benefits. However, "*first-mover advantage is more than a myth but far less than a sure thing*", they argue (Suarez and Lanzolla, 2005, p. 121).

On the one hand, a number of theoretical scholars have expressed enormous regard for the potential reward of being the first movers of an innovative strategy, such as the *learning-by-doing experiences* (Lieberman and Montgomery, 1988), *market share enhancement* (Mascarenhas, 1992a, 1992b; Tufano, 1989), *customer satisfaction and purchase retention* (Alpert and Kamins, 1995; Kalyanaram and Urban, 1992). On the other hand, several critical views have suggested that being a leader presents certain disadvantages, such as the *free-rider effect* (Lieberman, 1987; Lieberman and Montgomery, 1988; Utterback, 1994), *technological or market uncertainty* (Olausson and Berggren 2010). These debates raise suspicions that leading companies may not be able to keep/ or gain sustainable benefits in the long term.

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[40] However, the direction of the impact of transactional adoption on performance for each size group could go either way. Some authors argue that the impact of the size on firms' performance is likely very environment-specific and highly dependent on several institutional factors which affect the performance of firms (see Dalton et al., 1980; Vossen, 1998). As suggested by those authors, enterprises with different sizes all posess distinct advantages. For example, large firms often benefit from their immense resources, such as scale and scope, more cost-effective financial resources, more plentiful human resources and equipment (Nooteboom, 1994; Rothwell and Dodgson, 1994). On the contrary, behavioural characteristics are considered to be one of the most superior advantages of small banks as they have more variation in personnel tasks, tacit knowledge, dynamic capability (Chen and Hambrick, 1995; Dean et al., 1998; Nooteboom, 1994).

In the field of digital banking literature, unfortunately, only a handful of research papers focus on this issue. These studies find that in the short-term, first movers of adopting digital initiatives are able to earn superior performance compared to laggards (Lin et al., 2011; López and Roberts, 2002). However, it seems to contradict some other studies that provide evidence of the cost burden that leading banks suffered during the early stage of Internet banking (Furst et al., 2000a; Sullivan and Wang, 2013). These inconsistencies raise the question of whether the bank leaders in adopting the transactional websites get superior performance, and if so, whether this performance will be preserved over time.

On the one hand, pioneering banks in adopting the transactional website are likely to reap more benefits than late adopters. They may gain the upper hand in reputation because of being the first runners in the market potentially inducing a greater extent of customer awareness (Kerin et al., 1992). Furthermore, leading enterprises are possibly more preeminent than latecomers in influencing consumers' perceptions of how attributes of transactional websites are valued (Carpenter and Nakamoto, 1989, 1990). This is because, in the early stage, customers may know very little about transactional website attributes, and their evaluations are presumably based on the quality of the earliest provided services. Furthermore, it is pointed out by scholars that entry order is a determinant of market share, and thereby first runners may gain more market share than latecomers (Urban et al., 1986).

On the other hand, some studies state that the advantages of first movers could be short-lived or not guaranteed in the long term. It is suggested by Dutta et al. (2014) that the laggards potentially possess unique capabilities to gain competitive advantages or even outperform those who came first. In the same vein, Suarez and Lanzolla (2005) explain that the advantages of the first movers depend greatly on circumstances and market conditions. In the case of firms that turn out to be technology leaders, the authors warned that the ever-changing nature of technology could give later entrants lots of weapons for attacking first movers. Furthermore, when discussing first-mover advantages, several studies have stated that the advantages can be achieved only when businesses really understand what their resources are, how the market context they are involved in is, as well as the way they differentiate themselves from other rivals (Carpenter and Nakamoto, 1990; Dutta et al., 2014; Suarez and Lanzolla, 2005). This is in the same spirit as the resource-based view that is discussed throughout the chapter.

Hypothesis 5.4: The Inter-Firm Heterogeneity Attributed to Timing Effect
There exists the impact of the timing order effect which significantly differentiates the impact of transactional website adoption on the bank's performance across different adoption times.

Figure 5.1 below shows a diagram of the six proposed features as well as the hypotheses set to prove those features, based on the resource-based view theory.

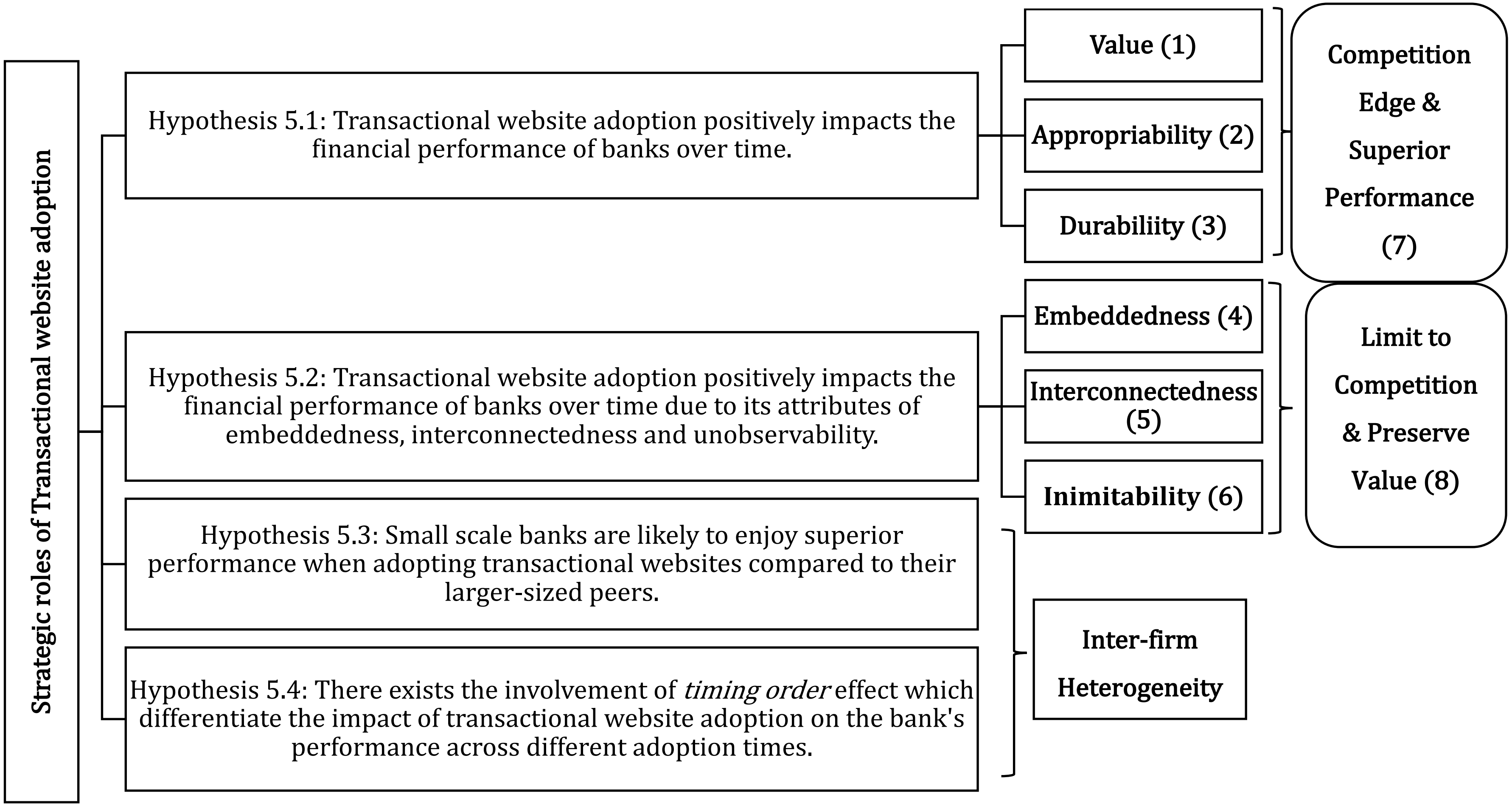


Figure 5.1 Framework of Research Hypotheses

Some key theorists are in following parentheses (1) (Barney, 1991; Dierickx and Cool, 1989); (2) (Amit and Schoemaker, 1993; Collis and Montgomery, 1995; Grant, 1991b); (3) (Black and Boal, 1994; Dagnino, 1996; Grant, 1991b); (4) (Barney, 1991; Grewal and Slotegraaf, 2007; Hsueh et al., 2010; Porter, 1981; Reed and DeFillippi, 1990; Rumelt, 1984); (5) (Barney, 1991; Black and Boal, 1994; Dierickx and Cool, 1989; Hart, 1995; Winter, 1995); (6) (Barney, 1986a; Dierickx and Cool, 1989; Lippman and Rumelt, 1982; Reed and DeFillippi, 1990; Rumelt and Lamb, 1997); (7)-(8) (Peteraf, 1993; Rumelt and Lamb, 1997; Wernerfelt, 1984).

5.4 Data

This chapter employs a sample of 307 listed commercial banks that adopted transactional websites from 1996 to 2010 in the US, as discussed in detail in Chapter 3. The focus of Chapter 5 is on the long-term impact of transactional website adoption on banks' financial performance, therefore accounting data for the 307 sample banks was collected. Annual performance ratios and other accounting characteristics are collected from the FDIC, SNL, Market Intelligence, and Bloomberg during the period of 1993-2018. Section 5.5.1 will discuss the performance ratios and accounting characteristics in detail.

The dataset is an unbalanced panel data of banks. Some sample banks are long-established banks while some other banks are IPOs/*de novo* banks at the time they launch websites. These IPO banks do not have any annual data available before their website launch event times. As there are differences in the nature of the sample banks, their business models might vary and influence the relationship between transactional website adoption and banks' performance.

Relating to other potential confounding events that happen to any bank during the 1993-2018 time period, it is beyond the scope of this thesis to manually check for M&A and stock split activities that occur at any given time. Therefore, it's acknowledged that there may be a limitation with respect to this. Please see Chapter 3, Section 3.4 for further details on possible M&A activity.

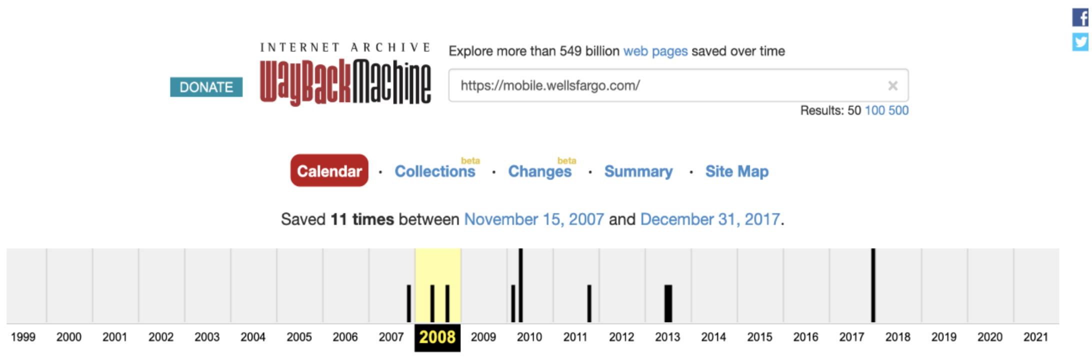
5.4.1 Mobile adoption data

To capture the combinative capability between the transactional website initiative and mobile website initiative, the data on the mobile website adoption event years was collected. The definition of the mobile website adoption is mainly based on the literature. To be more specific, previous studies define the mobile website adoption as the adoption which allows users to retrieve information or access services via their handheld devices (Hung et al., 2003, p. 43; Zhou, 2011, p. 636). The banking literature also defines mobile website adoption as the banking delivery channel which allows customers to access services via their smartphone (Nirala and Pandey, 2015; Taylor, 2012). Furthermore, on the website page, Well Fargo bank says: '*The mobile website is optimized to easily make transfers between your accounts and to other customers, pay your bills, find ATMs, and* *more, from your device*.'[41] Based on the above references, in this thesis, mobile website adoption is defined as the adoption which allows customers access to banks' website services via their smartphone.

According to the literature, the first smartphone was launched in 2007 (Akkara and Kuriakose, 2018; Statista, 2021; Thavalengal and Corcoran, 2016; Topf and Hiremath, 2019; Williams, 2019). Furthermore, according to Statista (2020), Apple earned $123 million in revenue during the 3rd and 4th quarters of 2007 thanks to the launch of the first iPhone.[42] Also, in the year 2007, 1.39 million units of iPhone were sold, as reported by (Statista, 2021).[43] Such evidence suggests that US banks could adopt a banking mobile website version in 2007 at the earliest.

Subsequently, the URL addresses of the sample banks wer, in turn, entered into the Wayback Machine in order to track the first time the bank offered a mobile banking version. For example, when the URL of Well Fargo- https://mobile.wellsfargo.com/ was inserted into Wayback, the first year recorded was year 2007 (see Figure 5.2).

Figure 5.2 Snapshots of Well Fargo website on Wayback Machine

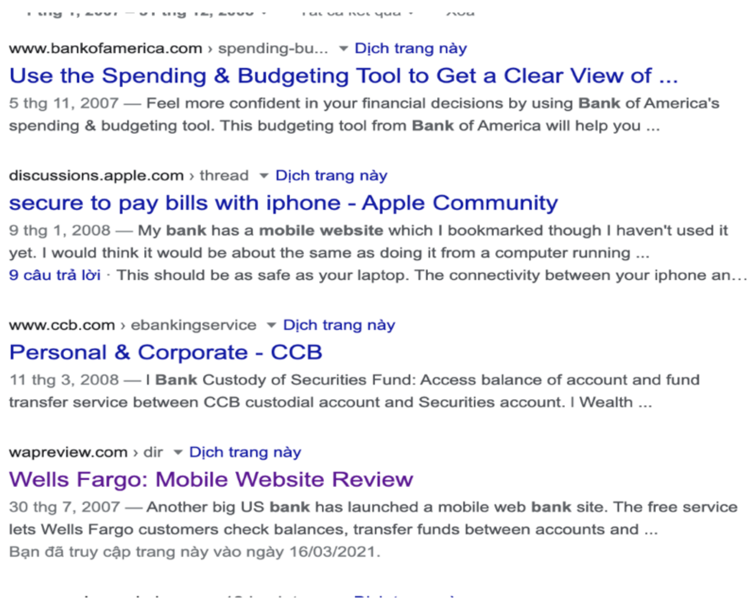


Afterwards, Google search tool was used to recheck the first time the bank offered mobile website version. For example, Well Fargo bank was checked if during year 2007 (from 1st January to 31 December 2007), there was any information relevant to Well Fargo's mobile website version. As illustrated in Figure 5.3, Google showed that, in fact, on July 30, 2007, Well Fargo announced they launched a mobile website site. Thus, the information of Well Fargo on Google also coincides with the information on Wayback, and

[41] Please refer to https://www.wellsfargo.com/help/mobile-features/mobile-faqs/ for further details.
[42] Please refer to https://www.statista.com/statistics/263402/apples-iphone-revenue-since-3rd-quarter-2007/ for further details.
[43] Please refer to https://www.statista.com/statistics/263402/apples-iphone-revenue-since-3rd-quarter-2007/ for further details.

also coincides with the time when the first iPhone was launched. Accordingly, the mobile website event year of Well Fargo was recorded in the year 2007.

Figure 5.3 Screenshot of Wells Fargo's Mobile Website Information on Google Tool in 2007


www.bankofamerica.com › spending-bu... ▾ Dịch trang này
Use the Spending & Budgeting Tool to Get a Clear View of ...
5 thg 11, 2007 — Feel more confident in your financial decisions by using **Bank** of America's spending & budgeting tool. This budgeting tool from **Bank** of America will help you ...

discussions.apple.com › thread ▾ Dịch trang này
secure to pay bills with iphone - Apple Community
9 thg 1, 2008 — My **bank** has a **mobile website** which I bookmarked though I haven't used it yet. I would think it would be about the same as doing it from a computer running ...
9 câu trả lời · This should be as safe as your laptop. The connectivity between your iphone an...

www.ccb.com › ebankingservice ▾ Dịch trang này
Personal & Corporate - CCB
11 thg 3, 2008 — I **Bank** Custody of Securities Fund: Access balance of account and fund transfer service between CCB custodial account and Securities account. I Wealth ...

wapreview.com › dir ▾ Dịch trang này
Wells Fargo: Mobile Website Review
30 thg 7, 2007 — Another big US **bank** has launched a mobile web **bank** site. The free service lets Wells Fargo customers check balances, transfer funds between accounts and ...
Bạn đã truy cập trang này vào ngày 16/03/2021.

The same process was taken down for the remaining sample banks. The final data shows that there are 303 banks that have adopted their mobile website version in 2007. There are 2, 1 and 1 banks, in turn, adopt their mobile website version in 2008, 2009 and 2010, respectively.

5.5 Methodology and Empirical Results

5.5.1 Hypothesis 5.1: The long-term impact of transactional website adoption on banks' financial performance

5.5.1.1 Methodology

A set of regressions is constructed in pursuance of exploring if banks are appreciably benefited when embracing digital by launching their transactional website initiatives. In which a set of seven performance variables are regressed against a dummy variable denoting the adoption of the transactional website as well as a set of control variables. The coefficients associated with the dummy variable will indicate the strength and direct association between transactional website enablement and the performance of financial institutions.

$$PERFORMANCE_{i,t} = \alpha + \beta \times \begin{matrix} Transactional\_ \\ \_website\_adoption \end{matrix}_{i,t} + \delta \times Control\ variables_{\ i,t} + Y_t + \varepsilon_{i,t} \quad \text{(Equation 5.1)}$$

Where:

- Subscripts i and t represents the bank and time (in years), respectively.
- *PERFORMANCE*$_{i,t}$ is the dependent variable. Seven proxies for performance are used, namely, *ROA, ROE, Net Interest Margin, Net operating income to assets, Noninterest income to assets, Noninterest expense to assets,* and *Efficiency Ratio* (see Table 5.1 for further details).
- *Transactional_website_adoption*$_{i,t}$ is the main independent variable of interest which is used for exploring the strength and direction of the relationship between transactional website adoption and banks' performance in the long term. It is a dummy variable, which equals 1 from the year the banks have adopted the transactional websites, and 0 otherwise.
- *Control variables*$_{i,t}$ consists of *Bank_Size*$_{i,t}$, *Bank_Leverage*$_{i,t}$, *Bank_Funding*$_{i,t}$, and *HHI*$_{i,t}$. The control variables are discussed below and in Table 5.1.
- $Bank\_Size_{i,t}$ is a proxy control for scale effect. It is calculated as the natural log of bank i's total assets. Both theoretical and empirical literature has shown that the size of a firm significantly affects performance. Key features of a large firm are its diverse capabilities, the ability to exploit economies of scale and scope, and the formalization of procedures. These characteristics, by making the implementation of operations more effective, allow larger firms to generate superior performance (Nooteboom, 1994; Rothwell and Dodgson, 1994). Alternative points of view suggest that size is correlated with inefficiencies (Shepherd, 1986). The literature, therefore, is equivocal on the relationship between size and performance.
- $Bank\_Leverage_{i,t}$ is a proxy that controls the bank's risk. One common estimation is via the ratio of equity capital to the assets. According to Lessambo (2018), the equity ratio highlights two prime financial concepts of a business: *solvent* and *sustainable* concepts. The solvent part would indicate how much of the total company assets are owned thoroughly by the investors whereas the second one inversely reveals how leveraged the company is with debt. Therefore, put simply, the equity ratio would show how much of a firm's assets were financed by investors. In which, higher investment levels by shareholders should show up that

the firm is worth investing in as so many investors are happy to finance the company. Furthermore, a higher ratio also shows potential creditors that that company is more trustworthy and secure to lend future loans to.

- $Bank\_Funding_{i,t}$ is a proxy that controls for the bank's liquidity risk (DeYoung and Jang, 2016). It is estimated as the ratio of net loans and leases over the core deposit. A loan-to-deposit ratio expresses the ability of a bank to cover loan losses and withdrawals by its customers. If the ratio is at a too high level, it indicates that the bank might not have sufficient liquidity to cover any unforeseen funding requirements. Additionally, the rising ratio might also reflect the pressure the industry confronts in achieving sustainable core deposits. Therefore, bank liquidity with a high level is expected to negatively impact banks' performance (Bilinski et al., 2012).
- $HHI_{i,t}$ is a common proxy that controls the competitive condition of banks (Hannan, 1997). It is calculated through the Herfindahl-Hirschman index (HHI). The HHI is calculated by squaring the market share of each firm competing in the market and then summing the resulting numbers (as following U.S. Department of Justice, 2018). A high value of HHI indicates a highly concentrated marketplace. According to the literature, a highly concentrated market imposes a negative impact on the firm's performance (Uddin and Suzuki, 2014).
- Y_t is a full set of year dummies to control for unobserved heterogeneity in the form of cyclical changes of bank performance that may not be captured by the other control variables. This is consistent in all subsequent equations. The preferred specification is to control for the year fixed effects only, which is consistent with numerous prior studies (DeLong and DeYoung, 2007; DeYoung, 2005; DeYoung et al., 2013; El Diri et al., 2021; Srivastav et al., 2018). State and bank fixed effects are also included for robustness (see Section 5.6).
- Equation 5.1 is estimated with robust standard errors clustered at bank level to account for serial correlation of the error term.
- Table 5.1 offers a description of the variables used in this chapter.

Table 5.1 Summary of Variables

Variables	Aim	Estimation	Expected sign
Dependent variable			
$ROA_{i,t}$ (Return on assets)	Examine the overall performance of banks	Net income after taxes and extraordinary items (annualized) as a percent of average total assets.	
$ROE_{i,t}$ (Return on equity)	Examine the overall performance of banks	Annualized net income as a percent of average total equity.	
$NIM_{i,t}$ (Net Interest Margin)	Examine banks' profitability and growth	Total interest income less total interest expense (annualized) as a percent of average earning assets.	
$NOIA_{i,t}$ (Net operating income to assets)	Examine the operating activities of banks	Net operating income (annualized) as a percent of average total assets.	
$NIIA_{i,t}$ (Noninterest income to assets)	Examine noninterest activities of banks	Income derived from bank services and sources other than interest-bearing assets (annualized) as a percent of average total assets.	
$NIEA_{i,t}$ (Noninterest expense to assets)	Examine noninterest activities of banks	Salaries and employee benefits, expenses of premises and fixed assets, and other noninterest expenses (annualized) as a percent of average total assets.	
$EFFR_{i,t}$ Efficiency Ratio	Examine the efficiency in operations of banks	Noninterest expense less amortization of intangible assets as a percent of net interest income plus noninterest income	
Control variables			
$Bank\_Size_{i,t}$	Control for scale effects.	Calculated as the natural log of $bank_i$'s asset	+/-
$Bank\_Leverage_{i,t}$	Control for the bank's risk.	Estimated as the ratio of equity capital to the asset.	+
$Bank\_Funding_{i,t}$	Control for the bank's liquidity.	Estimated as the ratio of Net loans and leases over Core Deposit.	-
$HHI_{i,t}$	Control for market concentration	The HHI is calculated by squaring the market share of each firm competing in the market and then summing the resulting numbers. A high value of HHI indicates a highly concentrated marketplace.	-

5.5.1.2 Results

Table 5.2 illustrates how have the sample banks performed over two different periods: the ex-ante period (pre-adoption) and the ex-post period (post-adoption). The adoption year is not the same for each bank in the sample (see Figure 3.4 for the distribution of transactional website adoption activity by year), therefore the pre-adoption and post-adoption period depend on which year banks adopted the transactional website.

Firstly, regarding the mean of ROA and ROE shown in column [1]- Panel A, it can be seen that banks were seemingly equally profitable in terms of ROA before and after they have adopted the websites while ROE was higher in the ex-ante period (11.855 versus 9.333). Panel B also does not show any statistical difference in mean ROA value but a significant difference in ROE is reported between the two periods. However, in considering the standard deviation shown in column [3]-Panel A, it is clearer that post-adoption ROA and ROE were much higher than the pre-adoption ROA and ROE (2.675 versus 0.916, and 10.320 versus 7.214, respectively). These figures indicate that there may be a larger gap between one data value and another in the post-adoption period. In other words, the profitability gap between banks potentially widened since they adopted the transaction websites. This point is also reinforced through the maximum value and the minimum value which are shown in columns [4] and [5]. As can be seen, after adopting the transactional website, the highest value of profitability that the banks can receive is up to 102.158 in terms of ROA and up to 319.744 in terms of ROE. More pointedly, compared to the ROA and ROE in the previous period, the post-adoption ROA and ROE were higher by approximately 25.79 times and 6.11 times.

Subsequently, 4.421 and 3.888 are the average of the net interest margin before and after banks have activated websites, respectively. Also, Panel B shows that, on average, the net interest margin of banks significantly declines by 0.533% following the transactional website adoption. A possible reason for such a decline is possibly an increasing competition in the banking sector, in which banks were striving against others to offer lower rates to borrowers (Saksonova, 2014). Alternatively, Saksonova (2014) also suggests that caused by compression in spreads (the difference between lending and borrowing rates), there might occur a speedy growth of interest-bearing assets, which is not offset by the growth of interest income. In addition, the net interest margin is said to be also significantly affected by the economy as well as monetary policies set by central banks (Altavilla et al., 2018; Arseneau, 2017). For example, in referring to the US economy in particular, Forbes (2018) claims that the low-interest-rate environment that has been widespread since the downturn in the economics of 2008 put substantial tension on interest margins for all the U.S. banks over the following period. This claim is in line with the data of the Federal Reserve Bank of St. Louis (FRED) which also shows a marked decline in net interest margins in the US banking industry after it recorded a high value in early 1994 (FRED, 2020).[44]

Non-interest income is one of the most notable growth aspects found in the data. 0.878 is average earnings in the pre-event period while 1.587 is the average income in the post-adoption period. Some authors have said that non-interest income has become an important source of income for the banks, especially in the context when net interest margin can decline due to greater competition or financial and technological innovations (Lepetit et al., 2008). In such scenarios, the earning inflow from other non-interest income becomes significantly crucial for the banks to offset the potential loss due to the lower rate of interest. Notably, the non-interest expense is also significantly higher by 0.079 points following the website adoption (Table 5.2, Panel B). This is consistent with the findings of prior studies that find that banks suffer higher cost after they have adopted transactional websites (Ciciretti et al., 2009; DeYoung, 2001, 2005; Hernando and Nieto, 2007). However, the good point is the banks have much improved their cost efficiency. Indeed, according to Panel B, the efficiency ratio in the post adoption period is significantly 10.432 points lower than the efficiency ratio in the pre-adoption period.

Bank funding (measured by the ratio of Net loans and leases over core deposits) increases from 86.31 to 95.68. On average, following the transactional website adoption the banks tend to fund their assets with higher loans and fewer core deposits shown by the significant difference in bank funding at 9.329 (Panel B). As discussed, bank funding is considered an indicator of liquidity risk (DeYoung and Jang, 2016). Therefore, this research data shows that banks have a higher liquidity risk in the post-adoption period. Meanwhile, the leverage of banks (measures as the ratio of equity capital to the assets) did not seem to change much after the banks have enabled their websites (10.518 vs. 10.598). That said, in the post-adoption period of the website from 1996 to 2018,

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[44] Please also refer to Figure A.5.4, Appendix, Section B for the graph concerning net interest margins of all US banks from 1986 to 2020, FRED (2020).

commercial banks in the US banking industry were still well-capitalized compared to the minimum requirement. Furthermore, banks also suffer more competitive pressure in their industry after they have adopted transactional websites as two panels show that HHI significantly increases by 204.668 points.

In short, the data shows some changes occurred following the transactional website adoptions, compared to the pre-adoption period. During the post-adoption period, there is a wider dispersion of profitability among banks, especially in terms of ROA and ROE. Meanwhile, the net interest margin shows a downward trend, which suggests several potential scenarios, such as intense industry competition, constant progress and development of technology and innovation, and changes in economic and political circumstances. Positively, the non-interest income has increased, suggesting that non-interest income become a strategic line item on the income statement of banks. This is particularly true when interest rates are low and make it more arduous for banks to make a profit. In fact, during the post-adoption adoption period from 1996 to 2018, the US banking industry seemed to be under stiff competition and therefore, the net interest margin might be difficult to be increased. Furthermore, although the banks tend to spend more after they have adopted transactional websites, the way they spend is more efficient. Besides, regarding funding strategy, banks tend to carry out more loans by comparison with their core deposits, suggesting a higher liquidity risk.

Table 5.2 Pre-adoption and Post-adoption Performance of Sample Banks

This table reports the comparison of the banks themselves before and after they have adopted the transactional websites across seven different financial performance measures, including ROA, ROE, Net Interest Margin, Net operating income to assets, Noninterest income to assets, Noninterest expense to assets, and Efficiency Ratio during the 1993-2018 period. The table also reports the funding strategy, liquidity risk, the state of capitalization of sample banks as well as the level of industry competition before and after the banks have adopted their website, which in turn are presented via the variables: Bank_Funding, Bank_Leverage, and HHI.

Panel A: Descriptive Statistics of Performance Ratios of 307 Sample Banks in their adoption and post-adoption periods

Pre-adoption	Mean	Median	Std.	Min	Max	N
ROA	1.052	1.178	0.916	-8.504	3.96	1744
ROE	11.855	12.658	7.214	-67.233	52.262	1744
Net Interest Margin	4.422	4.441	1.053	0.014	11.117	1744
Non-interest Income	0.878	0.666	0.983	0	17.74	1744
Non-interest Expense	3.204	3.064	1.263	0	17.024	1744
Net Operating Income	1.012	1.16	0.93	-8.504	3.96	1744
Efficiency Ratio	75.937	61.466	246.193	0	9800	1744
Bank Funding	86.351	82.545	28.859	0	291.008	1742
Bank Leverage	10.518	9.213	6.327	3.119	99.064	1742
HHI	1480.181	1429.153	138.813	1320.721	1976.71	1744
Post-adoption	**Mean**	**Median**	**Std.**	**Min**	**Max**	**N**
ROA	1.021	0.992	2.675	-10.341	102.158	5858
ROE	9.333	9.707	10.32	-101.547	319.744	5858
Net Interest Margin	3.888	3.808	0.815	-3.627	9.491	5858
Non-interest Income	1.587	0.875	7.869	-0.995	227.426	5858
Non-interest Expense	3.372	2.894	4.638	0.258	135.349	5858
Net Operating Income	1.01	0.982	2.672	-10.341	102.158	5858
Efficiency Ratio	65.505	63.697	21.386	-820	577.617	5858
Bank Funding	95.68	93.239	30.978	0	464.369	5855
Bank Leverage	10.598	9.854	5.705	1.427	98.027	5856
HHI	1684.849	1729.61	139.852	1320.721	1976.71	5858

Panel B: Difference in Performance Ratios between pre-adoption and post-adoption

Variable	ΔMean (Post-Pre)	Std. E	t-value
ROA	-0.031	0.065	0.472
ROE	-2.522***	0.265	9.535
Net Interest Margin	-0.533***	0.024	22.327

Non-interest Income	0.002	0.065	0.032
Non-interest Expense	0.709***	0.189	-3.752
Net Operating Income	0.168*	-0.168	-1.495
Efficiency Ratio	-10.432 ***	3.257	0.001
Bank Funding	9.329***	0.833	-11.205
Bank Leverage	0.080	0.160	-0.500
HHI	204.668***	3.808	-53.741

Table 5.3 represents the results of Equation 5.1, investigating to what extent the enablement of transactional websites adds value to the performance of financial institutions. Overall, the results support Hypothesis 5.1 in that the transactional website significantly improves the financial performance of banks in terms of various dimensions. To be more specific, banks are found to increase their profitability thanks to their adoption of transactional websites. By activating websites, banks achieve an additional 0.932, 3.446, and 0.231 points ($p < 0.05$) in terms of ROA and ROE, and Net Interest Margin, respectively. Furthermore, banks also improve their ability to perform their operating activities and utilize their expenses, with an increase in net operating income ratio by 0.962 points ($p < 0.05$) and a decrease in non-interest expense ratio by 11.639 points ($p < 0.05$). In terms of non-interest activities, the endorsement of website adoption is an increase in non-interest income by 3.059 points ($p < 0.05$), in relation to total assets. Notably, the adoption also induces higher non-interest expenses (e.g., employees' salary and benefits, premises, and fixed assets) for banks by 1.969 ($p < 0.01$), in relation to total assets. Nevertheless, the escalation in non-interest expenses is carried by a threefold increment in non-interest income (1.969 compared to 3.059).

To sum up, the findings presented in Table 5.3 strongly support Hypothesis 5.1. The results are firstly consistent with the evidence provided by previous authors on the relationship between digital banking adoption and banks' performance, especially in terms of profitability and efficiency (see Hypothesis 5.1). Furthermore, the growth of non-interest activities due to digital banking adoption is also acknowledged by some previous scholars (Delgado et al., 2007; DeLong and DeYoung, 2007; Furst et al., 2000a, 2002; He et al., 2020). This finding implies that the transactional website adoption is innovative and therefore rewarding banks with the capability of diversifying non-interest revenue streams. Finally, the findings authenticate three features set up by resource-based view: value, appropriability, and durability (Amit and Schoemaker, 1993; Barney, 1991; Collis and Montgomery, 1995; Dierickx and Cool, 1989; Grant, 1991b; Peteraf, 1993).

Table 5.3 The impact of transactional website adoption on the financial performance of banks

This table reports the ordinary least squares regression results for Equation 5.1, based on the sample of 307 web-launching announcements of publicly traded US banks during the 1993-2018 period. In each regression, the dependent variable is PERFORMANCE, which can be any of the accounting ratios mentioned in Table 5.1, including *ROA, ROE, Net Interest Margin, Net operating income to assets, Noninterest income to assets; Noninterest expense to assets;* and *Efficiency Ratio during 1996-2013 horizon*. Independent variables consist of the variable Transactional website adoption, which equals 1 since the year banks adopt transactional websites and 0 if otherwise. The set of control variables is also employed to control for exogenous cross-sectional differences in market structures and bank characteristics and are all observed annually during the 1993-2018 period. The sources for this table are mainly from FDIC, SNL Financial, Thomson Financial Securities Data, the author's calculations and some other sources. Standard errors in parentheses. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests. Equation 5.1 is estimated with robust standard errors clustered at bank level to account for serial correlation of the error term.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	ROA	ROE	Net Interest Margi	Net Operating Inco	Non-interest Income	Non-interest Expense	Cost efficiency
Transactional_ website_adoption$_{i,t}$	0.932**	3.446**	0.231**	0.962**	3.059**	1.969***	-11.639**
	(0.4629)	(1.3905)	(0.0892)	(0.4662)	(1.2948)	(0.7399)	(4.7884)
Bank_Funding$_{i,t}$	-0.009*	-0.022*	0.001	-0.009*	-0.021	-0.011	0.007
	(0.0046)	(0.0119)	(0.0013)	(0.0046)	(0.0133)	(0.0076)	(0.0450)
Bank_Leverage$_{i,t}$	0.171**	0.046	-0.022***	0.171**	0.721**	0.425**	1.429
	(0.0830)	(0.1533)	(0.0046)	(0.0831)	(0.2973)	(0.1681)	(1.0135)
Bank_Size$_{i,t}$	0.100***	0.968***	-0.052**	0.102***	0.192**	-0.051	-3.456***
	(0.0285)	(0.1489)	(0.0220)	(0.0285)	(0.0748)	(0.0568)	(0.5537)
HHI$_{i,t}$	-0.013***	-0.077***	-0.009***	-0.012***	-0.043***	-0.028***	0.154**
	(0.0043)	(0.0145)	(0.0010)	(0.0044)	(0.0135)	(0.0079)	(0.0595)
Constant	16.668***	110.618***	17.784***	15.722***	53.561***	40.623***	-123.228
	(5.8343)	(20.2628)	(1.4212)	(5.8659)	(17.2361)	(10.0390)	(77.0900)
Observations	7,597	7,597	7,597	7,597	7,597	7,597	7,597
R-squared	0.197	0.147	0.149	0.198	0.371	0.377	0.083
Year Fixed Effect	YES	YES	YES	YES	YES	YES	YES

5.5.2 Hypothesis 5.2: The Features of Embeddedness, Interconnectedness, and Inimitability of Transactional Website Adoption

5.5.2.1 Methodology for the impact of the embeddedness on banks' performance

Firstly, the embedded functionality of the transactional website is explored using the variable "$Transactional\_website\_experience_{i,t}$". It is calculated as the accumulated number of years since the adoption of the transactional website. Therefore, the $Transactional\ website\ experience_{i,t}$ variable will be 0 in the period before and up to the event year and will get incremental value each year after the event year, starting at 1. For example, if a bank adopts its website in 1996, its transactional website experience value will be 0 before and in 1996. After that, its transactional website experience points will be 1 in 1997, 2 in 1998, 3 in 1999 and so forth. The increased value in the $Transactional\_website\_experience_{i,t}$ variable will reflect the deeper embeddedness of the transactional website adoption into the business flow of the $bank_i$.

Notably, the way $Transactional\_website\_experience_{i,t}$ defined is based on a number of papers, especially the paper of DeYoung (2005).[45] More specifically, DeYoung (2005) examines the impact of accumulated experiences on the performance of banks, based on the sample of 12 start-up Internet banks and 644 start-up non-Internet banks. In which, the study of DeYoung (2005) uses accumulated time as the proxy for experiences (see DeYoung, 2005, p.6). The variable $Transactional\_website\_experience_{i,t}$ is defined similarly to the "technology-based experience" variable in the study of DeYoung (2005) which is estimated as accumulated time since the start-up banks adopt their Internet banking services.

$$PERFORMANCE_{i,t} = \alpha + \beta \times Transactional\_website\_experience_{i,t} + \delta \times Control\ variables_{\ i,t} + Y_t + \varepsilon_{i,t} \qquad \text{(Equation 5.2)}$$

Where:

- Subscripts i and t represents the bank and time (in years), respectively.
- $PERFORMANCE_{i,t}$ and $Control\ variables_{i,t}$ are as defined is Equation 5.1.

[45] I also follow other papers (Delgado et al., 2007; Hasan et al., 2002) which also use accumulated time as proxy of bank's experiences.

- $Transactional\_website\_experience_{i,t}$ is the main independent variable of interest.
- Y_t is a full set of year dummies. Please see the description of Equation 5.1 in Section 5.5.1.1 for further explanation on the fixed effects.
- Equation 5.2 is estimated with robust standard errors clustered at the bank level to account for serial correlation of the error term.

In this section, followed the paper of DeYoung (2005), only year time fixed effect is applied for Equation 5.2. However, I also acknowledge that there are two types of banks in the sample (ones that have shifted their models from traditional banking to both branching and Internet banking and others that have adopted Internet banking at the time they appear). Therefore, the $Transactional\_website\_experience_{i,t}$ variable might not capture a potential shift in the business models of some sample banks. State and bank fixed effects are added in robustness tests for Equation 5.2 in Section 5.6.4.

5.5.2.2 Results for the influence of Embeddedness

As could be seen from Table 5.4, the adoption of the transactional website indeed rewards banks with experience, which is embedded over the years and has a significant impact on financial performance over various aspects. More pointedly, except for the aspects of cost efficiency and net interest margin, other aspects (including ROA, ROE, core business activities, and non-interest activities) are all significantly affected by cumulative transactional website experiences. More pointedly, 0.154 points ($p<0.05$) and 0.610 points ($p<0.01$) are the benefits added to ROA and ROE, indicating that website-related experience strongly supports banks in generating returns from their assets and shareholders' investment. Furthermore, Table 5.4 also reveals a considerable impact of experience on non-interest activities of banks (e.g., loan processing fee, late payment fees, credit card charges, service charges, penalties, et cetera), with an increment of 0.477 points($p<0.05$) in terms of the non-interest income ratio.

In such a way, the outcomes of Table 5.4 are highly supportive of Hypothesis 4.2 in that banks can ultimately benefit from their accumulated experience which results from transactional website adoption (e.g., human resources, business resources, technology resources, expertise, knowledge, solutions). Over time, these experiences are likely to endow banks with efficiency, competitiveness, innovation, diversification and eventually turn this into long-term wealth generation.

Table 5.4 The overall impact of transactional website adoptions' experience on banks' performance

This table reports the ordinary least squares regression results for Equation 5.2, based on the sample of 307 web-launching announcements of publicly traded US banks during the 1993-2018 period. In each regression, the dependent variable is PERFORMANCE, which can be any of the accounting ratios mentioned in Table 5.1, including *ROA, ROE; Net Interest Margin; Net operating income to assets; Noninterest income to assets; Noninterest expense to assets;* and *Efficiency Ratio during 1993-2018 horizon*. Independent variables consist of the variable "$Transactional\_website\_experience_{i,t}$", *which* equals 0 before and at the time that banks adopt their transactional websites and equals 1,2,3,4… at year 1, 2,3,4… after banks have adopted the transactional websites. The set of control variables is also employed to control for exogenous cross-sectional differences in market structures and bank characteristics and are all observed annually during the 1993-2018 period. The sources for this table are mainly from FDIC, SNL Financial, Thomson Financial Securities Data, the author's calculations and some other sources. Standard errors in parentheses. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests. Equation 5.2 is estimated with robust standard errors clustered at bank level to account for serial correlation of the error term.

VARIABLES	(1) ROA	(2) ROE	(3) Net Interest Margin	(4) Net Operating Income	(5) Non-interest Income	(6) Non-interest Expense	(7) Cost efficiency
Transactional_ website_experience$_{i,t}$	0.154**	0.610***	0.025	0.157**	0.477**	0.295**	-0.857
	(0.0720)	(0.1747)	(0.0166)	(0.0720)	(0.2221)	(0.1304)	(0.5320)
Bank_Funding$_{i,t}$	-0.007*	-0.015	0.001	-0.007*	-0.016	-0.008	-0.000
	(0.0039)	(0.0104)	(0.0013)	(0.0039)	(0.0115)	(0.0067)	(0.0432)
Bank_Leverage$_{i,t}$	0.167**	0.031	-0.023***	0.167**	0.708**	0.418**	1.461
	(0.0802)	(0.1448)	(0.0046)	(0.0803)	(0.2894)	(0.1637)	(1.0134)
Bank_Size$_{i,t}$	0.041	0.728***	-0.060**	0.041	0.011	-0.161*	-3.242***
	(0.0492)	(0.1647)	(0.0250)	(0.0490)	(0.1357)	(0.0900)	(0.5647)
HHI$_{i,t}$	-0.030**	-0.148***	-0.011***	-0.029**	-0.095**	-0.060***	0.188*
	(0.0122)	(0.0304)	(0.0028)	(0.0121)	(0.0385)	(0.0225)	(0.1054)
Constant	41.459**	212.140***	20.723***	40.757**	128.054**	85.614***	-174.377
	(17.1114)	(43.2782)	(4.1067)	(17.0896)	(53.4449)	(31.3186)	(144.0571)
Observations	7,597	7,597	7,597	7,597	7,597	7,597	7,597
R-squared	0.203	0.153	0.148	0.204	0.377	0.383	0.081
Year Fixed Effect	YES	YES	YES	YES	YES	YES	YES

5.5.2.3 Methodology for the interconnectedness of transactional website initiatives and mobile website adoption

To examine the interconnectedness of transactional website adoption, another digital disruption is chosen that is closest to the transactional website adoption events: mobile website adoption. The purpose is to examine whether the cross-connection between the transactional website and mobile website exerts any considerable influence on banks' performance.

In order to achieve this aim, the following process was taken:

- As an initial step, a variable that is the proxy for the adoption of the mobile website version was created. This is a dummy variable that equals 0 before the mobile web is adopted and equals one since the year banks launch the mobile web version.
- Following this, the gap between transactional website adoption and mobile website adoption is estimated. From that, two equally distributed quantiles have been set up. The first quantile includes the banks whose distances between two adoptions are closer than the ones of banks in the second quantile. The first quantile is named as $Low\_Gap_{i,t}$ variable while the second quantile is titled as $High\_Gap_{i,t}$ variable.
- Subsequently, in order to reflect the interconnectedness between transactional website adoption and mobile website adoption, $Low\_Gap_{i,t}$ is interacted with the $Mobile\_website\_adoption_{i,t}$ variable.
- Finally, the following regressions are constructed to examine the impact of interconnectedness on banks' performance.
- Also, all the equations 5.3 and 5.4 are estimated with robust standard errors clustered at bank level to account for serial correlation of the error term.

$$\begin{aligned} PERFORMANCE_{I,t} &= \alpha + \beta \times Mobile\_website\_adoption_{i,t} \\ &+ \delta \times Control\ variables_{\ i,t} + Y_t + \varepsilon_{i,t} \end{aligned} \qquad \text{(Equation 5.3)}$$

$$\begin{aligned} PERFORMANCE_{I,t} &= \alpha + \beta \times Mobile\ website\ adoption_{i,t} \\ &+ \gamma \times Low\_Gap_{i,t} \\ &+ \rho \times Mobile\ website\ adoption_{i,t} \times Low\_Gap_{i,t} \\ &+ \delta \times Control\ variables_{\ i,t} + Y_t + \varepsilon_{i,t} \end{aligned} \qquad \text{(Equation 5.4)}$$

Where:

- Subscripts i and t represents the bank and time (in years), respectively.
- $PERFORMANCE_{i,t}$ and $Control\ variables_{i,t}$ are as defined in Equation 5.1.
- The main variable of interest is $Mobile\_website\_adoption_{i,t}$ in Equation 5.3, and the interaction between $Mobile\_website\_adoption_{i,t}$ and $Low\_Gap_{i,t}$ in Equation 5.4.
- The quantile of banks that qualify as $High\_Gap_{i,t}$ is used as the reference category in Equation 5.4.
- Y_t is a full set of year dummies. Please see the description og Equation 5.1 in Section 5.5.1.1 for further explanation on the fixed effects.
- Equation 5.3 and 5.4 are estimated with robust standard errors clustered at bank level to account for serial correlation of the error term.

5.5.2.4 Results for the influence of Interconnectedness

The results concerning the interconnectedness between transactional website adoption and mobile website adoption are presented in Table 5.5 and Table 5.6. In which, Table 5.5 shows the overall impact of mobile website adoption while Table 5.6 makes explicit how the relationship between mobile website adoption and transactional website adoption exerts influence on banks' performance.

Firstly, as can be seen from Table 5.5, the adoption of mobile websites significantly strengthens banks' performance, with regards to profitability and non-interest activities. The impact of mobile website adoption is significant for ROE, with an increase of 9.738 points over the years and critically significant at 1%. Furthermore, improvement is also reflected via the enhancement of 2.524 points ($p < 0.05$) in net operating income and growth of 3.765 points ($p<0.01$) in terms of non-interest income. Furthermore, the activation of a mobile website induces an increase in non-interest expenses by 1.486 points ($p<0.05$), but it is offset by higher non-interest income.

Thereafter, Table 5.6 explores the results concerning the examination of the interconnectedness, shown via the interaction between the mobile adoption variable *Low_Gap*. The results show that high and low gap banks could gain different financial benefits from the interconnectedness. To be more specific, banks that have a shorter gap between the two digital initiatives tend to have more benefits from the mobile website adoption relative to the banks that had a larger gap between the two adoptions. The mobile website adoption yields higher profitability and efficiency for low-gap banks by

0.228, 1.540, and 0.166 points ($p<0.05$) in terms of ROA, ROE, and Net Interest Margin, respectively, as well as by 0.232 and 1.050 points ($p<0.05$) in terms of Net Operating Income and Non-interest income, respectively. In terms of cost, it is seemingly more costly for low-gap banks to implement the connection compared to their high-gap rivals (0.816, $p<.01$). However, in return, low-gap banks also gain a remarkable income which is three times the amount they spend (3.329, $p<0.05$ compared to 1.192). Finally, the interaction seems to be cost-effective for all groups of banks, but there is no sign of statistical clarity.

Based on the above results, the following discussions can be drawn:

First of all, such findings demonstrate that there exists long-term wealth gained from the interconnectivity between transactional website adoption and mobile website adoption. These outcomes, therefore, support the ideas of two main theory streams: resource-based view and innovation. On the basis of the resource-based view, interconnectedness is considered an isolating mechanism that strengthens organizational structural complexity, inter-firm heterogeneity, ambiguous causality, and resource development (Barney, 1991; Black and Boal, 1994; Dierickx and Cool, 1989; Hart, 1995; Rumelt, 1984; Winter, 1995). The interconnectedness, thereby, potentially limits the imitability and offers sustainable growth (April, 2004; Kogut and Zander, 1992; Ruivo et al., 2014). Furthermore, the ground of innovation theory claims that the combinative capability between resources is beneficial for firms as it could deliver value to organizational versatility, serve the purpose of innovation (O'Cass et al., 2014), reward firms with stable market positions and more extraordinary performance results (Sheng, 2017). In general, the findings provide some support for both referred theories by proving that the combination of two digital adoptions can ultimately promote bank firms' financial prosperity.

Secondly, the findings reveal that the connection between two digital adoptions would appear to be stronger if the gap between them comes closer. The findings then somehow advocate a theoretical background in terms of exploitative innovation and explorative innovation. According to Jansen et al. (2006), exploitative innovation refers to innovations that are based on the further manipulation of the current technological resource base while exploratory innovation hints at the innovations which are built upon a new technological resource base.

The results, on the one hand, reveal that banks with a higher transferred gap between the two digital adoptions generally perform better, indicating that they are likely to be superior in their exploitative innovation activities. Indeed, previous authors have found that such well-established firms possess effective business processes, experiential market knowledge bases, well-constructed organizational standards (Anderson and Eshima, 2013; Slevin and Covin, 1997). Therefore, these firms benefit more from accustomed routines and processes which reinforce their competitive advantage in established market contexts and entrepreneurial strategies (Freeman et al., 1983). On the other hand, new banks with the lower transferred gap between two digital adoptions seem to achieve better results in their exploratory innovation. The findings are compatible with some authors who stress that new firms had a slight dominance over older firms in exploring new technologies (Nooteboom et al., 2006), leveraging their knowledge and expanding their businesses via the launch of new products or services (Naldi and Davidsson, 2014). The potential explanations are because new firms tend to react to new market opportunities more quickly (Kilenthong et al., 2016) and/or are more adaptive towards changing exigencies of the market (Hill and Rothaermel, 2003).

In short, the findings prove that the enablement of transactional websites is beneficial for bank enterprises in their digital transformation context, no matter they are either old-established or newly established organizations. However, it should be noted that these benefits tend to vary from bank to bank, potentially depending on organizational norms and entrepreneurial strategies.

Table 5.5 The impact of mobile website adoption on banks' performance

This table reports the ordinary least squares regression results for Equation 5.3, based on the sample of 307 web-launching announcements of publicly traded US banks. In each regression, the dependent variable is PERFORMANCE, which can be any of the accounting ratios mentioned in Table 5.1, including *ROA; ROE, Net Interest Margin; Net operating income to assets; Noninterest income to assets; Noninterest expense to assets;* and *Efficiency Ratio during 1993-2018 horizon*. Independent variables consist of the variable Mobile website adoption$_{i,t}$, which equals 1 since banks introduced mobile website version and 0 if otherwise. The set of control variables is also employed to control for exogenous cross-sectional differences in market structures and bank characteristics and are all observed annually during the 1993-2018 period. The sources for this table are mainly from FDIC, SNL Financial, Thomson Financial Securities Data, the author's calculations and some other sources. Standard errors in parentheses. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests. Equation 5.3 is estimated with robust standard errors clustered at bank level to account for serial correlation of the error term.

VARIABLES	(1) ROA	(2) ROE	(3) Net Interest Margin	(4) Net Operating Income	(5) Noninterest Income	(6) Noninterest Expense	(7) Cost efficiency
Mobile website adoption$_{i,t}$	2.487**	9.738***	1.136**	2.524**	3.756**	1.486	-79.082
	(1.0822)	(3.0230)	(0.5050)	(1.0648)	(1.7804)	(1.0800)	(57.9273)
Bank_Funding$_{i,t}$	-0.009*	-0.023*	0.001	-0.009*	-0.022	-0.011	0.011
	(0.0047)	(0.0122)	(0.0013)	(0.0047)	(0.0137)	(0.0078)	(0.0453)
Bank_Leverage$_{i,t}$	0.169**	0.041	-0.022***	0.169**	0.716**	0.422**	1.444
	(0.0839)	(0.1573)	(0.0043)	(0.0841)	(0.3008)	(0.1706)	(1.0290)
Bank_Size$_{i,t}$	0.117***	1.030***	-0.048**	0.119***	0.247***	-0.015	-3.664***
	(0.0232)	(0.1416)	(0.0221)	(0.0232)	(0.0694)	(0.0554)	(0.5740)
HHI$_{i,t}$	-0.028***	-0.139***	-0.018***	-0.027***	-0.051***	-0.024**	0.813
	(0.0105)	(0.0299)	(0.0050)	(0.0103)	(0.0186)	(0.0114)	(0.5655)
Constant	38.098***	197.218***	30.187***	37.234***	63.723***	34.448**	-1,046.045
	(14.5823)	(41.8030)	(6.9697)	(14.3336)	(24.2468)	(14.8901)	(792.2122)
Observations	7,597	7,597	7,597	7,597	7,597	7,597	7,597
R-squared	0.191	0.142	0.147	0.191	0.363	0.368	0.081
Year Fixed Effect	YES	YES	YES	YES	YES	YES	YES

Table 5.6 The impact of interconnectedness between transactional website adoption and mobile website adoption on banks' performance

This table reports the ordinary least squares regression results for Equation 5.4, based on the sample of 307 web-launching announcements of publicly traded US banks during the 1993-2018 period. In each regression, the dependent variable is PERFORMANCE, which can be any of the accounting ratios mentioned in Table 5.1, including *ROA; ROE; Net Interest Margin; Net operating income to assets; Noninterest income to assets; Noninterest expense to assets;* and *Efficiency Ratio during 1993-2018 horizon*. Independent variables consist of the variable $Low\_Gap_{i,t}$, $High\_Gap_{i,t}$, $Mobile\_website\_adoption_{i,t}$ and the interaction between them. The set of control variables is also employed to control for exogenous cross-sectional differences in market structures and bank characteristics and are all observed annually during the 1993-2018 period. The sources for this table are mainly from FDIC, SNL Financial, Thomson Financial Securities Data, the author's calculations and some other sources. Standard errors in parentheses. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests. Equation 5.4 is estimated with robust standard errors clustered at bank level to account for serial correlation of the error term.

VARIABLES	(1) ROA	(2) ROE	(3) Net Interest Margin	(4) Net Operating Income	(5) Non-interest Income	(6) Non-interest Expense	(7) Cost efficiency
$Mobile\_website\_adoption_{i,t}$	2.274**	8.663***	1.031**	2.302**	2.874*	0.838	-79.662
	(1.0861)	(3.1784)	(0.5077)	(1.0695)	(1.6145)	(0.9264)	(57.8291)
$Low\_Gap_{i,t}$	-0.409**	-1.860***	-0.171**	-0.429**	-1.638***	-1.178***	-1.051
	(0.2043)	(0.5968)	(0.0838)	(0.2043)	(0.6250)	(0.3738)	(2.0222)
$Low\_Gap_{i,t}$ x $Mobile\_website\_adoption_{i,t}$	0.228**	1.540**	0.166**	0.232**	1.050***	0.816***	0.777
	(0.0980)	(0.6596)	(0.0706)	(0.0999)	(0.3176)	(0.2307)	(2.1319)
$Bank\_Funding_{i,t}$	-0.008*	-0.020*	0.001	-0.008*	-0.019	-0.010	0.013
	(0.0044)	(0.0114)	(0.0012)	(0.0044)	(0.0127)	(0.0072)	(0.0441)
$Bank\_Leverage_{i,t}$	0.170**	0.043	-0.022***	0.169**	0.717**	0.423**	1.448
	(0.0815)	(0.1463)	(0.0050)	(0.0815)	(0.2909)	(0.1635)	(1.0396)
$Bank\_Size_{i,t}$	0.074*	0.835***	-0.065**	0.073*	0.072	-0.141*	-3.781***
	(0.0393)	(0.1660)	(0.0254)	(0.0393)	(0.1031)	(0.0724)	(0.5916)
$HHI_{i,t}$	-0.025**	-0.125***	-0.016***	-0.024**	-0.038**	-0.015	0.821
	(0.0104)	(0.0313)	(0.0050)	(0.0102)	(0.0158)	(0.0093)	(0.5642)
Constant	34.630**	180.152***	28.464***	33.602**	49.601**	24.077*	-1,054.827
	(14.5844)	(43.8344)	(7.0090)	(14.3467)	(21.2803)	(12.4322)	(790.6668)
Observations	7,571	7,571	7,571	7,571	7,571	7,571	7,571
R-squared	0.199	0.152	0.155	0.199	0.377	0.389	0.082

Year Fixed Effect	YES	YES	YES	YES	YES	YES	YES
Reference variable	High-gap	High-gap	High-gap	High-gap	High-gap	High-gap	High-gap

5.5.2.5 Methodology for the Inimitability of Transactional Website Adoption

For assessing the inimitability feature of transactional website adoption, the relationship between "vicarious learning" behaviour and banks' performances are explored. Vicarious learning behaviour, which is also known under many other terminologies (such as "observational learning "or "learning by observing"), is a knowledge-accumulated process that occurs through observing the behaviour, actions, and activities of others (Bandura, 1980; Weiss, 1990). This section proposes two scenarios relevant to vicarious learning:

- Firstly, if vicarious learning behaviour exerts a remarkable positive effect on financial performance, then the transactional website adoptions of antecedents could be learned and duplicated by followers to improve their own performance.
- On the contrary, if this "learning-by-observing" behaviour has a negative or insignificant impact on the performance of observers, it would be unsuccessful for later adopters to merely observe and mimic the adoption of transactional websites of earlier runners.

The construction of the "learning by observing" variable- $LBOY_{i,t}$ follows the design of DeLong and DeYoung (2007) and Moatti (2009).[46,47] This variable is estimated as the cumulative number of sample banks that adopted transactional websites during the three years prior to the transactional website of $\mathrm{bank}_{i,t}$. As a result, this variable should be the proxy for "learning by observing" behaviour or more to the point, for perceivable information spillover from a previous bank's transactional website adoption, as in line with the description of DeLong and DeYoung (2007).[48]

The descriptive statistics of the "learning by observing" variables are provided in the Appendix, Table A.5.15. Based on the construction of DeLong and DeYoung (2007), three "learning by observing" variables- LBOY1, LBOY2, LBOY3 are constructed, in turn representing the number of banks that adopted transactional websites in the previous one, two or three years, respectively. For example, for the banks that adopt transactional

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[46] This variable is also followed and applied by other studies afterwards in terms of M&A discipline (e.g. Liang et al., 2020; Francis et al., 2014).

[47] Moatti (2009) also constructs the same way to DeLong and DeYoung (2007) and defines the variable as the proxy of imitation behaviour. In which, imitation behaviour is estimated through the number of M&A carried out by other firms for two years prior or to the observation.

[48] The "learning by observing" behaviour of investors is also examined in the next chapter. Please refer to 6.3.2 for further discussion about this behaviour.

websites in 1999, there are 55 banks (LBOY1), 69 banks (LBOY2) and 98 banks (LBOY3) that adopted transactional websites in 1998, 1997 & 1998, and 1996-1998, respectively. The value of "learning by observing" is based on the number of banks that adopt the transactional website in a given period of time, i.e., one, two or three years. As can be seen in Figure 3.4 in Chapter 3, in the sample used in this thesis, banks have adopted the transactional website over 15 years between 1996 and 2010. The majority of the transactional website adoption occurs before 2003, and there is significant variation in the total adoptions within a year between the most active years, from 14 in 1997 to 67 in 2000. the years. This means that there is significant variation in the "learning by observing" variable over the years 1996-2010. As shown in Table A.5.15, the sample years is similar in length to that studied by DeLong and DeYoung (2007), where they examine the "learning by observing" in bank mergers and acquisitions over 13 years between 1987-1999. The distribution of their "learning by observing" variables is similar to this case, where several high and low points are observed.

$$PERFORMANCE_{i,t} = \alpha + \beta \times LBOY_{i,t} + \delta \times Control\ variables_{i,t} + Y_t + \varepsilon_{i,t} \qquad \text{(Equation 5.5)}$$

Where:

- Subscripts i and t represents the bank and time (in years), respectively.
- $PERFORMANCE_{i,t}$ and $Control\ variables_{i,t}$ are as defined is Equation 5.1.
- $LBOY_{i,t}$ is the main independent variable of interest.
- Y_t is a full set of year dummies. Please see the description of Equation 5.1 in Section 5.5.1.1 for further explanation on the fixed effects.
- Equation 5.5 is estimated with robust standard errors clustered at bank level to account for serial correlation of the error term.

5.5.2.6 Results for Inimitability of Transactional Website Adoption

The results of the inquiry into the inimitability feature of transactional website adoption are shown in Table 5.7. As proposed, a negative or insignificant relationship between "learning by observing" and financial performance would suggest that there are no significant financial awards for observing and reduplicating previous transactional website adoptions. Overall, authenticating Hypothesis 5.2., the results show a negative

and/or insignificant impact of "observational learning" behaviour on banks' performance, making clear the inimitability feature of transactional website adoption.
Firstly, observational learning behaviour is shown to make a significantly negative impact on ROE and non-interest income of banks, by a decrease of 0.015 ($p<0.05$) and 0.017 ($p<0.01$), respectively. The results suggest that it would be harmful to banks in terms of their ability to generate profit (especially by using investors' money and in non-interest activities) if they try to observe and copy the transactional website adoption of previous banks. Furthermore, in other respects (including ROA, Net Interest Margin, Cost Efficiency), "learning by observing" behaviour does not bring any significant financial benefits. The only aspect that should be advantageous from the "learning by observing" action is the non-interest expense with a drop of 0.012 points ($p<0.01$). Nevertheless, it is outbalanced by the worse decrease regarding non-interest income (-0.017 point).
To sum up, the results show no evidence that banks can achieve remarkable financial returns and efficiency by observing and imitating the adoption of transactional websites from previous adopters. Furthermore, imitating behaviour could worsen a bad scenario by reducing bank firms' profitability and efficiency. The findings, in this fashion, would indicate that the adoption of the transactional website of each bank potentially has tacit and specific features that make it not easy to be perfectly mimicked and profitable to other competitors. The findings, therefore, support studies that point out specific assets of ITC adoption and digital adoption that make it incomprehensible, elusive, and ambiguously correlated with individual firms (Arslan and Ozturan, 2011; Dibrell et al., 2008; Oh et al., 2007; Tian et al., 2010). On top of this, the findings support other research which clears up the biases, constraints, and negative consequences of imitative or vicarious learning mechanism (Argyris and Schön, 1978; De Carolis, 2003; Levinthal and March, 1993; Miner and Mezias, 1996; Terlaak and Gong, 2008).

Table 5.7 The impact of "learning by-observing" on banks' performance.

This table reports the ordinary least squares regression results for Equation 5.5, based on the sample of 307 web-launching announcements of publicly traded US banks during the period of 1993-2018. In each regression, the dependent variable is PERFORMANCE, which can be any of the accounting ratios mentioned in Table 5.1, including *ROA, ROE; Net Interest Margin; Net operating income to assets; Noninterest income to assets; Noninterest expense to assets;* and *Efficiency Ratio during 1993-2018 horizon*. The main independent variable is "Learning by observing" ($LBOY_{i,t}$) which is estimated as the number of the cumulative number of sample banks that adopted transactional websites during three years before the transactional website of $bank_i$. The set of control variables is also employed to control for exogenous cross-sectional differences in market structures and bank characteristics and are all observed annually during the 1993-2018 period. The sources for this table are mainly from FDIC, SNL Financial, Thomson Financial Securities Data, the author's calculations and some other sources. Standard errors in parentheses. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests. Equation 5.5 is estimated with robust standard errors clustered at bank level to account for serial correlation of the error term.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	ROA	ROE	Net Interest Margin	Net Operating Income	Non-interest Income	Non-interest Expense	Cost efficiency
$LBOY_{i,t}$	-0.003	-0.015**	-0.000	-0.003	-0.017***	-0.012***	-0.022
	(0.0020)	(0.0066)	(0.0007)	(0.0020)	(0.0060)	(0.0039)	(0.0152)
$Bank\_Funding_{i,t}$	-0.010**	-0.029**	0.002	-0.010**	-0.023	-0.010	0.058*
	(0.0049)	(0.0125)	(0.0014)	(0.0049)	(0.0144)	(0.0083)	(0.0340)
$Bank\_Leverage_{i,t}$	0.250***	0.172	-0.015	0.250***	0.976***	0.573***	0.083
	(0.0736)	(0.1208)	(0.0118)	(0.0738)	(0.2791)	(0.1559)	(0.2403)
$Bank\_Size_{i,t}$	0.040	0.670***	-0.065***	0.039	-0.072	-0.235**	-3.301***
	(0.0577)	(0.2128)	(0.0234)	(0.0578)	(0.1517)	(0.0997)	(0.5576)
$HHI_{i,t}$	-0.002	0.049*	0.010***	-0.003	0.024	0.025	-0.030
	(0.0151)	(0.0292)	(0.0027)	(0.0151)	(0.0359)	(0.0176)	(0.0437)
Constant	1.980	-71.500	-10.071**	3.059	-41.986	-36.000	152.442**
	(23.1531)	(45.4691)	(4.2887)	(23.1372)	(53.8584)	(26.3603)	(68.7851)
Observations	5,855	5,855	5,855	5,855	5,855	5,855	5,855
R-squared	0.316	0.155	0.098	0.317	0.520	0.535	0.088
Year Fixed Effect	YES	YES	YES	YES	YES	YES	YES

5.5.3 Hypothesis 5.5: The Inter-Firm Heterogeneity Attributed to Size Effect

5.5.3.1 Methodology

First of all, for each year, the banks are divided into two equally distributed quantiles: Small-sized banks and Large-sized banks. The small-sized bank group makes up 50% of sample banks with the smallest asset value each year, and the large-sized bank includes the remaining 50% of banks with the largest asset value. It's important to note that in Chapter 4, Section 4.4.2, sample banks are divided into three sub-samples based on their size. With the aim of simplifying the interpretation of the interaction term in Equation 5.6 below, it's decided to use two groups based on bank size here. However, to be consistent with Chapter 4 and for robustness, in Section 5.6.3, the results using three groups based on bank size are also examined.

Subsequently, two dummy variables are created, including $Small\_Bank_{i,t}$ and $Large\_Bank_{i,t}$. Regarding the $Small\_Bank_{i,t}$ variable, only banks that belong to the Small-sized group will receive the value of 1, and thereby banks in the Large-sized group will receive the value of 0. In a similar process, concerning the $Large\_Bank_{i,t}$ variable, only banks in the Large-sized group will get a value of 1. Finally, these two variables independently interacted with the $Transactional\_website\_adoption_{i,t}$ variable. These interactions will serve well the aim of the research objective as they enable us to track down two distinct degrees of transactional websites' impact on bank's performance across different size groups.

The model for Hypothesis 5.3 is presented as follows:

$$
\begin{aligned}
PERFORMANCE_{i,t} & \\
= \ & \alpha + \beta \times Transactional\_website\_adoption_{i,t} \\
& + \gamma \times Small\_Bank_{i,t} \\
& + \rho \times Transactional\_website\_adoption_{i,t} \\
& \times Small\_Bank_{i,t} + \delta \times Control\ variables_{\ i,t} + Y_t + \varepsilon_{i,t}
\end{aligned}
\qquad \text{(Equation 5.6)}
$$

Where:

- Subscripts i and t represents the bank and time (in years), respectively.
- $PERFORMANCE_{i,t}$ and $Control\ variables_{i,t}$ are as defined is Equation 5.1.
- The interaction between $Transactional\_website\_experience_{i,t}$ and $Small\_Bank_{i,t}$ is the main independent variable of interest. $Large\_Bank_{i,t}$ is used as the reference category.
- Y_t is a full set of year dummies. Please see the description of Equation 5.1 in Section 5.5.1.1 for further explanation on the fixed effects.
- Equation 5.6 is estimated with robust standard errors clustered at bank level to account for serial correlation of the error term.
- The large-sized bank group is used as the reference category.

In addition, regressions on two different sub-samples based on small-sized banks and large-sized banks are also examined to consider if there is any significant distinction in the impact of transactional website adoption on the performance of each sub-sample group. The equation is similar to Equation 5.1 but it is regressed in two different samples.

5.5.3.2 Results for the Size Effect

Table 5.8 and Table 5.9 report on how the size effect influences the relationship between transactional website adoption and banks' performance. In particular, Table 5.8 presents the results for the full sample, which includes both small-sized banks and large-sized banks whereas Table 5.9 shows the independent outcomes for two subsamples: the small-sized bank group (Panel A) and the large-sized bank group (Panel B). In general, both reveal that the adoption of the transactional website has a more profound effect on small banks than larger ones.

Firstly, as presented in Table 5.8, a significant difference in the performance of small banks could be seen in the absence and availability of transactional website adoption compared to their major competitors. With the lack of transactional websites, small banks are likely to perform worse than larger banks with negative coefficients in both five first terms and positive coefficients in terms of cost-efficiency. More concretely, without the adoption of the transactional website, compared to the large banks, small banks lead to a decrease of -0.819, -4.276, -0.824, and 14.035 points (all p-values <0.01) in terms of ROA, ROE, non-interest income and cost efficiency, respectively. Small banks seem to enjoy lower non-interest expenses (-1.042, $p<0.1$), but they still suffer from more negative non-interest income (-2.220, $p<0.05$) compared to their large-sized rivals.

But the situation has changed since transactional websites were activated. Small banks show a remarkable improvement over the big competitors. In particular, the coefficient values of the interaction between small banks and transactional website adoption are all positive for the first five columns, indicating that the impact of transactional website adoption has a more significant effect on smaller-sized companies than on large-scale companies. Small-scaled banks, by adopting transactional websites, could enjoy higher ROA, ROE, net interest margin, Net operating income, and Noninterest income by 0.626 ($p<0.1$), 1.741 ($p<0.1$), 0.197 ($p<0.05$), 0.620 ($p<0.1$) and 2.077 ($p<0.1$) percentage points, respectively, compared to their large rivals. The non-interest expense of small-sized banks is also higher by 1.437 points ($p<0.05$), but it is also offset by a higher increase of 2.077 ($p<0.1$) of non-interest income.

When the sample banks are divided into two size groups, the sign of magnitude effect is still hold. To be more specific, the performance of small banks was more significantly affected by the transactional website adoption than the large companies. As presented in Table 5.9, the coefficient values corresponding to Small Banks (Panel A) are significant mostly, at least at 10%. Meanwhile, the coefficient values regarding Large Banks (Panel B) are far less significant (only significant at 10% in terms of Net Operating Income and Non-interest income). Moreover, the coefficients that show the effect of transactional website adoption on small banks are also higher than on large ones. The coefficients are 15.9 times, 4.54 times, 2.84 times, 11.591 higher for smaller banks, corresponding to the area of ROA, ROE, and Net Interest Margin and Net Operating income, respectively. Small banks immensely improve cost efficiency compared to large banks, as the adoption of a transactional website reduces the cost-efficiency ratio by 58.75 times (-29.317 compared to 0.499). The margin of difference between income and expenses in non-interest activities is also higher for small banks. Income is about 1.62 times higher than expenses regarding small banks while this ratio is 1.26 for large banks.

To sum up, the results presented in Table 5.8 and Table 5.9 strongly support Hypothesis 5.3, in which, the transactional website adoption matters more for the performance of small banks, compared to the large-scale banks. Put differently, small bank enterprises are more financially benefited than larger peers from the transactional website enablement. Some potential explanations and relevant literature have been already discussed in Section 5.3.3. In which, small banks are likely to gain better values from the transactional website adoption due to (i) their dynamic and absorptive capability, (ii) their less sophisticated organizational structures, and (iii) their more opportunistic behaviour. This viewpoint is also in line with authors who also suggest that small banks are more successful and efficient in innovating or/and implementing business practices (Acs and Audretsch, 1990; Hamilton et al., 2009; Zenger, 1994). Furthermore, the findings also suggest that transactional website adoption brings more opportunities for small banks and leverages their potential capacities. Put differently, "*Internet banking could offer entry and expansion opportunities that small banks traditionally lacked*", as said by Carlson et al. (2001, p. 1).

Table 5.8 The impact of size effect on banks' performance

This table reports the ordinary least squares regression results for Equation 5.6, based on the sample of 307 web- launching announcements of publicly traded US banks during the 1993-2018 period. In each regression, the dependent variable is PERFORMANCE, which can be any of the accounting ratios mentioned in Table 5.1; including *ROA; ROE; Net Interest Margin; Net operating income to assets; Noninterest income to assets; Noninterest expense to assets;* and *Efficiency Ratio during 1996-2013 horizon*. The main independent variables are $Small\_Bank_{i,t}$ and the interaction with the $Transactional\_website\_adoption_{i,t}$. The set of control variables is also employed to control for exogenous cross-sectional differences in market structures and bank characteristics and are all observed annually during the 1993-2013 period. The sources for this table are mainly from FDIC, SNL Financial, Thomson Financial Securities Data, the author's calculations and some other sources. Please note that the results in this table only display the coefficients of $Small\_Bank_{i,t}$ and $Small_Bank_{i,t}$x $Transactional\_website\_adoption_{i,t}$. $Large\_Bank_{i,t}$ is treated as a reference category. Therefore, the coefficients shown $Small\_Bank_{i,t}$ and $Small_Bank_{i,t}$x $Transactional\_website\_adoption_{i,t}$ variables present the comparison to $Large\_Bank_{i,t}$ and $Large_Bank_{i,t}$x $Transactional\_website\_adoption_{i,t}$. The *small-sized bank* group comprises 50% of sample banks with the smallest asset values each year, and the *large-sized bank* group includes the remaining 50% of banks with the largest market capitalization. Standard errors in parentheses. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests. Equation 5.6 is estimated with robust standard errors clustered at bank level to account for serial correlation of the error term.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	ROA	ROE	Net Interest Margin	Net Operating Income	Noninterest Income	Noninterest Expense	Cost efficiency
$Transactional\_website\_adoption_{i,t}$	0.591**	2.694**	0.083	0.624**	1.916***	1.115***	-9.474**
	(0.2500)	(1.0784)	(0.0966)	(0.2530)	(0.6598)	(0.4010)	(4.1598)
$Small\_Bank_{i,t}$	-0.819***	-4.276***	-0.074	-0.824***	-2.220**	-1.042*	14.035***
	(0.2889)	(0.7516)	(0.1044)	(0.2895)	(0.9939)	(0.5769)	(3.4405)
$Small_Bank_{i,t}$x $Transactional\_website\_adoption_{i,t}$	0.626*	1.741*	0.197**	0.620*	2.077*	1.437**	-5.751
	(0.3666)	(0.9111)	(0.0917)	(0.3674)	(1.1981)	(0.6868)	(3.6802)
$Bank\_Funding_{i,t}$	-0.008*	-0.018	0.001	-0.009*	-0.020	-0.011	-0.007
	(0.0047)	(0.0121)	(0.0013)	(0.0047)	(0.0136)	(0.0077)	(0.0446)
$Bank\_Leverage_{i,t}$	0.170**	0.025	-0.020***	0.170**	0.720**	0.430**	1.510
	(0.0840)	(0.1567)	(0.0049)	(0.0841)	(0.2987)	(0.1678)	(1.0147)
$HHI_{i,t}$	-0.010**	-0.059***	-0.009***	-0.010**	-0.038***	-0.028***	0.093*
	(0.0043)	(0.0145)	(0.0010)	(0.0043)	(0.0129)	(0.0075)	(0.0557)
Constant	15.207***	99.614***	17.948***	14.228**	50.454***	40.177***	-87.396
	(5.6292)	(20.0706)	(1.4288)	(5.6629)	(16.4186)	(9.5353)	(75.2170)
Observations	7,597	7,597	7,597	7,597	7,597	7,597	7,597

R-squared	0.200	0.144	0.144	0.201	0.375	0.382	0.078
Year Fixed Effect	YES	YES	YES	YES	YES	YES	YES
Reference Category	Large-sized Banks	Large-sized Banks	Large-sized Banks	Large-sized Banks	Large-sized Banks	Large-sized Banks	Large-sized Banks

Table 5.9 The magnitude impact in adopting transactional website- Sub-samples.

This table reports the ordinary least squares regression results for Equation 5.1, based on the sub-sample of small-sized banks (Panel A) and larger-sized banks (Panel B). The original data sample includes 307 web-launching announcements of publicly traded US banks during the 1993-2018 period based on the sample of 307 web-launching announcements of publicly traded US banks during the 1996-2013 period. In each regression, the dependent variable is PERFORMANCE, which can be any of the accounting ratios mentioned in Table 5.1; including *ROA, ROE, Net Interest Margin, Net operating income to assets, Noninterest income to assets, Noninterest expense to assets,* and *Efficiency Ratio*. The set of control variables is also employed to control for exogenous cross-sectional differences in market structures and bank characteristics and are all observed annually during the 1993-2013 period. The sources for this table are SNL Financial, FIDC, Thomson Financial Securities Data, the author's calculations, and other sources. Standard errors in parentheses. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests. Equation 5.1 is estimated with robust standard errors clustered at bank level to account for serial correlation of the error term.

Panel A: Sub-sample- Small Banks							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	ROA	ROE	Net Interest Margin	Net Operating Income	Non-interest Income	Non-interest Expense	Cost efficiency
Transactional_ website_adoption$_{i,t}$	1.671*	5.386*	0.435***	1.704**	4.281**	2.641**	-29.317***
	(0.8538)	(2.7530)	(0.1540)	(0.8620)	(2.1160)	(1.1925)	(9.3580)
Bank_Funding$_{i,t}$	-0.018*	-0.046**	0.002	-0.018*	-0.044*	-0.021	0.061
	(0.0092)	(0.0224)	(0.0021)	(0.0092)	(0.0258)	(0.0146)	(0.0923)
Bank_Leverage$_{i,t}$	0.185***	0.146	-0.028***	0.185***	0.768***	0.443***	1.257
	(0.0677)	(0.0901)	(0.0056)	(0.0679)	(0.2564)	(0.1493)	(1.1701)
HHI$_{i,t}$	-0.020***	-0.111***	-0.011***	-0.019***	-0.034***	-0.017**	0.537***
	(0.0037)	(0.0178)	(0.0020)	(0.0037)	(0.0100)	(0.0067)	(0.1268)
Bank_Size$_{i,t}$	0.293	2.692***	-0.016	0.292	-0.138	-0.554	-15.170***
	(0.3027)	(0.8872)	(0.0882)	(0.3013)	(0.6120)	(0.3638)	(3.1987)
Constant	24.554***	138.901***	19.787***	23.031***	45.477***	29.950***	-531.727***
	(6.2674)	(28.9970)	(2.3480)	(6.3640)	(15.0727)	(9.0219)	(151.0744)
Observations	3,805	3,805	3,805	3,805	3,805	3,805	3,805
R-squared	0.225	0.114	0.155	0.225	0.426	0.443	0.105
Fixed effect	YES	YES	YES	YES	YES	YES	YES

Panel B: Sub-sample- Large Banks							
VARIABLES	ROA	ROE	Net Interest Margin	Net Operating Income	Non-interest Income	Non-interest Expense	Cost efficiency
Transactional_ website_adoption$_{i,t}$	0.105	1.186	0.153	0.147*	0.728*	0.576	0.499
	(0.0657)	(0.7487)	(0.0940)	(0.0748)	(0.4394)	(0.3701)	(1.7109)
Bank_Funding$_{i,t}$	-0.000	0.000	-0.000	-0.001	-0.000	-0.001	-0.034
	(0.0006)	(0.0065)	(0.0014)	(0.0006)	(0.0025)	(0.0026)	(0.0224)
Bank_Leverage$_{i,t}$	0.056***	-0.363***	0.062***	0.055***	0.069	0.052	-0.861***
	(0.0133)	(0.1123)	(0.0175)	(0.0130)	(0.1032)	(0.0836)	(0.2401)
HHI$_{i,t}$	-0.003**	-0.043***	-0.011***	-0.003**	-0.017*	-0.016**	0.023
	(0.0011)	(0.0120)	(0.0014)	(0.0012)	(0.0089)	(0.0073)	(0.0244)
Bank_Size$_{i,t}$	0.021*	0.368***	-0.080***	0.019	0.223***	0.056	-0.643**
	(0.0122)	(0.1409)	(0.0297)	(0.0128)	(0.0370)	(0.0371)	(0.3221)
Constant	4.675***	74.016***	20.195***	4.387***	21.909*	25.291***	46.896
	(1.5029)	(16.7957)	(1.7805)	(1.5891)	(11.4176)	(9.2935)	(31.5826)
Observations	3,792	3,792	3,792	3,792	3,792	3,792	3,792
R-squared	0.227	0.233	0.231	0.217	0.076	0.042	0.097
Fixed effect	YES	YES	YES	YES	YES	YES	YES

5.5.4 Hypothesis 5.4: Inter-firm Heterogeneity Attributed to the Timing Order.

5.5.4.1 Methodology

The aim of this section is to use regression equations to consider whether the timing orders affect the influence of banking website adoption on the performance of bank firms. To do this, the following steps were carried out:

Firstly, the bank samples are classified into three groups with equally distributed timing orders: the first-mover group, the second-mover group, and the laggard group. More pointedly, the first-mover group includes banks who have adopted their transactional website earliest, from 1996 to 1998. Meanwhile, the second-mover group consists of banks who were the followers in launching transactional websites. The event time of this group falls into the 1999-2000 period. Finally, the laggard group covers banks whose transactional websites have been triggered after the year 2000.

Afterwards, based on these classifications, three separate dummy variables are created, namely $First\_movers_{i,t}$, $Second\_movers_{i,t}$, and $Laggard_{i,t}$, which represent three distinct timing order banking groups, as discussed above. $First\_movers_{i,t}$ variable equals 1, if banks have the adoption year within the 1996-1998 interval, otherwise it equals 0. Similarly, the $Second\_movers_{i,t}$ variable equals 1 if the event year falls within 1999-2000, otherwise, it equals 0. $Laggard_{i,t}$ equals 1 if the adoption year is after 2000.

Finally, to explore the influence of the timing order effect on the relationship of transactional website adoption and bank's performance, the variables $First\_movers_{i,t}$, and $Second\_movers_{i,t}$ interacted with $Transactional\_website\_adoption_{i,t}$, independently.

The model for Hypothesis 5.4 is presented as follows:

$$\begin{aligned} PERFORMANCE_{i,t} &= \alpha + \beta \times Transactional\ website\ adoption_{i,t} \\ &+ \gamma_1 \times First\ movers_{i,t} + \gamma_2 \times Second\ movers_{i,t} \\ &+ \rho_1 \times Transactional\ website\ adoption_{i,t} \\ &\times First\ movers_{i,t} \\ &+ \rho_2 \times Transactional\ website\ adoption_{i,t} \\ &\times Second\ movers_{i,t} + \delta \times Control\ variables_{\ i,t} + Y_t \\ &+ \varepsilon_{i,t} \end{aligned} \qquad \text{(Equation 5.7)}$$

Where:

- Subscripts i and t represents the bank and time (in years), respectively.
- $PERFORMANCE_{i,t}$ and $Control\ variables_{i,t}$ are as defined is Equation 5.1.
- The interaction between $Transactional\_website\_experience_{i,t}$ and $First\_movers_{i,t}$ and the interaction between $Transactional\_website\_experience_{i,t}$ and $Second\_movers_{i,t}$ are the main independent variables of interest. $Laggards_{i,t}$ is used as the reference category.
- Y_t is a full set of year dummies. Please see the description of Equation 5.1 in Section 5.5.1.1 for further explanation on the fixed effects.
- Equation 5.7 is estimated with robust standard errors clustered at bank level to account for serial correlation of the error term.

5.5.4.2 Results for the Timing Effect

Table 5.10 shows the examination of the impact of timing order effect on the relationship between the transactional website adoption and banks' performance. Overall, the results show that the advantages of first and early movers would seem to be dismissed over time. The results are firstly reflected via the coefficients of the variables [$First\ Moverx\ Transactional\ Website\ Adoption$] and [$Second\ Mover\ x\ Transactional$ *website Adoption*][49]. As could be seen, the adoption of the transactional website appears to favour first and second runners. The relevant coefficients are positive in terms of ROA, ROE, Net Operating Income, Non-interest Income and negative in terms of Cost Efficiency Ratio. More pointedly, by the adoption of a transactional website, the first adopters could gain a surge of 0.224 and 0.554 in terms of ROA and ROE while the second movers can potentially enjoy the growth of 0.069 and 0.156 in terms of the same dimensions. Also, first movers are likely to manage their expenditure most effectively with a reduction in cost efficiency ratio (-0.491). In the interim, second-adopting firms appear to be less efficient in adopting their transactional website as the cost efficiency ratio steps up by 4.998 points. Interestingly, this finding is also compatible with the difference between earnings and expenses of non-interest activities. Leading-announcer firms seem to make

[49] Please note that the $Laggard_{i,t}$ is the reference variable in all the regressions, so the coefficients associated with this variable will not be shown.

more money than what they must pay (1.003 and 0.533) where there would seem not to be much difference in overheads and income from the secondary adopters' non-interest activities (0.474 and 0.305).

Although the coefficients are likely to reward first launchers and other early birds in comparison to their late-adopted rivals, it should be stressed that those coefficients are not statistically significant. Moreover, predecessors tend to be less profitable than latecomers throughout the years in terms of Net Interest Margin (-0.315 and -0.217).

In short, the results presented in Table 5.10 could claim that the first-mover status seems to bring more generous benefits, but these rewards do not appear to induce any appreciable difference between first runners and those who arrive late in the long term. Consequently, the results are in common with studies that show that the advantages of first comers are quickly eliminated and could be not insured over time (Carpenter and Nakamoto, 1990; Dutta et al., 2014; Suarez and Lanzolla, 2005). The results also support the studies which argue that adopters at different stages of adoption potentially have their own idiosyncratic advantages. Thereby, the timing order is not the key determinant in significantly differentiating the financial profits earned from transactional websites which are adopted at different times. However, it would be worthwhile to further delve into what the distinctive competitive edges of early adopters and latecomers are in adopting transactional websites over time. To answer the question, more conceptual and empirical examination should be developed in the future.

Table 5.10 The impact of timing effect in adopting the transactional website.

This table reports the ordinary least squares regression results for Equation 5.7, based on the sample of 307 web-launching announcements of publicly traded US banks during the 1993-2018 period. In each regression, the dependent variable is PERFORMANCE, which can be any of the accounting ratios mentioned in Table 5.1, including *ROA, ROE, Net Interest Margin, Net operating income to assets, Noninterest income to assets, Noninterest expense to assets,* and *Efficiency Ratio during 1993-2018 horizon*. Independent variables consist of three dummy variables: First_mover$_{i,t}$, Second_mover$_{i,t}$, and their interactions with Transactional_website_adoption$_{i,t}$. The set of control variables is also employed to control for exogenous cross-sectional differences in market structures and bank characteristics and are all observed annually during the 1993-2018 period. The sources for this table are mainly from FDIC, SNL Financial, Thomson Financial Securities Data, the author's calculations and some other sources. Please note that the results in the table only display the coefficients of First_mover$_{i,t}$, Second_mover$_{i,t}$, and their interactions with Transactional_website_adoption$_{i,t}$. Laggard$_{i,t}$ is treated as a reference category. Therefore, the coefficients shown in First_mover$_{i,t}$, Second_mover$_{i,t}$, and their interactions with Transactional_website_adoption$_{i,t}$ would reveal the comparison to Laggard$_{i,t}$ and Transactional_website_adoption$_{i,t}$ × Laggards$_{i,t}$. Standard errors in parentheses. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests. Equation 5.7 is estimated with robust standard errors clustered at bank level to account for serial correlation of the error term.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	ROA	ROE	Net Interest Margin	Net Operating Income	Non-interest Income	Non-interest Expense	Cost efficiency
Transactional_ website_adoption$_{i,t}$	0.631*	1.926	0.270***	0.667*	1.949**	1.274**	-12.707**
	(0.3363)	(1.2018)	(0.0888)	(0.3398)	(0.8692)	(0.4950)	(5.2169)
First_mover$_{i,t}$	0.269**	2.091***	0.381***	0.310***	0.694*	0.536*	0.169
	(0.1135)	(0.7314)	(0.1312)	(0.1159)	(0.3695)	(0.2737)	(6.4495)
Second_mover$_{i,t}$	0.131	1.029	0.278**	0.192	0.004	-0.042	-6.397
	(0.1283)	(0.6904)	(0.1353)	(0.1303)	(0.4177)	(0.2957)	(4.1513)
Transactional_ website_adoption$_{i,t}$ x First_mover$_{i,t}$	0.224	0.554	-0.315***	0.200	1.003	0.533	-0.491
	(0.2288)	(0.7458)	(0.1061)	(0.2322)	(0.8554)	(0.5456)	(6.1286)
Transactional_ website_adoption$_{i,t}$ x Second_mover$_{i,t}$	0.069	0.156	-0.217**	0.018	0.474	0.305	4.998
	(0.1325)	(0.7056)	(0.1026)	(0.1348)	(0.4303)	(0.2822)	(4.0458)
Bank_Funding$_{i,t}$	-0.008*	-0.016	0.001	-0.008*	-0.018	-0.009	0.007
	(0.0041)	(0.0110)	(0.0013)	(0.0041)	(0.0121)	(0.0069)	(0.0440)
	0.169**	0.036	-0.022***	0.169**	0.713**	0.420**	1.423

$Bank\_Leverage_{i,t}$	(0.0809)	(0.1450)	(0.0049)	(0.0809)	(0.2906)	(0.1641)	(1.0128)
$Bank\_Size_{i,t}$	0.055	0.723***	-0.059**	0.055	0.028	-0.156*	-3.512***
Constant	-0.679**	4.158**	5.238***	-0.770***	-5.079***	1.760	95.163***
	(0.2697)	(1.8056)	(0.3359)	(0.2723)	(1.5759)	(1.1902)	(11.2587)
Observations	7,597	7,597	7,597	7,597	7,597	7,597	7,597
R-squared	0.202	0.156	0.156	0.203	0.378	0.385	0.084
Year Fixed Effect	YES	YES	YES	YES	YES	YES	YES
Reference Variable	Laggards	Laggards	Laggards	Laggards	Laggards	Laggards	Laggards

5.6 Robustness test

5.6.1 Mean difference in banks accounting performance.

To determine the contribution of a specific practice to the performance of firms, previous studies employ an accounting approach to compare the performance of firms before and after adopting such practices (e.g. Cornett and Tehranian, 1992; Healy et al., 1992; Cornett et al., 2006; DeLong and DeYoung, 2007). The creation of pre-ratios and post-ratios allows researchers to draw the conclusion of whether there is an improvement in the firm before and after their adoption of particular business practices. Cornett et al. (2006) discuss the possibility that accounting ratios enable us to consider overall financial performance (ROA, ROE) as well as comprehensively analyse many dimensions of performance (e.g., cost efficiency, core deposit funding). In the same fashion, DeLong and DeYoung (2007) agree that the accounting-based approach outperforms the market-based approach in capturing actual financial performance over a specific time interval. Following the spirit of the previous studies, the mean difference test is applied to find out to what extent and in which aspects the activation of the transactional website may alter the banks' performance.

In more detail, to decipher if the formation of the transactional website considerably improves the bank's performance, the mean differences in accounting ratios of banks are tested in the first, second, or the third year after the year banks have launched their website, as compared to the event year. To be more specific, the year of the website launching announcement of each targeted $bank_i$ is set to 0 ($t_{banki} = 0$). Subsequently, the first, second, and third years after the announcement year are set as $t_{banki} = 1$, $t_{banki} = 2$, and $t_{banki} = 3$, respectively. A set of accounting performance ratios, thereafter, were collected at the time $t_{banki} = 0$, $t_{banki} = 1$, $t_{banki} = 2$ and $t_{banki} = 3$. After that, the difference in the accounting performance of $bank_i$ were observed between sets of two separate times ($t_{banki} = 1$ and $t_{banki} = 0$), ($t_{banki} = 2$ and$t_{banki} = 0$), ($t_{banki} = 3$ and $t_{banki} = 0$). These variations would indicate the potential transformation in the performance of banks after one, two, or three years after they set up their transactional websites. Finally, the t-test was conducted to gauge if performance differences are critically significant.

The results for the investigation of the mean difference in banks accounting performance are presented in Table A.5.11. In general, the results reveal an appreciable improvement in banks' profitability, at least over three years since their enablement of a transactional website, due to a growing trend in terms of ROA and ROE over the years. Significantly, the values of ROA and ROE are enlarged approximately by three times after three years since the time the transactional websites launched. In which, ROA increases from 0.1845 to 0.533 whereas ROE increases from 0.7382 to 2.327 over the next three-year interval.

Secondly, the findings also show an improving sense regarding the interest income and non-interest income dimensions. More indicatively, the variation in the ratio of net operating income relative to assets increases approximately five times (from 0.1779 to 0.5274) whereas the variation in the ratio of non-interest income to assets (NIIA) increases 11 times (from 0.07 to 0.794) after three years.

Thirdly, the transformation in cost efficiency (EFFR) and non-interest expense to assets (NIEA) indicators show that the bank has effectively employed capital and asset resources to generate income. EFFR continuously decreases from 7.309 to 8.639 and 9.053 while NIEA is found to be lower upon the first two years (0.1319 and 0.1454). Over three years, NIEA increases to 0.095, but it is critically insignificant and approximately 11 times smaller than NIIA.

5.6.2 Dynamics testing

Transactional website adoption may have a gradual influence on banks' efficiency and risk, which manifests different impacts in the short term and long term. Following from some previous studies (He et al., 2020), the dynamic effect is tested using the following equation:

$$\begin{aligned} Performance_{it} &= \alpha + \beta_0 \times Transactrional\_website\_adoption_{i,t} \\ &+ \beta_1 \times (Transactrional\_website\_adoption0_{i,t} \\ &+ Transactrional\_website\_adoption1_{i,t}) \\ &+ \beta_2 \times (Transactrional\_website\_adoption2_{i,t} \\ &+ Transactrional\_website\_adoption3_{i,t}) \\ &+ \beta_3 \times (Transactrional\_website\_adoption4_{i,t} \\ &+ Transactrional\_website\_adoption5_{i,t}) \\ &+ \beta_4 \times Transactrional\_website\_adoption6_{i,t} \\ &+ \delta \times Control\ varaible_{i,t} + \varepsilon_{i,t} \end{aligned} \qquad \text{(Equation 5.8)}$$

In which, the variable Transactional_website_adoption$0_{\mathrm{i,t}} = 1$ for the event year of the adoption of the transactional website, and zero otherwise. The variable Transactional_website_adoption$1_{\mathrm{i,t}} = 1$ for the first year since the adoption of transactional website channel, and zero otherwise. It is analogous to $Transactional\_website\_adoption2_{i,t}$, $Transactional\_website\_adoption3_{i,t}$, $Transactional\_website\_adoption4_{i,t}$, $Transactional\_website\_adoption5_{i,t}$. The variable $Transactional\_website\_adoption6_{i,t}$ for the sixth year and onwards after the transactional website adoption.

Please note that Equation 5.8 is estimated with robust standard errors clustered at bank level to account for serial correlation of the error term.

The results (reported in table A.5.12) shows that the value of the transactional website adoption delivered to the performance of banks has been consistently enlarged throughout the years analysed. These findings also suggest that the embeddedness of the transactional website experience has strengthened the continual and durable growth of financial performance.

5.6.3 Re-categorization of bank size into three quantiles

To facilitate the robustness test of the size effect, the sample is divided into three samples: small, medium, and large banks. Please note that Equation 5.9 is estimated with robust standard errors clustered at bank level to account for serial correlation of the error term Results are presented in Table A.5.13 and Table A.5.14 in the Appendix. The findings are entirely consistent with previous findings using the two-size quantiles, making it clear that small banks achieve better performance from their transactional website adoption when compared to their larger-scaled counterparts over the long term.

$$\begin{aligned} PERFORMANCE_{i,t} &= \alpha + \beta \times Transactional\_website\_adoption_{i,t} \\ &+ \gamma_1 \times Small\_Bank_{i,t} + \gamma_2 \times Medium\_Bank_{i,t} \\ &+ \rho_1 \times Transactional\_website\_adoption_{i,t} \\ &\times Small\_Bank_{i,t} \\ &+ \rho_2 \times Transactional\_website\_adoption_{i,t} \\ &\times Medium\_Bank_{i,t} \; \delta \times Control\ variables_{\ i,t} + \varepsilon_{i,t} \end{aligned} \quad \text{(Equation 5.9)}$$

- Banks that are ranked as *Large* is used as the reference category in Equation 5.9.

5.6.4 Re-estimation of all main equations, using year, state and bank-level fixed effect

As suggested by the literature (see Lahouel et al., 2019, p. 355), the endogeneity issue can be the result of: (i) simultaneity (or reverse causality) which occurs when explanatory and response variables affect/cause each other and have reciprocal feedback loops (Attig et al., 2016; Lahouel et al., 2019); and (ii) unobserved heterogeneity that corresponds to the omission of variables in the regression equation. For example, McWilliams and Siegel (2000) argue that the association between explanatory and response variables are doubtful if variables are omitted that have been shown to be important determinants.

In terms of the reverse causality, the fixed effect two-stage least square with instrumental variables can be considered, as suggested by the literature. For example, when examining the business value of big data and analytics, Müller et al. (2018) apply the average diffusion rates for these systems as instrumental variables to solve or reduce the potential problem of reverse causality. In the case of transactional website adoption, the diffusion of computer users in each state can be used as an instrumental variable. However, the data collection for instrumental variables has been beyond the scope of this thesis and therefore is a limitation in this chapter.

The issue of unobserved heterogeneity is when the explanatory variables do not explain "the full amount of individual heterogeneity in the conditional mean of the dependent variable" (Winkelmann, 2008, p. 127). The omitted variables become a part of unobserved heterogeneity, occurring when the analysis may exclude some important explanatory variables (Mannering et al., 2016, p. 12). The unobserved heterogeneity and omitted variables, accordingly, can make the association of explanatory and response variables doubtful (McWilliams and Siegel, 2000). In this chapter, there are a limited number of control variables in Equations 5.1 to 5.7, therefore these models may suffer from unobserved heterogeneity and omitted variables bias.

Prior studies suggest that the problem of unobserved heterogeneity and omitted variables can be solved by using panel data and by adopting a fixed effect (FE) model (Bell and Jones, 2015; Gómez-Herrera, 2013; Karlberg and Åkesson, 2015). For example, Bell and Jones (2015, p. 6) claim that "*because FE models only estimate within effects, they cannot suffer from heterogeneity bias*". Also, Roberts and Whited (2012, p.77) state that fixed effects can address the problem that some time-invariant characteristics cannot be observed in the data at hand. According to the banking literature, in particular, a number of studies state that they apply time fixed effect to address the unobserved heterogeneous components (De Marco and Wieladek, 2015, p. 13; Liu et al., 2020, p. 3; Moser et al., 2018, p. 9; Nam and An, 2018, p. 159).

As well as time fixed effects, bank and state-level fixed effects are considered to control for unobserved heterogeneity. The bank fixed effect can be used to capture the time-invariant differentiation at bank level (Riziki, 2015). For example, Chui et al. (2010) apply the bank fixed effect to control all unobserved time-invariant characteristics of the loan supply of a bank (e.g., the business model). Furthermore, state fixed effect can control for differentiation across US states that may affect the value of transactional website adds to banks' performance, such as culture, economic strength, specific policies, customer preferences (Lin, 2018; Shrestha et al., 2007).

In this section, all the main equations (Equations 5.1 to 5.7) of Section 5.5 are re-estimated firstly with year and state, and then with year, state, and bank fixed effects. The results with year and state fixed effects are shown in Appendix, Section B, from Table A.5.16 to Table A.5.23. In general, the results are consistent with the original results, indicating that the influence of explanatory variables (e.g., transactional website adoption, mobile website adoption, transactional website adoption, bank size, time effect) remains consistent, after controlling for the variation within states and within years.

Next, all regressions are re-estimated with year, state, and bank-fixed effects. The results are shown in Appendix, Section B, from Table A.5.24 to Table A.5.31. The main findings from Section 5.5 tend to change and significance disappears, with the inclusion of the bank fixed effects in the models. Therefore, the results within individual banks do not agree with the main conclusions drawn from Section 5.5, i.e., the results across banks. Following the reasoning of DeYoung (2005), much of the variation in the variable of interest is soaked up due to the bank fixed effects. As the main variable of interest, the transactional website adoption, is a bank-specific dummy variable, there is little variation in this variable through the years across all the banks. Therefore, it's not surprising to see that most of the results disappear with the inclusion of the bank fixed effects.

5.7 Conclusion

5.7.1 Summary of Findings

This study investigated the impact of transactional website adoption on the performance of 307 banks in the US market from 1993 to 2018, via constructing the regression analysis via seven accounting measures as proxies for the financial performance of banks. The main results are as follows.

Firstly, the results strongly suggest that transactional website adoption should be appreciated as a strategic initiative. This is because this adoption satisfies both the value vision of the stakeholders and the sustainable perspective of the resource-based view (Amit and Schoemaker, 1993; Dierickx and Cool, 1989; Grant, 1991b; Hamel and Prahalad, 1996; Hansen and Wernerfelt, 1989; Penrose, 1955, 2009; Peteraf, 1993; Prahalad and Hamel, 1997; Rumelt, 1984; Wernerfelt, 1984).

More specifically, for the first time, it is robustly confirmed that banks can achieve financial sustainability through the adoption of transactional websites. More pointedly, transactional website adoption durably rewards banks with an enlargement in profitability, an increase in income and expenditure efficiency as well as growth of non-interest activities. Against this background, the transactional website has proven itself to possess three features: value, appropriability, and durability, satisfying the first term of resource-based view theory (Amit and Schoemaker, 1993; Barney, 1991; Collis and Montgomery, 1995; Dierickx and Cool, 1989; Grant, 1991b; Peteraf, 1993). The results are also compatible with authors in digital banking literature who found the positive impact of digital adoption on financial performance (Al-Hawari and Ward, 2006; Ciciretti et al., 2009; Delgado et al., 2007; DeYoung, 2005; DeYoung et al., 2007; Furst et al., 2002; Goh and Kauffman, 2015; Hernando and Nieto, 2007; Mbama and Ezepue, 2018; Momparler et al., 2013; Pigni et al., 2002; Scott et al., 2017; Sullivan, 2000; Xue et al., 2007).

Furthermore, going beyond these features, transactional website adoption is also proven to be able to preserve banks' competitive advantages, protect the financial value and contribute to continuous growth. More concretely, the results prove that transactional website adoption endows banks with superior performance, in turn, attributed to the embeddedness of its experience, and inter-connectedness with other digital disruptions. Moreover, the results show that the observational learning behaviour is not favourable for the following adopters, indicating that the transactional website adoption of a bank can limit the imitation of its following rivals.

From the basis of the resource-based view, these features are perceived as isolating mechanisms that lead to ambiguous causality, resource development, tacit resources, and capabilities, making it more stringent and costly for rivals to learn and duplicate (Barney, 1986a, 1986b, 1991; Dierickx and Cool, 1989; Grant, 1991b; Lippman and Rumelt, 1982; Peteraf, 1993; Rumelt, 1984; Teece et al., 1997).

The findings in this chapter are consistent with authors who find a positive relationship between cumulative IT/digital experiences and firms' performance (Bharadwaj, 2000; Bi et al., 2014; Lin, 2007; Popa et al., 2018; Powell and Dent-Micallef, 1997; Setia et al., 2011), the negative outcomes of observational learning (Argyris and Schön, 1978; De Carolis, 2003; Levinthal and March, 1993; Miner and Mezias, 1996; Terlaak and Gong, 2008), the inimitability of IT and digital (Arslan and Ozturan, 2011; Bloodgood and Salisbury, 2001; Oh et al., 2007; Tian et al., 2010), the positive influence of the interconnectedness among resources and capabilities (April, 2004; Chou et al., 2017; Cohen and Olsen, 2013; Kogut and Zander, 1992; Lin, 2007; Oliveira and Martins, 2011; Powell and Dent-Micallef, 1997; Ruivo et al., 2014).

Secondly, the size effect is found to affect the impact of transactional website adoption on financial performance among banks. In which, there is a more dramatic change in the financial performance of small banks when they undergo transactional website adoption when compared to their larger counterparts. The results are consistent with the authors who claim that small banks are more successful innovators/implementors (Acs and Audretsch, 1990; Hamilton et al., 2009; Zenger, 1994). The suggestion on why the small banks could be more successful in innovating is well provided in the literature (Chen and Hambrick, 1995; Dean et al., 1998; MacPherson, 1998; Meziou, 1991; Regehr and Sengupta, 2016). Furthermore, when examining the performance of two sub-samples: small banks and large banks, the results also show the more significant impact of transactional website adoption on small banks' profitability and efficiency. This finding, therefore, suggests that transactional website adoption tends to matter more for small banks. It might be because the transactional website adoption can promote and optimize the potential capabilities of small banks as well as provide innovative capability which facilitates those banks in approaching more opportunities, exploit new niche markets, deepen customer relationships, and alleviate competition threats from large banks.

Thirdly, the findings reveal that timing order is not a determinant in differentiating the impact of transactional website adoption on banks. More specifically, transactional website adoption seems no longer favour first movers with significantly improved profitability and efficiency in the long run. The findings are then compatible with authors who show that first-mover advantages may be diminished over time. Also, the findings support the view that late-joining organizations can compete with and even overtake first movers by developing similar or better capabilities in digital systems (Carpenter and Nakamoto, 1990; Dutta et al., 2014; Suarez and Lanzolla, 2005).

Finally, the findings, which are about the cross-connection of transactional website adoption and mobile website adoption, might be to some extent relevant to the terms of exploitative and explorative innovations.[50] More pointedly, the findings show that banks with a big gap between their digital innovations are likely to achieve better financial performance in general. Meanwhile, banks with a smaller gap between their transactional website adoption and mobile website adoption tend to reap more financial rewards in exploring the value of the interaction between those two adoptions. The findings, therefore, suggest that banks with a large gap tend to benefit more from innovating and exploiting the advantages from their current transactional website adoption base. Meanwhile, banks with a smaller gap tend to reap more financial rewards in exploring the value of the interaction between the two adoptions. Therefore, during the digital banking transformation, transactional website adoption should be favourable for banks that are both either new or old-established. Nevertheless, benefits should vary as both new or old-established banks have their own strengths and constraints. On this point, this chapter supports authors who find the positive relationship between new firms and explorative innovations (Hill and Rothaermel, 2003; Kilenthong et al., 2016; Naldi and Davidsson, 2014; Nooteboom et al., 2006) and the positive correlation between established firms and exploitative innovations (Anderson and Eshima, 2013; Freeman et al., 1983; Slevin and Covin, 1997).

5.7.2 Main Contributions

What this chapter wishes for is to show the enhanced value of transactional website adoption in the banking digitalization context, which does not seem to get much interest in current literature in comparison to the past. There is a lack of updates and validation of the long-term and sustainable value of transactional website adoption in digital banking literature, and this is the first motivation for us to conduct this research. To my knowledge, the research has the following new features and contributions:

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[50] Please refer to Section 5.5.2.4 for further details.

Firstly, with original data retrieved and synthesized from different platforms, accompanied with the most up-to-date accounting data from the 26 years between 1993 and 2018, this chapter is the first to validate the sustainability of transactional website adoption in delivering value to banks' financial performance.

Secondly, the central theme of conceptual analysis and empirical examination is mainly influenced by its foundation in the resource-based view. This is the first time in digital banking literature that viewpoints about the fundamental of superior performance and competitive edges, intangible resources and capabilities, and the conditions and mechanisms of sustainability have been applied to develop conceptual models and empirical hypotheses. This point could become an inspiration for further research on the origins and mechanisms for the sustainability of bank enterprises during their digital innovation and transformation.

Thirdly, based on this theoretical background, this chapter is the first to approach transactional website adoption in a novel and more comprehensive manner. To be more specific, the mechanisms and features of transactional websites are estimated that make them strategic and sustainable, beyond three features that have been exploited by previous authors: lucrativeness, innovation, and efficiency. Also, the transactional website adoption is also examined in the spirit of connecting to another digital disruption. This is also the first-time transactional website adoption is evaluated as a new starting point.

Fourthly, this chapter provides robust proofs of the sustainability of transactional website adoption, including six strategic features that have not been named before: value, appropriability, durability, embeddedness, inimitability, and interconnectedness. This chapter is also the first in providing evidence of inter-firm heterogeneity, observational learning, combinative capability throughout the time since the websites have been triggered.

In short, the empirical evidence has filled a gap in the literature about the value of transactional website adoption, including (i) the long-term and durable impact (ii) the sources and mechanisms of sustainability (iii) intangibles and tacit values (iv) a starting point of interconnection and complementary value in the digital context.

5.7.3 Managerial Implications

Firstly, under the viewpoints of some practitioners, banks are struggling to figure out where their priorities should be in the digital transformation. This chapter provides authenticated evidence that transactional websites are worth being a long-term priority and should be prized for their strategic attributes. Furthermore, managers should pay more attention to the intangible values and tacit mechanisms that would explain the underlying basis of financial values and competitive advantages. Some mechanisms for managers that have been verified in this study are (i) embedded digital competencies and experiences, (ii) combinative capability between two digital disruptions, (iii) the ability to limit learning behaviour. The sustainability of a digital initiative should be assessed in a comprehensive manner to thoroughly investigate its capability of generating values and limiting competition.

Secondly, this chapter detects that learning by observing behaviour has no significant impact on the observers' financial performance, and perhaps this behaviour is even harmful in some cases. Therefore, when making use of observation information spillover from previous adopters, bank managers should be aware that the success of previous adopters may be caused by ambiguous causality, the development of resources, corporate culture, and tacit knowledge. Vicarious learning should be applied appropriately to each enterprise discipline rather than merely duplicated. "*Experience is often a poor teacher, being typically quite meagre relative to the complex and changing nature of the world in which learning is taking place*", said Levinthal and March (1993, p. 96) and "*Even highly capable individuals and organizations are confused by the difficulties of using small samples of ambiguous experience to interpret complex worlds*" (Levinthal and March, 1993, p. 97).

Fourthly, managers should consider the size effect when undergoing their digital initiatives. As argued by many scholars, small firms are likely to be relatively robust in practices where they can take advantage of their flexibility and vicinity to satisfy market demand (e.g., new products/services, modifications to existing products for niche markets, and small-scale applications).[51] In such a way, small banks should take advantage of digital disruption as a trigger for their other potential capabilities such as

[51] Some key relevant authors are in the following parentheses (Acs and Audretsch, 1990; Hamilton et al., 2009; Zenger, 1994).

dynamic capabilities, absorptive capabilities, and new niche markets. Nevertheless, it is neither small firms nor large firms that are the better innovators/adopters per se. Instead, small and large firms are probably good at different types of practices, as said by Vossen (1998). In this sense, digital and other initiatives should be applied and deployed efficiently to best suit the size, capability, and discipline of the enterprises. *"Banks need not grow larger to be successful: business strategies and local economic growth are no less important in determining bank profitability than size",* said Regehr and Sengupta (2016, p. 85).

Finally, firms should be aware that the advantage of timing order could be diminished over time. On the one hand, the business value from early investments into innovation is likely to be associated with superior profitability. Nevertheless, over time, timing order may no longer play a vital role in achieving financial performance. The following entrants can ultimately defeat their predecessors if they can create their own unique advantages, innovate, or develop capabilities in digital systems (Dutta et al., 2014). In other words, managers should be aware that when a firm invests in digital projects, the business value of that system will not be accrued instantaneously, but over time, and competitors will not sit still during that time. Instead, focusing on the unique resources and capabilities of the business as well as understanding market conditions and competitors should be critical priorities for bank firms.

5.7.4 Limitations and Future Discussion

This section provides some limitations as well as some suggestions for further research.

Firstly, this chapter had not gone into a detailed analysis of the specific dimensions of banks (e.g., the balance sheet items, income items). Therefore, a further dig into particular financial items of banks would be helpful to see how transactional websites deliver value to production processes, product mix and to particular activities (e.g., transactions deposits, small time deposits, fed funds, brokered deposits, consumer loans, credit card loans, real estate loans). Further studies of financial categories would also be worthwhile as they could point out where the earnings come from (e.g., debt securities, trading account assets, service charges, card income) and how banks have utilized their operating expenditures with the companionship of website adoption in each of their activities (e.g., personnel, marketing, professional fees). Given this limitation, more evidence into these specified items should be provided, assisting managers in better targeting their categories.

Secondly, although this chapter proves the existence of cumulative experiences, connectedness, and inimitability of transactional website adoption, it has not specified what resources are causally related. Some potential resources, such as tacit knowledge, digital culture, unique experiences, networks were pointed out, but nevertheless, only at The conceptual and analytical perspective. A continuation in identifying and examining the impact of specific resources and capabilities related to transactional website adoption is a suggestion for further research.

Thirdly, given the existence of the size effect, this chapter has not yet to examine what specific factors this is actually involved in. Some potential cases were discussed, such as small banks being nimbler, agile, less hierarchal, and targeting themselves uniquely. However, they have not been examined empirically yet. Further empirical tests to support these discussions, therefore, are essential. This will help banks understand more deeply which advantages are activated in their system since they have adopted transactional websites and what they should focus on with the companionship of a transactional website.

Fourthly, this chapter has not yet explored deeply the distinct advantages of both first movers and laggards in terms of their transactional website adoption. Further research into the particular advantages of first movers (and of laggards as well) would be useful to determine what their actual sustainable advantages are and provide banks with more justifications to decide on their strategic timing.

Besides, a number of other following suggestions for the future would be:

Firstly, external factors (e.g., brands, customers, stakeholders, strategic partners, outsourcing agreements, networks, and eco-system relationships) should be included in future investigations of the relationship between transactional website adoption and banks' performance. External factors have been proven to possess intangible attributes (Srivastava et al., 2001; Varadarajan, 2020). Therefore, most likely, website adoption has created some strategic external resources and resources, which then also reward banks with sustainable performance.

Furthermore, the interconnection between omni-digital channels as well as the interconnection between digital channels and traditional channels should be continued to be examined. The combination of transactional website adoption and mobile website adoption in this chapter is hopefully an inspiration for wider and more multidimensional research in the future.

6 Chapter 6: Do Digital Transactional Website Initiatives Add Value to Banks in Long Run?

6.1 Introduction

A highlight taken from recent articles is that investors now lack conviction in the financial service industry's digital strategies. According to a report by Wyman (2020), only 25 percent of investors surveyed are optimistic that banking digital transformation strategies will be effective, and less than 1 percent have faith that digital plans will be transparent and credible. More specifically, investors are confused about the direction of banks' digital investments, and they are unclear whether the banks' digital investments will deliver the returns and offset the costs they invested in. *“Investors do not feel they understand what firms are investing in, or why –... They don’t see any useful metrics on progress, and they are largely distrustful of the cost-benefit case of significant technology investmen*ts" (Wyman, 2020, p. 10). This point of Wyman indicates two issues that the banks are facing in their digital roadmap nowadays to improve investors’ confidence and attract more investors. Firstly, banks are lacking clear evidence of their digital orientations (e.g., what digital investments banks are focusing on) to attract more conservative investors and maximize market valuation. Secondly, banks seemingly fail to separate the unique merits and benefits of each of their digital initiatives, making their digital strategies ambiguous and unclear to investors.

However, some optimism still exists among investors that digital investment does have the possibility to drive earnings improvement. “*80 percent still say transformation is critical or important in their investment appetite. Nearly 60 percent of investors believe digital will impact profitability positively over the next five years*” (Wyman, 2020, p. 10). Thus, investors have not necessarily lost faith in digital projects, but they need more convincing evidence from banks for their investment strategies. Therefore, it is more essential for banks to provide evidence of both short-term and long-term performance of digital technology investments. As Wyman suggested, banks need to provide value metrics for every investment in each stage before the next funding is released.

Regrettably, in digital banking, the study of the market performance of digital initiatives is exceedingly rare. Research mainly pays heed to accounting metrics (Al-Hawari and Ward, 2006; Ciciretti et al., 2009; DeYoung, 2001, 2005; DeYoung et al., 2004, 2007; Egland et al., 1998; Furst et al., 2000a, 2002; Gutu, 2014; Mbama and Ezepue, 2018; Pigni et al., 2002; Scott et al., 2017; Sullivan, 2000; Sullivan and Wang, 2013; Weigelt and Sarkar, 2012). However, this approach is likely to lag in measuring the immediate impact of digital initiative events.[52] Additionally, it is more challenging for the accounting approach to show how investors react to digital adoptions over the long term while investors' evaluation is a preeminent measure of the efficiency and outstanding performance of organizations' strategies.

This chapter, therefore, is developed based on two vital motivations:

(i) *the need to get insights into the impact of digital-based initiatives on financial institutions' performance in the long term, and*

(ii) *the lack of research papers on the role of market evaluation in assessing the value of transactional website adoption added to institutions in the long term*.

The objective of this chapter is to answer the research question "*Do transactional website initiatives create value for financial institutions in the long run? What will be revealed about the transactional website adoption behind the investor's buy-and-hold strategy?"*

More specifically, this research aims to achieve the following specific research objectives:

- Investigate the wealth-creating capability of transactional website adoption events in the long term, governed by the buy and hold strategy of investors.
- Investigate the learning-by-observing mechanism of investors to explain why the investors and the market can recognize the value creation in transactional website adoption events.
- Inquire into some moderating effects that possibly differentiate performance between banks as well as alter the way the market reacts to transactional website announcements, including the "magnitude effect" and "timing order".

Firstly, a long-term positive market reaction to the transactional website is expected, comprehensively based on the *resource-based view* (Grant, 1991b; Barney, 1991; Amit and Schoemaker, 1993; Peteraf, 1993).[53] More directly, it is asserted by resource-based

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[52] Also refer to Chapter 5, Section 5.2, for further discussion on accounting measures in digital banking literature.

[53] Over the long run, the evaluation of the market could overcome a number of potential biases in the short term, such as hot-market issue, overreaction. Therefore, under a long-term perspective, this chapter focuses on theoretical foundations that show the market evaluation's validity. The resource-based view was preferred as it allows to explain why a bank is likely to gain superior performance over the long term since their transactional website adoption, thus it also makes sense with the rationality of market.

theorists that the impact of strategy on firms is based on two different stages: the *ex-ante* and *ex-post* stage (Peteraf, 1993; Rumelt and Lamb, 1997; Wernerfelt, 1984). If the ex-ante stage is an excellent opportunity for seeking superior rents and efficiency, the ex-post stage will be the time for the firm to preserve and sustain those values. From this, a set of resources and capabilities of transactional website initiatives is proposed that are likely to become hard-to-copy competitive advantages of banks in the long term, such as *tacit knowledge, digital culture*, and *digital humanities*. Based on this set of capabilities, the bank can attain superior market value in the long term starting from the time they embrace transactional website channels. A wide range of theories is also referenced in this chapter to predict the impact of the "*vicarious learning*" effect, *size effect*, and *timing effect* on banks' market performance during their adoption of transactional websites.

In order to estimate the long-term performance of banks, the Buy-and-hold Abnormal Returns metric (BHAR) is employed, which according to Lyon et al. (1999, 198) has the advantage of yielding "*an abnormal return measure that accurately represents investor experience*". This metric is defined as the measurement of multi-year returns from a strategy of investing in all firms that complete an event and selling at the end of a specific holding period versus a tantamount strategy using other benchmarks (Mitchell and Stafford, 2000). Following several studies, this chapter examines five different benchmarks, including the market indices (including S&P500, Nasdaq, equally-weighted Market Index), control-firm portfolio, and ex-ante Buy-and-Hold benchmark. The BHAR afterwards was estimated as the difference between buy-and-hold returns of the targeted banks and the benchmarks, over a 12-month, 24-month, and 36-month period since the event month.

Subsequently, to investigate the impact of transactional website adoption on long-term excess earnings of banks, a number of regressions are conducted over both the ex-ante period and ex-post period of the transactional website adoption. The regressions examine the mechanisms of the "learning-by-observing" behaviour, the size effect, and the timing order effect. These effects potentially influence investors' behaviour as well as differentiate the excessing earnings attributed to the transactional website adoption.

The results provide important insights into the impact of transactional website adoption. Abnormal returns (BHAR) turned out to be positive and significant over 12-month, 24-month, and 36-month time periods following the transactional website launch. A positive and significant relationship is also shown between BHAR and the transactional website adoption variable. As a result, the study is an effective reassertion of the benefits of transactional website adoption on banks' long-term performance.

The significant impacts of the *learning-by-observing* effect, *size effect*, and *timing order effect* on BHAR as long-term performance of banks are also confirmed in this chapter. In which, the learning-by-observing effect has a positive impact on investor's evaluation of transactional website adoption. The size effect and the timing order effect are two critical factors leading to heterogeneity among different banking groups in earning excess returns. More notably, small-sized banks and later adopters (including second movers and laggards) are most positively affected by transactional website adoption. In contrast, the advantages of the first-mover banks seem to be eliminated while the large-sized banks tend to get fewer benefits of adopting transactional websites than their small-sized rivals in the long run.

To the best of my knowledge, this chapter makes the following key contributions:

Firstly, regarding methodology, this is the first to adopt the event-time approach with the Buy-and-Hold Abnormal Return (BHAR) metric to assess the value of a digital banking initiative. Secondly, this chapter reveals the existence of "learning by observing" behaviour which significantly improves the economic value of digital adoption. Thirdly, this chapter confirms the existence of "size effect" and "timing effect" which significantly influence the long-term excess earnings of banks via their transactional website investment. To the best of my knowledge, the size effect and the timing order effect have been rarely examined as moderating effects in the discipline of digital banking literature.[54]

The remainder of this chapter is organized as follows: Section 6.2 provides a brief outline of the relevant theoretical perspectives and empirical findings, Section 6.3 presents the

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[54] -Size effect in Internet banking discipline is most commonly associated with the work of DeYoung (2005) and Cyree et al. (2009). Nevertheless, DeYoung (2005) examine the size effect on the sample of only 12 banks from 1992 to 2000 while Cyree et al. (2009) only examine the size effect of 17 banks during the period of 1993 to 2003. Furthermore, their data sample includes Internet-primary banks only.

-One of the most recent cited studies which investigates the first-mover advantage of Internet banking is that of Lin et al. (2011). In that study, the authors look into the impact of timing orders on the probability of improved performance during the period of 2003-2008. This chapter focuses on a comparative analysis of the value added to banks which are in three different timing orders: first movers, second movers and laggards. Besides, this chapter also offers an investigation of timing orders in the more extended period from 1993 to 2013.

hypotheses, Section 6.4 presents the methodology and data, Section 6.5 and 6.6 discusses the results and robustness tests, respectively, and Section 6.7 concludes the chapter.

6.2 Literature Review

6.2.1 The impact of digital adoption on banks' performance in the long run.

There has been little analysis of research on banks' long-term performance corresponding to their transactional website adoption. A brief on typical studies, which provide the most relevant evidence concerning the long-term performance of digital-enabled banks, is presented in Table 6.1 below. Briefly put, in the long term, innovation is widely accepted as the core benefit gained through digital banking adoption (DeYoung et al., 2007; Pigni et al., 2002). To be more specific, by embracing digital initiatives, banks come to be more diversified and advanced in terms of their transactional activities (e.g., input mix, production innovation, lending process). Innovative features, therefore, could potentially endow banks with an enhancement in customers' value perception (Pigni et al., 2002) and an increase in terms of ROE, ROA in the long run (DeYoung et al., 2007; Goh and Kauffman, 2013; Scott et al., 2017).

Regarding long-term operating expenses, however, there are still conflicts between studies. Some researchers have shown evidence that activating digital banking does not reduce costs as expected in theory. Conversely, in the long run, labour costs increase due to the requirements of highly skilled labour (Ciciretti et al., 2009). In contrast, Scott et al. (2017) provide evidence that the operating costs significantly decrease from the third year of the SWIFT adoption. In the more neutral position, DeYoung (2005) found no difference in operating costs among Internet-based banks and branch-based banks in the preliminary stages of Internet adoption.

6.2.2 The gap in digital banking literature and the importance of long-term examination

In general, there has been empirical evidence concerning the long-term performance of banks that have embraced digitalization. Nevertheless, they still mainly rely on accounting metrics. In contrast to the limited research in digital banking literature towards a long-term vision of the field, IT-related literature has made explicit why organizational performance should be examined over the long term. More indicatively, these studies denote a significant difference between the short-term and the long-term performance of IT investment (X. Bi and Zhang, 2008; Brynjolfsson, 1991; Brynjolfsson and Hitt, 1996; M. Campbell, 2012; Hitt et al., 2002; Ji et al., 2021; Kim et al., 2017; Kohli and Devaraj, 2003; Sabherwal and Jeyaraj, 2015; Winarno et al., 2021; Yao et al., 2010; Yu et al., 2020). Authors believe that there is a remarkable lag in the returns to IT investments over time (Brynjolfsson, 1991; Brynjolfsson and Hitt, 1996; Campbell, 2012; Hitt et al., 2002; Kohli and Devaraj, 2003). For example, Brynjolfsson (1992) has claimed: "*Investments in IT systems may take years to add value to a firm and are therefore more likely to be reflected in future profit streams*" (Brynjolfsson, 1991, p. 1011). Meanwhile, Brynjolfsson and Hitt (1996) find out that long-term returns are about from two to eight times greater than short-term gains.

To explain why the long-term value of an investment is remarkably non-identical with the value gained in the short term, authors tend to blame the lag effect in market reaction. For instance, Barua and Mani (2018) detect a considerable amount of positive long-term market returns gained by IT events that involve low technological maturity or require a large amount of change in the business. This is explained by the fact that the market needs significant time and information to assess such IT events. Besides this, an insufficient amount of information in the past could also cause an inadequate understanding of the long-term benefits of IT events. As a result, the authors advocate long-term observation whereby investors have plenty of time to accurately evaluate and predict the underlying value and growth opportunities of these IT events.

6.2.3 Long-run return Anomalies Literature.

What is proved by IT literature is also somehow linked with the perspective of *long-run return anomalies* literature. In which, advocators of long-run return anomalies argue that the stock price does not fully and immediately reflect new information in the short run and abnormal returns do exist in the long run (Afego, 2018; Bessler and Thies, 2007; Carter et al., 1998; Chen and Zheng, 2021; Cremers and Pareek, 2015; Cusatis et al., 1993; Ikenberry et al., 1996; Jegadeesh, 2000; Kadiyala and Rau, 2004; Kolari et al., 2021; Lakonishok and Vermaelen, 1990; Levis, 1993; Loughran, 1993; Loughran and Ritter, 1995; Rajan and Servaes, 1997; Sehgal and Singh, 2008; Spiess and Affleck-Graves, 1995; Wang et al., 2021). To explain the phenomenon of anomalies, academics have given several hypotheses, especially the overreaction hypothesis and the underreaction hypothesis. More pointedly, the overreaction hypothesis asserts that stock that has underperformed the market over a time interval will outperform the market over a subsequent and similar period. In other words, past winners tend to be future losers and vice versa. By contrast, the idea of underreaction is that investors underreact to the positive signals expressed by events about future performance, thereby leading the way to different return patterns and explaining the long-run positive trend in returns. In the overreaction camp, there is a growing body of studies that have provided evidence for "anomalies" in long-term post-event returns, such as in terms of IPOs (e.g., Levis, 1993; Loughran, 1993; Loughran and Ritter, 1995; Rajan and Servaes, 1997; Carter et al., 1998), SEOs (e.g. Loughran and Ritter, 1995; Spiess and Affleck-Graves, 1995; Jegadeesh, 2000). Meanwhile, some typical studies advocating the underreaction hypothesis are of Cusatis et al. (1993), Ikenberry et al. (1996), Kadiyala and Rau (2004), Lakonishok and Vermaelen (1990).

Notably, *hot-issue market* phenomena also deserve attention as an abnormality in investors' reactions.[55] More concretely, the *hot-issue market* phenomenon is a feature of a period where investors' demand is incredibly high. The phenomenon goes against the hypothesis of the efficient market hypothesis as it does not believe there is a full assessment of the market towards events. Conversely, the *hot-issue market* phenomenon indicates that the behaviour of investors is irrational due to some heuristic-driven biases (e.g., imitating, betting on trends, regretting in mind) (Shefrin, 2002). Such a behaviour thereby potentially leads to an unprecedented increase in stock prices surrounding an event. Stated more thoroughly, if there is a large number of companies announcing the same activity over a continuous-time band, the "*hot-issue*" notion may exist and explain for *"irrational prices in the aftermarket"* (Shefrin, 2002, p. 249).

6.2.4 Main findings in the literature and this research contribution.

In short, the literature so far has shown:

(i) There is an appreciably positive impact of digital adoption on the long-term performance of banks, at least reflected through accounting indicators (Ciciretti et al., 2009; DeYoung, 2005; DeYoung et al., 2007; Goh and Kauffman, 2013; Scott et al., 2017). Despite that, how well digital-activated events affect the market performance of financial

[55] Hot-issue market phenomenon is documented in Ibbotson et al. (1988), Ibbotson and Jaffe (1975), Ritter (1984).

institutions, based on investor participation and evaluation, is still an underexplored matter thus far.

(ii) There is remarkable differentiation between the short-term and long-term market value of events related to IT investment and other technological initiatives, mainly due to the latency of information evaluation in a comprehensive manner (X. Bi and Zhang, 2008; Brynjolfsson, 1991; Brynjolfsson and Hitt, 1996; M. Campbell, 2012; Hitt et al., 2002; Ji et al., 2021; Kim et al., 2017; Kohli and Devaraj, 2003; Sabherwal and Jeyaraj, 2015; Winarno et al., 2021; Yao et al., 2010; Yu et al., 2020). Such evidence thereby clarifies why the long-term market performance examination should be monitored, in order that the value-enhancing capability of technological-initiated events is comprehensively authenticated.

(iii) There are arguments regarding market anomalies and irrational investor behaviour, especially in a short time interval immediately upon the news (Afego, 2018; Bessler and Thies, 2007; R. B. Carter et al., 1998; H. Chen and Zheng, 2021; Cremers and Pareek, 2015; Cusatis et al., 1993; Dutta et al., 2014; Igual and Santamaría, 2017; Ikenberry et al., 1996; Jegadeesh, 2000; Kadiyala and Rau, 2004; Kolari et al., 2021; Lakonishok and Vermaelen, 1990; Levis, 1993; T.-Y. Lin et al., 2021; Loughran and Ritter, 1995; Mayur, 2018; Rajan and Servaes, 1997; Sehgal and Singh, 2008; Spiess and Affleck-Graves, 1995; F. Wang et al., 2021). Accordingly, the scrutiny of long-term market behaviour becomes more authentic and comprehensive in evaluating the value of corporate events. Moreover, it would be the optimal way to validate whether the market makes sense in the short run.

Based on the discussions above, this chapter aims to contribute the first evidence to be explored so far in banking literature regarding:

(i) The genuine value of transactional websites added to banks' performance, especially to banks’ shareholders, evaluated by the market and investors.

(ii) The long-term market performance investigation in the field of digital banking.

(iii) The importance and rationality of markets and investors’ participation in predicting and evaluating banking digital initiative events.

The following sections will shed more light on the points mentioned above.

Table 6.1 Literature on the impacts of digital adoption on banks' performance in the long run.

Authors	Examination Period	Main findings
Pigni et al. (2002)	The 3-year window from 2000 to 2002	Internet banking adoption is associated with an increase of 0.4% in customer deposits and a decrease in loans (-0.9%) and ROE (from 18.1% in 2000 to 16.2% in 2001). The benefit of Internet adoption is the improvement in overall product service quality perceived by the clients, rather than economic value.
DeYoung (2005)	The 5-year window from 1997 to 2001	Internet-only de novo banks have access to significant technology-based scale economies, over and above the significant broad-scale economies available to all start-up banks. Profitability at the typical Internet-only start-up bank was lower than the already poor profitability at the typical branching start-up bank. On average, ROA and ROE were about 300 and 1,400 basis points lower, respectively. Overhead spending is no lower at Internet-only banks, compared to the branching banks (including Non-interest expense, Premise and Equipment Expense, the book value of the physical asset, employee salary).
DeYoung et al. (2007)	The 2-year window from 1999 to 2001	Revenues from service charges at click-and-mortal banks increase from 4 to 6 percent. Profitability increases from 7% to 11%. Salaries and benefits increase from 2.2% to 4.6% as the shift from lower-skilled to higher-skilled labour. Internet banking is a process of innovation, change in production cost, input mix, lending processes.
Ciciretti et al. (2009)	The the10-year window from 1993-2002	By activating Internet banking: ROA increases by 5.92%, 15.251%, and 21.331% after 1, 3, and 5 years. Commercial loans significantly increase by 4.912%, 3.032%; 7.736% after 1, 3, and 5 years. Employee expenses significantly increase by 8.559% after five years
Goh and Kauffman (2013, 2015)	The 3-year window from 2003 to 2005	Banks that invested in Internet banking incur 7.3% lower transaction costs. Banks that invested in Internet banking can capture 29.3% more deposits than those that did not. Internet banking investment is associated with an increase of 18.1% in net operating income.

Scott et al. (2017)	The 10-year window from 1997 to 2006	SWIFT adoption significantly impacts banks' profitability over the years (except for some of the early years). Sales are positively and significantly associated with SWIFT adoption over the long run (approximately 50%). Operating costs start to decrease from the third year and decrease by about 20% over ten years.

6.3 Hypothesis Proposal

6.3.1 Hypothesis 6.1: Wealth creation of transactional website adoption in the long term.

The hypothesis is about the long-term wealth creation of the transactional website. Primarily based on the resource-based point of view, the transactional website enablement is expected to deliver sustainable value in the long run. The main explanation is because transactional website adoption can create unique valuable resources and competencies. Therefore, banks can sustain competitive advantages over the long term that cannot be easily imitated by competitors, as suggested by resource-based view theorists (Amit and Schoemaker, 1993; Barney, 1991; Collis and Montgomery, 1995; Dierickx and Cool, 1989; Grant, 1991b; Lippman and Rumelt, 1982; Peteraf, 1993; Rumelt and Lamb, 1997). Figure 6.1 is provided below to clarify why resources and capabilities can create superior performance and competitive advantages for firms in both the short term and long term.

As can be seen from Figure 6.1, organizational resources and capabilities are likely to have an intertwined and mutually supportive correlation. Through this, resources and capabilities conceivably endow firms with strategic advantages *(e.g., uniqueness, value, appropriability, interconnectedness, agility, dynamicity)* which thereby become the fundamental base of enterprises' competitive advantage and outstanding performance. Besides this, strategic resources and capabilities could also engender monopolistic values (e.g., invisibility and inimitability; complexity and limited substitution; diversification) which are deeply embedded in each organization and as such are laborious to be imitated by other firms. In this vein, it is far better for firms to preserve their value and competitive advantages in the long term.

Therefore, one of the justifications for investors to evaluate an event relevant to transactional website activation may stem from a query as to whether transactional websites give birth to any strategic resources and capabilities in the long run. To support the point that transactional website adoption can create unique valuable resources and competencies, Table 6.2 is provided below. In which, that table exhibits the potential resources and capabilities originating from transactional website adoption. As can be seen, transactional website adoption may reward banks with some strategic resources, in the long run, including digital tangible assets (e.g., digital human) and intangible assets (e.g., organizational knowledge, culture). Based on a series of theories, these resources will reward banks with a set of strategic advantages (e.g., differentiation from others, promotion of strategic advantages, market-oriented performance).[56]

Based on the justification of Figure 6.1 and Table 6.2, this hypothesis expects a positive wealth creation from transactional website investment in the long run. This expectation is also based on a good number of empirical studies in banking literature (Ciciretti et al., 2009; DeYoung, 2005; DeYoung et al., 2007; Goh and Kauffman, 2013; Scott et al., 2017- as discussed in Section 6.2 Literature Review) is also followed. Although these studies do not use the market-based approach, the positive findings in accounting metrics (e.g., ROE, ROA) could be counted as references for the long-term impact of transactional website adoption. The literature about the reaction of investors to some events similar to banking website-enabled events is also the reference for this hypothesis, such as in the case of enterprise resource planning (Morris, 2011), innovation (Szutowski, 2018, 2019), supply chain management investment (Hendricks et al., 2007), blockchain announcements (Cahill et al., 2020), e-commerce initiatives (Subramani and Walden, 2002), value-added economic adoption (Hamilton et al., 2009), capability maturity model investment (Filbeck et al., 2013). In general, investors are found to react positively to these events. The standard explanation from scholars is that there is an incremental value from those events added to the performance and growth of the business.

In this manner:

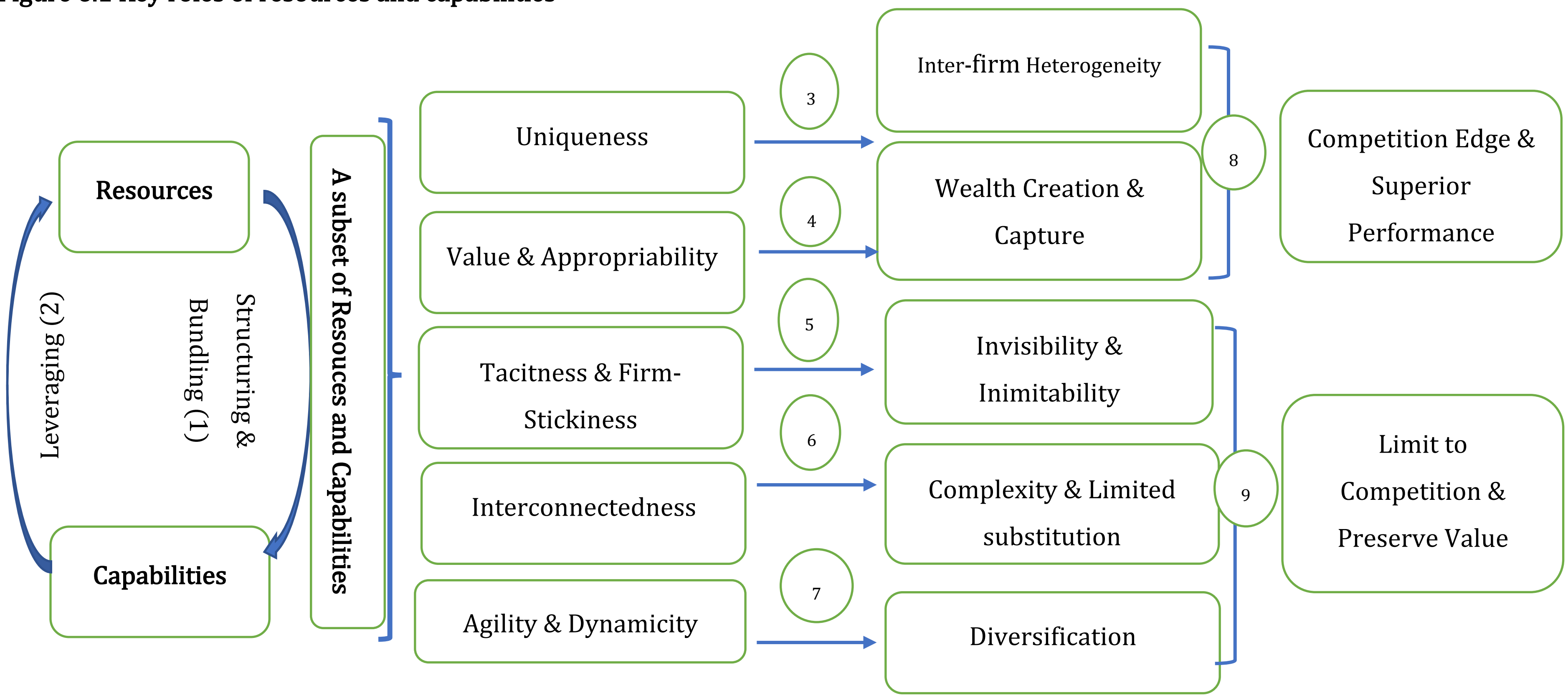
Hypothesis 6.1: Wealth-creating capability of transactional website adoption in the long run.

a. Banks earn positive long-run abnormal returns following their transactional website adoption.

b. Transactional website adoption positively impacts the performance of banks in the long term

[56] See Column 2, Table 6.2.

Figure 6.1 Key roles of resources and capabilities



Some key authors are in the following parentheses:
(1) (Amit and Schoemaker, 1993; Grant, 1991b; Sirmon et al., 2007).
(2) (Amit and Schoemaker, 1993; Grant, 1991b; Sirmon et al., 2007).
(3) (Barney, 1991; Hall, 1992, 1993; Peteraf, 1993).
(4) (Barney, 1991; Peteraf, 1993).
(5) (Porter, 1981; Wernerfelt, 1984).
(6) (Barney, 1991; Black and Boal, 1994; Dierickx and Cool, 1989; Reed and DeFillippi, 1990; Winter, 1995).
(7) (Teece et al., 1997; Wernerfelt, 1984)

Table 6.2 Proposed Strategic Resources and Capabilities of Transactional Website Adoption

Resources	Theoretical base	Endowments Transferred competitive advantages
Tangible assets		
Digital Human		
Digital technical skills: programming, systems integration, database development Digital managerial skills: project planning, interpersonal skills	**Core competencies** (Nordhaug, 1993) **Dynamic capabilities** (Wright and Snell, 1998)	- Organization architecture (Nadler and Tushman, 1997). - An environment in which IT personnel can leverage not only their own technical and managerial skills but can also effectively bring to bear the assets of the entire socio-technical network to which the members belong. - The collaboration with business units and external organizations project planning (Bharadwaj, 2000; Melville et al., 2004).
Intangible assets		
Tacit knowledge (Nonaka and Takeuchi, 1995; Polanyi, 1966): Awareness of customers' problems and desires	**Differentiate from others** (Cohen and Levinthal, 1990; Johannessen et al., 2001; Peteraf, 1993; Rumelt and Lamb, 1984, 1997).	Capabilities: absorptive capabilities, entrepreneurial capabilities, adaptive capabilities.
Capabilities of competitors Market value The change of technology and market business	**Promote strategic advantages** (Cohen and Levinthal, 1990; Johannessen et al., 2001).	Optimal digital-based strategies by giving the appropriability of strategic and tacit actions.
Explicit knowledge Experiences	**Market-oriented performance** (Shane, 2000; Slater and Narver, 1995)	-Intensify the comprehension of customer tastes, the speed of market movement, standard criteria for positive customer outcomes. -Recognize unique digital problems during dealing with customers. -Enrich banks knowledge, solutions, experiences, competencies, and ability to respond to customers. -Predict more precisely the nature and the potential of changes in the environment.

	Strategic partnership (Slater and Narver, 1995)	- Enhance banks' digital knowledge base which enables banks to build/ reinforce relationships with targeted partners who also want to share digital knowledge for win-win purposes.
	Innovation (Sabherwal and Sabherwal, 2005; Shane, 2000)	- Enhance the capability of discovering and exploiting digital-related opportunities (e.g., customer trends awareness, new scientific discovery, optimal product design and decision).
	Competitive Advantages (Barney, 1986a; Camerer and Vepsalainen, 1988; Deal and Kennedy, 1982; Gordon and DiTomaso, 1992; Nadler and Tushman, 1980; Ouchi and Cuchi, 1981; Peters et al., 1982)	- Being linked with banks' tacit knowledge. - Differentiate with others due to the collective leadership attitudes to manage change and team learning. - Become the determinant of economic value because it intensifies harmony around digital-related strategic direction and places the highest priority on profitability creation as well as customer value.
Digital-based Organizational Culture	**Efficiency and Effectiveness** (Barney, 1986a; Ouchi and Cuchi, 1981; Slater and Narver, 1995)	Foster behaviours that lead to improvements and effectiveness or efficiency in the digital era. Enhance employee productivity and enrich employee commitment (e.g., align and clarify staff members to their specific role and function). Promote a digital-based learning environment that encourages employees to learn and develop new skills and share their existing skills and perspectives with colleagues.
	Innovation (Deshpandé et al., 1993; Slater and Narver, 1995)	Provide unique insight into opportunities in a new or existing market. Encourage entrepreneurial behaviours to seek further and capture digital value. Encourage creative atmosphere for innovation (e.g., unusual or exciting plans, digital-related scientific discussions, frame-breaking actions).

Superior customer and business performance (Slater and Narver, 1995)	Simulate a continuous learning process that enriches banks' understanding of customer expectations and perception of new digital services as well the optimal ways of doing business.
Flexible capability (Slater and Narver, 1995)	Quickly reconfigure its architecture and re-allocate its resources to focus on digital opportunities and threats. Speedy response to opportunities and threats.

6.3.2 Hypothesis 6.2: The impact of the "learning by observing" effect.

"Learning by observing" has been discussed in Chapter 5 (see Section 5.5.2.5) to describe a knowledge-accumulated process of the firm which can be obtained by observing and learning the actions, activities from others (e.g. competitors, suppliers, customers, universities, and governments) (Bandura, 1980; Weiss, 1990). The role of learning by observing has also been examined in many fields, such as innovation incentives (Riedl and Seidel, 2018), merger and acquisitions (DeLong and DeYoung, 2007; Francis et al., 2014; Haunschild, 1993; Liang et al., 2021), the choice of new projects (Ofek and Sarvary, 2001), corporate financial policy (Adhikari and Agrawal, 2018; Leary and Roberts, 2014). Although the "vicarious learning" idea has been developed, observation of this effect on investor behaviour and market reactions is still quite limited. A few typical studies that have demonstrated a link between learning-by-observing and market reaction are DeLong and DeYoung (2007) and the followers (Francis et al., 2014; Liang et al., 2021). To be more specific, DeLong and DeYoung (2007) detect that in the context that the market possesses a sufficiently good amount of information on M&A events in the recent past, investors are likely to better appreciate the value generated by a similar event in the present time. It is interpreted by the authors that investors are external to the firms they are attempting to evaluate and accordingly, it is unattainable for the stock market to "learn-by-doing" but "learn-by-observing" throughout private information that spills over to the public sphere. As the investors are unable to access previous performance information sufficiently, they could only base their evaluations on the accumulation of observable information released to the market.

Regarding the context of banking website-enabled events, this hypothesis follows the viewpoint of DeLong and DeYoung (2007) that the market is most likely to fall into a semi-strong state where the amount of information concerning the digital banking transformation transmitted out to the public is not in its entirety but only to a certain extent. Therefore, investors tend to take advantage of such information relevant to digital launch events over the recent past to assess the potential value created by a similar event.

Hypothesis 6.2: The impact of the "learning by observing" effect.

The stock market will be better able to identify value-enhancing banks' transactional website adoptions if a substantial number of other banks have enabled websites in the recent past.

6.3.3 Hypothesis 6.3 and Hypothesis 6.4: The impact of the magnitude effect and timing effect over the long term.

The importance of size effect and timing effect in predicting firms' market performance have been discussed in detail previously (Section 4.4.2 and Section 4.4.3, Chapter 4). In the long run, the gaps in excess returns among banks, attributed to their size and time of events, are likely to be wider. It might be because, in the long run, investors could have plenty of information and time to analyse the value of a business practice/innovation/adoption. In fact, the market-based literature shows the evidence of superior long-term earnings for smaller firms compared to their large peers, such as in the discipline of equity issuance (Krishnamurthy et al., 2005), innovations (Sood and Tellis, 2009), international momentum strategies (Rouwenhorst, 1998). Some studies also find that firms that launch new products do not outperform their rival peers in the same industry over the three-year period following the innovation announcement (e.g., Akhigbe, 2002).

Hypothesis 5.3 and Hypothesis 5.4 in the previous chapter (in Section 5.3.3 and 5.3.4) discussed some reasons why small banks and laggards tend to be more successful in adopting and leveraging their digital or/and technological adoption. In which, small banks are likely to be more dynamic, more flexible, less sophisticated in their organizational structures and more opportunistic behaviour in making decisions, communicating, or/and accessing new markets (Chen and Hambrick, 1995; Dean et al., 1998). Therefore, small banks are likely to be more successful in adopting/innovating/implementing and earning higher returns from their adoptions in the long term. The laggards also have some advantages that may lead them to outperform their earlier adopted rivals in earning long-term benefits, such as learning from their predecessors' failures and offering more effective solutions or improvements (Zach et al., 2020), taking advantage of key technological and market difficulties which have been resolved (Lieberman, 2005).

In the same vein with the viewpoint of Hypothesis 5.3 and Hypothesis 5.4 in Chapter 5, this section expects:

Hypothesis 6.3: The impact of magnitude effect in the long run

Smaller banks are more likely to enjoy superior performance upon their transactional website enablement, in relation to their larger-sized peers.

Hypothesis 6.4: The impact of the timing effect in the long run

The following transactional website adopters are likely to outperform pioneers in achieving higher long-run abnormal returns.

6.4 Methodology and Data Description

6.4.1 Estimation of long-term Abnormal Returns

There is a considerable number of studies employing the Cumulative Abnormal Return (CAR) metric to estimate the short-window abnormal return.[57] Unfortunately, the CAR metric is understood to suffer from several pitfalls when applied over the long term. A well-known criticism of the CAR metric is that it ignores the fact that investors regularly buy a stock and hold it for a particular time rather than instantly sell it. In contrast, BHAR corrects CAR's drawback by assuming investors hold the same portfolio over a certain investment period.

Researchers investigating long-run abnormal returns also advocate for the BHAR metric as it alleviates measurement bias compared to the CAR metric. Of relevance here is the empirical investigation of Barber and Lyon (1997a), which underlines the incorrect inferences resulting from the CAR metric. Primarily, the study document that a sample of firms that all have zero annual BHAR values have a corresponding 12-month cumulative abnormal return of +5% on average. In this case, researchers who rely on CAR and ignore the BHAR metric may conclude that the sample earned long-run abnormal returns when

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[57]For example, the CAR metric is applied in IT investment (Dos Santos et al., 1993; Im et al., 2001; Chatterjee and Carl Pacini, 2002), e-commerce announcements (Agrawal et al., 2006; Benbunan-Fich and Fich, 2004, 2005; Lee, 2001), security breach (Campbell et al., 2003; Kannan et al., 2007; Roztocki and Weistroffer, 2011; Rosati et al., 2017). Please also refer to Chapter 4, especially Section 4.2 for further details.

it did not. In another way, the BHAR metric is superior to the CAR metric as it includes the effects of compounding.

Considering these discussions, the BHAR metric is selected to estimate long-run abnormal returns in this chapter. The following section will discuss in more detail the estimation of the BHAR metric.

6.4.1.1 Determining Benchmarks

Researchers have pointed out several biases that may lead to the mismeasurement of long-term abnormal returns. Of relevance, there is the research of Fama (1998), who argues that long-term abnormal returns are vulnerable to some bad models. More specifically, the CAPM model, which explains the cross-section of stock returns with only one factor (the systematic risk), can produce spurious abnormal returns due to the mismeasurement of risk. Meanwhile, the market model also does not entirely describe expected returns because this model cannot identify anomalies (e.g. size effect).[58] Mitchell and Stafford (2000) also argue that abnormal return estimation may be biased if the factor models of expected returns are incomplete in measuring risks. Therefore, authors employing long-term event studies are often cautious in choosing their approach. According to Barber and Lyon (1997a), there are three popular approaches: (1) *Market-index* (2) *Control-firm Portfolio and* (3) *Multi-factor Models*. Table 6.3 below shows some typical studies using BHAR metric with different benchmarks. Panel A shows studies which observe the sample in a cross-section of industries while Panel B provides studies in the banking industry only. As can be seen, the studies in Panel A show a greater deal of variety in the benchmarks. Meanwhile, in the discipline of banking industries in particular (Panel B), most of studies apply market indices as the benchmark. Some studies also apply size-matched, book-to-market or/and momentum reference portfolios in banking industry as benchmarks but the sample size is quite small (Cornett et al., 1998, 2006; Cyree et al., 2012; Filbeck et al., 2013).

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[58] See Banz (1981)

Table 6.3 Summary of studies analysing long-run abnormal stock returns.

Authors	Event studies	Data	Return Benchmark
Panel A: Cross-sectional industries			
Ritter (1991)	Initial Public Offering (IPO)	1526 IPOs from1975 to 1984	Market Index Size/industry control approach Size portfolio
Agrawal et al. (1992)	Acquisition	937 mergers and 227 tender offers from 1955 to1987.	Size portfolio
Ikenberry et al. (1995)	Shares repurchase	1239 market share repurchase announcements from 1980 to 1990.	Market Index Size portfolio Size and book-to-market portfolio
Loughran and Ritter (1995)	Initial Public and Seasoned Equity Offering	4753 operating firms from 1970-1990 who go public in the next three years.	Market Index Size control Firm Three-Factor Model
Womack (1996)	Analyst recommendations	1573 recommendation changes from 1989 to 1991.	Size portfolio Three-factor model
Brav and Gompers (1997)	Initial Public Offering	934 venture-backed IPOs from 1972 to 1992 and 3,407 non-venture-backed IPOs from 1975 to 1992.	Size and Book-to-market portfolio
Dichev and Piotroski (2001)	Bonds Rating Change	5493 bond rating changes from Moody's Default Risk Service, from 1970-1977.	Size and Book-to-market portfolio
(Otchere, 2005)	Privatization announcements	18 banks that were privatized between 1989 and 1997 and 28 rival banks.	Market index
Byun and Rozeff (2003)	Stock Split	12,747 stock splits from 1927 to 1996	Size and book-to-market control/reference firms

Eberhart et al. (2004)	R&D	8,313 cases, between 1951-2001 which increase R&D expenditure.	Three-factor Model Carhart four-factor model
Ryan and Taffler (2006)	Brokerage recommendation changes	Six leading London-based brokerage houses from Dec 1993 to June 1995	Size control portfolio
Filbeck et al. (2007)	CFO Magazine's Rank	Magazine survey firms over the period from 1997 to 2000.	Industry and size control portfolio
Campbell et al. (2009)	Real Estate Investment Trust (REIT) mergers	114 REIT merger announcements over the sample period 1994–2001.	Size control portfolio
Savor and Lu (2009)	Merges and Acquisition	The final sample consists of 1,773 (1,050 stock and 723 cash) consummated and 355 (187 stock and 168 cash) unconsummated deals from January 1962 to December 2000.	Size and book-to-market control firms
Erdogan (2010)	IPO	126 IPOs for the period from 1995 to 2000 in Turkey.	Market Index
Su and Bangassa (2011)	IPO	590 IPOs listed on the SHSE or SZSE over the period from January 2001 to September 2008.	Market index
Chen et al. (2016)	Trading statement announcements (TSA)	464 quarterly TSAs from August 2002 to April 2013.	Market Index
Malmendier et al. (2018)	Mergers and Acquisition	16,632 event-time observations from 231 bidders from 1985 to 2012.	Market Index CAPM Model Fama-French three-factor model
Panel B: The banking industry			
Cornett et al. (1998)	Common Stock Issues	150 common stock issues of commercial banks from 1983 to 1991.	Size-matched reference portfolio Book-to-market reference portfolio Momentum reference portfolio

Bessler et al. (2003)	Bank IPO	252 banks went public from 1970 to 1997	Market index
Cornett et al. (2006)	Bank mergers	134 bank mergers completed from 1990 to 2000.	Size-matched reference portfolio Book-to-market reference portfolio Momentum reference portfolio
Cyree et al., 2012)	Derivatives use	335 commercial banks from 2003 to 2009.	Size and book-to-market control firms
Filbeck et al. (2013)	Superior accounting performance report	188 distinct banks that appear on the ABA list from 1993 to 2009.	Size-matched control firms
Liu et al. (2013)	Capital Purchase Program (CPP)	272 CPP banks from first quarter 2002 to first quarter 2011.	Size and book-to-market reference portfolio
Cowan and Salotti (2015)	Winning bidders in FDIC failed bank auctions	241 P&As (purchase and assumption) completed from January 2008 through December 2013.	Market index
King et al. (2016)	Excessive trading activity	10,682 bank-quarter observations from Q1 2006 to Q4 2013.	Market index
Unsal et al. (2017)	Lobby activities	2,579 firm-year observations between 2000 and 2013.	Market index
Boulland et al. (2019)	Unrealized gains and losses on available-for-sale securities	5,365 bank-year observations from 2001 to 2004.	Market index
Chen and Zheng (2021)	Financial crisis and risk governance	30 pairs of matched banks that were the centre of the financial crisis from 2006 to 2010.	Market index

Notably, the data properties and research purposes are the key factors determining the chosen benchmark in this chapter.

Firstly, the market index is applied as a benchmark to measure BHAR because it does not require size or book-to-market data. With the nature of the sample, there are some banks facing problems of a missing value of book-to-market. The selection of control/reference firms also has a problem because some banks may not find the matched firms, leading to the potential of sample size reduction.[59] Therefore, to preserve sample size when calculating BHAR, market indices are chosen as the benchmarks.

Furthermore, the control/ reference portfolio is what is adopted for. Several authors have claimed that cross-firm variation can be controlled by estimating abnormal returns using the control firm approach. According to Fama (1998), average stock returns are related to firm size and book-to-market ratio. Thus, the control firm approach does not solve the bad-model problem, but it yields well-specified test statistics as it controls for the new listing, rebalancing, and skewness biases (Barber and Lyon, 1997a).[60]

In short, two market indices, including S&P500 and Nasdaq, and the matched-size firm control portfolio are adopted as the main benchmarks.[61] What follows is a description of how to estimate those benchmarks for sample firms and the calculation of BHAR.

6.4.1.2 Matched-firm Portfolio Selection.

As described earlier, the control-firm portfolio approach (which can include either single or multi-firm possessing closet characteristics to event firms), is selected for benchmarking. In the initial stage of the process, the announcement month of the website launch of each sample bank is assumed to be t_0. At this point, the standards for the portfolio are set as follows.

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[59] For example, the banks who adopt a transactional website in 2010 could not find the matched firms as no banks in our sample launch the website after 2010.

[60] According to Barber and Lyon (1997a), new listing bias arises in event studies of long-term abnormal returns because sample firms usually have a long pre-event return record. At the same time, the benchmark portfolio may include firms that have only recently begun trading and are known to underperform market averages. Secondly, rebalancing bias arises because the compounded return on the benchmark portfolio typically assumes periodic rebalancing of the portfolio weights, while sample firms' returns are compounded without rebalancing. Lastly, skewness bias arises because long-term abnormal returns are likely to be positively skewed, i.e., they have a right-skewed distribution.

[61] Notably, the equally weighted market index as well as the ex-ante buy-and-hold return are also used as the alternative benchmarks. Those benchmarks will be discussed further in Section 6.6- Robustness Tests. Additionally, as the limit of this chapter, the multifactor models were not applied. Barber and Lyon (1997a), however, argue that the arithmetic summation of return does not precisely measure investor experience with the construction of multifactor models.

For each sample $bank_i$, the candidate banks must launch the website at least 36 months (three years) after this sample bank's event time.[62] In other words, for each sample $bank_i$, other banks that have debuted their websites before or within the first 36 months since the event month of the sample $bank_i$ are excluded from the list of control firms. This setting is because abnormal returns are estimated as the difference between actual returns and normal returns. Accordingly, the banks selected to the benchmark must ensure the maintenance of normal returns within a specific time around the event date of targeted banks. For such a reason, banks selected as candidates for the benchmarks are those that set up websites at least 36 months later than the sample banks.

The next step is identifying matched banks that must satisfy the criteria of size.[63] Following the methodology of Ikenberry et al. (1995) and Barber and Lyon (1997a), at each month, all the sample banks are sorted into ten decile-sized portfolios. The portfolio must include the banks of the same size rank as the targeted bank. As the size is reset each month, the benchmark portfolio is different each month.

To sum up, the control-firm portfolio selected for each sample firm must satisfy two conditions: (1) launch websites at least 36 months later than the sample firm, (2) possess the size characteristic similar to the sample firm during the holding period (in the same size rank with the sample bank). However, it should be acknowledged that setting the above conditions cannot guarantee that each sample bank will have a full ten control firms. Referring to Savor and Lu (2009), the matched portfolios containing less than ten control banks are still kept in case there are not enough to reach ten banks satisfying all three criteria, as long as the amount of control banks is at least one.

6.4.1.3 Market Index Portfolio

Following some authors (Ikenberry et al., 1995; Ritter, 1991), the market index is also adopted for estimating the BHAR. To be more specific, two main market indices are

[62] For example, if the targe bank has the event in January 1996 (t_0 = January 1996), the control banks need to have the events at least after 36 months (from t_{36} = January 1999).

[63] Firm size is defined as the market capitalization (Barber and Lyon, 1997a; Savor and Lu, 2009).

applied, which are S&P500 and Nasdaq.[64] Both S&P500 and Nasdaq are collected monthly from the Thompson data source.

6.4.1.4 Model of Abnormal Returns

BHAR is described as the difference in return between a buy-and-hold investment in the sample firm and a buy-and-hold investment in control-firm/reference portfolio:

$$BHAR_T^i = BH_T^i - BH_T^b \qquad \text{(Equation 6.1)}$$

Where BH_T^i is the buy-and-hold return for $firm_i$ over the holding period and BH_T^b is the corresponding buy-and-hold return matched portfolio of $firm_i$.

Similar to the short-run investigation, abnormal return estimation cannot be reached until the holding period is set. Referring to many studies, the main holding periods chosen are T (0, 11); T (0, 23); T (0, 35).

As can be seen in Equation 6.1, two metrics should be estimated first: the buy-and-hold return of each target bank (BH_T^i) and the buy-and-hold return of the benchmark (BH_T^b). Equation 6,2, Equation 6.3 and Equation 6.4 are applied for the construction of buy-and-hold return of target bank$_i$ and its benchmarks. To estimate BH_T^b in this case, the monthly mean return for each portfolio is calculated first, and then the mean return is compounded over the holding period.

$$BH_T^i = \prod_{t=0}^{t=\tau}\left[1 + R_{i,t}\right] - 1 \qquad \text{(Equation 6.2)}$$

Where:

$R_{i,t}$ = monthly return of $bank_i$ during the holding period.

$\prod_{t=0}^{t=\tau}\left[1 + R_{i,t}\right] - 1$= compounded return of monthly returns of $bank_i$ during the holding period.

$$BH_T^b = \prod_{t=0}^{t=\tau}\left[1 + \frac{\sum_{i=1}^{n_t} R_{match_{b,t}}}{n_t}\right] - 1 \qquad \text{(Equation 6.3)}$$

[64] As followed Barber and Lyon (1997a), the equally weighted index is also applied, which is estimated by the mean return of the three largest stock indices in the US: S&P 500, Nasdaq, and Dow Jones. The results of equally weighted market index are presented in the robustness test section.

Where:

$\frac{\sum_{i=1}^{n_t} R_{match_{b,t}}}{n_t}$ = monthly average return of matched firms during the holding period.

$\prod_{t=0}^{t=\tau}\left[1+\frac{\sum_{i=1}^{n_t} R_{match_{b,t}}}{n_t}\right]-1$ = compounded return of monthly average returns during the holding period.

$$BH_T^b = \prod_{t=0}^{t=\tau}\left[1+R_{m,t}\right]-1 \qquad \text{(Equation 6.4)}$$

Where:

$R_{m,t}$ = monthly return of market index during the holding period.

$\prod_{t=0}^{t=\tau}\left[1+R_{m,t}\right]-1$ = compounded return of monthly returns of the market index during the holding period.

Two commonly applied tests in event studies are the parametric test that supports the assumption of normal distribution and the nonparametric test being distribution-free. The parametric test is chosen by following the recommendation of Brown and Warner (1985) and some other authors. The authors indicate that parametric tests are well-specified when testing the abnormal performance of stocks.

$$t = \frac{\overline{BHAR_i}}{sd(BHAR_i)/\sqrt{N}} \qquad \text{(Equation 6.5)}$$

Where:

- $\overline{BHAR_i}$ is the mean value of excess returns of the whole sample of securities during the holding period.
- $sd(BHAR_i)$ is the standard deviation of excess returns of the whole sample of securities during the holding period.
- N is the number of sample securities whose excess returns are available during the holding period.

6.4.2 Methodology of Hypothesis 6.1: The regression between BHAR and transactional website adoption

To examine the impact of transactional website adoption on the long-term performance of banks, the regression with the equation is carried out as follow:

$$BHAR_{i,t} = \alpha + \beta \times Transactional\_website\_adtopion_{i,t} + \delta \times Control\ variables_{i,t} + \varepsilon_{i,t}$$ (Equation 6.6)

- $BHAR_{i,t}$ is the difference in the monthly compounded returns of banks and the monthly compounded returns of the benchmark, during the pre-adoption and post-adoption of the transactional websites. The holding periods used are 12 months before (-12, -1) and 12 months since the transactional website event month (0, 11); 24 months before (-24, -1) and 24 months since the transactional website event month (0, 23); 36 months before (-36, -1) and 36 months since the transactional website event month (0, 35).
- $Transactional\_website\_adoption_{i,t}$ is a dummy variable, which equals 1 if $BHAR_{i,t}$ is estimated in the post adoption period (0, 11); (0, 23) or (0, 35). Otherwise, this variable equal to 0 if $BHAR_{i,t}$ is estimated in the pre-adoption period (-12, -1); (-24, -1); (-36, -1).
- $\Delta ROA_{i,t}, Funding_{i,t}, Leverage_{i,t}, BankSize_{i,t}, HHI_{i,t}$ are the set of control variables that are estimated for both the preadoption period and post-adoption period. The definition of this set of control variables is summarized in Table 6.4.

6.4.3 Methodology of Hypothesis 6.2: The impact of the "learning by observing"

Hypothesis 6.2 investigates the impact of "learning-by-observing" on banks' performance, expecting that investors can evaluate the transactional website announcements of banks better by observing the performance of banks who adopted the transactional website earlier. To verify Hypothesis 6.2, the following equation is constructed:

$$post - BHAR_{i,t} = \alpha + \beta \times LBOY(1)_{i,t} + \delta \times Control\ variables_{i,t} + \varepsilon_{i,t}$$ (Equation 6.7)

- Specifically, Equation 6.7 is used to test the relationship between post-BHAR and the impact of the learning-by-observing effect, under the control of a set of variables.
- $post - BHAR_{i,t}$ are the monthly compounded returns of banks after they adopted the transactional websites. The holding periods used are 12 months, 24 months, and 36 months, using three different benchmarks mentioned in Section 6.4.1
- The variable $LBOY(1)_{i,t}$ is the proxy for learning by observing, or more precisely, for observable information spillover from transactional website adoption of previous banks from which bank investors can potentially learn. $LBOY(1)_{i,t}$ is the cumulative number of sample banks that adopted transactional websites during one year prior to the transactional website of $bank_i$.[65]

6.4.4 Methodology of Hypothesis 6.3: The impact of magnitude effect in the long run

Hypothesis 6.3 investigates how the magnitude effect influences the impact of the transactional website adoption on financial performance among banks. To test Hypothesis 6.3, the following equation is constructed which examine the impact of the size effect on the long-term performance of banks in the post-adoption period only.[66]

$$BHAR_{i,t} = \alpha + \gamma \times Largebank_{i,t} + \delta \times Control\ variables_{\ i,t} + \varepsilon_{i,t} \qquad \text{(Equation 6.8)}$$

In which, for each year, the banks are divided into two groups: small-sized banks and large-sized banks. The small-sized bank group comprises 50% of sample banks with the smallest asset values each year, and the large-sized bank group includes the remaining 50% of banks with the largest asset values. After that, two dummy variables were created, including $\text{Smallbank}_{i,t}$ and $\text{Largebank}_{i,t}$. For the $\text{Smallbank}_{i,t}$ variable, banks that belong to the Small-sized group will receive the value of 1, and banks in the Large-sized group will receive the value of 0. In contrast, for the $\text{Largebank}_{i,t}$ variable, banks in the large-

[65] The impact of $\text{LBOY}(2)_{i,t}$ and $\text{LBOY}(3)_{i,t}$ on the BHAR are also tested to avoid the bias selection. Please refer to Section 6.6- Robustness Tests for further details.
[66] The size effect over both ex-ante and ex-post periods of the transactional website launching event is also tested. Please refer to Section 6.6- Robustness Tests for more details.

sized group will receive the value of 1, and banks in small-sized group will receive the value of 0. Notably, in this chapter, $\text{Smallbank}_{i,t}$ variable is treated as the reference variable. Therefore, the empirical results only show the coefficient values of the $\text{Largebank}_{i,t}$ variable.

Additionally, BHAR and other independent variables were estimated during the ex-post period of transactional website adoption only. Therefore, three holding periods employed were (0, 11); (0, 23); (0, 35). BHAR and other variables are similar to the ones in Equation 6.6.

6.4.5 Methodology of Hypothesis 6.4: The impact of timing effect in the long run

Hypothesis 6.4 investigates if the timing order influences the relationship between transactional website adoption and banks' performance. To test Hypothesis 6.4, the following equation is constructed which examines the impact of the size effect on the long-term performance of banks in the post-adoption period only.[67]

$$BHAR_{i,t} = \alpha + \gamma_1 \times Second\_mover_{i,t} + \gamma_2 \times \text{Laggard}_{i,t} + \delta \times Control\ variables_{\ i,t} + \varepsilon_{i,t} \qquad \text{(Equation 6.9)}$$

In which, three different dummy variables are created, namely $\text{First\_movers}_{i,t}$, $\text{Second\_movers}_{i,t}$ and $\text{Laggard}_{i,t}$. $\text{First\_movers}_{i,t}$ equals 1 if the adoption year is within the 1996-1998 interval, otherwise, it equals 0. $\text{Second\_movers}_{i,t}$ equals 1 if the adoption year is within 1999-2000, otherwise equals 0.[68] $\text{Laggard}_{i,t}$ equals 1 if the adoption year is after 2000. In this chapter, $\text{First\_mover}_{i,t}$ variable is treated as the reference variable. Therefore, the empirical results only show the coefficient values of the $\text{Second\_movers}_{i,t}$ and $\text{Laggard}_{i,t}$variables.

Besides, $\text{BHAR}_{i,t}$ and other independent variables are estimated during the post-adoption only (0, 11); (0, 23); (0, 35).

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[67] The timing order effect over both ex-ante and ex-post periods of the transactional website launching event is also tested. Please refer to Section 6.6- Robustness Tests for more details.

[68] The selected cut-off years are discussed in detail in Section 3.3- Data Description.

Table 6.4 Summary of Variables

	Aim	Estimation	Expected sign
Dependent variable			
$BHAR_{i,t}$	Examine the long-run performance of banks	Estimated as the difference in compounding return between a buy-and-hold investment in the sample firm and its benchmark during a specified holding period. Three benchmarks have been applied: S&P 500, Nasdaq, and matched-bank portfolio. Six different holding periods have been applied: (-12, -1); (0, 11); (-24, -1); (0, 23); (-36, -1); (0, 35).	
Independent variable			
$Transactional\_website\_adoption_{i,t}$	Examine the impact of transactional website launching on banks' performance.	Dummy variable equals 1 if the holding periods are (0, +11 months); (0, +23 months); (0, +35 months) and equals 0 if the holding periods are (-1, -12 months); (-1,- 23 months); (-1, -35 months).	β >0 indicates transactional website adoption positively impacts the long-run performance of banks.
$LBOY(1)_{i,t}$	The variable LBOY is the proxy for "learning by observing" effect, or more precisely, for observable information spillover from previous bank transactional website adoption from which bank managers and bank investors can potentially learn.	$LBOY(1)_{i,t}$ is the number of the cumulative number of sample banks that adopted transactional websites during one year before the transactional website of bank t.	β >0 indicates that the more information about website adoption in the recent past, the better an investor's assessment of the value of the current bank's website adoption.

$Largebank_{i,t}$	Examine the impact of large size in influencing the banks' performance	Dummy variable, which equals 0 if banks are in large-sized banks group.	β >0 indicates that banks with large size have a positive impact on banks' performance[69]
$Second\_movers_{i,t}$		Dummy variable, which equals 1 if the announcement years are from 1999 to 2000; otherwise, equals 0.	β >0 indicates that banks who are the second movers in adopting transactional website are likely to gain superior performance[70]
$Laggards_{i,t}$		Dummy variable, which equals 1 if the announcement years are after 2000; otherwise, equals 0.	β >0 indicates that banks who are the laggards in adopting transactional website are likely to gain superior performance
Control variables			
$Bank\_Size_{i,t}$	Control for scale effects.	Calculated as the natural log of $bank_i$'s market capitalization.	+
$Bank\_Leverage_{i,t}$	Control for the bank's risk.	Estimated as the ratio of equity capital to the asset.	+

[69] In some regressions (Equation 6.8), $Smallbank_{i,t}$ variable is treated as the reference variable. Therefore, the empirical results only show the coefficient values of the $Largebank_{i,t}$. Those coefficient values reveal the impacts of the $Largebank_{i,t}$ to BHAR in relation to $Smallbank_{i,t}$.

[70] In some regressions (Equation 6.9), $Firstmovers_{i,t}$ variable is treated as the reference variable. Therefore, the empirical results only show the coefficient values of the $Secondmovers_{i,t}$ and $Laggard_{i,t}$ variables. Those coefficient value reveals the impacts of the $Secondmovers_{i,t}$ and $Laggard_{i,t}$ to BHAR, in relation to $Firstmovers_{i,t}$.

$Bank\_Funding_{i,t}$	Control for the bank's liquidity.	Estimated as the ratio of Net loans and leases over Core Deposit.	-
$HHI_{i,t}$	Control for market concentration	Calculated by squaring the market share of each firm competing in the market and then summing the resulting numbers. A high value of HHI indicates a highly concentrated marketplace.	
$\Delta ROA_{i,t}$	Control for changes in financial performance	Calculated as the difference in performance before and after adopting the transactional website.	+

6.4.6 Descriptive Statistics

Table 6.5 provides some important statistical information about the data in the pre-event (Panel A) and in the post-event of transactional website adoptions (Panel B).

Firstly, what is striking in this table is the continual growth of ROA. Specifically, after 1, 2, and 3 years from the year of website enablement, the bank can increase to 0.185, 0.482, 0.533 points of their ROA respectively (see panel B). Meanwhile, in the 3 years prior to the adoption, the improvement of ROA could be between 0.031 points and 0.081 points (see panel A). If compared over the same 3-year period before and after the adoption, the improvement in profitability in the post-adoption period could be up to 17 times (0.533 vs 0.185).

Secondly, there has been a marked change in bank funding strategy in the ex-post period. More pointedly, the ratio of net loan and lease to core deposits of banks tends to increase sharply, showing that their liquidity risk is likely to be higher since they have adopted websites. On average, over one, two, three years from the time of adoption, the mean score of the bank funding ratio could reach 99.82%, 99.49%, 100.63%, respectively (see panel B). Meanwhile, in the ex-ante adoption, banks had maintained a funding strategy with lower liquidity risk (the funding ratio ranges from 89.25% to 91.96%) (see panel A). These rates are between 7.86% -11.013% lower than the rates in the ex-post adoption period.

Thirdly, the bank's capitalization status also shows a decrease from about 11.940 % to 10.807% on average after the adoption (see panel B). However, as the median and mean capital ratios are both in excess of 10%, it is likely that the banks are still well above the statutory requirements.

Fourthly, it can be clearly seen in this table is the growth of the market value of sample banks. Over the three years since the adoption, the average market value of the sample banks has increased significantly, reaching around USD 970 million (see panel B). Meanwhile, the average value was between 442 and 566 million USD dollars over the 3 years preceding the adoption (see panel A). If the average market value of the 3rd year before adoption (market value -1, -4) is taken as a benchmark, then the growth of market value in the following years will be 9.5%, 28.05%, 62.44 %, 88.91%, and 119.46%, respectively.

Finally, it is worth noting that the HHI is consistently above 1500 points, and as such the sample banks are considered to be in a consistently highly competitive status (as following the guidelines of the U.S. Department of Justice, 2018) (see both panel A and B).

Table 6.5 Data Description

This table reports the comparison of the banks themselves before (Panel A) and after (Panel B) they have adopted the transactional websites, via the change in profitability, the funding strategy, liquidity risk, the state of capitalization of sample banks, the level of industry competition before and after the banks have adopted their website as well as banks' market value, which in turn are presented via the variables: $\Delta ROA_{i,t}$. $Bank\_Funding_{i,t}$, $Bank\_Leverage_{i,t}$, $HHI_{i,t}$ and $Bank\_Size_{i,t}$. The sources for this table are mainly from FDIC, SNL Financial, Thomson Financial Securities Data, the author's calculations, and some other sources. The sources for this table are mainly from FDIC, SNL Financial, Thomson Financial Securities Data, the author's calculations, and some other sources.

Panel A: Pre-event					
	Mean	Std.	Min	Max	N
$\Delta ROA_{i,t}$ (-1, -2)	0.081	0.738	-4.617	3.833	277
$\Delta ROA_{i,t}$ (-1, -3)	0.028	0.779	-6.122	4.927	271
$\Delta ROA_{i,t}$(-1, -4)	0.031	0.668	-5.717	5.208	235
$Bank\_Funding_{i,t}$ (-1, -2)	91.955	31.169	0.000	281.896	293
$Bank\_Funding_{i,t}$ (-1, -3)	90.314	30.833	0.000	271.327	293
$Bank\_Funding_{i,t}$ (-1, -4)	89.252	30.200	0.000	255.083	293
$Bank\_Leverage_{i,t}$ (-1, -2)	11.526	8.433	5.339	91.240	293
$Bank\_Leverage_{i,t}$ (-1, -3)	11.890	8.642	5.481	84.996	293
$Bank\_Leverage_{i,t}$ (-1, -4)	11.940	8.642	5.742	84.996	293
$HHI_{i,t}$ (-1, -2)	1552.003	111.567	1320.721	1901.871	295
$HHI_{i,t}$ (-1, -3)	1524.371	86.960	1320.721	1874.458	295
$HHI_{i,t}$ (-1, -4)	1513.897	83.207	1320.721	1874.458	295
$Bank\_Size_{i,t}$ (-1, -2)	566	2140	0.268	23000	297
$Bank\_Size_{i,t}$ (-1, -3)	484	1760	0.268	18800	297
$Bank\_Size_{i,t}$ (-1, -4)	442	1600	0.268	17100	297
Panel B: Post-event					
	Mean	Std.	Min	Max	N
$\Delta ROA_{i,t}$(1, 0)	0.185	0.944	-2.266	6.926	303
$\Delta ROA_{i,t}$(2, 0)	0.482	3.906	-1.948	65.007	303
$\Delta ROA_{i,t}$(3, 0)	0.533	5.024	-3.546	84.665	303
$Bank\_Funding_{i,t}$ (1, 0)	99.815	37.064	0.000	353.415	303
$Bank\_Funding_{i,t}$ (2, 0)	99.458	36.556	0.000	364.386	305
$Bank\_Funding_{i,t}$ (3, 0)	100.265	36.715	0.000	378.505	306
$Bank\_Leverage_{i,t}$ (1, 0)	10.807	8.398	5.134	97.864	304
$Bank\_Leverage_{i,t}$ (2, 0)	10.413	5.935	5.241	57.389	305
$Bank\_Leverage_{i,t}$ (3, 0)	10.241	4.967	5.302	51.188	306
$HHI_{i,t}$ (1, 0)	1578.765	85.146	1386.398	1888.835	304
$HHI_{i,t}$ (2, 0)	1576.895	80.340	1446.379	1901.871	305
$HHI_{i,t}$ (3, 0)	1593.817	68.020	1509.508	1868.234	307
$Bank\_Size_{i,t}$ (1, 0)	718	3180	0.656	39400	307
$Bank\_Size_{i,t}$ (2, 0)	835	4020	0.598	55600	307
$Bank\_Size_{i,t}$ (3, 0)	970	5180	0.599	74600	307

6.5 Empirical Results

6.5.1 Results of Hypothesis 6.1: Wealth creation of transactional website adoption in the long term.

Table 6.6 and Table 6.7 present the long-term abnormal returns earned by banks since their transactional websites have been adopted. In which, Table 6.6 displays the values of BHAR earned within the 12-month period (Panel A), 24-month period (Panel B), and 36-month period (Panel C) since the adoption of the transactional website. Meanwhile, Table 6.7 shows the results of the regressions reflecting the relationship between BHAR and transactional website adoption.

Overall, the results of Table 6.6 strongly support Hypothesis 6.1 at the point that banks earn significant positive abnormal returns in the long term from when they embraced the transactional website channel. Table 6.7 also supports Hypothesis 6.1 as they exhibit a positive impact of transactional website adoption on BHARs, indicating the wealth-creating capability of this digital initiative.

To be more specific, the results in Table 6.6 reveal some facts as follows:

Firstly, the buy-and-hold abnormal returns of bank events are found to have consecutive growth over 12, 24, and 36 months following their transactional website launch announcements. More pointedly, over the first 12 months, banks can earn excess returns ranging from 2.7% ($p<0.1$) to 8.7% ($p<0.01$). Excess returns continue to increase significantly when the window length is extended to 24 months (range from 4.7%, $p<0.1$ to 23.8%, $p<0.01$) and 36 months (range from 9.5%, $p<0.01$ to 33%, $p<0.01$).

Secondly, BHAR shows the highest growth if the benchmark is the Nasdaq index while BHAR experiences the strongest change if the benchmark is the non-event matched-size bank portfolio. More specifically, BHAR using Nasdaq benchmark increased from 0.087, (12-month, $p<0.01$) to 0.238 (24-month, $p<0.01$) and 0.33 (36-month, $p<0.01$). Thus, compared with 12-month BHAR, 24-month BHAR and 36- month BHAR increased by 173.56% and 279.3%, respectively. Meanwhile, regarding control-firm benchmark, BHARs saw a strong increase from 74.07% in the first 24 months (up from 0.027, $p<0.1$ to 0.047, $p<0.1$) to 251.9% in 36 months (up from 0.027, $p<0.1$ to 0.095, $p<0.01$).

Those findings, thereby, authenticate the growth in the market performance of banks from when they adopt digital websites. The findings also provide comparative evidence that website-event banks outperform the market and their non-event competitors in holding long-term buy-and-hold investments. Also, the findings reveal higher interest and faith of investors for transactional website adoption portfolios in the long term, in relation to other portfolios in the market on average as well as especially in relation to similar-capitalized bank competitors with no transactional website adoption.

Table 6.6 earlier provides evidence that compares the buy-and-hold strategies of event banks against their hypothetical benchmarks since the time website events were announced. Table 6.7 is more inclined to provide evidence of a difference in the buy-and-hold performance of banks before and after they adopt transactional websites when compared with the same benchmarks. Thus, the findings in Table 6.7 can show the direct value that transactional websites contribute to the market performance of bank adopters as well as their ability to create wealth for shareholders.

To be more specific, by adopting a transactional website, at least in relation to the market as a hypothetical portfolio, banks can significantly enhance their market performance by from 0.074 ($p<0.05$) to 0.082 ($p<0.1$) points over the first 12 months of the adoption.[71] Over 24 months, transactional website adoption continues to add from 0.281 ($p<0.01$) to 0.397 points ($p<0.01$) to banks' performance in relation to the market. Equivalently, the impact of transactional websites on the market performance of banks has grown up to 384.1% over 24 months and 850% over 36 months following the month they have adopted, in comparison to the first 12-month period.[72]

In conclusion, the results in this section reveal the following findings. Firstly, there is the direct involvement of the market upon banking website launch events in the long term. Portfolios pertaining to such events are found to hold significant growth over a long term interval, at least for three years following the launch event. This reaction from the market, thereby, enables banks to achieve favourable market performance which vigorously

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[71] Regarding the value of transactional website adoption adds to BHAR using the matched-firm portfolio, although the coefficients are positive, they are not statistically significant. To clarify this issue, the impact of the transactional website variable on BHAR at both levels 0 and 1 are tested. The results reveal when the transactional website adoption variable = 1, it shows a significant influence on the bank's BHAR over 24 month (10% level) and 36 months (1% level). This finding suggests that the adoption of transactional website needs at least 24 months to show its significant value added to event banks, compared to the group of non-event competitors. Meanwhile, when examining the impact of transactional website adoption on BHAR using the market indices, the transactional website adoption clearly demonstrated the spectacular transformation of BHAR before and after adoption.

[72] The maximum impact of transactional website adoption on 12-month BHAR and 24-month BHAR are 0.082 ($p<0.1$) and 0.281 ($p<0.01$), respectively. Therefore, over 24-month period, the impact of transactional website adoption can grow up to by $\frac{(0.281-0.082)}{0.082}\% = 384.1\%$, compared to the 12-month period.

grows over the following years. Secondly, compared to the ex-ante period, the enablement of websites had a markedly increased impact on the value of BHAR, with BHAR growth reaching at least 384.1% after two years and up to 850% after three years. The results are partly consistent with the resource-based view theory, with the provision of at least two critical attributes of digital innovation, value, and durability. The findings also support some studies in banking literature that digital banking exerts a positive influence on banks' performance over the longterm (Ciciretti et al., 2009; DeYoung, 2005; DeYoung et al., 2007; Goh and Kauffman, 2013; Scott et al., 2017).[73] However, while digital banking literature so far tends to mainly focus on the long-term financial benefits of digital banking adoption, this chapter provides new evidence regarding the long-term benefits of transactional website adoption added to shareholders.

[73] Please also refer to Section 6.2.1 for further discussions about digital banking literature.

Table 6.6 Buy-and-Hold Abnormal Returns (BHARs) upon the transactional website launching announcements of 307 banks.

This table reports the values of Buy-and-Hold Abnormal Returns (BHARs) and their descriptive statistical characteristics to stockholders upon the transactional website launching announcement of sample banks. The sample consists of website launch announcements of 307 US banks between 1996 and 2010. The BHARs are obtained by taking the difference in return between a buy-and-hold investment in the sample bank and a specific benchmark. Three benchmarks used are the S&P500 Market Index, Nasdaq Market Index and matched portfolio. The table is divided into three panels which present the BHARs calculated during three different holding periods: 12-month period (Panel A), 24-month (Panel B), and 36-month (Panel C). The data of Market Indices were collected from Thomson Reuters. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests.

12-month period	$\overline{\textbf{BHAR}}$	**Std.**	**t-stat**	**Min**	**Max**	**N**
BHAR using Market Index S&P500	0.079^{***}	0.350	3.958	-0.731	1.421	307
BHAR using Market Index Nasdaq	0.087^{***}	0.553	2.752	-1.320	1.526	307
BHAR using matched-firm portfolio	0.027^{*}	0.313	1.292	-1.105	1.067	220
24-month period	$\overline{\textbf{BHAR}}$	**Std.**	**t-stat**	**Min**	**Max**	**N**
BHAR using Market Index S&P500	0.185^{***}	0.563	5.757	-1.102	2.305	307
BHAR using Market Index Nasdaq	0.238^{***}	0.745	5.595	-1.629	2.352	307
BHAR using matched-firm portfolio	0.047^{*}	0.466	1.540	-1.333	1.703	231
36-month period	$\overline{\textbf{BHAR}}$	**Std.**	**t-stat**	**Min**	**Max**	**N**
BHAR using Market Index S&P500	0.299^{***}	0.699	7.498	-1.656	2.326	307
BHAR using Market Index Nasdaq	0.330^{***}	0.898	6.438	-2.229	2.613	307
BHAR using matched-firm portfolio	0.095^{***}	0.635	2.326	-1.522	2.202	240

Table 6.7 The impact of transactional website adoption on BHARs over three holding periods

This table reports the ordinary least square regression results for Equation 6.6. based on the sample of 307 web-launching announcements of publicly traded U.S. banks. In each regression, the dependent variable is BHAR, which is estimated as the difference between the compounded returns of sample banks, and the benchmark returns over the holding periods. The holding periods used to estimate BHAR are over both ex-ante and ex-post period of the website-activated events, including (-12, -1); (0, 11); (-24, -1); (0, 23); (-36, -1); (0,35). Three benchmarks used to estimate BHAR are S&P500, Nasdaq, and matched-bank portfolio. The main independent variable is the variable Transactional_website_adoption$_{i,t}$ which equals 0 if the holding periods are ex-ante (-12, -1); (-24, -1); (-36, -1), equals 1 if the holding periods are ex-post (0; 11); (0; 23); (0;35). The control variables are also employed to control for exogenous cross-sectional differences in market structures and bank characteristics and are all observed annually. The sources for this table are FDIC, SNL Financial, Wayback Machine U.S. Census Bureau of Economic (BEA), U.S. Bureau of Labor Statistics, the World Bank, Thomson Financial Securities Data, and the author's calculations. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests.

	Panel A: 12-month period			Panel B:24-month period			Panel C: 36-month period		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
VARIABLES	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio
Transactional_website_adoption$_{i,t}$	0.074**	0.082*	0.001	0.281***	0.397***	0.031	0.606***	0.779***	0.037
	(0.0310)	(0.0464)	(0.0366)	(0.0496)	(0.0683)	(0.0558)	(0.0699)	(0.0924)	(0.0863)
Bank_Size$_{i,t}$	-0.004	-0.004	-0.023**	-0.018	-0.026	-0.033**	-0.060***	-0.102***	-0.032
	(0.0094)	(0.0141)	(0.0109)	(0.0143)	(0.0196)	(0.0150)	(0.0185)	(0.0245)	(0.0203)
Bank_Leverage$_{i,t}$	0.004	0.004	0.010***	0.001	-0.002	0.002	-0.002	-0.004	0.003
	(0.0023)	(0.0035)	(0.0037)	(0.0043)	(0.0059)	(0.0070)	(0.0085)	(0.0112)	(0.0131)
Bank_Funding$_{i,t}$	0.000	0.001	0.000	0.001	0.001	0.001	0.002*	0.002*	0.002
	(0.0005)	(0.0007)	(0.0006)	(0.0007)	(0.0010)	(0.0009)	(0.0009)	(0.0012)	(0.0012)
HHI$_{i,t}$	-0.000	0.000	-0.000	-0.000	-0.000	-0.001	-0.001*	-0.001**	-0.001*
	(0.0002)	(0.0003)	(0.0002)	(0.0003)	(0.0004)	(0.0004)	(0.0005)	(0.0007)	(0.0007)
ΔROA$_{i,t}$	-0.006	-0.015	-0.002	-0.002	0.002	0.003	-0.001	-0.003	0.003
	(0.0186)	(0.0279)	(0.0237)	(0.0086)	(0.0118)	(0.0092)	(0.0089)	(0.0118)	(0.0101)
Constant	0.269	-0.180	0.492	0.707	0.535	1.387*	2.072**	3.340***	2.414**
	(0.3496)	(0.5239)	(0.4210)	(0.6091)	(0.8389)	(0.7456)	(0.8582)	(1.1351)	(1.2016)
Observations	576	576	411	570	570	424	534	534	408
R-squared	0.020	0.011	0.030	0.064	0.072	0.017	0.157	0.154	0.021

6.5.2 Results of Hypothesis 6.2: The impact of the “learning by observing”

Table 6.8 presents the investigation into the impact of “learning-by-observing” behaviour and information spillover on banks’ BHAR in the ex-post period of transactional website adoption, over three different holding periods (12 months, 24 months, and 36 months, respectively). In general, the results strongly support Hypothesis 6.2, suggesting that the “learning-by-observing” behaviour, which is throughout the mechanism of information spillover to the public, has a positive impact on the long-term excess earnings of banks following their adoption of transactional websites. The findings also show that the stock market would be better in identifying the value of the current transactional website adoption if a substantial number of other banks have enabled websites in the recent past. To be more specific, for all three holding periods, the coefficients of the $LBOY(1)_{i,t}$ variable are significantly positive and almost significant at a 1% level. As described previously, the $LBOY(1)_{i,t}$ is the proxy of the amount of information spillover in the recent past pertaining to transactional website adoption. Therefore, the coefficients found in Table 6.8 indicate that the amount of transactional website adoption in the past positively impacts the abnormal return earned by current transactional website events.

For example, as illustrated in Table 6.8 (panel A), over the holding period of the 12 months following the adoption of a transactional website, a one-point increase in the $LBOY(1)_{i,t}$ variable will build up the BHAR value by from 0.001 ($p<0.05$) to 0.004 points ($p<0.01$). These figures suggest that if the number of banks that adopt transactional websites before the target $bank_i$ increases by one, the target $bank_i$ can earn a further 0.001 to 0.004 points of abnormal returns within the next 12 months. In the same vein, in Table 6.8 -panel B, the 24-month BHAR value of the target $bank_i$ potentially increases by the range of 0.003 ($p<0.01$)-0.009 ($p<0.01$) if the number of banks that adopt transactional websites increases by one within one year prior to the adoption of $bank_i$. Finally, in Table 6.8-Panel C, if there is one more bank that has adopted a transactional website one year before the transactional website announcement of the target $bank_i$, from 0.006 ($p<0.01$) to 0.014 points ($p<0.01$) would be added to the 36-month BHAR of the targeted $bank_i$.

Notably, with the same $LBOY(1)_{i,t}$ variable used for all three horizons, the value of the variable BHAR continued to expand. For example, regarding the S&P500 benchmark (Column1), a one-point increase in the $LBOY(1)_{i,t}$ variable would enlarge from 0.004

points to 0.009 points (an increase of 12.5%) and 0.011 (growth of 17.5%) of BHAR over 12, 24 and 36 months, respectively. The same thing also happened for the remaining two benchmarks (Columns 2 and 3). These results suggest the critical meaning of the amount of information extracted from banks that adopted digital websites a year before the current website-enabled event. In which, such an amount of information is still vital for market assessment over the next three years. Also, it is most likely one of the core grounds for investors to evaluate and identify the value enhancement of a current transactional website launch during their portfolio's holding period. Following the viewpoint of DeLong and DeYoung (2007), it is likely that in a semi-strong efficient market, investors are unlikely to access the full information. As the information is materially inadequate, some additional information from the surrounding period can help investors identify the value enhancement added to the transactional website events more accurately.

In conclusion, the results in this section reveal findings of the positive impact of information spillover and "learning by observing" behaviour. Such findings reveal that at least within the first three years following the announcement of a transactional website event, investors' judgment and market assessment towards this event are potentially impacted by the amount of information from previous transactional website events. Put differently, investors could assess the long-term value of the current transactional website events better by capturing the information of other transactional website events in the recent past. So far, in digital banking literature, only "learning by doing" mechanism of banks is empirically tested to see if this mechanism adds any financial benefits to banks (Delgado et al., 2007; DeYoung, 2002, 2005; Hasan et al., 2002).[74] However, in the market, as the investors are external to the banks, they could not learn by doing but learning by observing via the information revealed to the public (see DeLong and DeYoung, 2007, p. 189). Therefore, this evidence can advance the understanding of a new learning mechanism in digital banking that can add economic value to banks' shareholders. The results also argue for rationality in market assessment and investor behaviour in the long term. The market evaluation would most likely be based on precise mechanisms, especially the information of the same website enablement events in the recent past,

[74] Please refer to Section 5.5.2.5 for the relevant discussion.

rather than one based on constrained behaviours and anomalies (e.g., hot issue, imitation).

Table 6.8 The impact of "Learning-by-Observing" from Information Spillover on BHARs since the transactional website adoption.

This table reports the ordinary least square regression results for Equation 6.7 based on the sample of 307 web-launching announcements of publicly traded U.S. banks. In each regression, the dependent variable is BHARs, which are estimated as the difference between the compounded returns of sample banks, and the benchmark returns over the post-adoption holding period. The holding periods used to estimate BHAR are ex-post period of the website-activated events, including (0; 11); (0; 23); (0;35). Three benchmarks used to estimate BHAR are S&P500, Nasdaq, and matched-bank portfolio. The main independent variable is $LBOY(1)_{i,t}$, representing "learning-by-observing" behaviour, or more specifically, for the amount of observable information spillover from previous website-adopted events from which bank investors can potentially learn. This variable is estimated by the number of the cumulative number of sample banks that adopted transactional websites one year before the transactional website of $bank_t$. An equally weighted Market Index and Ex-ante Buy-and-Hold benchmark as the alternatives is also adopted. Please refer to the Robustness test and Appendix for further details. The sources for this table are FDIC, SNL Financial, Wayback Machine U.S. Census Bureau of Economic (BEA), U.S. Bureau of Labor Statistics, the World Bank, Thomson Financial Securities Data, and the author's calculations. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests.

	Panel A: 12-month period			Panel B:24-month period			Panel C: 36-month period		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
VARIABLES	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio
$LBOY(1)_{i,t}$	0.004***	0.006***	0.001**	0.009***	0.011***	0.003***	0.011***	0.014***	0.006***
	(0.0005)	(0.0009)	(0.0007)	(0.0008)	(0.0011)	(0.0011)	(0.0010)	(0.0012)	(0.0014)
$Bank\_Size_{i,t}$	0.006	0.002	-0.006	-0.012	-0.029	-0.018	-0.042**	-0.083***	0.002
	(0.0117)	(0.0185)	(0.0134)	(0.0176)	(0.0240)	(0.0193)	(0.0203)	(0.0253)	(0.0253)
$Bank\_Leverage_{i,t}$	0.004	0.007	0.005	-0.003	-0.005	-0.013	-0.010	-0.012	-0.032*
	(0.0027)	(0.0043)	(0.0042)	(0.0064)	(0.0087)	(0.0126)	(0.0085)	(0.0106)	(0.0179)
$Bank\_Funding_{i,t}$	0.001	0.001*	0.000	0.001	0.001	-0.000	0.001	0.001	0.001
	(0.0005)	(0.0008)	(0.0007)	(0.0008)	(0.0011)	(0.0010)	(0.0009)	(0.0012)	(0.0014)
$HHI_{i,t}$	-0.001***	-0.002***	-0.000	-0.001***	-0.002***	-0.001	-0.002***	-0.002***	-0.003**
	(0.0002)	(0.0004)	(0.0003)	(0.0004)	(0.0005)	(0.0006)	(0.0005)	(0.0007)	(0.0012)
$\Delta ROA_{i,t}$	0.012	0.019	-0.014	0.012	0.019	0.014	0.010	0.011	0.020*
	(0.0200)	(0.0317)	(0.0286)	(0.0089)	(0.0121)	(0.0117)	(0.0080)	(0.0099)	(0.0116)
Constant	1.522***	2.462***	0.714	2.005***	2.656**	1.770*	3.690***	4.326***	3.873*
	(0.4714)	(0.7473)	(0.5617)	(0.7560)	(1.0287)	(1.0600)	(0.9902)	(1.2333)	(1.9876)
Observations	303	303	217	303	303	228	303	303	236
R-squared	0.250	0.257	0.054	0.330	0.292	0.062	0.390	0.428	0.088

6.5.3 Results of Hypothesis 6.3: The impact of magnitude effect in the long run

Table 6.9 presents result relevant to the impact of the size effect on banks' performance over the long term following their transactional website adoption. In general, these results robustly support Hypothesis 6.3, which proposes that small banks are more positively influenced by their website adoption than their larger-scaled peers.

In which, the coefficients of the $Largebank_{i,t}$ variable were found to be negative and statistically significant across the event windows. This result indicates that in the ex-post period of transactional website adoption, small banks outperform the big ones in earning buy-and-hold excess returns. In the first 12 months since the event month, when compared to small banks, large banks have a lower value of BHAR from 0.098 ($p<0.05$) to 0.182 points ($p<0.01$). Over 24 months, the size effect continues to drastically lower BHAR of large banks from 0.229 ($p<0.01$) to 0.356 points ($p<0.01$), compared to smaller banks. Upon a 36-month window, the BHAR value continued to be lower for large banks, ranging from 0.162 ($p<0.1$) to 0.337 ($p<0.01$). If described in percentages, in relation to the 12-month period, the size effect over a 24-month period increases its influence by at least 95.6% and up to 133.67%. Upon 36 months, the size effect increases its power in the range of 158.24% to 276.74%, when compared to the first 12-month period.

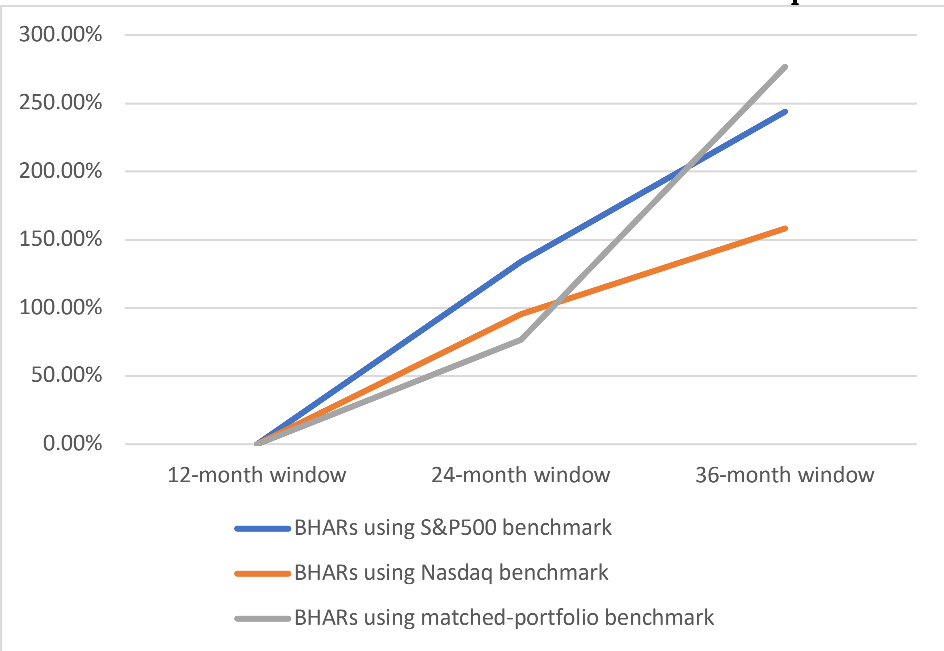
In general, the findings support the notion that the size effect is most likely a critical factor that heavily influences the response and evaluation of the market to corporate events. Regarding the events of banking website enablement, this effect significantly differentiates the market performance between small and large banks. The differentiation in market performance is most dramatic following the second year of the website-activated event, followed by the growing tendency afterwards. To the best of my knowledge, not much attention is paid in the literature on size effect in influencing the value that transactional website adoption adds to banks. A few relevant studies are of DeYoung (2005) and Cyree et al. (2009) but the number of research banks is quite moderate and the research times of those studies have been a while ago. Meanwhile, asset pricing literature and market advocators state that size is an important factor in predicting the cross-sectional variation in firms' returns and should be taken into consideration. This chapter, accordingly, strengthens the understanding of the impact of size factor in influencing the economic value of transactional website adoption, in the more up-to-date research time and more systematic research sample.

Table 6.9 The magnitude effect on BHAR upon ex-post period of the transactional website adoption

This table reports the ordinary least square regression results based on the sample of 307 web-launching announcements of publicly traded U.S. banks. In the regression, the dependent variable is BHAR, which is estimated as the difference between the compounded returns of sample banks, and the benchmark returns over the post-adoption holding period. The holding periods used to estimate BHAR are ex-post period of the website-activated events, including (0; 11); (0; 23); (0;35). Three benchmarks used to estimate BHAR are S&P500, Nasdaq, and matched-bank portfolio. The main independent variables are $Smallbank_{i,t}$ and $Largebank_{i,t}$. The control variables are also employed to control for exogenous cross-sectional differences in market structures and bank characteristics and are all observed annually. The sources for this table are FDIC, SNL Financial, Wayback Machine U.S. Census Bureau of Economic (BEA), U.S. Bureau of Labor Statistics, the World Bank, Thomson Financial Securities Data, and the author's calculations. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests.

	Panel A: 12-month period			Panel B:24-month period			Panel C: 36-month period		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
VARIABLES	BHAR Market Index S&P500	BHAR Market Index Nasdaq	BHAR matched portfolio	BHAR Market Index S&P500	BHAR Market Index Nasdaq	BHAR matched portfolio	BHAR Market Index S&P500	BHAR Market Index Nasdaq	BHAR matched portfolio
$Largebank_{i,t}$	-0.098**	-0.182***	-0.043	-0.229***	-0.356***	-0.076	-0.337***	-0.470***	-0.162*
	(0.0384)	(0.0613)	(0.0436)	(0.0653)	(0.0862)	(0.0652)	(0.0793)	(0.1023)	(0.0847)
$Bank\_Leverage_{i,t}$	0.003	0.006	0.005	0.001	0.000	-0.006	-0.002	-0.001	-0.019
	(0.0029)	(0.0046)	(0.0042)	(0.0075)	(0.0099)	(0.0128)	(0.0103)	(0.0132)	(0.0181)
$Bank\_Funding_{i,t}$	0.001	0.002**	0.000	0.001	0.001	0.000	0.001	0.001	0.001
	(0.0005)	(0.0008)	(0.0007)	(0.0009)	(0.0012)	(0.0011)	(0.0011)	(0.0015)	(0.0014)
$HHI_{i,t}$	-0.001***	-0.002***	-0.000	-0.002***	-0.002***	-0.000	-0.003***	-0.003***	-0.001
	(0.0002)	(0.0004)	(0.0003)	(0.0004)	(0.0006)	(0.0005)	(0.0006)	(0.0008)	(0.0012)
$\Delta ROA_{i,t}$	-0.003	-0.004	-0.008	-0.002	0.001	0.007	-0.004	-0.009	0.011
	(0.0212)	(0.0338)	(0.0284)	(0.0104)	(0.0137)	(0.0118)	(0.0095)	(0.0123)	(0.0116)
Constant	2.306***	3.581***	0.449	2.731***	3.343***	0.141	4.724***	5.012***	1.910
	(0.3744)	(0.5973)	(0.4655)	(0.6651)	(0.8777)	(0.8823)	(0.9771)	(1.2611)	(1.8824)
Observations	303	303	217	303	303	228	303	303	236
R-squared	0.136	0.133	0.030	0.069	0.074	0.008	0.098	0.092	0.025
Reference variable	Small Bank	Small Bank	Small Bank	Small Bank	Small Bank	Small Bank	Small Bank	Small Bank	Small Bank

Figure 6.2 The enlargement of the size effect on BHARs of small and large banks over the 24-month and 36-month period



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6.5.4 Results of Hypothesis 6.4: The impact of timing effect in the long run

Table 6.10 presents the results of the investigation concerning the impact of the timing effect on banks' market performance in the long term following their transactional website adoption. Put differently, Table 6.10 shows the results pertaining to the relationship between transactional website adoption and the long-term performance of different banks who launch the websites at different times: $First\_movers$, $Second\_movers$, $Laggards$. Overall, the results support Hypothesis 6.4 in the following points:

- Firstly, there is a strong influence of the timing effect upon the website-launch events, leading to significant heterogeneity in abnormal returns of banks in the long run.
- Secondly, second movers and laggards are more rewarded by the adoption of transactional websites, compared to their first-mover peers in the long run.

To be more specific, investors tend to appreciate the website portfolio of second movers and laggards more when compared to their first-mover peers. For example, second movers potentially gain higher points of BHAR than their first-mover peers, to a maximum of 0.888 points ($p<0.01$), 1.510 points ($p<0.01$), and 1.421 points ($p<0.01$) over 12months, 24-months, and 36-months, respectively. In the same vein, in comparison with first movers, the laggard banks potentially thrive on the amplification of the value of BHAR, to a maximum of 0.754 points ($p<0.01$), 1.108 points ($p <0.01$), and 1.164 points ($p<0.01$) in the interval of 12-month, the 24-month and the 36-month periods, correspondingly.

Moreover, the timing order effect is reflected quickest if the benchmark is a market index. In which, BHAR of first movers and followers are significantly different since the first 12 months. Meanwhile, the timing effect takes at least 24 months to show a significant impact on BHAR using the control firm approach.

Besides, the timing order effect has the most powerful impact on the BHAR with the matched-firm benchmark. Regarding the second movers and first movers, the timing effect grows by 64.957% over 24 months and by 417.07% over 36 months, in relation to the 12-month period. Regarding laggards and first movers, the timing effect grows by 74.828% over 24 months and by 691.78% over 36 months, in relation to the 12-month period. Meanwhile, if the benchmark is a market index (Nasdaq or S&P500), the timing effect reaches the maximum growth of 58.412% and 155.53% over 24 months and 36 months respectively, in relation to the 12-month period.

In general, the findings show that the timing effect should be one of the main determinants which exert influence on the bank's long-term market performance in their website-adopted events. Surprisingly, it is not the pioneers, but the later adopters of the transactional websites are the ones who gain more sustainable and evolving returns in the long term when their value of BHAR continually widens over the years since the event month. The timing effect is detected to have the most robust influence on BHAR using the matched-firm portfolio, especially within a 36-month period. Meanwhile, BHAR using S&P 500 and BHAR using Nasdaq are most strongly influenced by the timing effect over a period of 24 months before a milder growth tendency has been shown afterwards. The growth of timing effect towards ex-post BHAR using three different benchmarks is illustrated in Figure 6.3 and Figure 6.4. To the best of my knowledge, there has been little discussion on the cross-sectional variation in transactional website value, attributed to the time of adoption. It is because the studies tend to focus on the early stage of Internet banking and therefore, the value of transactional website in the later stage has not been explored extensively. Prior to this study, the longest time period examined is from 2003 to 2008 in the study of Lin et al. (2011). Compared to literature, this chapter provides a comparative analysis of the economic value added to banks which are in three different timing orders: first movers, second movers and laggards in the more extended period from 1993 to 2013.

Table 6.10 The timing effect on BHAR upon ex-post period of the transactional website adoption

This table reports the ordinary least square regression results for Equation 6.10, based on the sample of 307 web-launching announcements of publicly traded U.S. banks. In the regression, the dependent variable is BHAR, which is estimated as the difference between the compounded returns of sample banks, and the benchmark returns over the post-adoption holding period. The holding periods used to estimate BHAR are the ex-post periods of the website-activated events, including (0, 11); (0, 23); (0, 35). Three benchmarks used to estimate BHAR are S&P500, Nasdaq, and matched-bank portfolio. The leading independent variables are $First\_movers_{i,t}$, $Second\_movers_{i,t}$, and $Laggards_{i,t}$. In which, $First\_movers_{i,t}$ equals 1 if the adoption year is within the 1996-1998 interval, otherwise equals 0. $Second\ movers_{i,t}$ equals 1 if the adoption year is within 1999-2000, otherwise equals 0. $Laggard_{i,t}$ equals 1 if the adoption year is after 2000. The control variables are also employed to control for exogenous cross-sectional differences in market structures and bank characteristics and are all observed annually. The sources for this table are FDIC, SNL Financial, Wayback Machine U.S. Census Bureau of Economic (BEA), U.S. Bureau of Labor Statistics, the World Bank, Thomson Financial Securities Data, and the author's calculations. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests.

	Panel A: 12-month period			Panel B:24-month period			Panel C: 36-month period		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
VARIABLES	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio
$Second\_movers_{i,t}$	0.398***	0.888***	0.041	0.957***	1.510***	0.117	1.017***	1.421***	0.212**
	(0.0453)	(0.0650)	(0.0593)	(0.0621)	(0.0715)	(0.0825)	(0.0763)	(0.0953)	(0.0991)
$Laggards_{i,t}$	0.442***	0.754***	0.073	0.874***	1.108***	0.290***	1.050***	1.164***	0.578***
	(0.0426)	(0.0612)	(0.0665)	(0.0618)	(0.0712)	(0.0919)	(0.0838)	(0.1048)	(0.1238)
$Bank\_Size_{i,t}$	0.013	0.021	-0.013	-0.001	-0.001	-0.022	-0.032*	-0.070***	-0.012
	(0.0103)	(0.0148)	(0.0131)	(0.0147)	(0.0169)	(0.0190)	(0.0183)	(0.0229)	(0.0246)
$Bank\_Funding_{i,t}$	0.000	0.000	0.000	-0.000	-0.000	-0.000	-0.000	-0.000	0.001
	(0.0004)	(0.0006)	(0.0007)	(0.0007)	(0.0008)	(0.0011)	(0.0009)	(0.0011)	(0.0014)
$Bank\_Leverage_{i,t}$	0.002	0.005	0.005	-0.006	-0.006	-0.009	-0.015*	-0.016	-0.028
	(0.0025)	(0.0036)	(0.0043)	(0.0055)	(0.0063)	(0.0127)	(0.0077)	(0.0097)	(0.0177)
$HHI_{i,t}$	-0.002***	-0.004***	-0.000	-0.003***	-0.004***	-0.000	-0.005***	-0.004***	-0.003***
	(0.0002)	(0.0003)	(0.0003)	(0.0003)	(0.0004)	(0.0006)	(0.0005)	(0.0007)	(0.0012)
$\Delta ROA_{i,t}$	0.006	0.024	-0.015	0.008	0.013	0.010	0.009	0.007	0.016
	(0.0182)	(0.0262)	(0.0290)	(0.0075)	(0.0087)	(0.0117)	(0.0072)	(0.0090)	(0.0114)
Constant	2.802***	4.959***	0.818	4.543***	5.796***	1.123	7.556***	7.898***	5.619***
	(0.4022)	(0.5778)	(0.6124)	(0.6101)	(0.7031)	(1.1076)	(0.9459)	(1.1819)	(2.0582)
Observations	303	303	217	303	303	228	303	303	236

R-squared	0.381	0.497	0.042	0.525	0.640	0.065	0.502	0.530	0.108
Reference variable	First Movers	First Movers	First Movers	First Movers	First Movers	First Movers	First Movers	First Movers	First Movers

Figure 6.3 The enlargement of the timing effect on BHARs among second-mover and first-mover groups over the 24-month and 36-month periods following transactional website events.

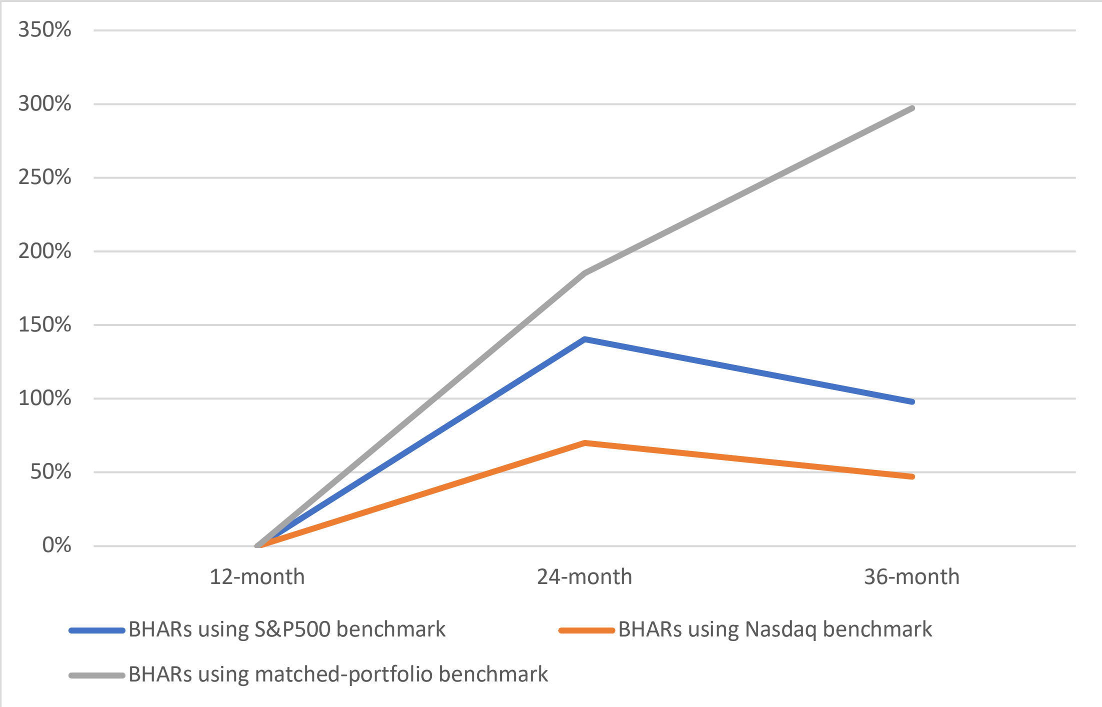
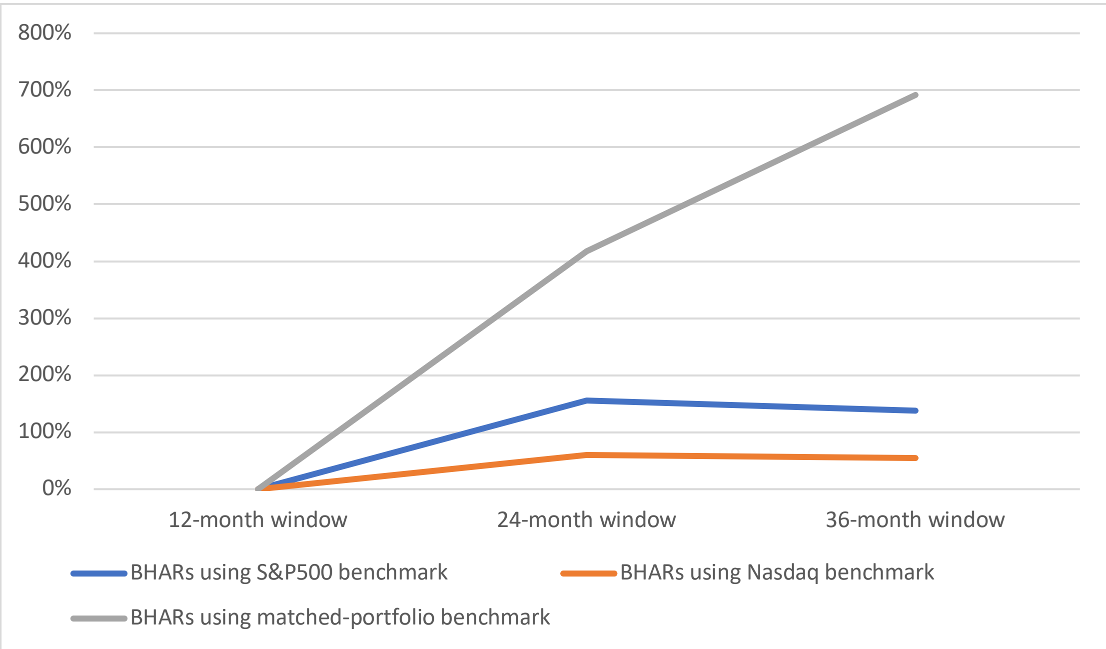


Figure 6.4 The enlargement of the timing effect against BHARs among larger and first-mover groups over the 24-month and 36-month periods following transactional website events.



6.6 Robustness Tests

6.6.1 Application of alternative benchmarks

In this section, two other alternative benchmarks are used to look at the impact of transactional website adoption on a bank's long-term stock performance. Firstly, the Buy-and-Hold Returns (BH_T^i) of sample banks are verified if they are significantly impacted by the launch of websites. Subsequently, the same equation (Equation 6.6) is applied but in this equation, the variable $BHAR_T^i$ is replaced by variable BH_T^i.

$$BH_T^i = \alpha + \beta \times Transactional\_website\_adtopion_{i,t} + \delta \times Control\ variables_{\ i,t} + \varepsilon_{i,t} \quad \text{(Equation 6.10)}$$

Secondly, following this method, an equally weighted market index as an alternative benchmark to calculate the BHAR is applied. More specially, equally weighted market index is calculated as the average value of the three largest US stock markets: Dow Jones, S&P500, and Nasdaq.

The results for BH_T^i and $BHAR_T^i$ using an equally weighted market index are shown in Table A.6.11, Column (1). All the coefficients are found to be positive and significant. The values are strongest over 24-months and 36-months when all coefficients in Column (2) and Column (3) are significant at 1%.

6.6.2 The "Learning-by-observing" effect.

In this section, $\mathrm{LBOY(2)_{it}}$ and $\mathrm{LBOY(3)_{it}}$ instead of $\mathrm{LBOY(1)_{it}}$ are used to see if the "learning-by-observing" effect is still effective over a longer time period. In which, $\mathrm{LBOY(2)_{it}}$ and $\mathrm{LBOY(3)_{it}}$ are the numbers of sample banks that adopted transactional websites during the two and three years prior to the transactional website adoption of $\mathrm{bank_i}$, respectively. In general, the results (presented in Table A.6.12 and Table A.6.13, Appendix) are found to be consistent with the results in Section 6.5.2, suggesting the positive influence of "learning-by-observing" behaviour and the information spillover effect. Especially, the results present the positive coefficients of $\mathrm{LBOY(3)_{it}}$ on BHAR over 36-months, indicating that old information relating to the same banking digital-enabled events is still effective over the next six years.

6.6.3 The size effect over both ex-ante and ex-post periods of transactional website launching events.

In this section, the size effect is tested over both ex-ante and ex-post periods of the transactional website launching event. To serve this objective, firstly, two variables $\text{Smallbank}_{i,t}$ and $\text{Largebank}_{i,t}$ are created which are the same as the variables described in Section 6.4.4. Afterwards, these two variables interacted with the $\text{Transactional\_website\_adoption}_{i,t}$ variable, respectively. Notably, $\text{Smallbank}_{i,t}$ variable is treated as the reference variable. Therefore, the empirical results only show the coefficient values of the $\text{Largebank}_{i,t}$ variable.

$$\begin{aligned} BHAR_{i,t} = {} & \alpha + \beta \times Transactional\_website\_adoption_{i,t} \\ & + \gamma \times Largebank_{i,t} \\ & + \rho \times Transactional\_website\_adoption_{i,t} \\ & \times Largebank_{i,t} + \delta \times Control\ variables_{\ i,t} + \varepsilon_{i,t} \end{aligned} \qquad \text{(Equation 6.11)}$$

The results are presented in Appendix, Table A.6.14 In general, the findings are compatible with the results in Section 6.5.3. To be more specific, the results show the significant influence of the size effect upon banking website launch events, leading to considerable differentiation in market performance among small and large banks. It could be seen that the coefficients of $\text{LargeBank}_{i,t}$ and $\text{Transactional\_website\_adoption}_{i,t}$ in Panel B (24 months) and Panel C (36 months) are all negative and most significant. These findings thereby reveal that there is a significant influence of the size effect on the value of transactional website adoptions added to banks, at least over 24 months and 36 months. In which, website adoption has a more powerful influence on small-sized banks in comparison with large-sized banks. More concretely, within the 24 months following the event month (Panel B), the value of website adoption added to BHAR of large banks is less than to BHAR of small banks from 0.188 points ($p<0.05$) to 0.281 points ($p<0.05$). Over 36 months, this effect further degrades the BHAR of large banks (in relation to small banks) from 0.29 points ($p<0.05$) to 0.403 points ($p<0.01$). If described in percentages, over 36 months, the size effect increases the difference in influence between large-cap BHAR and small-cap BHAR by 43.41%-54.2%, compared to the 24-month period.

6.6.4 The timing effect over the ex-post period of transactional website launch events.

In this section, the timing effect is re-tested over both ex-ante and ex-post periods of the transactional website launching event. In the same way with Section 6.4.5, three different dummy variables, namely $\text{First\_movers}_{i,t}$, $\text{Second\_movers}_{i,t}$ and $\text{Laggard}_{i,t}$ are created. Afterwards, those variables interact with the variable $\text{Transactional\_website\_adoption}_{i,t}$.

$$\begin{aligned} BHAR_{i,t} = \; & \alpha + \beta \times Transactional\_website\_adoption_{i,t} \\ & + \gamma_1 \times Second\_movers_{i,t} + \gamma_2 \times Laggard_{i,t} \\ & + \rho_1 \times Transactional\_website\_adoption_{i,t} \\ & \times Second\_movers_{i,t} \\ & + \rho_2 \times Transactional\_website\_adoption_{i,t} \\ & \times Laggard_{i,t} + \delta \times Control\ variables_{\,i,t} + \varepsilon_{i,t} \end{aligned} \qquad \text{(Equation 6.12)}$$

$\text{BHAR}_{i,t}$, $\text{Transactional\_website\_adoption}_{i,t}$ and the set of control variables are described similarly to Equation 6.6. Notably, $\text{First\_mover}_{i,t}$ variable is treated as the reference variable. Therefore, the empirical results only show the coefficient values of the $\text{Second\_movers}_{i,t}$ and $\text{Laggard}_{i,t}$variables.

The results are presented in Table A.6.15, Appendix. In general, the results are in line with the findings of Section 6.5.4. More pointedly, when treating the market index as a hypothetical portfolio, within the first 12 months, the transactional websites which were adopted from 1999 to 2000 contributed a higher value of BHARs from 0.454 points ($p<0.01$) to 1.999 points ($p<0.01$) compared to the transactional websites adopted from 1996 to 1998. The timing effect continued to expand over 24 months to 36 months, diverging the value of website adoption added to first movers and second movers from 1.160 points, $p<0.01$ to 2.210 points, $p<0.01$ (24 months) and from 1.276, $p<0.01$ to 2.369 points, $p<0.01$ (36 months).

Furthermore, there would be a time lag for the timing order effect to have a significantly different impact on the value of transactional website adoption added to first movers and laggards. Upon the first 12 months (Panel A), the coefficients concerning the interaction between laggards and websites range from -0.02 to -0.003, but no values are statistically significant. Conversely, over the 24-month (Panel B) and 36-month (Panel

C) windows, the coefficients show a notable change from negative signs to positive signs, and all values are statistically robust at a 1% level (diverging from 0.274 to 0.436 points in the 24-month window and running from 0.476-0.657 points in the 36-month window). These figures make it understandable that the instauration of the banking websites would endow the laggard banks with a superior value of BHAR than their first-mover peers, within the intervals of 0.274-0.436 points in the 24-month period (in accordance with a growth of 17% to 146.3%) and from 0.476 to 0.657 points (congruous with a growth of 16.29 - 220%) in the 36-month event window.

6.6.5 Re-estimation of all main equations, using fixed effects

In this section, Equations 6.6-6.9 are re-estimated, applying various specifications of fixed effects. The results for Equations from 6.6-6.9 are shown in Tables A.6.16, A.6.17, A.6.18, and A.6.19, respectively. Please see Chapter 5, Section 5.6.4 for a discussion on endogeneity and unobserved heterogeneity.

Each equation is re-estimated with state fixed effects, then with state and year, and finally with state, year and bank fixed effects. On the whole, the results are qualitatively consistent with the main results in Section 6.5. Particularly with state fixed effects, only the results remain more or less entirely consistent. Therefore, the impact of the transactional website adoption on BHARs is consistent within states, and across states. Due to the nature of the independent variables of interest in Equations 6.8 and 6.9, in Tables A6.18 and A6.19, it can be seen that the bank fixed effect is taking away the effect, because the variables *Largebank, Second_movers* and *Laggards*, are themselves bank-specific fixed effects, i.e., some banks are treated in all observations. DeYoung (2005) does not use bank fixed effects in their analysis for this reason.

6.7 Conclusion

6.7.1 Summary of Findings

This study investigates the impact of transactional website adoption on the long-term performance of 307 banks in the US market from 1993 to 2013. To the best of my knowledge, it is the first study that applies the market-based approach, which allows the involvement of market and investor behaviour, in order to estimate banks' long-term performance concerning their transactional website enablement. This study advances the understanding of the value that transactional website adoption adds to banks' shareholders while the digital baking literature so far has only focused on the financial benefits of digital adoptions. Moreover, the estimation is based on manually collected exclusive data of announcement dates of a full list of available banks listed on the US stock markets as of December 2018, thereby being the first to provide systematic evidence concerning the value-creating capability of banking website initiatives. This is also the first study to confirm the rationality of the market in assessing banking digital initiative events through "learning-by-observing" behaviour as well as to examine some critical moderating effects that may alter the relationship between transactional website adoption and banks' performance. In relation to relevant literature, to the best of my knowledge, only the "learning by observing" mechanism is empirical tested, but it is not feasible in the market perspective.[75] Furthermore, size effect and timing effect have been tested over the extended period (1993-2013) and for a systematic data (full listed US banks) so far.[76]

In the most general way, the following findings are made:

(1) Investors still held their portfolios and kept their positive optimism concerning the banking website-launch events over the long term, rewarding event banks with higher returns relative to the market and their non-event competitors (with the same scale and in the same industry). This finding also confirms that the transactional website is one of the bank's strategic digital initiatives due to its two key characteristics: value and durability.

(2) The participation of investors in banking website-launch events is not only vital but also rational due to their "*learning by observing"* behaviour. Wherein, the amount of information concerning the same website-launch events in the recent past would be a critical mechanism for investors to identify the value of the current event.

(3) The *timing effect* and the *size effect* are critical factors that robustly differentiate the market performance between banks, although such effects lag before showing up and thriving. Valuations for small-cap and late enablers have been at desirable levels over the three years following their website-launch events, relative to their large-cap and first-mover counterparts.

[75] Please refer to Section 6.5.2 for further discussions.
[76] Please refer to Sections 6.5.3 and 6.5.4 for further discussions.

6.7.2 Supportive Literature and Further Discussions.

By applying different benchmarks, this chapter provides robust evidence that banks earn significant positive Buy-and-Hold Abnormal Returns over 12-month, 24-month, and 36- month periods following their transactional website adoption. Concurrently, the relationship between transactional website adoption and BHAR is tested, controlling for exogenous cross-sectional differences in market structures and bank characteristics. The main results reveal that transactional website adoption endows banks with superior market values in the long term, accordingly, enhancing banks' shareholder wealth. This finding is lined up with previous studies that also find the positive impacts of digital initiatives influencing the performance of financial institutions, such as *Internet* banking (Al-Hawari and Ward, 2006; Ciciretti et al., 2009; Delgado et al., 2007; DeYoung, 2005; DeYoung et al., 2007; Furst et al., 2002; Goh and Kauffman, 2015; Hernando and Nieto, 2007; Mbama and Ezepue, 2018; Momparler et al., 2013; Pigni et al., 2002; Scott et al., 2017; Sullivan, 2000; Xue et al., 2007), e-banking (Akhisar et al., 2015), technological innovation (Scott et al., 2017; Weigelt and Sarkar, 2012), digital banking (Mbama and Ezepue, 2018). It is also in concurrence with some studies which support the positive reaction of investors on firms' implementation. The fresh evidence from this chapter compared to recent digital banking literature is the long-term value of transactional website adoption conferred on not financial performance but shareholder wealth. As suggested by some studies, the superior financial performance does not necessarily convert into shareholder value (Johnson et al., 1985; Rappaport, 1999; Reimann, 1987). The evidence of improved shareholder wealth in the long run via transactional website investment, therefore, brings fresh implications for banks, especially for their capital strategy.

This chapter also looks at factors influencing BHAR, including the "learning-by observing" effect. The findings reveal that the increase in BHAR is significantly related to the number of banks adopting transactional websites during the previous years. Put differently, this chapter finds evidence of more accurate stock market prediction on long-run financial performance when a large number of banks have adopted a transactional website in the recent past. This finding is thereby consistent with the semi-strong Efficient Market Hypothesis. In a semi-strong efficient market, investors are unlikely to have access to the full, but rather the partial information. As the information is materially inadequate, some additional information from recent events possibly helps investors identify value more accurately. This finding is supported by several researchers investigating the impact of "learning–by–observing" on the long-term performance of firms (DeLong and DeYoung, 2007; Francis et al., 2014; Liang et al., 2021).

Regarding magnitude effect, the findings show that there are divergences in banks' performance, based on the different sizes of the banks. More specifically, when interacting with transactional website adoption in the long term, small-sized banks are more likely to benefit from the adoption of transactional websites when compared to their large-scaled rivals. This finding is in line with recent evidence, which suggests that smaller firms benefit more than large ones from financial development (Guiso et al., 2004; Regehr and Sengupta, 2016). Put another way, transactional website adoption has a greater impact on small-scaled banks. This might have resulted from the reason that the transactional website adoption has significantly changed the operational structure, profit streams, and deepened customer relationships. Moreover, it might also be because transactional website adoption allows small banks to reach targets in more remote geographic areas and get access to proprietary information which is useful in setting contract terms and making better credit underwriting decisions.[77]

Besides this, the post-adoption period has shown that small banks perform better than their larger peers. The results, hence, may support the theories of small banks' advantages, in which, small banks may enjoy benefits from their structure, such as flexibility and less complexity, which makes them more efficient in their management (Hamilton et al., 2009; Premkumar, 2003; Walker and Petty, 1978). Also, small banks have more financial slack, in comparison to their large peers. Therefore, they can enjoy a significant degree of freedom using their resources for various strategic operating purposes, such as capabilities utilization (Parida and Örtqvist, 2015).

Lastly, the timing order effect is found to significantly differentiate the buy-and-hold excess returns between first movers and followers. When observing the timing effect, the results also show that the competitive advantages of pioneers are lessened in the long run. In contrast, second and latter entrants gain a higher long-term market value

[77] Please also refer to Chapter 4, Section 4.2.2 for further discussions about the transactional website adoption of small banks and large banks.

than pioneers. With those findings, the results support the authors who contend that the following competitors are the ones who will benefit more from their adoption (Lieberman, 1987; Lieberman and Montgomery, 1988; Utterback, 1994).

6.7.3 Managerial Implications

The findings of this research have some useful managerial implications listed below:

Firstly, this research gives managers and investors a convincing justification for the value creation of digital initiatives. These findings confirm that banks can earn value from their digital initiatives, at least within the three years following their adoption. These results can be used as a reference for investors and managers when they consider investing in a digital banking portfolio. As presented, only 25 percent of investors are found to be confident that the financial service industry's digital transformation is effective although 80 percent of investors still believe digital transformation is important (Wyman, 2020). Obviously, there are still many investors who are wary of bank digital investments and hesitating in investing in digital banking because they lack clear data. Therefore, proof of positive long-term value within the first three years of transactional website adoption can be an important reference for investors in the next stages of their capital investment.

Secondly, bank managers should exploit the market performance and investor behaviour in the long run to evaluate their business health. As both scholars and practitioners admit, the abnormal return of an investment is an indication of how it performed over a given period. It would reflect investor perceptions of its ability to earn and grow profits in the future. Therefore, by keeping track of how the investors hold and buy stocks over time, managers may enhance their understanding of how investors evaluate their financial health relevant to digital activities. It should also be noticed that it might take time for investors to fully evaluate a portfolio and therefore, long-term evaluation is highly recommended for managers in judging how well an investment is doing.

Thirdly, managers should consider the "*learning-by-observing*" behaviour and information spillover effect as it may significantly affect investors' evaluations and reactions at present. This study's findings have drawn attention to the fact that investors can better identify and assess the value creation of a transactional website adoption if there is a good number of banks adopting a website in the recent past. This effect is found to be effective for up to six years, which means that investors can refer to the past six years of information to evaluate current portfolios. Therefore, managers should take the "*learning-by-observing*" effect into account, such as considering how their processors perform since their digital adoption, at least within the last six years. This is because investors are likely to consult such information before deciding to invest in a current digital project. In another scenario, assuming the market becomes scarce of sources of information for pricing, managers should give more explicit signals to investors as they may feel confused and inconclusive.

Fourthly, managers should produce management policies that are appropriate for the size of the business. The findings of this study highlight the heterogeneity in the performance of banks in different size groups since their adoption of transactional websites. Therefore, for more accurate estimation and prediction of the long-term vision of digital transformation, managers should take into consideration the size factor. For large banks, as they are found to be less impacted by transactional website adoption when compared to small-scaled rivals, it may require more comprehensive and innovative strategies to accelerate the value-enhancing capability of their transactional website. For example, managers can promote omnichannel strategies, where transactional websites and other digital channels can be intertwined and complement resources. Regarding small banks, transactional website adoption seems to have a more profound effect on their operating structure and value creation. Therefore, when it comes to digital initiatives, small companies should consider whether these initiatives are conducive to restructuring and enhancing value streams. An excellent digital initiative (like transactional website adoption) should help them to strengthen relationships with their customers and to increasingly focus on niche markets in a particular market segment, geographic region, part of the supply chain, or specific service.

Fifthly, selecting the timing of digital adoption is also an important factor affecting the long-term market performance of banks. It seems that the advantages of the predecessors are eliminated over a long-term period. Instead, the second movers and the laggards are likely to get more favour from adopting their transactional website over time. Therefore, managers should bear the implications of the timing effect in mind, especially in the long-term vision. For example, managers should consider the sustainable advantages and potential disadvantages of being first movers or followers in adopting digital initiatives in the long-term perspective. Short-term competitive advantages could fade away over time as the industry is ever-changing, and competitors are not treading water. Kalyanaram and Urban (1992, p. 219) state that: "*Market pioneering is not for a risk-averse or financially strapped business. A business should attempt to pioneer a new market only if it has an appropriate skill and resource profile and is willing to pursue a high risk-high return strategy*".

Finally, market signalling should always be the top priority of managers to communicate well with their investors. No matter what structure and size the banks are or when banks launched their digital adoption or how the context in which the amount of information was leaked to the market, managers need to give more reliable signals to their investors. Wyman (2020) has suggested quantifying progress in which investors are interested in how the firms are performing and what they are planning. He recorded that "*What investors need are more numbers - it is hard to find even anecdotes on what the benefits are and what costs are coming out*" (Wyman, 2020, p. 29). Accordingly, providing signals (e.g., commitment, improvement, achievements) related to digital adoption is vital to determining a healthy long-term market performance of banks on their digitalization roadmap.

6.7.4 Limitations and Future Discussions

This research could not avoid some certain limitations as follow:

Firstly, due to the limited number of samples (n=307), benchmarks for estimation of BHAR (e.g., control banks; size-matched portfolios) faced some challenges. More precisely, using these benchmarks requires ous conditions (e.g., the homogeneity of size), leading to the elimination of some ineligible sample banks from the benchmark portfolio. With a sample size of 307, continuing to exclude some banks from the sample portfolio may result in biases. In order to optimize the benchmark selection, researchers should also consider the expansion of the sample (e.g., banks in other countries); and/or the development of benchmark candidates (e.g., firms that adopt transactional websites in other industries).

Secondly, there is a limitation in the bank sample. In more detail, the selection consists of several banks whose time of transactional website launches coincides with the first time those banks show up in the market, leading to the absence of data before the time the websites had been established. Therefore, it is tough to compare performance before and after website creation.

Thirdly, in this research, only market capitalization is used as a size proxy for selecting the benchmark in the matched portfolio analysis. It has been shown that the book-to-market ratio is an important factor to consider in long-run returns, and so future research could test for this factor also (Barber and Lyon, 1997a; Barber and Lyon, 1997b).

Finally, further investigation of some large events that may occur in the long run, such as mobile banking, digital applications, is suggested. It may help reduce confounding event bias while also demonstrating the impact of complementary capabilities and resources among digital adoptions on the long-term horizon.

7 Chapter 7: Conclusion

The purpose of this thesis was to examine if transactional website adoption delivers significant value to banks and their shareholders over both short-term and long-term intervals. More specifically, three main research aims were set up to examine if transactional website adoption can:

- *(i) deliver short-term value to banks' shareholders under the assessment of market and investors*
- *(ii) generate strategic and sustainable value via the reflection of accounting measures in the long run*
- *(iii) bring long-term value to banks' shareholders under the assessment of buy-and-hold strategy.*

The three main targets were respectively addressed in Empirical Chapters 4,5, and 6 by employing (i) *event study methodology with CAR metric*; (ii) *accounting measures with seven dimensions* and (iii) *BHAR metric with five different benchmarks*. In general, the results provide new findings regarding the value of transactional website adoption conferred on banks and their shareholders, which have not been explored in the literature of the past two decades.

7.1 The Findings in each Empirical Chapter

7.1.1 Chapter 4: Do Transactional Website Initiatives Add Value to Banks?

The main aim of Chapter 4 was to examine if the adoption of transactional websites adds any immediate value to banks' shareholders, under the evaluation of the market and investors.

This chapter firstly, set up a conceptual model based on the grounds of: (i) *Efficient Market Hypothesis*; (ii) *Resource-based View*; and (iii) *Market Signalling Perspective.* This model helped to explain how transactional website adoption might enhance banks' market value and by how the market can evaluate and predict the value of transactional website adoption. To be more specific, this model expected that transactional website adoption assesses strategic resources and capabilities. Under the perspective of the resource-based view, such strategic resources and capabilities would be the root of the value creation of transactional website adoption. Subsequently, based on the ground of market signalling perspective and efficient market hypothesis, the model proposed that strategic resources and capabilities are the right signals released to the market. In return, the market could potentially exploit those good signals to accurately evaluate and predict the value and potential brought from website-activated events.

Subsequently, event study methodology was employed to estimate Cumulative Abnormal Return metric (CAR) upon several short-term event windows. As CAR is the difference in the value of banks in the case banks adopt transactional websites and in the case that banks do not adopt transactional websites, it can reflect the added value from the adoption of transactional websites in particular. Furthermore, as CAR is estimated under the reaction of market participants, the information reflected by CAR is immediate, accurate and predictive, as suggested by Efficient Market Hypothesis.

Chapter 4 found that the transactional website induces significantly positive CAR immediately around the time it was launched. Such findings were still robust even in the intervence of timing and size factors. To be more specific, in the short run, transactional website adoption created a level playing field for banks, regardless of whether they are large-scaled or small-scaled and whether they are the first runners and latecomers. The findings, accordingly, verified the value that transactional website adds to banks' shareholders in the short run. Furthermore, as the market showed a considerate enthusiasm and faith towards transactional website adoption events, it indicated a long-term prosperous future by investing in transactional websites.

7.1.2 Chapter 5: Does the Adoption of Transactional Websites Improve Banks' Financial Performance?

The purpose of Chapter 5 was to examine if transactional website adoption is a strategic initiative that could sustainably deliver value in the long run. Under the ground of *resource-based view*, an initiative is considered strategic if it possesses strategic resources and capabilities. Strategic resources and capabilities are what possess strategic attributes (e.g. *value, firm- specificity, inimitability, durability, appropriability, limited substitutability)* and are capable of: (i) creating competitive edges and inducing superior performance; and (ii) preserving value and limiting competition (Amit and Schoemaker, 1993; Barney, 1991; Collis and Montgomery, 1995; Dierickx and Cool, 1989; Grant, 1991b; Lippman and Rumelt, 1982; Peteraf, 1993; Rumelt and Lamb, 1997).

From the resource-based view, six features of transactional website adoption were set up, namely *appropriability*, *durability*, *embeddedness*, *inimitability*, and *interconnectedness*. Firstly, the attributes of *value* and *appropriability* were verified by the way transactional website adoption significantly delivers profitability and efficiency to banks. Subsequently, *embeddedness* was reflected via the cumulative transactional website experience proxy which significantly improves banks' performance. The inimitability was demonstrated via the unsuccess in gaining any financial benefit from vicarious learning behaviour. *Interconnectedness* was reflected through the combination of transactional website adoption and mobile website adoption. Finally, *durability* was proved by observing the impact of transactional website adoption on the financial performance of banks over time since the time they were launched.

In general, Chapter 5 found that:

- Over the long run, transactional website adoption rewards banks with an increase in profitability, a strengthening in income and expenditure efficiency, and growth of non-interest activities. This evidence, hence, verified the attributes of value, appropriability and durability.
- Transactional website adoption endows banks with sustainable performance, in turn, attributed to the embeddedness of its cumulative experiences, the limitation of observational learning behaviour of rivals, and the inter-connectedness with the next digital disruption. This evidence, accordingly, verified the attributes of *embeddedness, inimitability* and *interconnectedness.*
- There exists a differentiation among banks in earning financial rewards from their website adoption, attributed to their size or timing order effects. Of which, small banks are found to be more successful than their larger peers while first movers no longer earn significant earnings in adopting transactional website adoption over the long run.

7.1.3 Chapter 6: Do Digital Transactional Website Initiatives Add Value to Banks in Long Run?

Chapter 6 aimed to examine the long-term value of transactional website adds to banks' shareholders. Researchers have affirmed that the success of a business does not only depend on how it delivers financial performance. The bottom line lies in how this business benefits the communities it involves in.

Firstly, the event-time approach was applied to estimate the Buy-and-Hold Abnormal Return (BHAR) metric to capture the dynamics in investors' trading strategy over a year, two years, and three years following the banking website events announcements. In more detail, the BHAR metric was calculated as the mean difference between the investor's buy-and-hold returns gained from website events and standard buy-and-hold returns. The three main benchmarks used to estimate the standard buy-and-hold returns were two market indices (S&P500 and Nasdaq) and the matched-firm portfolio, which include the non-event but same-type candidates. Thereafter, two alternative benchmarks applied for the robustness test were the equally weighted market portfolio and the ex-ante buy-and-hold portfolio. As BHAR is calculated as the subtraction of event-firm returns from the standard returns held over the same intervals, a positive value of this metric would verify the enthusiasm and appreciation of investors towards the event in the long term.

Furthermore, in Chapter 6, BHAR was treated as a proxy of banks' performance. From which, a set of regressions was constructed, using BHAR as representative of banks' performance, to capture the capability of transactional website adoption in delivering excess returns to shareholders over the long term. Besides this, the learning by observing proxy, size-quantized proxies, and timing order proxies were also regressed to capture their impacts on BHAR.

In general, Chapter 6 found that:

- Investors still hold their portfolios and keep are optimistic with the banking website-launch event over the long term, awarding event banks with abnormal positive returns. In return, the adoption of the transactional website delivers wealth to shareholders over the long run.
- The published information from past transactional website events can enhance the value of current transactional website events. The finding then indicated that "*learning by observing*" would be a mechanism for investors to learn and enhance their evaluation of current portfolios.
- The *timing effect* and the *size effect* are the critical factors that robustly differentiate the market performance among banks. More specifically, long-term valuations for small-cap and late enablers were higher relative to their large-cap and first-mover counterparts.

7.2 Research Contributions

Firstly, this thesis provided novel data of digital event data in the banking industry, hence, activating the access to market-based approach and the examination of the value of a digital adoption under the evaluation of market and investors. From that, two performance metrics were applied for the first time in digital banking literature, CAR and BHAR. These metrics can gauge the evaluation of the market towards an event/activity in an immediate, accurate and predictive manner, as stated by various authors. Unfortunately, these metrics require the collection of event date data and in the digital banking discipline, such data has not been provided systematically in any official database platform. CAR and BHAR, therefore, have not been estimated in digital banking literature.

Another key strength of this thesis is the research duration. Compared to other previous studies in the scope of transactional website adoption, this thesis observes the impact of transactional website adoption on banks' financial performance over a more recent period - 26 years from 1993 to 2018. Based on this, this thesis improves the understanding of the impact of transactional website adoptions in the long run as well as clarify its duration attributes.

Furthermore, this thesis advances the understanding of the value of transactional websites added to banks' shareholders. To my knowledge, customer value and financial benefits are what are primarily focused on in digital banking literature. Meanwhile, as argued by some studies, shareholder value is also another important indicator of banks' success. However, this perspective has not been explored widely in digital banking literature. By using CAR and BHAR, this thesis provides evidence that transactional website adoption can deliver wealth for banks' shareholders in both the short and long run. The findings then give the implication for banks in satisfying their shareholders as well as planning their capital strategy in both the short and long run.

Additionally, this thesis advances the understanding of the strategic role of transactional website adoption. In which, transactional website adoption possesses six attributes that positively impact banks' financial performance over the long term. Thus, compared to previous studies, this thesis finds that transactional website adoption not only brings profitability and efficiency to banks but also possess some attributes which can be the root of banks' superior performance in the long run.

This thesis has extended the knowledge concerning the impact of size factor and timing factor in influencing the value of transactional websites. To my knowledge, most studies in the impact of size factor on the value of transactional website have been carried out in small samples (Cyree et al., 2009; DeYoung, 2005) while some others have tended to focus on the performance of first movers only (Lin, 2011). Since 1992, the divergence in the strategies of small and large banks is increasingly wider. By examining the impact of size factor in a larger and more systematic, this thesis allows advancing the understanding of the strategies and behaviour of small and large banks in embracing Internet banking. Furthermore, as the time research extends from the early stage (since 1996) to the very late stage (in 2010), this thesis provides a comparative analysis of not only first movers but also second movers and laggards who adopted transactional websites in later stages.

Finally, learning by observing for both banks and investors is now examined for the first time in digital banking literature. Before that, only learning by doing is examined before by some studies in the scope of Internet banking. The learning by observing the behaviour of the market is also examined primarily in the M&A discipline. The evidence concerning the "learning by observing" behaviour of the thesis, accordingly, bring new implications for banks on the way they would like to learn from others and/or maximize their shareholder value. The evidence also indicates the rationality of the market and investors as they tend to observe and analyse pieces of past information to evaluate their current portfolio in the long run.

7.3 Managerial Implications

Firstly, this thesis suggests that managers should consider the true nature of generating benefits in adopting transactional websites in the short and long term. For example, the findings in Chapter 4 indicate that the short-term excess returns earned by transactional website events well depend on how the market participants predict the future potential. Chapter 5 reveals that the long-term financial rewards are attributed to transactional website attributes, such as *value, appropriability, durability, embeddedness, imitation, and interconnectedness.* Finally, Chapter 6 suggests that transactional website adoption might possess the resources and capabilities that keep it being on the right track, maintaining the enthusiasm and confidence of investors over time. Taken together, the success in adopting transactional websites would bring other stories behind. Therefore, to maximize wealth for the banks themselves and their shareholders from a digital adoption, managers should first understand the root of the success in each stage. The findings of this thesis suggest some important factors that may affect the wealth creation from transactional website adoption: (i) strategic resources and capabilities; (ii) the perception of investors and market towards an event; (iii) the information of the same events/activities from the past published to the market; and (iv) the size and/or the time the website has been adopted.

Secondly, given the importance and rationality of the market and investors in perceiving, evaluating, and predicting, managers should focus on building a deep understanding of the nature of the market as well as the financial behaviours of market participants. In the short term, when the formation of initiatives is still new to the market, banks should focus on giving clear and positive signals to gain attention from the market and connections with investors. In the long term, banks should keep building deep trust by providing groundwork and evidence of their success, sharing the key metrics to track progress.

Thirdly, businesses should be aware of where there are distinct strengths and unique competitive advantages during the implementation of their strategies. The evidence of this thesis suggests that banks do not have to be large or lead to becoming successful in digital adoption. Also, the thesis found that banks who have launched their websites during the turbulence of the stock market are still thriving in the long run and gain the trust of investors. Furthermore, in the long term, the late adopters are the ones who see the higher earnings growth from their website events. These things show that the advantages of timing orders are not decisive factors in long-term success. The core of the matter might hinge on how enterprises are cognizant of the inherent features of the adoption as well as the way they leverage their distinct competitive advantages.

Finally, this thesis suggests some recommendations regarding learning behaviour in the adoption of transactional websites. The evidence shows that businesses benefit more from their learning behaviour rather than from tracking and copying from previous banks ‘adoptions. More specifically, Chapter 5 found that businesses benefit financially from experience accumulated over the time of website adoption. On the contrary, businesses would not gain financial benefit by merely capturing the visual information from their previous rivals' adoptions. Therefore, this thesis suggests that the success or failure in adopting this practice may have ambiguous causality with each specific firm discipline (e.g., culture, knowledge base, unique resources, cumulative experience). Therefore, bank firms should be aware of the adverse effects of vicarious learning or/and imitate behaviour and in what situations, actions should be following business discipline and firms' idiosyncratic strengths.

7.4 Limitations and Further Research

Firstly, this thesis focuses on the value of the transactional website delivered to banks' financial performance and their shareholders. Further research can examine the value of transactional website adoption delivered to other stakeholders, such as customers, regulators, and alliances. As stressed, banks could not accomplish their desired aims relating to digital projects by delivering financial benefits to themselves only. Far more, during their digital transformation, sustainable wealth creation to stakeholders is also of fundamental importance. By examining various stakeholders, banks can advance their understanding of what each group of stakeholders is most concerned with, accordingly, defining their strategic priorities to maximize the wealth created from their transactional website adoption or/and other digital adoptions.

Secondly, this thesis only provides some empirical results concerning a few numbers of resources and capabilities stemming from the adoption of transactional websites (e.g., cumulative transactional website experiences, interconnectedness capability). However, as analytically proposed in Chapter 6, there might exist other resources and capabilities which could be the root for the sustainability of transactional website adoption, such as digital culture, digital humans, knowledge exchange, and so on. Further studies could continue to dig into the value of each specific resource/ capability of transactional website adoption or other digital initiatives bestowed on banks.

Thirdly, this thesis has not delved into the principles behind the heterogeneity among bank enterprises attributed to their size and adoption time. This thesis only conceptually suggests some potential reasons why small banks and laggards reap superior long-term advantages, in comparison to their other rivals. For example, small banks tend to be more dynamic, agile, and opportunistic than their larger rivals in grabbing new market share and customers. Likewise, laggards may differentiate from their predecessors by upgrading more features for their transactional websites reaping the fruits from the technological refinement caused by feedback from the early birds.

Nevertheless, it is necessary to study further the underlying basis, which genuinely differentiates the performance among banking groups.

Fourthly, this thesis did not include other digital-related and organizational factors that might affect the influence of transactional website adoption. Nowadays, banks are implementing mixed strategies that combine some financial intermediation activities (e.g., lending and financing personal financing corporate banking services, payment), technological, functional, or instrumental activities (e.g., Blockchain, data analytics, security) as well as the various type of digital strategic solutions (e.g., artificial intelligence). Furthermore, a few studies have admitted the influence of corporate governance on the adoption of innovation and digital initiatives. For example, well-governed companies are more attractive to investments (Tricker and Tricker, 2015); improved shareholders' protection and rights (Klapper and Love, 2004); significantly associated long-term wealth creation with sustainability (Kocmanová et al., 2011). Thereby, further investigations of digital-related factors and corporate governance would be worthwhile as they will better reflect the impact of transactional website adoption in the flow of digitalization and the role of corporate governance in digital transformation.

Finally, this thesis suggests an expansion of event-related data in order that the market-based methodology in digital banking is applied more widely. This thesis only provided transactional website launch event data of 307 banks in the US market. With these unavoidable limitations in the data, this thesis could not construct some other benchmarks to optimize the CAR and BHAR metrics (e.g., employing book-to-market ratio or a combination of market capitalization and book-to-market ratio). This thesis suggests an expansion of the transactional website launch events across countries or an extension of the type of digital initiatives (e.g., mobile banking, mobile apps). With that said, CAR and BHAR are optimal metrics that reflect the assessment of investors and the market of the impact and potential of initiatives in both the short term and long term. Therefore, further research can consider improving data and methods to optimize market-based metrics in digital banking literature.

REFERENCES

Aboelmaged, M., Gebba, T. R. (2013). Mobile banking adoption: an examination of technology acceptance model and theory of planned behaviour. *International Journal of Business Research and Development*, *2*(1), 35–50.

Accenture. (2019). Does digital leadership in banking really matter? Retrieved 30 November 2019, from https://www.accenture.com/us-en/insights/banking/does-digital-banking-leadership-matter

Acs, Z. J., Audretsch, D. B. (1990). *Innovation and small firms*. Cambridge, Massachusetts and London, England: MIT Press.

Adams, R. M. (2012). *Consolidation and merger activity in the United States banking industry from 2000 through 2010* (FEDS Working Paper No. 2012–51). Washington, DC: FEDS. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2193886#

Adhikari, B. K., Agrawal, A. (2018). Peer influence on payout policies. *Journal of Corporate Finance*, *48*(44), 615–637.

Afego, P. N. (2018). Index shocks, investor action and long-run stock performance in Japan: A case of cultural behaviouralism? *Journal of Behavioural and Experimental Finance*, *18*, 54–66.

Agrawal, A., Jaffe, J. F., Mandelker, G. N. (1992). The post-merger performance of acquiring firms: a re-examination of an anomaly. *The Journal of Finance*, *47*(4), 1605–1621.

Agrawal, M., Kishore, R., Rao, H. R. (2006). Market reactions to e-business outsourcing announcements: An event study. *Information & Management*, *43*(7), 861–873.

Ahmad, A. M. K., Al-Zu'bi, H. A. (2011). E-banking functionality and outcomes of customer satisfaction: an empirical investigation. *International Journal of Marketing Studies*, *3*(1), 50–65.

Akhigbe, A. (2002). New product innovations, information signalling and industry competition. *Applied Financial Economics*, *12*(5), 371–378. https://doi.org/10.1080/09603100010007715

Akhisar, İ., Tunay, K. B., Tunay, N. (2015). The effects of innovations on bank performance: The case of electronic banking services. *Procedia-Social and Behavioural Sciences*, *195*, 369–375.

Akkara, J. D., Kuriakose, A. (2018). Innovative smartphone apps for ophthalmologists.

Kerala Journal of Ophthalmology, *30*(2), 138–144.

Al-Hawari, M., Ward, T. (2006). The effect of automated service quality on Australian banks' financial performance and the mediating role of customer satisfaction. *Marketing Intelligence & Planning*, *24*(2), 127–147.

Alalwan, A. A., Dwivedi, Y. K., Rana, N. P. (2017). Factors influencing adoption of mobile banking by Jordanian bank customers: Extending UTAUT2 with trust. *International Journal of Information Management*, *37*(3), 99–110.

Alalwan, A. A., Dwivedi, Y. K., Rana, N. P. P., Williams, M. D. (2016). Consumer adoption of mobile banking in Jordan: examining the role of usefulness, ease of use, perceived risk and self-efficacy. *Journal of Enterprise Information Management*, *29*(1), 118–139.

Alexandru, I. O., Sascha, A., Christian, S., Jan, W. (2019). Does Digital Transformation in B2B Sales Really Pay Off? The Core Role of Selling Complexity. In K. L. Son, G. Markus, & L. Xueming (Eds.), *Understanding Complexity, Transforming the Marketplace* (p. PS-4). Austin, TX: 2019 American Marketing Association Winter Conference.

Aliyu, A. A., Rosmain, T., Takala, J. (2014). Online banking and customer service delivery in Malaysia: data screening and preliminary findings. *Procedia-Social and Behavioural Sciences*, *129*, 562–570.

Aliyu, A. A., Tasmin, R. (2012). The impact of information and communication technology on banks' performance and customer service delivery in the banking industry. *International Journal of Latest Trends Finance and Economy*, *2*(1), 80–90.

Alpert, F. H., Kamins, M. A. (1995). An empirical investigation of consumer memory, attitude, and perceptions toward pioneer and follower brands. *Journal of Marketing*, *59*(4), 34–45.

Altavilla, C., Boucinha, M., Peydró, J.-L. (2018). Monetary policy and bank profitability in a low interest rate environment. *Economic Policy*, *33*(96), 531–586.

Amici, A., Fiordelisi, F., Masala, F., Ricci, O., Sist, F. (2013). Value creation in banking through strategic alliances and joint ventures. *Journal of Banking & Finance*, *37*(5), 1386–1396.

Amin, M. (2016). Internet banking service quality and its implication on e-customer satisfaction and e-customer loyalty. *International Journal of Bank Marketing*, *34*(3), 280–306.

Amit, R., Schoemaker, P. J. H. (1993). Strategic assets and organizational rent. *Strategic Management Journal*, *14*(1), 33–46.

Anderson, B. S., Eshima, Y. (2013). The influence of firm age and intangible resources on the relationship between entrepreneurial orientation and firm growth among Japanese SMEs. *Journal of Business Venturing*, *28*(3), 413–429.

Andoh-Baidoo, F. K., Osei-Bryson, K.-M., Amoako-Gyampah, K. (2012). Effects of firm and IT characteristics on the value of e-commerce initiatives: An inductive theoretical framework. *Information Systems Frontiers*, *14*(2), 237–259.

Andrew, C. J., Mills, T. C., Roberts, J. (1997). Time series and cross-section parameter stability in the market model: the implications for event studies. *The European Journal of Finance*, *3*(3), 243–259.

Andrews, D., Nicoletti, G., Timiliotis, C. (2018). Going digital: What determines technology diffusion among firms. In *The 3rd Annual Conference of the Global Forum on Productivity.* (pp. 1–74). Ottawa. Retrieved from http://www.csls.ca/events/cea2018/nicoletti.pdf

April, K. (2004). *A Resource-Based View of the Firm: Integrating the Role of IT as a Strategic Resource* (PhD Thesis). Cape Town, Western Cape: University of Cape Town.

Argyris, C., Schön, D. A. (1978). *Organizational Learning. A Theory of Action Perspective*. Reading, MA: Addison Wesley Longman Publishing Co.

Arseneau, D. M. (2017). *How would US banks fare in a negative interest rate environment?* (FEDS Working Paper No. 2017– 030). Washington, D.C.: Federal Reserve Board.

Arslan, B., Ozturan, M. (2011). The path to information technology business value: Case of Turkey. *Technology and Investment*, *2*(1), 52–63.

Arthurs, J. D., Busenitz, L. W., Hoskisson, R. E., Johnson, R. A. (2009). Signaling and initial public offerings: The use and impact of the lockup period. *Journal of Business Venturing*, *24*(4), 360–372.

Atiase, R. K. (1985). Predisclosure information, firm capitalization, and security price behaviour around earnings announcements. *Journal of Accounting Research*, *23*(1), 21–36.

Attig, N., Boubakri, N., El Ghoul, S., Guedhami, O. (2016). Firm internationalization and corporate social responsibility. *Journal of Business Ethics*, *134*(2), 171–197.

Balasubramanian, S. K., Mathur, I., Thakur, R. (2005). The impact of high-quality firm achievements on shareholder value: focus on Malcolm Baldrige and JD Power and Associates awards. *Journal of the Academy of Marketing Science*, *33*(4), 413–422.

Baldwin, W. L., Childs, G. L. (1969). The fast second and rivalry in research and development. *Southern Economic Journal*, *36*(1), 18–24.

Ball, R. T., Gallo, L. A. (2018). A mixed data sampling approach to accounting research. Retrieved 20 June 2021, from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3250445

Bamber, L. S. (1987). Unexpected earnings, firm size, and trading volume around quarterly earnings announcements. *Accounting Review*, *62*(3), 510–532.

Bandura, A. (1980). Social learning theory of Aggression. In R. Falk & S. S. Kim (Eds.), *The War System: An Interdisciplinary Approach* (1st ed., pp. 141–158). New York and Oxon: Routledge.

Banz, R. W. (1981). The relationship between return and market value of common stocks. *Journal of Financial Economics*, *9*(1), 3–18.

Barber, B. M., Lyon, J. D. (1997a). Detecting long-run abnormal stock returns: The empirical power and specification of test statistics. *Journal of Financial Economics*, *43*(3), 341–372.

Barber, B. M., Lyon, J. D. (1997b). Firm size, book-to-market ratio, and security returns: A holdout sample of financial firms. *The Journal of Finance*, *52*(2), 875–883.

Barley, S. R. (1983). Semiotics and the study of occupational and organizational cultures. *Administrative Science Quarterly*, *28*(3), 393–413.

Barney, J. B. (1986a). Organizational culture: can it be a source of sustained competitive advantage? *Academy of Management Review*, *11*(3), 656–665.

Barney, J. B. (1986b). Strategic Factor Markets: Expectations, Luck, and Business Strategy. *Management Science*, *32*(10), 1231–1241. https://doi.org/10.1287/mnsc.32.10.1231

Barney, J. B. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, *17*(1), 99–120.

Barney, J. B. (1996). The resource-based theory of the firm. *Organization Science*, *7*(5), 469–592.

Barry, C. B., Brown, S. J. (1984). Differential information and the small firm effect. *Journal of Financial Economics*, *13*(2), 283–294.

Barth, J. R., Li, T., Lu, W. (2010). Bank regulation in the United States. *CESifo Economic Studies*, *56*(1), 112–140.

Bartram, S. M., Grinblatt, M., Nozawa, Y. (2020). *Book-to-market, mispricing, and the cross-section of corporate bond returns* (Working paper No. 27655). Cambridge, Massachusetts: National Bureau of Economic Research.

Barua, A., Mani, D. (2018). Reexamining the market value of information technology events. *Information Systems Research*, *29*(1), 225–240.

Basu, S. (1983). The relationship between earnings' yield, market value and return for NYSE common stocks: Further evidence. *Journal of Financial Economics*, *12*(1), 129–156.

Basuony, M., Ehab, K. A., Al-Baidhani, A. M. (2014). The effect of corporate governance on bank financial performance: evidence from the Arabian Peninsula. *Corporate Ownership & Control*, *11*(2), 178–191.

Bauer, R. A. (1960). Consumer behaviour as risk taking. In E. Robert & S. Hancock. (Eds.), *Dynamic Marketing for a Changing World* (pp. 384–398). Chicago: American Marketing Association.

Bell, A., Jones, K. (2015). Explaining Fixed Effects: Random Effects Modeling of Time-Series Cross-Sectional and Panel Data, *3*(1), 133–153. https://doi.org/10.1017/psrm.2014.7

Benbunan-Fich, R., Fich, E. M. (2004). Effects of web traffic announcements on firm value. *International Journal of Electronic Commerce*, *8*(4), 161–181.

Benbunan-Fich, R., Fich, E. M. (2005). Measuring the value of refining a web presence. *Journal of Electronic Commerce in Organizations*, *3*(1), 35–52.

Berger, A. N. (2003). The economic effects of technological progress: Evidence from the banking industry. *Journal of Money, Credit and Banking*, *35*(2), 141–176.

Berger, A. N., DeYoung, R. (2006). Technological progress and the geographic expansion of the banking industry. *Journal of Money, Credit and Banking*, *38*(6), 1483–1513.

Berk, J. B. (1995). A critique of size-related anomalies. *The Review of Financial Studies*, *8*(2), 275–286.

Bessler, W., Murtagh, J. P., Siregar, D. (2003). Dividend policy of bank initial public offerings. In M. Bagella, L. Becchetti, & H. Iftekhar (Eds.), *Transparency, governance and markets* (1st ed.). Oxford: Emerald Group Publishing.

Bessler, W., Thies, S. (2007). The long-run performance of initial public offerings in

Germany. *Managerial Finance*.

Bharadwaj, A. (2000). A resource-based perspective on information technology capability and firm performance: an empirical investigation. *MIS Quarterly*, *24*(1), 169–196.

Bharadwaj, A., El Sawy, O., Pavlou, P., Venkatraman, V. (2013). Digital business strategy: toward a next generation of insights. *MIS Quarterly*, *37*(2), 471–482.

Bi, R., Davison, R. M., Smyrnios, K. X. (2014). E-Business Use and Value for Fast Growth Small-to-medium Eenterprises in Turbulent Environment. In *PACIS 2014 Proceedings*. Chengdu, China.

Bi, X., Zhang, H. (2008). An empirical research on relationship between information technology capability and firm performance the evidence from the listed companies and informatization power 500 in China. In *2008 International Conference on Computer Science and Software Engineering* (Vol. 5, pp. 540–544). IEEE.

Bilinski, P., Liu, W., Strong, N. (2012). Does liquidity risk explain low firm performance following seasoned equity offerings? *Journal of Banking & Finance*, *36*(10), 2770–2785.

Birgit, A. A. S., Elsa, K. (2019). The Complexity of Event Management from a Service Ecosystems Perspective. In K. L. Son, G. Markus, & L. Xueming (Eds.), *Understanding Complexity, Transforming the Marketplace* (p. CFR-29). Austin, TX.

Black, J. A., Boal, K. B. (1994). Strategic resources: Traits, configurations and paths to sustainable competitive advantage. *Strategic Management Journal*, *15*(S2), 131–148.

Bloodgood, J. M., Salisbury, W. D. (2001). Understanding the influence of organizational change strategies on information technology and knowledge management strategies. *Decision Support Systems*, *31*(1), 55–69.

Boehmer, E., Masumeci, J., Poulsen, A. B. (1991). Event-study methodology under conditions of event-induced variance. *Journal of Financial Economics*, *30*(2), 253–272.

Bonin, J. P., Hasan, I., Wachtel, P. (2005). Bank performance, efficiency and ownership in transition countries. *Journal of Banking & Finance*, *29*(1), 31–53.

Boulland, R., Lobo, G. J., Paugam, L. (2019). Do investors pay sufficient attention to banks' unrealized gains and losses on available-for-sale securities? *European Accounting Review*, *28*(5), 819–848.

Brav, A., Gompers, P. A. (1997a). Myth or Reality? The Long-Run Underperformance of Initial Public Offerings: Evidence from Venture and Nonventure Capital-Backed Companies. *The Journal of Finance*, *52*(5), 1791–1821. https://doi.org/10.2307/2329465

Brav, A., Gompers, P. A. (1997b). Myth or reality? The long-run underperformance of initial public offerings: Evidence from venture and nonventure capital-backed companies. *The Journal of Finance*, *52*(5), 1791–1821.

Brown, P., Kleidon, A. W., Marsh, T. A. (1983). New evidence on the nature of size-related anomalies in stock prices. *Journal of Financial Economics*, *12*(1), 33–56.

Brown, S. J., Warner, J. B. (1980). Measuring security price performance. *Journal of Financial Economics*, *8*(3), 205–258.

Brown, S. J., Warner, J. B. (1985). Using daily stock returns: The case of event studies. *Journal of Financial Economics*, *14*(1), 3–31.

Brynjolfsson, E. (1991). *The productivity of information technology: Review and assessment* (Sloan School Working Paper No. 3417–3492). Cambridge, MA: Center for Coordination Science, MIT Sloan School of Management.

Brynjolfsson, E., Hitt, L. (1996). Paradox lost? Firm-level evidence on the returns to information systems spending. *Management Science*, *42*(4), 541–558.

Buchak, G., Matvos, G., Piskorski, T., Seru, A. (2018). Fintech, regulatory arbitrage, and the rise of shadow banks. *Journal of Financial Economics*, *130*(3), 453–483.

Buell, R. W., Campbell, D., Frei, F. X. (2010). Are self-service customers satisfied or stuck? *Production and Operations Management*, *19*(6), 679–697.

Byun, J., Rozeff, M. S. (2003). Long-run performance after stock splits: 1927 to 1996. *The Journal of Finance*, *58*(3), 1063–1085.

Cahill, D., Baur, D. G., Liu, Z. F., Yang, J. W. (2020). I Am a Blockchain Too: How Does the Market Respond to Companies' Interest in Blockchain? *Journal of Banking and Finance*, *113*, 1–16.

Cainelli, G., Ganau, R. (2019). Related variety and firm heterogeneity. What really matters for short-run firm growth? *Entrepreneurship & Regional Development*, *31*(9–10), 768–784.

Calzada, J., Fageda, X., Martínez-Santos, F. (2019). *Mergers, branch consolidation and financial exclusion in the US bank market* (UB Economics Working Papers No. E19/397). Barcelona: University de Barcelona.

Camerer, C., Vepsalainen, A. (1988). The economic efficiency of corporate culture. *Strategic Management Journal*, *9*(S1), 115–126.

Campbel, T. S., Kracaw, W. A. (1980). Information production, market signalling, and the theory of financial intermediation. *The Journal of Finance*, *35*(4), 863–882.

Campbell, D., Frei, F. (2010). Cost structure, customer profitability, and retention implications of self-service distribution channels: Evidence from customer behaviour in an online banking channel. *Management Science*, *56*(1), 4–24.

Campbell, J. Y., Lo, A. W., MacKinlay, A. C. (1997). Event-study analysis. In *The Econometrics of Financial Markets* (pp. 149–180). Princeton, NJ: Princeton University Press.

Campbell, K., Gordon, L. A., Loeb, M. P., Zhou, L. (2003). The economic cost of publicly announced information security breaches: Empirical evidence from the stock market. *Journal of Computer Security*, *11*(3), 431–448. https://doi.org/10.3233/JCS-2003-11308

Campbell, M. (2012). What a difference a year makes: time lag effect of information technology investment on firm performance. *Journal of Organizational Computing and Electronic Commerce*, *22*(3), 237–255.

Campbell, R. D., Giambona, E., Sirmans, C. F. (2009). The long-horizon performance of REIT mergers. *The Journal of Real Estate Finance and Economics*, *38*(2), 105–114.

Carbó-Valverde, S., Cuadros-Solas, P., Rodríguez-Fernández, F. (2020). A Machine Learning Approach to the Digitalization of Bank Customers: Evidence from Random and Causal Forests'. *Plos One*, *15*(10), 1–39.

Card, D., DellaVigna, S. (2012). *Revealed preferences for journals: Evidence from page limits* (Working Paper No. 18863). Cambridge, Massachusetts: National Bureau of Economic Research.

Carlson, J., Furst, K., Lang, W. W., Nolle, D. E. (2001). Internet banking: market developments and regulatory issues. In *Paper presented to Society of Government Economists*. Washington, DC.: Citeseer. Retrieved from www.occ.treas.gov/netbank/SGEC2000.pdf

Carpenter, G. S., Nakamoto, K. (1989). Consumer preference formation and pioneering advantage. *Journal of Marketing Research*, *26*(3), 285–298.

Carpenter, G. S., Nakamoto, K. (1990). Competitive strategies for late entry into a market with a dominant brand. *Management Science*, *36*(10), 1268–1278.

Carson, D., McCartan-Quinn, D. (1995). Non-Practice of Theoretically Based Marketing in Small Business-Issues Arising and Their Implications. *Journal of Marketing Theory and Practice*, *3*(4), 24–32. https://doi.org/10.1080/10696679.1995.11501702

Carter, D. A., McNulty, J. E. (2005). Deregulation, technological change, and the business-lending performance of large and small banks. *Journal of Banking & Finance*, *29*(5), 1113–1130.

Carter, R. B., Dark, F. H., Singh, A. K. (1998). Underwriter reputation, initial returns, and the long-run performance of IPO stocks. *The Journal of Finance*, *53*(1), 285–311.

Census. (2021). Datasets. Retrieved 4 November 2021, from https://www2.census.gov/programs-surveys/popest/datasets/

Chaney, P. K., Devinney, T. M., Winer, R. S. (1991). The impact of new product introductions on the market value of firms. *Journal of Business*, *64*(4), 573–610.

Chang, Y. (2002). *Dynamics of banking technology adoption: An application to Internet banking* (Economic Research Papers). Coventry: Department of Economics, University of Warwick.

Chatterjee, D., Pacini, V. S. C. (2002). The shareholder-wealth and trading-volume effects of information-technology infrastructure investments. *Journal of Management Information Systems*, *19*(2), 7–42.

Chatterjee, D., Richardson, V. J., Zmud, R. W. (2001). Examining the shareholder wealth effects of announcements of newly created CIO positions. *MIS Quarterly*, *25*(1), 43–70.

Chau, P. Y. K., Lai, V. S. K. (2003). An empirical investigation of the determinants of user acceptance of internet banking. *Journal of Organizational Computing and Electronic Commerce*, *13*(2), 123–145.

Chen, H., Zheng, M. (2021). IPO Underperformance and the Idiosyncratic Risk Puzzle. *Journal of Banking & Finance*, *131*, 1–12.

Chen, M.-J., Hambrick, D. C. (1995). Speed, stealth, and selective attack: How small firms differ from large firms in competitive behaviour. *Academy of Management Journal*, *38*(2), 453–482.

Chen, S.-S., Su, X.-Q. (2010). Market reaction to entry timing of corporate capital investment announcement: Evidence from announcement-period abnormal returns and analysts' earnings forecast revisions. *Review of Pacific Basin Financial*

Markets and Policies, *13*(04), 495–515.

Chen, X., Solomon, E., Verousis, T. (2016). Asymmetric post-announcement drift to good and bad news: evidence from voluntary trading disclosures in the Chinese stock market. *International Journal of the Economics of Business*, *23*(2), 183–198.

Cheng, J. M.-S., Tsao, S.-M., Tsai, W.-H., Tu, H. H.-J. (2007). Will eChannel additions increase the financial performance of the firm?—The evidence from Taiwan. *Industrial Marketing Management*, *36*(1), 50–57.

Cheng, T. C. E., Lam, D. Y. C., Yeung, A. C. L. (2006). Adoption of internet banking: an empirical study in Hong Kong. *Decision Support Systems*, *42*(3), 1558–1572.

Chhaochharia, V., Grinstein, Y. (2007). Corporate governance and firm value: The impact of the 2002 governance rules. *The Journal of Finance*, *62*(4), 1789–1825.

Chong, A. Y.-L., Ooi, K.-B., Lin, B., Tan, B.-I. (2010). Online banking adoption: an empirical analysis. *International Journal of Bank Marketing*, *28*(4), 267–287.

Chou, C. Y., Chen, J.-S., Liu, Y.-P. (2017). Inter-firm relational resources in cloud service adoption and their effect on service innovation. *The Service Industries Journal*, *37*(3–4), 256–276.

Christensen, K. S. (2006). Losing innovativeness: the challenge of being acquired. *Management Decision*, *4*(9), 1161–1182.

Chu, S.-C., Leung, L. C., Hui, Y. Van, Cheung, W. (2007). Evolution of e-commerce Web sites: A conceptual framework and a longitudinal study. *Information & Management*, *44*(2), 154–164. https://doi.org/https://doi.org/10.1016/j.im.2006.11.003

Chui, M. K. F., Domanski, D., Kugler, P., Shek, J. (2010). *The collapse of international bank finance during the crisis: evidence from syndicated loan markets* (BIS Quarterly Review September-2010). Basel: Bank for International Settlements.

Ciciretti, R., Hasan, I., Zazzara, C. (2009). Do internet activities add value? Evidence from the traditional banks. *Journal of Financial Services Research*, *35*(1), 81–98.

Cipriani, M., Guarino, A. (2013). The impacts of complementary information technology resources on the service-profit chain and competitive performance of South African hospitality firms. *International Journal of Hospitality Management*, *34*, 245–254. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=965422

Clarkson, P. M., Li, Y., Richardson, G. D., Vasvari, F. P. (2011). Does it really pay to be green? Determinants and consequences of proactive environmental strategies.

Journal of Accounting and Public Policy, *30*(2), 122–144.

Cohen, J. F., Olsen, K. (2013). The impacts of complementary information technology resources on the service-profit chain and competitive performance of South African hospitality firms. *International Journal of Hospitality Management*, *34*(1), 245–254.

Cohen, W. M., Klepper, S. (1996). Firm size and the nature of innovation within industries: the case of process and product R&D. *The Review of Economics and Statistics*, *78*(2), 232–243.

Cohen, W. M., Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*, *35*(1), 128–152.

Cole, J. A. (1980). *Theory and evidence regarding the information content in dividends* (PhD Thesis). Ann Arbor, Michigan: University of Michigan.

Collis, D. J., Montgomery, C. A. (1995). Competing on Resources: Strategy in the 1990s. *Harvard Business Review*, *73*(4), 118–128.

Connelly, B. L., Certo, S. T., Ireland, R. D., Reutzel, C. R. (2011). Signaling theory: A review and assessment. *Journal of Management*, *37*(1), 39–67.

Considine, E., Cormican, K. (2016). Self-service technology adoption: An analysis of customer to technology interactions. *Procedia Computer Science*, *100*, 103–109.

Cooper, M. J., Dimitrov, O., Rau, P. R. (2001). A rose. com by any other name. *The Journal of Finance*, *56*(6), 2371–2388.

Cooper, M. J., Khorana, A., Osobov, I., Patel, A., Rau, P. R. (2005). Managerial actions in response to a market downturn: Valuation effects of name changes in the dot. com decline. *Journal of Corporate Finance*, *11*(1–2), 319–335.

Cornett, M. M., McNutt, J. J., Tehranian, H. (2006). Performance changes around bank mergers: Revenue enhancements versus cost reductions. *Journal of Money, Credit and Banking*, *38*(4), 1013–1050.

Cornett, M. M., Mehran, H., Tehranian, H. (1998). Are financial markets overly optimistic about the prospects of firms that issue equity? Evidence from voluntary versus involuntary equity issuances by banks. *The Journal of Finance*, *53*(6), 2139–2159.

Cornett, M. M., Tehranian, H. (1992). Changes in corporate performance associated with bank acquisitions. *Journal of Financial Economics*, *31*(2), 211–234.

Corsini, L., Dammicco, V., Bowker-Lonnecker, L., Blythe, R. (2020). *The Maker movement and its impact in the fight against COVID-19* (Centre for Technology Management

Working Paper Series No. 5). Cambridge: University of Cambridge.

Cortet, M., Rijks, T., Nijland, S. (2016). PSD2: The digital transformation accelerator for banks. *Journal of Payments Strategy & Systems*, *10*(1), 13–27.

Cowan, A. R., Salotti, V. (2015). The resolution of failed banks during the crisis: Acquirer performance and FDIC guarantees, 2008–2013. *Journal of Banking & Finance*, *54*, 222–238.

Coyne, K. P. (1986). Sustainable competitive advantage—What it is, what it isn't. *Business Horizons*, *29*(1), 54–61.

Cremers, M., Pareek, A. (2015). Short-term trading and stock return anomalies: Momentum, reversal, and share issuance. *Review of Finance*, *19*(4), 1649–1701.

Cruz, P., Barretto Filgueiras Neto, L., Munoz-Gallego, P., Laukkanen, T. (2010). Mobile banking rollout in emerging markets: evidence from Brazil. *International Journal of Bank Marketing*, *28*(5), 342–371.

Cuesta, C., Ruesta, M., Tuesta, D., Urbiola, P. (2015). *The digital transformation of the banking industry* (BBVA Research Working Paper). BBVA Research.

Cummings, J., Dennis, A., Cho, W., Cooney, K. (2018). The Benefit of Being Second: An Event Study of Social Media Adoption. *ACM SIGMIS Database: The DATABASE for Advances in Information Systems*, *49*(2), 54–78.

Cummins, J. D., Weiss, M. A. (2004). Consolidation in the European insurance industry: do mergers and acquisitions create value for shareholders? *Brookings-Wharton Papers on Financial Services*, 217–258.

Curty, R. G., Zhang, P. (2013). Website features that gave rise to social commerce: a historical analysis. *Electronic Commerce Research and Applications*, *12*(4), 260–279.

Cusatis, P. J., Miles, J. A., Woolridge, J. R. (1993). Restructuring through spinoffs: The stock market evidence. *Journal of Financial Economics*, *33*(3), 293–311.

Cyree, K. B., Delcoure, N., Dickens, R. (2009). An examination of the performance and prospects for the future of internet-primary banks. *Journal of Economics and Finance*, *33*(2), 128–147. https://doi.org/10.1007/s12197-008-9048-0

Cyree, K. B., Huang, P., Lindley, J. T. (2012). The economic consequences of banks' derivatives use in good times and bad times. *Journal of Financial Services Research*, *41*(3), 121–144.

Dabholkar, P. A. (1996). Consumer evaluations of new technology-based self-service options: an investigation of alternative models of service quality. *International Journal of Research in Marketing*, *13*(1), 29–51.

Dagnino, G. (1996). Understanding the enconomics of Riracdian, Chamberlinian and Schumpeterian rents. *International Review of Economics & Business*, *43*(1), 213–235.

Dalton, D. R., Todor, W. D., Spendolini, M. J., Fielding, G. J., Porter, L. W. (1980). Organization structure and performance: A critical review. *Academy of Management Review*, *5*(1), 49–64.

Dandapani, K., Lawrence, E. R., Rodriguez, J. (2018). Determinants of Transactional Internet Banking. *Journal of Financial Services Research*, *54*, 243–267.

Dapp, T., Slomka, L. (2015). *Fintech reloaded–Traditional banks as digital ecosystems* (Deutsche Bank Research). Frankfurt: Deutsche Bank.

Das, S., Debbarma, J. (2011). Designing a biometric strategy (fingerprint) measure for enhancing atm security in indian e-banking system. *International Journal of Information and Communication Technology Research*, *1*(5), 197–203.

Dasgupta, M., Gupta, R. K. (2009). Innovation in organizations: A review of the role of organizational learning and knowledge management. *Global Business Review*, *10*(2), 203–224.

Dauda, S. Y., Lee, J. (2015). Technology adoption: A conjoint analysis of consumers′ preference on future online banking services. *Information Systems*, *53*, 1–15.

Davis, F. D., Bagozzi, R. P., Warshaw, P. R. (1989). User acceptance of computer technology: a comparison of two theoretical models. *Management Science*, *35*(8), 982–1003.

Dayasindhu, N. (2002). Embeddedness, knowledge transfer, industry clusters and global competitiveness: a case study of the Indian software industry. *Technovation*, *22*(9), 551–560.

De-Aguilera-Moyano, M., Castro-Higueras, A., Pérez-Rufí, J.-P. (2019). Between broadcast yourself and broadcast whatever: YouTube’s homepage as a synthesis of its business strategy. *Profesional de La Información*, *28*(2), 1–13.

De Carolis, D. M. (2003). Competencies and imitability in the pharmaceutical industry: An analysis of their relationship with firm performance. *Journal of Management*, *29*(1), 27–50.

De Marco, F., Wieladek, T. (2015). *The real effects of capital requirements and monetary* *policy: Evidence from the United Kingdom* (Staff working paper- Journal of Banking and Finance, Forthcoming. No. 573). London: Bank of England.

Deal, T. E., Kennedy, A. A. (1982). *Corporate cultures*. Reading, MA: Addison Wesley.

Dean, T. J., Brown, R. L., Bamford, C. E. (1998). Differences in large and small firm responses to environmental context: Strategic implications from a comparative analysis of business formations. *Strategic Management Journal*, *19*(8), 709–728.

Deane, J. K., Goldberg, D. M., Rakes, T. R., Rees, L. P. (2019). The effect of information security certification announcements on the market value of the firm. *Information Technology and Management*, *20*(3), 1–15.

Dehning, B., Richardson, V. J., Urbaczewski, A., Wells, J. D. (2004). Reexamining the value relevance of e-commerce initiatives. *Journal of Management Information Systems*, *21*(1), 55–82.

Dehning, B., Richardson, V. J., Zmud, R. W. (2003). The value relevance of announcements of transformational information technology investments. *Mis Quarterly*, *27*(4), 637–656.

Dehning, B., Richardson, V. J., Zmud, R. W. (2007). The financial performance effects of IT-based supply chain management systems in manufacturing firms. *Journal of Operations Management*, *25*(4), 806–824.

Delgado, J., Hernando, I., Nieto, M. J. (2007). Do European primarily Internet banks show scale and experience efficiencies? *European Financial Management*, *13*(4), 643–671.

Deloitte. (2017). *Deloitte Luxembourg Digital Banking Benchmark – improving the digital performance*. Luxembourg. Retrieved from https://www2.deloitte.com/lu/en/pages/banking-and-securities/articles/digital-banking-benchmark.html

Deloitte. (2018). The value of online banking channels in a mobile-centric world. Retrieved 1 January 2019, from https://www2.deloitte.com/us/en/insights/industry/financial-services/online-banking-usage-in-mobile-centric-world.html#

Deloitte. (2019). Digital Banking Benchmark Improving digital performance. Retrieved 20 October 2019, from https://www2.deloitte.com/content/dam/Deloitte/lu/Documents/financial-services/Banking/lu-digital-banking-benchmark.pdf

DeLong, G., DeYoung, R. (2007). Learning by observing: Information spillovers in the execution and valuation of commercial bank M&As. *The Journal of Finance*, *62*(1), 181–216.

Dempsey, M. (2010). The book-to-market equity ratio as a proxy for risk: evidence from Australian markets. *Australian Journal of Management*, *35*(1), 7–21.

Deshpandé, R., Farley, J. U., Webster Jr, F. E. (1993). Corporate culture, customer orientation, and innovativeness in Japanese firms: a quadrad analysis. *Journal of Marketing*, *57*(1), 23–37.

DeYoung, R. (2001). The financial performance of pure play Internet banks. *Economic Perspectives*, *25*(1), 60–75.

DeYoung, R. (2002). *Learning-by-doing, scale efficiencies, and financial performance at Internet-only banks* (FRB Chicago Working Paper No. 2001– 06). Chicago: Federal Reserve Bank of Chicago.

DeYoung, R. (2005). The performance of Internet-based business models: Evidence from the banking industry. *The Journal of Business*, *78*(3), 893–948.

DeYoung, R. (2007). Safety, soundness, and the evolution of the US banking industry. *Economic Review-Federal Reserve Bank of Atlanta*, *92*(1/2), 41–66.

DeYoung, R. (2010). Banking in the United States. In A. N. Berger, P. Molyneux, & J. O. S. Wilson (Eds.), *The Oxford handbook of banking* (1st ed., pp. 777–806). Oxford: Oxford University Press.

DeYoung, R., Frame, W. S., Glennon, D., Nigro, P. (2011). The information revolution and small business lending: The missing evidence. *Journal of Financial Services Research*, *39*(1–2), 19–33.

DeYoung, R., Hunter, W. C. (2001). *Deregulation, the Internet, and the competitive viability of large banks and community banks* (No. WP-01-11). Chicago: Federal Reserve Bank of Chicago.

DeYoung, R., Hunter, W. C. (2003). Large Banks and Community Banks. *The Future of Banking*, 173.

DeYoung, R., Hunter, W. C., Udell, G. F. (2004). The past, present, and probable future for community banks. *Journal of Financial Services Research*, *25*(2–3), 85–133.

DeYoung, R., Jang, K. Y. (2016). Do banks actively manage their liquidity? *Journal of Banking & Finance*, *66*, 143–161.

DeYoung, R., Lang, W. W., Nolle, D. L. (2007). How the Internet affects output and performance at community banks. *Journal of Banking & Finance*, *31*(4), 1033–1060.

DeYoung, R., Peng, E. Y., Yan, M. (2013). Executive compensation and business policy choices at US commercial banks. *Journal of Financial and Quantitative Analysis*, *48*(1), 165–196.

Dibrell, C., Davis, P. S., Craig, J. (2008). Fueling innovation through information technology in SMEs. *Journal of Small Business Management*, *46*(2), 203–218.

Dichev, I. D., Piotroski, J. D. (2001). The long-run stock returns following bond ratings changes. *The Journal of Finance*, *56*(1), 173–203.

Dierickx, I., Cool, K. (1989). Asset stock accumulation and sustainability of competitive advantage. *Management Science*, *35*(12), 1504–1511.

Dimson, E., Marsh, P. (1986). Event study methodologies and the size effect: The case of UK press recommendations. *Journal of Financial Economics*, *17*(1), 113–142.

Docking, D. S., Koch, P. D. (2005). Sensitivity of investor reaction to market direction and volatility: dividend change announcements. *Journal of Financial Research*, *28*(1), 21–40.

Dootson, P., Beatson, A., Drennan, J. (2016). Financial institutions using social media–do consumers perceive value? *International Journal of Bank Marketing*, *34*(1), 9–36.

Dos Santos, B. L., Peffers, K. (1995). Rewards to investors in innovative information technology applications: First movers and early followers in ATMs. *Organization Science*, *6*(3), 241–259.

Dos Santos, B. L., Peffers, K., Mauer, D. C. (1993). The impact of information technology investment announcements on the market value of the firm. *Information Systems Research*, *4*(1), 1–23.

Doz, Y. L. (1987). Technology partnerships between larger and smaller firms: Some critical issues. *International Studies of Management & Organization*, *17*(4), 31–57.

Drechsler, K., Wagner, H.-T., Reibenspiess, V. A. (2019). Risk and Return of Chief Digital Officers' Appointment–An Event Study. In *40th International Conference on Information System* (pp. 1–17). Munich, Germany.

Drigă, I., Isac, C. (2014). E-banking services–features, challenges and benefits. *Annals of the University of Petroşani. Economics*, *14*(1), 49–58.

Drucker, P. F. (1985). Entrepreneurial strategies. *California Management Review*, *27*(2), 9–21.

Dutta, A., Lee, H., Yasai-Ardekani, M. (2014). Digital systems and competitive responsiveness: The dynamics of IT business value. *Information & Management*, *51*(6), 762–773.

Eberhart, A. C., Maxwell, W. F., Siddique, A. R. (2004). An examination of long-term abnormal stock returns and operating performance following R&D increases. *The Journal of Finance*, *59*(2), 623–650.

Egland, K. L., Gurst, K., Nolle, D. E., Robertson, D. (1998). Special Studies on Technology and Banking: Banking over the Internet. *Office of the Comptroller of the Currency Quarterly Journal*, *17*(4), 25–30.

El Diri, M., King, T., Spokeviciute, L., Williams, J. (2021). Hands in the cookie jar: Exploiting loan loss provisions under bank financial distress. *Economics Letters*, *209*, 110098.

Elfakhani, S., Ghantous, R. F., Baalbaki, I. (2003). Mega-mergers in the US banking industry. *Applied Financial Economics*, *13*(8), 609–622.

Eliashberg, J., Robertson, T. S. (1988). New product preannouncing behaviour: A market signaling study. *Journal of Marketing Research*, *25*(3), 282–292.

Erdogan, A. (2010). The long-run performance of initial public offerings: The case of Turkey. *European Journal of Economics, Finance and Administrative Sciences*, *26*, 57–64.

Fahy, J., Hooley, G. (2002). Sustainable competitive advantage in electronic business: towards a contingency perspective on the resource-based view. *Journal of Strategic Marketing*, *10*(4), 241–253.

Fama, E. F. (1970). Efficient Capital Markets: A Review of Theory and Empirical Work. *The Journal of Finance*, *25*(2), 383–417. https://doi.org/10.2307/2325486

Fama, E. F. (1995). Random walks in stock market prices. *Financial Analysts Journal*, *51*(1), 75–80.

Fama, E. F. (1998). Market efficiency, long-term returns, and behavioural finance. *Journal of Financial Economics*, *49*(3), 283–306.

Fama, E. F. (2021). Efficient capital markets a review of theory and empirical work. In J. H. Cochrane & T. J. Moskowitz (Eds.), *The Fama Portfolio: Selected Papers of Eugene F. Fama* (pp. 76–121). Moskowitz, Chicago: University of Chicago Press.

Fama, E. F., Fisher, L., Jensen, M. C., Roll, R. (1969). The adjustment of stock prices to new information. *International Economic Review*, *10*(1), 1–21.

Fama, E. F., French, K. R. (1992). The cross-section of expected stock returns. *The Journal of Finance*, *47*(2), 427–465.

Fama, E. F., French, K. R. (1993). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics*, *33*(1), 3–56.

Fama, E. F., French, K. R. (1995). Size and book-to-market factors in earnings and returns. *The Journal of Finance*, *50*(1), 131–155.

Fanta, A. B., Kemal, K. S., Waka, Y. K. (2013). Corporate governance and impact on bank performance. *Journal of Finance and Accounting*, *1*(1), 19–26.

Farrell, J. (1987). Cheap talk, coordination, and entry. *The RAND Journal of Economics*, *18*(1), 34–39.

Fathollahzadeh, M., Hashemi, A., Kahreh, M. S. (2011). Designing a new model for determining customer value satisfaction and loyalty towards banking sector of Iran. *European Journal of Economics, Finance and Administrative Sciences*, *28*(1), 126–138.

Ferguson, C., Finn, F., Hall, J. (2005). Electronic commerce investments, the resource-based view of the firm, and firm market value. *International Journal of Accounting Information Systems*, *6*(1), 5–29.

Filbeck, G., Krueger, T., Preece, D. (2007). CFO Magazine's" working capital survey": do selected firms work for shareholders? *Quarterly Journal of Business and Economics*, *46*(2), 3–22.

Filbeck, G., Preece, D., Zhao, X. (2013). Top performing banks: the benefits to investors. *Journal of Economics and Finance*, *37*(4), 560–583.

Filbeck, G., Swinarski, M., Zhao, X. (2013). Shareholder reaction to firm investments in the capability maturity model: an event study. *European Journal of Information Systems*, *22*(2), 170–190. https://doi.org/10.1057/ejis.2012.54

Filbeck, G., Webb, S. E. (2001). Information asymmetries, managerial ownership, and the impact of layoff announcements on shareholder wealth. *Quarterly Journal of Business and Economics*, *40*(2), 31–47.

Financial Crisis Inquiry Commission. (2011). *The financial crisis inquiry report: The final report of the National Commission on the causes of the financial and economic crisis in the United States including dissenting views*. (D. Schechter, Ed.). New York: Cosimo, Inc.

FinancialTimes. (2018, February 25). Cyber attacks on financial services sector rise fivefold in 2018. Retrieved 20 June 2019, from https://www.ft.com/content/6a2d9d76-3692-11e9-bd3a-8b2a211d90d5

Finger, M., Gavious, I., Manos, R. (2018). Environmental risk management and financial performance in the banking industry: A cross-country comparison. *Journal of International Financial Markets, Institutions and Money*, *52*, 240–261.

Firdous, S., Farooqi, R. (2017). Impact of internet banking service quality on customer satisfaction. *The Journal of Internet Banking and Commerce*, *22*(1), 1–17.

Forbes. (2018). Why Have Net Interest Margins Trended Lower For Some Of The Largest U.S. Banks? Retrieved 28 January 2020, from https://www.forbes.com/sites/greatspeculations/2018/09/10/why-have-net-interest-margins-trended-lower-for-some-of-the-largest-u-s-banks/?sh=61218b2e6fcb

Forbes. (2019). 100 Stats On Digital Transformation And Customer Experience. Retrieved 1 October 2020, from https://www.forbes.com/sites/blakemorgan/2019/12/16/100-stats-on-digital-transformation-and-customer-experience/#50236e053bf3

Fornell, C., Ittner, C. D., Larcker, D. F. (1996). *The valuation consequences of customer satisfaction* (National Quality Research Center Working Paper). Ann Arbor, MI: National Quality Research Center.

Fornell, C., Johnson, M. D., Anderson, E. W., Cha, J., Bryant, B. E. (1996). The American customer satisfaction index: nature, purpose, and findings. *Journal of Marketing*, *60*(4), 7–18.

Frame, W. S., White, L. J. (2014). Technological change, financial innovation, and diffusion in banking. In A. N. Berger, P. Molyneux, & J. O. S. Wilson (Eds.), *The Oxford Handbook of Banking* (2nd ed.). Oxford: Oxford University Press.

Francis, B. B., Hasan, I., Sun, X., Waisman, M. (2014). Can firms learn by observing? Evidence from cross-border M&As. *Journal of Corporate Finance*, *25*, 202–215.

FRED. (2020). Net Interest Margin for all U.S. Banks. Retrieved 18 January 2021, from https://fred.stlouisfed.org/series/USNIM/

Frederick, F. R., Sasser, W. E. (1990). Zero defections: quality comes to services. *Harvard Business Review*, *68*(5), 105–111.

Freeman, J., Carroll, G. R., Hannan, M. T. (1983). The liability of newness: Age dependence in organizational death rates. *American Sociological Review*, *48*(5), 692–710.

Freeman, R. N. (1987). The association between accounting earnings and security returns for large and small firms. *Journal of Accounting and Economics*, *9*(2), 195–228.

Fung, T. K. F. (2008). Banking with a personalized touch: Examining the impact of website customization on commitment. *Journal of Electronic Commerce Research*, *9*(4), 296–309.

Furst, K., Lang, W. W., Nolle, D. E. (2000a). *Internet banking: developments and prospects* (Economic and Policy Analysis Working Paper No. 2000–9). Washington, D.C: Office of the Comptroller of the Currency.

Furst, K., Lang, W. W., Nolle, D. E. (2000b). Special Studies on Technology and Banking. *Quarterly Journal*, *19*(2), 29–48.

Furst, K., Lang, W. W., Nolle, D. E. (2002). Internet banking. *Journal of Financial Services Research*, *22*(1), 95–117.

Galbreath, J. (2005). Which resources matter the most to firm success? An exploratory study of resource-based theory. *Technovation*, *25*(9), 979–987.

Galetić, F., Obradović, T. (2018). Measuring Concentration of the Banking Market of the Republic of Croatia. In *6th International OFEL Conference on Governance, Management and Entrepreneurship. New Business Models and Institutional Entrepreneurs: Leading Disruptive Change. April 13th-14th, 2018, Dubrovnik, Croatia* (pp. 598–625). Zagreb: Governance Research and Development Centre (CIRU).

Galy, E., Sauceda, M. J. (2014). Post-implementation practices of ERP systems and their relationship to financial performance. *Information & Management*, *51*(3), 310–319.

Gensler, S., Leeflang, P., Skiera, B. (2012). Impact of online channel use on customer revenues and costs to serve: Considering product portfolios and self-selection. *International Journal of Research in Marketing*, *29*(2), 192–201.

Gerrard, P., Barton, C. J. (2003). The diffusion of internet banking among Singapore consumers. *International Journal of Bank Marketing*, *21*(1), 16–28.

Gieskes, J., Heijden, B. van der. (2004). Measuring and enabling learning behaviour in product innovation processes. *Creativity and Innovation Management*, *13*(2), 109–125.

Gilbert, E., Strugnell, D. (2010). Does survivorship bias really matter? An empirical investigation into its effects on the mean reversion of share returns on the JSE (1984–2007). *Investment Analysts Journal*, *39*(72), 31–42.

Goddard, J., McKillop, D., Wilson, J. O. S. (2008). The diversification and financial performance of US credit unions. *Journal of Banking & Finance*, *32*(9), 1836–1849.

Goh, K. H., Kauffman, R. J. (2013). Firm strategy and the Internet in US commercial banking. *Journal of Management Information Systems*, *30*(2), 9–40.

Goh, K. H., Kauffman, R. J. (2015). Investments in internet-based innovations for financial services: strategic advantage or strategic necessity? *International Journal of Business Excellence*, *8*(4), 378–395.

Gómez-Herrera, E. (2013). Comparing alternative methods to estimate gravity models of bilateral trade. *Empirical Economics*, *44*(3), 1087–1111.

Gordon, G. G., DiTomaso, N. (1992). Predicting corporate performance from organizational culture. *Journal of Management Studies*, *29*(6), 783–798.

Grant, R. M. (1991a). Porter's 'competitive advantage of nations': an assessment. *Strategic Management Journal*, *12*(7), 535–548.

Grant, R. M. (1991b). The resource-based theory of competitive advantage: implications for strategy formulation. *California Management Review*, *33*(3), 114–135.

Gregory, K. L. (1983). Native-view paradigms: Multiple cultures and culture conflicts in organizations. *Administrative Science Quarterly*, *28*(3), 359–376.

Grewal, R., Slotegraaf, R. J. (2007). Embeddedness of organizational capabilities. *Decision Sciences*, *38*(3), 451–488.

Grover, V., Kohli, R. (2012). Cocreating IT value: New capabilities and metrics for multifirm environments. *Mis Quarterly*, *36*(1), 225–232.

Guiso, L., Jappelli, T., Padula, M., Pagano, M. (2004). Financial market integration and economic growth in the EU. *Economic Policy*, *19*(40), 524–577.

Gutu, L. M. (2014). The impact of internet technology on the Romanian banks performance. In *Proceedings of International Academic Conferences*. Prague: International Institute of Social and Economic Sciences.

Hackett, S., Parmanto, B. (2005). A longitudinal evaluation of accessibility: higher education web sites. *Internet Research: Electronic Networking Applications and Policy*, *15*(3), 281–294.

Haleblian, J., Kim, J.-Y., Rajagopalan, N. (2006). The influence of acquisition experience and performance on acquisition behaviour: Evidence from the US commercial banking industry. *Academy of Management Journal*, *49*(2), 357–370.

Hall, R. (1992). The strategic analysis of intangible resources. *Strategic Management Journal*, *13*(2), 135–144.

Hall, R. (1993). A framework linking intangible resources and capabiliites to sustainable competitive advantage. *Strategic Management Journal*, *14*(8), 607–618.

Hallowell, R. (1996). The relationships of customer satisfaction, customer loyalty, and profitability: an empirical study. *International Journal of Service Industry Management*, *7*(4), 27–42.

Hamel, G., Prahalad, C. K. (1996). *Competing for the Future*. Boston: Harvard Business Press.

Hamilton, J., Rahman, S., Lee, A. C. (2009). EVA: does size matter? *Review of Pacific Basin Financial Markets and Policies*, *12*(02), 267–287.

Hanafizadeh, P., Keating, B. W., Khedmatgozar, H. R. (2014). A systematic review of Internet banking adoption. *Telematics and Informatics*, *31*(3), 492–510.

Haninun, H., Lindrianasari, L., Denziana, A. (2018). The effect of environmental performance and disclosure on financial performance. *International Journal of Trade and Global Markets*, *11*(1–2), 138–148.

Hannan, T. H. (1997). Market share inequality, the number of competitors, and the HHI: An examination of bank pricing. *Review of Industrial Organization*, *12*(1), 23–35.

Hansen, G. S., Wernerfelt, B. (1989). Determinants of firm performance: The relative importance of economic and organizational factors. *Strategic Management Journal*, *10*(5), 399–411.

Harmanen, J. (2019). *Digital online strategy for B2B internationalization a multiple case-study on manufacturing SMEs* (Master Dissertation). Espoo: Aalto University.

Hart, S. L. (1995). A natural-resource-based view of the firm. *Academy of Management Review*, *20*(4), 986–1014.

Harvey, D. (2016). Digital transformation in banks: The trials, opportunities and a guide to what is important. *Journal of Digital Banking*, *1*(2), 136–145.

Hasan, I., Maccario, A., Zazzara, C. (2002). *Do Internet activities add value? The Italian bank experience* (Consolidated and Bank Financial Statements and Auditor's Report for the year ended). New York: Berkley Research Center, New York University.

Haunschild, P. R. (1993). Interorganizational imitation: The impact of interlocks on

corporate acquisition activity. *Administrative Science Quarterly*, *38*(4), 564–592.
He, D., Ho, C.-Y., Xu, L. (2020). Risk and return of online channel adoption in the banking industry. *Pacific-Basin Finance Journal*, *60*, 1–22.
Healy, P. M., Palepu, K. G., Ruback, R. S. (1992). Does corporate performance improve after mergers? *Journal of Financial Economics*, *31*(2), 135–175.
Hege, U., Hennessy, C. (2010). Acquisition values and optimal financial (in) flexibility. *The Review of Financial Studies*, *23*(7), 2865–2899.
Hendricks, K. B., Singhal, V. R., Stratman, J. K. (2007). The impact of enterprise systems on corporate performance: A study of ERP, SCM, and CRM system implementations. *Journal of Operations Management*, *25*(1), 65–82.
Herbig, P. (1996). Market signalling: a review. *Management Decision*, *34*(1), 35–45.
Hernando, I., Nieto, M. J. (2007). Is the Internet delivery channel changing banks' performance? The case of Spanish banks. *Journal of Banking & Finance*, *31*(4), 1083–1099.
Heskett, J. L., Jones, T. O., Loveman, G. W., Sasser, W. E., Schlesinger, L. A. (1994). Putting the service-profit chain to work. *Harvard Business Review*, *72*(2), 164–174.
Hess, T., Matt, C., Benlian, A., Wiesböck, F. (2016). Options for formulating a digital transformation strategy. *MIS Quarterly Executive*, *15*(2), 123–139.
Hill, C. W. L., Rothaermel, F. T. (2003). The performance of incumbent firms in the face of radical technological innovation. *Academy of Management Review*, *28*(2), 257–274.
Hitt, L. M., Frei, F. X. (2002). Do better customers utilize electronic distribution channels? The case of PC banking. *Management Science*, *48*(6), 732–748.
Hitt, L. M., Wu, D. J., Zhou, X. (2002). Investment in enterprise resource planning: Business impact and productivity measures. *Journal of Management Information Systems*, *19*(1), 71–98.
Hoehle, H., Scornavacca, E., Huff, S. (2012). Three decades of research on consumer adoption and utilization of electronic banking channels: A literature analysis. *Decision Support Systems*, *54*(1), 122–132.
Holzmann, H., Nejdl, W., Anand, A. (2016). The Dawn of today's popular domains: A study of the archived German Web over 18 years. In *2016 IEEE/ACM Joint Conference on Digital Libraries (JCDL)* (pp. 73–82). Piscataway, New Jersey: IEEE.
Homburg, C., Wielgos, D., Kuehnl, C. (2019). Digital Business Capability and Its Effect on

Firm Performance. In S. K. Lam, M. Giesler, & X. Luo (Eds.), *Understanding Complexity, Transforming the Marketplace* (pp. ICM–2). Austin, TX: Lam, Son K. Retrieved from https://www.ama.org/wp-content/uploads/2019/02/2019-AMA-Winter-Academic-Conference.pdf?rs=true&wid=

Hopkins, H. D. (1987). Long-term acquisition strategies in the US economy. *Journal of Management*, *13*(3), 557–572.

Hsu, L.-T., Jang, S. (2007). The postmerger financial performance of hotel companies. *Journal of Hospitality & Tourism Research*, *31*(4), 471–485.

Hsueh, J.-T., Lin, N.-P., Li, H.-C. (2010). The effects of network embeddedness on service innovation performance. *The Service Industries Journal*, *30*(10), 1723–1736.

Huian, M. C. (2012). Post M&A accounting performance of Romanian banks. *Journal of Eastern Europe Research in Business & Economics, IBIMA Publishing*, *2012*, 1–12.

Hung, S.-Y., Ku, C.-Y., Chang, C.-M. (2003). Critical factors of WAP services adoption: an empirical study. *Electronic Commerce Research and Applications*, *2*(1), 42–60.

Hunton, J. E., Lippincott, B., Reck, J. L. (2003). Enterprise resource planning systems: comparing firm performance of adopters and nonadopters. *International Journal of Accounting Information Systems*, *4*(3), 165–184.

Ibbotson, R. G., Jaffe, J. F. (1975). "Hot issue" markets. *The Journal of Finance*, *30*(4), 1027–1042.

Ibbotson, R. G., Sindelar, J. L., Ritter, J. R. (1988). Initial public offerings. *Journal of Applied Corporate Finance*, *1*(2), 37–45.

IDG. (2018). State of Digital Business Transformation. Retrieved 10 December 2019, from https://resources.idg.com/download/white-paper/2018-digital-business?hsCtaTracking=0e45fea0-22ec-40e4-9408-ac5ce60e7d1d%7Ca4c6ab9d-9cf1-4ee6-bf66-398a5357d2ba

Igual, M. G., Santamaría, T. C. (2017). Overconfidence, loss aversion and irrational investor behaviour: a conceptual map. *Journal of Economic & Management Perspectives*, *11*(1), 273–290.

Ikenberry, D., Lakonishok, J., Vermaelen, T. (1995). Market underreaction to open market share repurchases. *Journal of Financial Economics*, *39*(2–3), 181–208.

Ikenberry, D., Rankine, G., Stice, E. (1996). What do stock splits really signal? *Journal of Financial and Quantitative Analysis*, *31*(3), 357–375.

Im, K. S., Dow, K. E., Grover, V. (2001). A reexamination of IT investment and the market value of the firm—An event study methodology. *Information Systems Research*, *12*(1), 103–117.

Itami, H., Roehl, T. W. (1991). *Mobilizing invisible assets* (1st ed.). Cambridge, Massachusetts and London, England: Harvard University Press.

Jahangir, N., Begum, N. (2008). The role of perceived usefulness, perceived ease of use, security and privacy, and customer attitude to engender customer adaptation in the context of electronic banking. *African Journal of Business Management*, *2*(2), 32–40.

Jalal, S. K. (2019). Exploring Web Link Analysis of Websites of Indian Institute of Technology. *DESIDOC Journal of Library & Information Technology*, *39*(1), 3–9.

Jansen, J. J. P., Van Den Bosch, F. A. J., Volberda, H. W. (2006). Exploratory innovation, exploitative innovation, and performance: Effects of organizational antecedents and environmental moderators. *Management Science*, *52*(11), 1661–1674.

Jarvenpaa, S. L., Todd, P. A. (1996). Consumer reactions to electronic shopping on the World Wide Web. *International Journal of Electronic Commerce*, *1*(2), 59–88.

Jegadeesh, N. (2000). Long-term performance of seasoned equity offerings: Benchmark errors and biases in expectations. *Financial Management*, *29*(3), 5–30.

Ji, P., Yan, X., Shi, Y. (2021). Information technology investment and innovation performance: does investment paradox exist? *Journal of Asia Business Studies*.

Jin, Z., Navare, J., Lynch, R. (2019). The relationship between innovation culture and innovation outcomes: exploring the effects of sustainability orientation and firm size. *R&D Management*, *49*(4), 607–623.

Johannessen, J.-A., Olaisen, J., Olsen, B. (2001). Mismanagement of tacit knowledge: the importance of tacit knowledge, the danger of information technology, and what to do about it. *International Journal of Information Management*, *21*(1), 3–20.

Johnson, M. D., Nader, G., Fornell, C. (1996). Expectations, perceived performance, and customer satisfaction for a complex service: The case of bank loans. *Journal of Economic Psychology*, *17*(2), 163–182.

Johnson, W. B., Natarajan, A., Rappaport, A. (1985). Shareholder returns and corporate excellence. *Journal of Business Strategy*, *6*(2), 52–62.

Jones, K. D., Critchfield, T. (2005). Consolidation in the US banking industry: is the long, strange trip about to end. *FDIC Banking Rev.*, *17*(4), 31–61.

Juniper Research. (2020). Digital Banking Users to Exceed 3.6 Billion Globally by 2024, as Digital-Only Banks Catalyse Market. Retrieved 1 October 2020, from https://www.juniperresearch.com/press/press-releases/digital-banking-users-to-exceed-3-6-billion

Kadiyala, P., Rau, P. R. (2004). Investor reaction to corporate event announcements: underreaction or overreaction? *The Journal of Business*, *77*(2), 357–386.

Kalyanaram, G., Urban, G. L. (1992). Dynamic effects of the order of entry on market share, trial penetration, and repeat purchases for frequently purchased consumer goods. *Marketing Science*, *11*(3), 235–250.

Kannan, K., Rees, J., Sridhar, S. (2007). Market reactions to information security breach announcements: An empirical analysis. *International Journal of Electronic Commerce*, *12*(1), 69–91.

Karlberg, L., Åkesson, J. (2015). Trade Facilitation: Bringing Kazakhstan Closer to the EU. Lund: Department of Economics-Lund University.

Kassim, N. M., Ramayah, T. (2015). Perceived risk factors influence on intention to continue using Internet banking among Malaysians. *Global Business Review*, *16*(3), 393–414.

Keim, D. B. (1983). Size-related anomalies and stock return seasonality: Further empirical evidence. *Journal of Financial Economics*, *12*(1), 13–32.

Keisidou, E., Sarigiannidis, L., Maditinos, D. I., Thalassinos, E. I. (2013). Customer satisfaction, loyalty and financial performance: A holistic approach of the Greek banking sector. *International Journal of Bank Marketing*, *31*(4), 259–288.

Kelly, G. (2014). *The digital revolution in banking* (1st ed.). Washington, D.C.: Group of Thirty.

Kerin, R. A., Varadarajan, P. R., Peterson, R. A. (1992). First-mover advantage: A synthesis, conceptual framework, and research propositions. *Journal of Marketing*, *56*(4), 33–52.

Ketchen, J. D. J., Ireland, R. D., Snow, C. C. (2007). Strategic entrepreneurship, collaborative innovation, and wealth creation. *Strategic Entrepreneurship Journal*, *1*(3-4), 371–385.

Kilenthong, P., Hultman, C. M., Hills, G. E. (2016). Entrepreneurial marketing behaviours: impact of firm age, firm size and firm's founder. *Journal of Research in Marketing and Entrepreneurship*, *18*(1), 127–145.

Kim, T. H., Wimble, M., Sambamurthy, V. (2017). Disaggregation of the IT capital effects on firm performance: Empirical evidence from an IT asset portfolio perspective. *European Journal of Information Systems*, 1–23.

King, M. R., Massoud, N., Song, K. (2016). Who Benefits from Bank Trading Activity: Shareholders or Employees? The SRRN. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2264344

Klapper, L. F., Love, I. (2004). Corporate governance, investor protection, and performance in emerging markets. *Journal of Corporate Finance*, *10*(5), 703–728.

Kocmanová, A., Hřebíček, J., Dočekalová, M. (2011). Corporate Governance and Sustainability. *Economics & Management*, *16*, 543–550.

Koellinger, P. (2008). The relationship between technology, innovation, and firm performance—Empirical evidence from e-business in Europe. *Research Policy*, *37*(8), 1317–1328. https://doi.org/https://doi.org/10.1016/j.respol.2008.04.024

Koford, K. (2009). *The Digitization of the Shikshapatri* (Oxford Seminar). Retrieved from https://ils.unc.edu/~wildem/Oxford_Seminar_2009/Koford.pdf

Kogut, B., Zander, U. (1992). Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization Science*, *3*(3), 383–397.

Kohli, R., Devaraj, S. (2003). Measuring information technology payoff: A meta-analysis of structural variables in firm-level empirical research. *Information Systems Research*, *14*(2), 127–145.

Kolari, J. W., Pynnonen, S., Tuncez, A. M. (2021). Further evidence on long-run abnormal returns after corporate events. *The Quarterly Review of Economics and Finance*, *81*, 421–439.

Konchitchki, Y., O'Leary, D. E. (2011). Event study methodologies in information systems research. *International Journal of Accounting Information Systems*, *12*(2), 99–115.

Kothari, S. P., Warner, J. (2007). Econometrics of event studies. *Handbook of Empirical Corporate Finance*, *1*, 3–36.

Kowalik, M., Davig, T., Morris, C. S., Regehr, K. (2015). Bank consolidation and merger activity following the crisis. *Federal Reserve Bank of Kansas City Economic Review*, *100*(1), 31–49.

Kraft, R., Hastor, E., Stata, R. (2003). TimeLinks: Exploring the link structure of the evolving Web. In *WAW2003 Second Workshop on Algorithms and Models for the Web-Graph*. Citeseer.

Krishanan, D., Khin, A. A., Teng, K. L. L., Chinna, K. (2016). Consumers' perceived interactivity & intention to use mobile banking in structural equation modeling. *International Review of Management and Marketing*, *6*(4), 883–890.

Krishnamurthy, S., Spindt, P., Subramaniam, V., Woidtke, T. (2005). Does investor identity matter in equity issues? Evidence from private placements. *Journal of Financial Intermediation*, *14*(2), 210–238.

Kritzman, M. P. (1994). What practitioners need to know… about event studies. *Financial Analysts Journal*, *50*(6), 17–20.

Kuisma, T., Laukkanen, T., Hiltunen, M. (2007). Mapping the reasons for resistance to Internet banking: A means-end approach. *International Journal of Information Management*, *27*(2), 75–85.

Kunc, M. H., Morecroft, J. D. W. (2010). Managerial decision making and firm performance under a resource-based paradigm. *Strategic Management Journal*, *31*(11), 1164–1182.

Laforet, S., Li, X. (2005). Consumers' attitudes towards online and mobile banking in China. *International Journal of Bank Marketing*, *23*(5), 362–380.

Lahouel, B. Ben, Gaies, B., Zaied, Y. Ben, Jahmane, A. (2019). Accounting for endogeneity and the dynamics of corporate social–corporate financial performance relationship. *Journal of Cleaner Production*, *230*, 352–364.

Lakonishok, J., Vermaelen, T. (1990). Anomalous price behaviour around repurchase tender offers. *The Journal of Finance*, *45*(2), 455–477.

Leary, M. T., Roberts, M. R. (2014). Do peer firms affect corporate financial policy? *The Journal of Finance*, *69*(1), 139–178.

Lee, H., Smith, K. G., Grimm, C. M., Schomburg, A. (2000). Timing, order and durability of new product advantages with imitation. *Strategic Management Journal*, *21*(1), 23–30.

Lee, I. H. (1998). Market crashes and informational avalanches. *The Review of Economic Studies*, *65*(4), 741–759.

Lee, M.-C. (2009). Factors influencing the adoption of internet banking: An integration of TAM and TPB with perceived risk and perceived benefit. *Electronic Commerce Research and Applications*, *8*(3), 130–141.

Lee, P. M. (2001). What's in a name. com?: The effects of '. com'name changes on stock prices and trading activity. *Strategic Management Journal*, *22*(8), 793–804.

Lepetit, L., Nys, E., Rous, P., Tarazi, A. (2008). Bank income structure and risk: An empirical analysis of European banks. *Journal of Banking & Finance*, *32*(8), 1452–1467.

Lessambo, F. I. (2018). *Auditing, Assurance Services, and Forensics: A Comprehensive Approach*. New Britian, CT, USA: Springer.

Levin, S. G., Levin, S. L., Meisel, J. B. (1992). Market structure, uncertainty, and intrafirm diffusion: The case of optical scanners in grocery stores. *The Review of Economics and Statistics*, *74*(2), 345–350.

Levinthal, D. A., March, J. G. (1993). The myopia of learning. *Strategic Management Journal*, *14*(S2), 95–112.

Levis, M. (1993). The long-run performance of initial public offerings: The UK experience 1980-1988. *Financial Management*, *22*(1), 28–41.

Li, Y., Huang, J. (2012). Risk and return of IT investment: evidence from SCM and CRM announcements. *International Journal of Networking and Virtual Organisations*, *11*(3/4), 290–304.

Liang, Q., Miao, J., Li, D., Chen, Z. (2021). Does learning by observing matter for M&As? International evidence from the insurance industry. *Spanish Journal of Finance and Accounting*, *50*(2), 162–186.

Lieberman, M. B. (1987). The learning curve, diffusion, and competitive strategy. *Strategic Management Journal*, *8*(5), 441–452.

Lieberman, M. B. (2005). *Did first-mover advantage survive the dot-com crash* (Working Paper). Los Angeles, CA: Anderson School of Management, UCLA.

Lieberman, M. B., Montgomery, D. B. (1988). First-mover advantages. *Strategic Management Journal*, *9*(S1), 41–58.

Lilien, G. L., Yoon, E. (1990). The timing of competitive market entry: An exploratory study of new industrial products. *Management Science*, *36*(5), 568–585.

Lin, B.-W. (2007). Information technology capability and value creation: Evidence from the US banking industry. *Technology in Society*, *29*(1), 93–106.

Lin, M., Lucas, H. C., Bailey, J. (2011). *'Banking'on the Internet: Does Internet Banking Really Improve Bank Performance?* Tucson: University of Arizona.

Lin, Q. (2018). Do Welfare Distribution Methods Changing from Cash Payment to Digital Transfer Influence Drug Abuse Problem? Retrieved 20 June 2021, from http://giovanniperi.ucdavis.edu/uploads/5/6/8/2/56826033/qiuyun_final_paper.pdf

Lin, T.-Y., Yu, J., Lin, C.-Y. (2021). IPO's Long-Run Performance: Hot Market versus Earnings Management. *Journal of Risk and Financial Management*, *14*(3), 132.

Lippman, S. A., Rumelt, R. P. (1982). Uncertain imitability: An analysis of interfirm differences in efficiency under competition. *The Bell Journal of Economics*, *13*(2), 418–438.

Liu, B., Shilling, J. D., Sing, T. F. (2020). Large banks and efficient banks: how do they influence credit supply and default risk? *Journal of Financial Services Research*, *57*(1), 1–28.

Liu, D. Y., Chen, S. W., Chou, T. C. (2011). Resource fit in digital transformation: Lessons learned from the CBC Bank global e-banking project. *Management Decision*, *49*(10), 1728–1742. https://doi.org/10.1108/00251741111183852

Liu, W., Kolari, J. W., Tippens, T. K., Fraser, D. R. (2013). Did capital infusions enhance bank recovery from the great recession? *Journal of Banking & Finance*, *37*(12), 5048–5061.

Llorente, G., Michaely, R., Saar, G., Wang, J. (2002). Dynamic volume-return relation of individual stocks. *The Review of Financial Studies*, *15*(4), 1005–1047.

Loh, L., Venkatraman, N. (1992). *Stock market reaction to information technology outsourcing: An event study* (Working Paper No. 3499– 92BPS). Cambridge, Mass: School of Management.

López, L. E., Roberts, E. B. (2002). First-mover advantages in regimes of weak appropriability: the case of financial services innovations. *Journal of Business Research*, *55*(12), 997–1005.

Loughran, T. (1993). NYSE vs NASDAQ returns: Market microstructure or the poor performance of initial public offerings? *Journal of Financial Economics*, *33*(2), 241–260.

Loughran, T., Ritter, J. (1995). The new issues puzzle. *The Journal of Finance*, *50*(1), 23–51.

Lu, Y., Yang, S., Chau, P. Y. K., Cao, Y. (2011). Dynamics between the trust transfer process and intention to use mobile payment services: A cross-environment perspective. *Information & Management*, *48*(8), 393–403.

Lubatkin, M., Shrieves, R. E. (1986). Towards reconciliation of market performance measures to strategic management research. *Academy of Management Review*, *11*(3), 497–512.

Lunardi, G. L., Becker, J. L., Maçada, A. C. G., Dolci, P. C. (2014). The impact of adopting IT governance on financial performance: An empirical analysis among Brazilian firms. *International Journal of Accounting Information Systems*, *15*(1), 66–81.

Lüneborg, J. L., Nielsen, J. F. (2003). Customer-focused technology and performance in small and large banks. *European Management Journal*, *21*(2), 258–269.

Luo, Y. (2005). Do insiders learn from outsiders? Evidence from mergers and acquisitions. *The Journal of Finance*, *60*(4), 1951–1982.

MacKinlay, A. C. (1997). Event studies in economics and finance. *Journal of Economic Literature*, *35*(1), 13–39.

MacPherson, A. D. (1998). Academic-industry linkages and small firm innovation: evidence from the scientific instruments sector. *Entrepreneurship & Regional Development*, *10*(4), 261–276.

Mahajan, V., Srinivasan, R., Wind, J. (2002). The dot. com retail failures of 2000: were there any winners? *Journal of the Academy of Marketing Science*, *30*(4), 474–486.

Malkiel, B. G. (1989). Efficient market hypothesis. In J. Eatwell, M. Milgate, & P. Newman (Eds.), *Finance* (1st ed., pp. 127–134). London: Palgrave Macmillan.

Malkiel, B. G. (2003). The efficient market hypothesis and its critics. *Journal of Economic Perspectives*, *17*(1), 59–82.

Malmendier, U., Moretti, E., Peters, F. S. (2018). Winning by losing: evidence on the long-run effects of mergers. *The Review of Financial Studies*, *31*(8), 3212–3264.

Mann, B. J. S., Sahni, S. K. (2011). Inter-relationship of web site interactivity and customer outcomes: Building trust in Internet banking web site. *Global Business Review*, *12*(1), 99–115.

Mannering, F. L., Shankar, V., Bhat, C. R. (2016). Unobserved heterogeneity and the statistical analysis of highway accident data. *Analytic Methods in Accident Research*, *11*, 1–16. https://doi.org/https://doi.org/10.1016/j.amar.2016.04.001

Mascarenhas, B. (1992a). Order of entry and performance in international markets. *Strategic Management Journal*, *13*(7), 499–510.

Mascarenhas, B. (1992b). Research notes and communications first-mover effects in multiple dynamic markets. *Strategic Management Journal*, *13*(3), 237–243.

Masli, A., Richardson, V. J., Sanchez, J. M., Smith, R. E. (2011). Returns to IT excellence: Evidence from financial performance around information technology excellence awards. *International Journal of Accounting Information Systems*, *12*(3), 189–205.

Mat-Nor, F., Said, R. M., Hisham, M. (2006). Financial performance and efficiency changes of Malaysian banking institutions in mergers and acquisitions. *Banks and Bank Systems*, *1*(1), 102–108.

Mayur, M. (2018). Investor sentiment and IPO pricing: Market: Evidence from India. *Corp. Ownersh. Control*, *15*, 64–72.

Mbama, C. I., Ezepue, P. O. (2018). Digital banking, customer experience and bank financial performance: UK customers' perceptions. *International Journal of Bank Marketing*, *36*(2), 230–255.

McAlister, L., Sonnier, G., Shively, T. (2012). The relationship between online chatter and firm value. *Marketing Letters*, *23*(1), 1–12.

MCKinsey. (2019). Realizing M&A value creation in US banking and fintech: Nine steps for success. Retrieved 20 September 2021, from https://www.mckinsey.com/industries/financial-services/our-insights/banking-matters/realizing-m-and-a-value-creation-in-us-banking-and-fintech-nine-steps-for-success

McWilliams, A., Siegel, D. (1997). Event Studies in Management Research: Theoretical and Empirical Issues. *The Academy of Management Journal*, *40*(3), 626–657. https://doi.org/10.2307/257056

McWilliams, A., Siegel, D. (2000). Corporate social responsibility and financial performance: correlation or misspecification? *Strategic Management Journal*, *21*(5), 603–609.

Mei, B., Sun, C. (2007). Impact of mergers and acquisitions on the forest products industry: an event study of stock market returns. In D. G. Hodges (Ed.), *Emerging Issues in Forest Economics* (pp. 1–10). Knoxville, TN: The University of Tennessee, Natural Resource Policy Center.

Melville, N., Kraemer, K., Gurbaxani, V. (2004). Information technology and organizational performance: An integrative model of IT business value. *MIS Quarterly*, *28*(2), 283–322.

Mendenhall, S. (2019). *Financial Competition and Regulation since the Great Recession* (PhD Thesis). Virginia: George Mason University.

Meng, Z., Lee, S.-Y. T. (2007). The value of IT to firms in a developing country in the catch-up process: An empirical comparison of China and the United States. *Decision Support Systems*, *43*(3), 737–745.

Meziou, F. (1991). Areas of strength and weakness in the adoption of the marketing concept by small manufacturing firms. *Journal of Small Business Management*, *29*(4), 72–78.

Miner, A. S., Mezias, S. J. (1996). Ugly duckling no more: Pasts and futures of organizational learning research. *Organization Science*, *7*(1), 88–99.

Mishra, D. P., Bhabra, H. S. (2001). Assessing the economic worth of new product pre-announcement signals: Theory and empirical evidence. *Journal of Product & Brand Management*.

Mitchell, M. L., Stafford, E. (2000). Managerial Decisions and Long-Term Stock Price Performance. *The Journal of Business*, *73*(3), 287–329. https://doi.org/10.1086/209645

Moatti, V. (2009). Learning to expand or expanding to learn? The role of imitation and experience in the choice among several expansion modes. *European Management Journal*, *27*(1), 36–46.

Mols, N. P. (1998). The Internet and the banks' strategic distribution channel decisions. *Internet Research*, *8*(4), 331–337.

Momparler, A., Lassala, C., Ribeiro, D. (2013). Efficiency in banking services: a comparative analysis of Internet-primary and branching banks in the US. *Service Business*, *7*(4), 641–663.

Morris, J. J. (2011). Measuring the impact of enterprise resource planning (ERP) systems on shareholder value. *Review of Business Information Systems (RBIS)*, *15*(1), 31–40.

Moser, C., Saidi, F., Wirth, B. (2018). The effects of credit supply on wage inequality between and within firms. Retrieved 10 May 2021, from https://www.cbs.dk/files/cbs.dk/paper_farzad_saidi_0.pdf

Müller, O., Fay, M., Vom Brocke, J. (2018). The effect of big data and analytics on firm performance: An econometric analysis considering industry characteristics. *Journal of Management Information Systems*, *35*(2), 488–509.

Munoz-Leiva, F., Climent-Climent, S., Liébana-Cabanillas, F. (2017). Determinants of intention to use the mobile banking apps: An extension of the classic TAM model. *Spanish Journal of Marketing-ESIC*, *21*(1), 25–38.

Nadler, D. A., Tushman, M. L. (1980). A model for diagnosing organizational behaviour. *Organizational Dynamics*, *9*(2), 35–51.

Nadler, D. A., Tushman, M. L. (1997). *Competing by design: The power of organizational architecture*. New York and Oxford: Oxford University Press.

Naldi, L., Davidsson, P. (2014). Entrepreneurial growth: The role of international knowledge acquisition as moderated by firm age. *Journal of Business Venturing*, *29*(5), 687–703.

Nam, H.-J., An, Y. (2018). The effect of interlocking directors network on firm value and performance: evidence from Korean-listed firms. *Global Economic Review*, *47*(2), 151–173.

Nath, R., Schrick, P., Parzinger, M. (2001). Bankers' perspectives on Internet banking. *E-Service*, *1*(1), 21–36.

National Quality Research Center, University of Michigan, B. S., American Society. (1995). *The American customer satisfaction index (ACSI) methodology report*. Milwaukee, WI: American Society for Quality Control.

Nätti, S., Lähteenmäki, I. (2016). The evolution of market orientation in Finnish retail banking–from regulation to value creation. *Management & Organizational History*, *11*(1), 28–47.

Neill, J. D., Pfeiffer, G. M., Young-Ybarra, C. E. (2001). Technology R&D alliances and firm value. *The Journal of High Technology Management Research*, *12*(2), 227–237.

Neill, S., McKee, D., Rose, G. M. (2007). Developing the organization's sensemaking capability: Precursor to an adaptive strategic marketing response. *Industrial Marketing Management*, *36*(6), 731–744. https://doi.org/https://doi.org/10.1016/j.indmarman.2006.05.008

Ngai, E. W. T., Chau, D. C. K., Chan, T. L. A. (2011). Information technology, operational, and management competencies for supply chain agility: Findings from case studies. *The Journal of Strategic Information Systems*, *20*(3), 232–249.

Nicolaou, A. I. (2004). Firm performance effects in relation to the implementation and use of enterprise resource planning systems. *Journal of Information Systems*, *18*(2), 79–105.

Nielsen, B. B. (2005). The role of knowledge embeddedness in the creation of synergies in strategic alliances. *Journal of Business Research*, *58*(9), 1194–1204.

Nirala, C., Pandey, S. B. B. (2015). Customer Perception on Mobile-Banking in Chhattisgarh. *International Journal of Engineering and Management Research (IJEMR)*, *5*(2), 729–737.

Nonaka, I., Takeuchi, H. (1995). *The knowledge-creating company: How Japanese companies create the dynamics of innovation*. New York: Oxford university press.

Nooteboom, B. (1994). Innovation and diffusion in small firms: theory and evidence. *Small Business Economics*, *6*(5), 327–347.

Nooteboom, B., Vanhaverbeke, W., Duysters, G., Gilsing, V. A., van den Oord, A. (2006). Optimal cognitive distance and absorptive capacity. *Research Policy*, *36*(7), 1016–1034.

Nor, M. K., Pearson, J. M., Ahmad, A. (2010). Adoption of internet banking theory of the diffusion of innovation. *International Journal of Management Studies (IJMS)*, *17*(1), 69–85.

Nordhaug, O. (1993). *Human capital in organizations: Competence, training, and learning*. Oslo/London: Scandanavian University Press/Oxford University Press.

O'Cass, A., Heirati, N., Ngo, L. V. (2014). Achieving new product success via the synchronization of exploration and exploitation across multiple levels and functional areas. *Industrial Marketing Management*, *43*(5), 862–872.

OCC. (2000). *Summary Results of OCC's Internet Banking Questionnaire*. Retrieved from https://www.occ.treas.gov/news-issuances/news-releases/2000/nr-occ-2000-84a.pdf

OCC. (2001). *Interpretive Letter #928*. Washington, D.C. Retrieved from https://www.occ.gov/topics/charters-and-licensing/interpretations-and-actions/2002/int928.pdf

OCC. (2019). *Licensing Manual: Charters*. Retrieved from https://www.occ.gov/publications-and-resources/publications/comptrollers-licensing-manual/files/licensing-booklet-charters.html

Ofek, E., Richardson, M. (2003). Dotcom mania: The rise and fall of internet stock prices. *The Journal of Finance*, *58*(3), 1113–1137.

Ofek, E., Sarvary, M. (2001). Leveraging the customer base: Creating competitive advantage through knowledge management. *Management Science*, *47*(11), 1441–1456.

Oh, L.-B., Leong, Y.-X., Teo, H.-H. (2007). A model of IT-enabled organizational integration and sustained competitive advantage. In *BLED 2007 Proceedings* (pp. 838–851).

Olavarrieta, S., Friedmann, R. (1999). Market-oriented culture, knowledge-related resources, reputational assets and superior performance: a conceptual framework. *Journal of Strategic Marketing*, *7*(4), 215–228.

Oliveira, D. D. L., Lipke, F. A., Silva, S. R. F. (2016). Internet banking capabilities and performance of small business: The IT business value from the perspective of external capabilities. *BASE Revista de Administracao e Contabilidade Da UNISINOS*, *13*(4), 265–278.

Oliveira, P., Roth, A. V, Gilland, W. (2002). Achieving competitive capabilities in e-services. *Technological Forecasting and Social Change*, *69*(7), 721–739.

Oliveira, T., Martins, M. F. (2011). Literature review of information technology adoption models at firm level. *Electronic Journal of Information Systems Evaluation*, *14*(1), 110–121.

Otchere, I. (2005). Do privatized banks in middle-and low-income countries perform better than rival banks? An intra-industry analysis of bank privatization. *Journal of Banking & Finance*, *29*(8–9), 2067–2093.

Ouchi, W. G., Cuchi, W. G. (1981). *Theory Z: How American business can meet the Japanese challenge* (Vol. 13). Reading, MA: Addison-Wesley.

Pagani, M. (2013). Digital business strategy and value creation: framing the dynamic cycle of control points. *Mis Quarterly*, *37*(2), 617–632.

Parida, V., Örtqvist, D. (2015). Interactive Effects of Network Capability, ICT Capability, and Financial Slack on Technology-Based Small Firm Innovation Performance. *Journal of Small Business Management*, *53*(1), 278–298. https://doi.org/10.1111/jsbm.12191

Park, N. K., Mezias, J. M. (2005). Before and after the technology sector crash: The effect of environmental munificence on stock market response to alliances of e-commerce firms. *Strategic Management Journal*, *26*(11), 987–1007.

Peak, D. A., Windsor, J. C., James, C. (2002). Risks and effects of IS/IT outsourcing: a securities market assessment. *Journal of Information Technology Case and Application Research*, *4*(1), 6–33.

Penrose, E. (1955). Limits to the Growth and Size of Firms. *The American Economic Review*, *45*(2), 531–543.

Penrose, E. (2009). *The Theory of the Growth of the Firm* (4th ed.). Oxford: Oxford university press.

Peter, J. P., Ryan, M. J. (1976). An investigation of perceived risk at the brand level.

Journal of Marketing Research, *13*(2), 184–188.
Peteraf, M. A. (1993). The cornerstones of competitive advantage: a resource-based view. *Strategic Management Journal*, *14*(3), 179–191.
Peters, T. J., Waterman, R. H., Jones, I. (1982). *In search of excellence: Lessons from America's best-run companies*. New York: Harper & Row.
Petersen, M. A., Rajan, R. G. (2002). Does distance still matter? The information revolution in small business lending. *The Journal of Finance*, *57*(6), 2533–2570.
Pigni, F., Ravarini, A., Tagliavini, M., Vitari, C. (2002). Bank strategies and the internet: an interpretation of the banking industry based on the Italian retail market. *Journal of Information Technology Case and Application Research*, *4*(3), 8–37.
Pikkarainen, T., Pikkarainen, K., Karjaluoto, H., Pahnila, S. (2004). Consumer acceptance of online banking: an extension of the technology acceptance model. *Internet Research*, *14*(3), 224–235.
Polanyi, M. (1966). *The tacit dimension*. London: Routledge & Kegan Paul.
Poletti, M., Ling, H., Brian, E. (2008). An Empirical Study of Launch Order Valuation Based upon Stock Market Reaction. *Marketing Management Journal*, *18*(1), 1–13.
Popa, S., Soto-Acosta, P., Perez-Gonzalez, D. (2018). An investigation of the effect of electronic business on financial performance of Spanish manufacturing SMEs. *Technological Forecasting and Social Change*, *136*, 355–362.
Porter, M. E. (1981). The contributions of industrial organization to strategic management. *Academy of Management Review*, *6*(4), 609–620.
Porter, M. E. (1990). Why are firms successful. In *Fundamental Issues in Strategy Conference*. Napa, CA.
Powell, T. C., Dent-Micallef, A. (1997). Information technology as competitive advantage: The role of human, business, and technology resources. *Strategic Management Journal*, *18*(5), 375–405.
Prahalad, C. K., Hamel, G. (1997). The core competence of the corporation. In D. Hahn & B. Taylor (Eds.), *Strategische Unternehmungsplanung* (pp. 969–987). Berlin, Heidelberg: Springer.
Premkumar, G. (2003). A meta-analysis of research on information technology implementation in small business. *Journal of Organizational Computing and Electronic Commerce*, *13*(2), 91–121.
Püschel, J., Afonso Mazzon, J., Mauro C. Hernandez, J. (2010). Mobile banking:

proposition of an integrated adoption intention framework. *International Journal of Bank Marketing*, *28*(5), 389–409.

Putri, W. H., Nurwiyanta, N., Sungkono, S., Wahyuningsih, T. (2019). The emerging fintech and financial slack on corporate financial performance. *Investment Management & Financial Innovations*, *16*(2), 348–354.

Quah, P., Young, S. (2005). Post-acquisition Management:: A Phases Approach for Cross-border M&As. *European Management Journal*, *23*(1), 65–75.

Rai, A., Patnayakuni, R., Seth, N. (2006). Firm performance impacts of digitally enabled supply chain integration capabilities. *MIS Quarterly*, *30*(2), 225–246.

Rajan, R., Servaes, H. (1997). Analyst following of initial public offerings. *The Journal of Finance*, *52*(2), 507–529.

Rakowski, D., Shirley, S. E., Stark, J. R. (2021). Twitter activity, investor attention, and the diffusion of information. *Financial Management*, *50*(1), 3–46.

Rappaport, A. (1999). *Creating shareholder value: a guide for managers and investors*. New York: The Free Press.

Reed, R., DeFillippi, R. J. (1990). Causal ambiguity, barriers to imitation, and sustainable competitive advantage. *Academy of Management Review*, *15*(1), 88–102.

Regehr, K., Sengupta, R. (2016). Has the relationship between bank size and profitability changed? *Economic Review*, *101*(2), 49–72.

Reibstein, D. J. (2002). What attracts customers to online stores, and what keeps them coming back? *Journal of the Academy of Marketing Science*, *30*(4), 465–473.

Reichheld, F. F., Sasser, W. E. (1990). Zero defeofions: Quoliiy comes to services. *Harvard Business Review*, *68*(5), 105–111.

Reimann, B. C. (1987). Stock Price and Business Success: What is the relationship? *Journal of Business Strategy*, *8*, 38–49.

Reinganum, M. R. (1981). Misspecification of capital asset pricing: Empirical anomalies based on earnings' yields and market values. *Journal of Financial Economics*, *9*(1), 19–46.

Reinganum, M. R. (1983). The anomalous stock market behaviour of small firms in January: Empirical tests for tax-loss selling effects. *Journal of Financial Economics*, *12*(1), 89–104.

Reinganum, M. R., Smith, J. K. (1983). Investor preference for large firms: new evidence on economies of size. *The Journal of Industrial Economics*, *32*(2), 213–227.

Rhoades, S. A. (2000). *Bank mergers and banking structure in the United States, 1980-98* (Staff Study 174). Washington, DC: Board of Governors of the Federal Reserve System (US).

Rhyne, L. C. (1986). The relationship of strategic planning to financial performance. *Strategic Management Journal*, *7*(5), 423–436.

Riedl, C., Seidel, V. P. (2018). Learning from mixed signals in online innovation communities. *Organization Science*, *29*(6), 1010–1032.

Ritter, J. R. (1984). The" hot issue" market of 1980. *Journal of Business*, *57*(2), 215–240.

Ritter, J. R. (1991). The long-run performance of initial public offerings. *The Journal of Finance*, *46*(1), 3–27.

Riziki, M. (2015). *Bank Charges and Performance of Commercial Banks in Tanzania* (University of Dar es Salaam Business School Working Paper).

Roberts, M. R., Whited, T. M. (2013). Endogeneity in empirical corporate finance. In G. Constantinides, R. Stulz, & M. Harris (Eds.), *Handbook of the Economics of Finance* (Vol. 2, pp. 493–572). Amsterdam: Elsevier.

Rohleder, M., Scholz, H., Wilkens, M. (2011). Survivorship bias and mutual fund performance: Relevance, significance, and methodical differences. *Review of Finance*, *15*(2), 441–474.

Roll, R. (1983). On computing mean returns and the small firm premium. *Journal of Financial Economics*, *12*(3), 371–386.

Rosati, P., Cummins, M., Deeney, P., Gogolin, F., van der Werff, L., Lynn, T. (2017). The effect of data breach announcements beyond the stock price: Empirical evidence on market activity. *International Review of Financial Analysis*, *49*, 146–154.

Rosen, R. J. (1991). Research and development with asymmetric firm sizes. *The RAND Journal of Economics*, *22*(3), 411–429.

Rothwell, R., Dodgson, M. (1994). Innovation and size of firm. In M. Dodgson & R. Rothwell (Eds.), *The handbook of industrial innovation* (Vol. 324). Cornwall: Edward Elgar Cheltenham.

Rouwenhorst, K. G. (1998). International momentum strategies. *The Journal of Finance*, *53*(1), 267–284.

Roy, S. K., Balaji, M. S., Kesharwani, A., Sekhon, H. (2017). Predicting Internet banking adoption in India: A perceived risk perspective. *Journal of Strategic Marketing*, *25*(5–6), 418–438.

Roztocki, N., Weistroffer, H. R. (2011). Event studies in information systems research: past, present and future. In *ECIS 2011 Proceedings* (p. 235).

Ruivo, P., Mestre, A., Johansson, B., Oliveira, T. (2014). Defining the ERP and CRM integrative value. *Procedia Technology*, *16*, 704–709.

Rumelt, R. P. (1984). Toward a Strategic Theory of the Firm. Resources Firms and Strategic. Editado por Nicolai J. Foss. *Competitive Strategic Management*, *26*(3), 556–570.

Rumelt, R. P., Lamb, R. (1984). Competitive strategic management. *Toward a Strategic Theory of the Firm*, *26*(1), 556–570.

Rumelt, R. P., Lamb, R. (1997). Towards a strategic theory of the firm. In *Resources, firms, and strategies: A reader in the resource-based perspective* (pp. 131–145). Oxford: Oxford University Press.

Ryan, P., Taffler, R. J. (2006). Do brokerage houses add value? The market impact of UK sell-side analyst recommendation changes. *The British Accounting Review*, *38*(4), 371–386. https://doi.org/https://doi.org/10.1016/j.bar.2006.07.015

Sabherwal, R., Jeyaraj, A. (2015). Information Technology Impacts on Firm Performance: An Extension of Kohli and Devaraj (2003). *MIS Quarterly*, *39*(4), 809–836.

Sabherwal, R., Sabherwal, S. (2005). Knowledge management using information technology: Determinants of short-term impact on firm value. *Decision Sciences*, *36*(4), 531–567.

Saksonova, S. (2014). The role of net interest margin in improving banks' asset structure and assessing the stability and efficiency of their operations. *Procedia-Social and Behavioural Sciences*, *150*, 132–141.

Samuelson, P. A. (2016). Proof that properly anticipated prices fluctuate randomly. In *The World Scientific Handbook of Futures Markets* (pp. 25–38). New Jersey: World Scientific.

Sarkar, S. K., de Jong, P. J. (2006). Market response to FDA announcements. *The Quarterly Review of Economics and Finance*, *46*(4), 586–597.

Savor, P. G., Lu, Q. (2009). Do Stock Mergers Create Value for Acquirers? *The Journal of Finance*, *64*(3), 1061–1097. Retrieved from http://www.jstor.org.ezproxy.bangor.ac.uk/stable/20487996

Scherer, F. M., Ross, D. (1990). *Industrial market structure and economic performance* (3rd ed.). Boston: Houghton Mifflin.

Schneider, B., Hanges, P. J., Smith, D. B., Salvaggio, A. N. (2003). Which comes first: employee attitudes or organizational financial and market performance? *Journal of Applied Psychology*, *88*(5), 836–851.

Schultz, P. (1983). Transaction costs and the small firm effect: A comment. *Journal of Financial Economics*, *12*(1), 81–88.

Scott, S. V, Van Reenen, J., Zachariadis, M. (2017). The long-term effect of digital innovation on bank performance: An empirical study of SWIFT adoption in financial services. *Research Policy*, *46*(5), 984–1004.

Sears, J., Hoetker, G. (2014). Technological overlap, technological capabilities, and resource recombination in technological acquisitions. *Strategic Management Journal*, *35*(1), 48–67.

Sehgal, S., Singh, B. (2008). Determinants of initial and long-run performance of IPOs in Indian stock market. *Asia Pacific Business Review*, *4*(4), 24–37.

Servion. (2018). What Makes Emerging Technologies The Future Of Customer Experience? Retrieved 1 October 2020, from https://servion.com/blog/what-emerging-technologies-future-customer-experience/

Setia, P., Setia, M., Krishnan, R., Sambamurthy, V. (2011). The effects of the assimilation and use of IT applications on financial performance in healthcare organizations. *Journal of the Association for Information Systems*, *12*(3), 274–298.

Setia, P., Setia, P., Venkatesh, V., Joglekar, S. (2013). Leveraging digital technologies: How information quality leads to localized capabilities and customer service performance. *MIS Quarterly*, *37*(2), 565–590.

Shaikh, A. A., Karjaluoto, H. (2015). Mobile banking adoption: A literature review. *Telematics and Informatics*, *32*(1), 129–142.

Shane, S. (2000). Prior knowledge and the discovery of entrepreneurial opportunities. *Organization Science*, *11*(4), 448–469.

Shankar, V., Smith, A. K., Rangaswamy, A. (2003). Customer satisfaction and loyalty in online and offline environments. *International Journal of Research in Marketing*, *20*(2), 153–175.

Shefrin, H. (2002). *Beyond greed and fear: Understanding behavioural finance and the psychology of investing*. Cambridge, MA: Oxford University Press.

Sheng, M. L. (2017). A dynamic capabilities-based framework of organizational sensemaking through combinative capabilities towards exploratory and exploitative product innovation in turbulent environments. *Industrial Marketing Management*, *65*, 28–38.

Shrestha, S. S., Goetz, S. J., Rupasingha, A. (2007). Proprietorship formations and US job growth. *Review of Regional Studies*, *37*(2), 146–168.

Sia, S. K., Soh, C., Weill, P. (2016). How DBS Bank Pursued a Digital Business Strategy. *MIS Quarterly Executive*, *15*(2), 105–121.

Simmonds, P. G. (1990). The combined diversification breadth and mode dimensions and the performance of large diversified firms. *Strategic Management Journal*, *11*(5), 399–410.

Simpson, W. G., Kohers, T. (2002). The link between corporate social and financial performance: Evidence from the banking industry. *Journal of Business Ethics*, *35*(2), 97–109.

Singh, H., Zollo, M. (1999). *Post-acquisition strategies, integration capability, and the economic performance of corporate acquisitions* (INSEAD Working Paper Series No. 99/42/SM). INSEAD.

Singhania, K., Girish, G. P. (2015). Impact of macroeconomic events on shanghai stock exchange. *Asian Journal of Empirical Research*, *5*(6), 64–76.

Sirmon, D. G., Hitt, M. A., Ireland, R. D. (2007). Managing firm resources in dynamic environments to create value: Looking inside the black box. *Academy of Management Review*, *32*(1), 273–292.

Slade, E. L., Dwivedi, Y. K., Piercy, N. C., Williams, M. D. (2015). Modeling consumers' adoption intentions of remote mobile payments in the United Kingdom: extending UTAUT with innovativeness, risk, and trust. *Psychology & Marketing*, *32*(8), 860–873.

Slater, S. F., Narver, J. C. (1995). Market orientation and the learning organization. *Journal of Marketing*, *59*(3), 63–74.

Slevin, D. P., Covin, J. G. (1997). Strategy formation patterns, performance, and the significance of context. *Journal of Management*, *23*(2), 189–209.

Slovin, M. B., Johnson, S. A., Glascock, J. L. (1992). Firm size and the information content of bank loan announcements. *Journal of Banking & Finance*, *16*(6), 1057–1071.

Smith, C. W. (1977). Alternative methods for raising capital: Rights versus underwritten offerings. *Journal of Financial Economics*, *5*(3), 273–307. https://doi.org/10.1016/0304-405X(77)90040-X

Smith, K. G., Grimm, C. M., Gannon, M. J., Chen, M.-J. (1991). Organizational information processing, competitive responses, and performance in the US domestic airline industry. *Academy of Management Journal*, *34*(1), 60–85.

Song, H., Zhao, C., Zeng, J. (2017). Can environmental management improve financial performance: An empirical study of A-shares listed companies in China. *Journal of Cleaner Production*, *141*, 1051–1056.

Sood, A., Tellis, G. J. (2009). Do innovations really pay off? Total stock market returns to innovation. *Marketing Science*, *28*(3), 442–456.

Spence, M. (1978). Job market signaling. In *Uncertainty in Economics* (pp. 281–306). Cambridge: Harvard University Press.

Spence, M. (2002). Signaling in retrospect and the informational structure of markets. *American Economic Review*, *92*(3), 434–459.

Spender, J., Grant, R. M. (1996). Knowledge and the firm: overview. *Strategic Management Journal*, *17*(S2), 5–9.

Spiess, D. K., Affleck-Graves, J. (1995). Underperformance in long-run stock returns following seasoned equity offerings. *Journal of Financial Economics*, *38*(3), 243–267.

Srivastav, A., Armitage, S., Hagendorff, J., King, T. (2018). Better safe than sorry? CEO inside debt and risk-taking in bank acquisitions. *Journal of Financial Stability*, *36*, 208–224.

Srivastava, R. K., Fahey, L., Christensen, H. K. (2001). The resource-based view and marketing: The role of market-based assets in gaining competitive advantage. *Journal of Management*, *27*(6), 777–802.

Statista. (2020). Apple iPhone sales revenue 2007-2020. Retrieved 1 January 2020, from https://www.statista.com/statistics/263402/apples-iphone-revenue-since-3rd-quarter-2007/

Statista. (2021). Apple's iPhone revenue from 3rd quarter 2007 to 3rd quarter 2021. Retrieved 1 September 2021, from https://www.statista.com/statistics/263402/apples-iphone-revenue-since-3rd-quarter-2007/

Sternal, M., Schiereck, D. (2019). *Do Digital Giants Create Value by Mergers and Acquisitions?* (Working Paper). Darmstad: Darmstadt Technical University, Institute for Business Studies (BWL) 117126, Darmstadt Technical University, Department of Business Administration, Economics and Law, Institute for Business Studies (BWL).

Stiroh, K. J., Strahan, P. E. (2003). Competitive dynamics of deregulation: Evidence from US banking. *Journal of Money, Credit and Banking*, *35*(5), 801–828.

Stoll, H. R., Whaley, R. E. (1983). Transaction costs and the small firm effect. *Journal of Financial Economics*, *12*(1), 57–79.

Strader, T. J., Hendrickson, A. R. (2001). Introduction to the special section on marketing and consumer behaviour in electronic markets. *E-Service Journal*, *1*(1), 37–39.

Stulz, R. M. (2019). Fintech, bigtech, and the future of banks. *Journal of Applied Corporate Finance*, *31*(4), 86–97.

Su, C., Bangassa, K. (2011). The impact of underwriter reputation on initial returns and long-run performance of Chinese IPOs. *Journal of International Financial Markets, Institutions and Money*, *21*(5), 760–791.

Suarez, F., Lanzolla, G. (2005). The half-truth of first-mover advantage. *Harvard Business Review*, *83*(4), 121–127.

Subramani, M., Walden, E. (2002). *Employing the event study to assess returns to firms from novel information technologies: An examination of e-commerce initiative announcements*. Minneapolis: University of Minnesota.

Sudha, S. (2020). Corporate environmental performance–financial performance relationship in India using eco-efficiency metrics. *Management of Environmental Quality Journal*, *31*(6), 1497–1514.

Suganthi, B. (2001). Internet banking patronage: an empirical investigation of Malaysia. *Journal of Internet Banking and Commerce*, *6*(1).

Sullivan, R. J. (2000). How has the adoption of internet banking affected performance and risk in banks? *Financial Industry Perspectives*, *12*(1), 1–16.

Sullivan, R. J., Wang, Z. (2013). *Internet banking: an exploration in technology diffusion and impact* (FRB Richmond Working Paper No. 13–10). Richmond: Federal Reserve Bank of Richmond.

Swacha-Lech, M. (2017). The main challenges facing the retail banking industry in the era of digitalisation. *Journal of Insurance, Financial Markets and Consumer Protection*, *4*(26), 94–116.

Switzer, L. N., Cao, Y. (2011). Shareholder interests vs board of director members' interests and company performance: A new look. *Review of Accounting and*

Finance, *10*(3), 228–245.

Szutowski, D. (2018). Market reaction to open innovation announcements. *European Journal of Innovation Management*, *21*(1), 142–156.

Szutowski, D. (2019). Innovation source, advancement stage and company stock returns. *The Service Industries Journal*, *39*(13–14), 925–942.

Tanda, A., Schena, C.-M. (2019). Bank Strategies in the Light of the Digitalisation of Financial Activities. In Philip (Ed.), *FinTech, BigTech and Banks* (pp. 51–81). New York: Palgrave Pivot, Cham.

Tarullo, D. K. (2019). Financial regulation: Still unsettled a decade after the crisis. *Journal of Economic Perspectives*, *33*(1), 61–80.

Taylor, I. (2012). Good things come in small packages. *Superfunds Magazine*, (374), s14–s15.

Teece, D. J. (1988). Capturing value from technological innovation: Integration, strategic partnering, and licensing decisions. *Interfaces*, *18*(3), 46–61.

Teece, D. J., Pisano, G., Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, *18*(7), 509–533.

Telang, R., Wattal, S. (2005). Impact of software vulnerability announcements on the market value of software vendors-an empirical investigation. *IEEE Transactions on Software Engineering*, *33*, 544–557.

Terlaak, A., Gong, Y. (2008). Vicarious learning and inferential accuracy in adoption processes. *Academy of Management Review*, *33*(4), 846–868.

Thakor, A. V. (2020). Fintech and banking: What do we know? *Journal of Financial Intermediation*, *21*, 1–12.

Thakur, R., Srivastava, M. (2014). Adoption readiness, personal innovativeness, perceived risk and usage intention across customer groups for mobile payment services in India. *Internet Research*, *24*(3), 369–392.

Thanos, I. C., Papadakis, V. M. (2012). The use of accounting-based measures in measuring M&A performance: a review of five decades of research. In L. Cooper, C. & S. Finkelstein (Eds.), *Advances in mergers and acquisitions* (pp. 103–120). West Yorkshire, England: Emerald Group Publishing Limited.

Thavalengal, S., Corcoran, P. (2016). User authentication on smartphones: Focusing on iris biometrics. *IEEE Consumer Electronics Magazine*, *5*(2), 87–93.

Tian, J., Wang, K., Chen, Y., Johansson, B. (2010). From IT deployment capabilities to competitive advantage: An exploratory study in China. *Information Systems Frontiers*, *12*(3), 239–255.

Timmermann, A., Granger, C. W. J. (2004). Efficient market hypothesis and forecasting. *International Journal of Forecasting*, *20*(1), 15–27.

Topf, J. M., Hiremath, S. (2019). Got CKD? There's an app for that! *Clinical Journal of the American Society of Nephrology*, *14*(4), 491–492.

Tregenna, F. (2009). The fat years: the structure and profitability of the US banking sector in the pre-crisis period. *Cambridge Journal of Economics*, *33*(4), 609–632.

Tricker, R. I. B., Tricker, R. I. (2015). *Corporate governance: Principles, policies, and practices*. USA: Oxford University Press.

Trinks, A., Mulder, M., Scholtens, B. (2020). An efficiency perspective on carbon emissions and financial performance. *Ecological Economics*, *175*, 1–12.

Tufano, P. (1989). Financial innovation and first-mover advantages. *Journal of Financial Economics*, *25*(2), 213–240.

U.S. Department of Justice. (2018). Herfindahl-Hirschman Index. Retrieved 20 September 2021, from https://www.justice.gov/atr/herfindahl-hirschman-index

Uddin, S. M. S., Suzuki, Y. (2014). The impact of competition on bank performance in Bangladesh: an empirical study. *International Journal of Financial Services Management 2*, *7*(1), 73–94.

Unsal, O., Hassan, M. K., Hippler, W. (2017). *Lobbying in Finance Industry: Evidence from US Banking System*. Terre Haute: Networks Financial Institute, Indiana State University.

Urban, G. L., Carter, T., Gaskin, S., Mucha, Z. (1986). Market share rewards to pioneering brands: An empirical analysis and strategic implications. *Management Science*, *32*(6), 645–659.

Utterback, J. (1994). *Mastering the dynamics of innovation: How companies can seize opportunities in the face of technological change*. Cambridge, MA: Harvard Business School Press.

Varadarajan, R. (2020). Customer information resources advantage, marketing strategy and business performance: A market resources based view. *Industrial Marketing Management*, *89*, 89–97.

Venkatraman, S., Delpachitra, I. (2008). Biometrics in banking security: a case study. *Information Management & Computer Security*, *16*(4), 415–430.

Veronesi, P. (1999). Stock market overreactions to bad news in good times: a rational expectations equilibrium model. *The Review of Financial Studies*, *12*(5), 975–1007.

Vithessonthi, C., Racela, O. C. (2016). Short-and long-run effects of internationalization and R&D intensity on firm performance. *Journal of Multinational Financial Management*, *34*, 28–45.

Vives, X. (2016). *Competition and stability in banking: The role of regulation and competition policy*. Princeton, NJ: Princeton University Press.

Vives, X. (2017). The impact of FinTech on banking. *European Economy*, (2), 97–105.

Vives, X. (2019). Competition and stability in modern banking: A post-crisis perspective. *International Journal of Industrial Organization*, *64*, 55–69.

Vossen, R. W. (1998). *Combining small and large firm advantages in innovation: Theory and examples* (SOM Research Report No. 98B21). Research School Systems Organisation and Management.

Wade, M., Hulland, J. (2004). The resource-based view and information systems research: Review, extension, and suggestions for future research. *MIS Quarterly*, *28*(1), 107–142.

Wadesango, N., Magaya, B. (2020). The impact of digital banking services on performance of commercial banks. *Journal of Management Information and Decision Sciences*, *23*, 343–353.

Walden, E., Browne, G. J. (2008). Rational fads in investor reactions to electronic commerce announcements: An explanation of the Internet bubble. *Electronic Commerce Research and Applications*, *7*(1), 44–54.

Walker, E. W., Petty, J. W. (1978). Financial differences between large and small firms. *Financial Management*, *7*(4), 61–68.

Wang, F., Yan, X., Zheng, L. (2021). Time-series and cross-sectional momentum in anomaly returns. *European Financial Management*, *27*(4), 736–771.

Wang, T., Wang, Y., McLeod, A. (2018). Do health information technology investments impact hospital financial performance and productivity? *International Journal of Accounting Information Systems*, *28*, 1–13.

Wardhani, P. P. C. (2019). The Signalling of Sustainability Reporting Award in Indonesia and Its Effects on Financial Performance and Firm Value. *International Journal of Innovation, Creativity and Change*, *9*(8), 14–32.

Weekenborg, M. (2018). *Rational partisan theory and other partisan effects in the EU:*

an event study (Bachelor Dissertation). Rotterdam: Erasmus University Rotterdam.

Weigelt, C., Sarkar, M. B. (2012). Performance implications of outsourcing for technological innovations: managing the efficiency and adaptability trade-off. *Strategic Management Journal*, *33*(2), 189–216.

Weiss, H. M. (1990). Learning theory and industrial and organizational psychology. In M. D. Dunnette & Hough L. M. (Eds.), *Handbook of industrial and organizational psychology* (2nd ed.). Palo Alto, CA: Consulting Psychologists Press.

Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic Management Journal*, *5*(2), 171–180.

Williams, M. (2019). Are we the dumbest devices in the room? *News Weekly*, *3053*, 13–26.

Williamson, O. E. (1979). Transaction-cost economics: the governance of contractual relations. *The Journal of Law and Economics*, *22*(2), 233–261.

Wilson, P. W. (2018). US banking in the post-crisis era: New results from new methods. In *North American Productivity Workshop* (pp. 233–264). Miami, FL: Springer.

Winarno, W. A., Tjahjadi, B., Irwanto, A. (2021). Time Lag Effects of IT Investment on Firm Performance: Evidence form Indonesia. *Jurnal Ekonomi Malaysia*, *55*(3), 89–101.

Winkelmann, R. (2008). Unobserved Heterogeneity. In R. Winkelmann (Ed.), *Econometric Analysis of Count Data* (5th ed., pp. 127–142). Berlin, Heidelberg: Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-540-78389-3_4

Winter, S. G. (1995). Four Rs of profitability: rents, resources, routines, and replication. In M. C.A. (Ed.), *Resource-based and evolutionary theories of the firm: Towards a synthesis* (pp. 147–178). Boston, MA: Springer.

Womack, K. L. (1996). Do brokerage analysts' recommendations have investment value? *The Journal of Finance*, *51*(1), 137–167.

Wright, P. M., Snell, S. A. (1998). Toward a unifying framework for exploring fit and flexibility in strategic human resource management. *Academy of Management Review*, *23*(4), 756–772.

Wyman, O. (2020). When Vision and Value Collide. Retrieved 1 September 2020, from https://www.oliverwyman.com/content/dam/oliver-wyman/v2/publications/2020/January/Oliver-Wyman-State-of-the-Financial-Services-Industry-2020.pdf

Xia, Y., Singhal, V. R., Peter Zhang, G. (2016). Product design awards and the market value of the firm. *Production and Operations Management*, *25*(6), 1038–1055.

Xu, J. (David), Benbasat, I., Cenfetelli, R. T. (2013). Integrating Service Quality with System and Information Quality: An Empirical Test in the E-Service Context. *MIS Quarterly*, *37*(3), 777–794. Retrieved from http://www.jstor.org/stable/43825999

Xue, M., Hitt, L. M., Chen, P. (2011). Determinants and outcomes of internet banking adoption. *Management Science*, *57*(2), 291–307.

Xue, M., Hitt, L. M., Harker, P. T. (2007). Customer efficiency, channel usage, and firm performance in retail banking. *Manufacturing & Service Operations Management*, *9*(4), 535–558.

Yang, H.-D., Lee, J., Park, C., Lee, K. (2014). The adoption of mobile self-service technologies: Effects of availability in alternative media and trust on the relative importance of perceived usefulness and ease of use. *International Journal of Smart Home*, *8*(4), 165–178.

Yao, L. J., Liu, C., Chan, S. H. (2010). The influence of firm specific context on realizing information technology business value in manufacturing industry. *International Journal of Accounting Information Systems*, *11*(4), 353–362.

Yu, F., Wang, L., Li, X. (2020). The effects of government subsidies on new energy vehicle enterprises: The moderating role of intelligent transformation. *Energy Policy*, *141*, 1–8.

Zach, F. J., Nicolau, J. L., Sharma, A. (2020). Disruptive innovation, innovation adoption and incumbent market value: The case of Airbnb. *Annals of Tourism Research*, *80*, 1–12. https://doi.org/https://doi.org/10.1016/j.annals.2019.102818

Zachariadis, M., Ozcan, P. (2017). *The API economy and digital transformation in financial services: The case of open banking* (SWIFT Institute Working Paper No. 2016– 001). SWIFT Institute.

Zantout, Z., Chaganti, R. (1996). New product introductions, shareholders' wealth, and first-mover advantages. *Journal of Financial and Strategic Decisions*, *9*(3), 49–61.

Zantout, Z., Tsetsekos, G. P. (1994). The wealth effects of announcements of R&D expenditure increases. *Journal of Financial Research*, *17*(2), 205–216.

Zenger, T. R. (1994). Explaining organizational diseconomies of scale in R&D: Agency problems and the allocation of engineering talent, ideas, and effort by firm size.

Management Science, *40*(6), 708–729.
Zhou, T. (2011). Examining the critical success factors of mobile website adoption. *Online Information Review*, *35*(4), 636–652.

APPENDIX

Appendix A - Additional Analyses for Models in Chapter 4

This section presents:

- Results of CAR points using alternative estimation periods.
- Results of CAR points for sub-sample size groups, using alternative estimation periods.

Table A.4.5 Cumulative Abnormal Return upon Website-Launching Announcements, using alternative estimation periods.

This table reports Cumulative Abnormal Returns to stockholders upon the website launching announcements. The sample consists of website launch announcements of 307 US commercial banks between 1996 and 2010. Daily Abnormal Return is obtained using the market model with different estimation periods (*200 days and 300 days*) and different event windows *(-1+1 window; -2+2 window; -3+3 window*). The market index used is the Nasdaq Index. All data of Market Index and Price Indices of 307 banks are collected daily in 3238 days (about 9 years) from 05/02/1996 to 20/7/2010 for the 180-day estimation period and seven-day event window. The number of daily stocks index will differ slightly between the different lengths of windows and estimation. The source of market index and price indices is at the source Thompson Securities Data. The statistical significance of CAR is tested by using the formula of Amici et al. (2013) and Boehmer et al. (1991), which is produced to capture the event-induced increase in return volatility. The values of significant tests are displayed in the sixth column with the heading Z-stat. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests.

	Mean (%)	Std.	Min (%)	Max (%)	Z-score
200-day Estimation Period (-20; -219)					
CAR (-1; +1)	0.135%**	0.029	-11.07%	11.22%	1.769
CAR (-2; +2)	0.181%**	0.031	-13.10%	12.03%	1.673
CAR (-3; +3)	0.168%	0.037	-14.03%	15.49%	1.200
300-day Estimation Period (-20; -319)					
CAR (-1; +1)	0.119%**	0.029	-11.12%	11.26%	1.645
CAR (-2; +2)	0.146%*	0.031	-13.04%	12.58%	1.624
CAR (-3; +3)	0.138%	0.037	-13.95%	15.21%	1.131

Table A.4.6 CAR (%) of firms, which are subsampled using market size around the date of announcement

This table reports the values of Cumulative Abnormal Returns (displayed in percentage) and their descriptive statistical characteristics to stockholders upon the website launch announcement of sample banks classified into three size-based portfolios. The sample consists of website launch announcements of 307 US banks between 1996 and 2010. Daily Abnormal Return is obtained using the market model with the 120-day estimation period (-20; -219) and different event windows *(-1+1 window; -2+2 window; -3+3 window)*. Sample banks fall in the three same size quantiles based on their market values. MV1 includes banks with the smallest market value, and MV3 includes banks with the largest market value. The market index used is the Nasdaq Index. All data of Market Index and Price Indices of 307 banks are collected daily during 3238 days (about 9 years) from 05/02/1996 to 20/7/2010 for the 120-day estimation period and seven-day event window. The number of daily stocks index will differ slightly between the different lengths of windows and estimation. The source of market index and price indices is at the source Thompson Securities Data. The statistical significance of CAR is tested by using the formula of Amici et al. (2013) and Boehmer et al. (1991), which is produced to capture the event-induced increase in return volatility. Three significant tests have proceeded individually for three size-based portfolios. The values of significant tests are displayed in the sixth column with the heading Z-stat The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests.

	180-day	**Mean**	**Std.**	**Min**	**Max**	**Z-test**
(1; +1)	Small Bank	0.04%	0.031	-11.12%	8.62%	0.949
	Medium Bank	0.03%***	0.032	-9.94%	11.17%	2.919
	Large Bank	0.33%***	0.026	-6.13%	6.43%	5.745
(-2: +2)	Small Bank	0.48%***	0.031	-8.21%	9.37%	5.361
	Medium Bank	-0.13%	0.031	-13.25%	12.24%	0.743
	Large Bank	0.15%***	0.031	-7.74%	7.92%	2.947
	Small Bank	0.55%***	0.042	-11.65%	15.64%	4.975
(-3; +3)	Medium Bank	0.36%***	0.035	-14.24%	7.98%	4.377
	Large Bank	-0.48%***	0.035	-9.28%	8.21%	-2.427
	200-day	**Mean**	**Std.**	**Min**	**Max**	**Z-test**
(1; +1)	Small Bank	0.05%	0.031	-11.07%	8.62%	0.891
	Medium Bank	0.02%***	0.032	-9.94%	11.22%	2.646
	Large Bank	0.33%***	0.025	-6.04%	6.34%	5.717
(-2: +2)	Small Bank	0.50%***	0.031	-8.21%	9.62%	5.392
	Medium Bank	-0.13%	0.031	-13.10%	12.03%	0.420
	Large Bank	0.17%***	0.031	-8.02%	7.84%	3.111
	Small Bank	0.58%***	0.041	-11.53%	15.49%	4.931
(-3; +3)	Medium Bank	0.37%***	0.035	-14.03%	7.35%	4.165
	Large Bank	-0.45%	0.035	-8.86%	8.42%	-2.130
	300-day	**Mean**	**Std.**	**Min**	**Max**	**Z-test**
	Small Bank	0.02%	0.03	-11.12%	8.62%	0.513
(1; +1)	Medium Bank	-0.02%**	0.032	-9.94%	11.26%	2.319
	Large Bank	0.36%***	0.025	-5.21%	6.20%	5.888
	Small Bank	0.45%***	0.031	-8.21%	9.62%	4.791
(-2: +2)	Medium Bank	-0.19%	0.031	-13.04%	12.58%	0.397
	Large Bank	0.18%***	0.031	-8.46%	7.89%	3.381
	Small Bank	0.51%***	0.041	-11.68%	15.21%	4.277
	Medium Bank	0.30%***	0.035	-13.95%	6.67%	3.825
(-3; +3)	Large Bank	-0.40%**	0.034	-8.31%	9.07%	-1.658

Table A.4.7 Cumulative Abnormal Return upon Website-Launching Announcements, using alternative benchmark

This table reports the values of Cumulative Abnormal Returns (displayed in percentage) and their descriptive statistical characteristics to stockholders upon the website launching announcement of sample banks over three different periods. The sample consists of website launching announcements of 307 US banks between 1996 and 2010. Daily Abnormal Return is obtained using the market model with the 120-day estimation period (-20; -219) and different event windows (-1+1 window; -2+2 window; -3+3 window). The market index used is a banking benchmark. All data of Market Index and Price Indices of 307 banks are collected daily for 3238 days (about 9 years) from 05/02/1996 to 20/7/2010 for the 120-day estimation period and seven-day event window. The number of daily stocks index will differ slightly between different lengths of windows and estimation. The source of market index and price indices is at the source Thompson Securities Data. The cut-off years are also inspired by the arguments of Furst et al. (2002) who describes the banks who launched transactional website by 1998 as "first movers"; by authors who describe the period of 1999- 2000 as hot bubble period (Lee, 1998; Ofek and Richardson, 2003; Singhania and Girish, 2015; Walden and Browne, 2008) and authors who describe the period after 2000 as information avalanche (Dehning et al., 2004; Lee, 1998). The statistical significance of CAR is tested by using the formula of Amici et al. (2013) and Boehmer et al. (1991), which is produced to capture the event-induced increase in return volatility. Significant tests have proceeded individually for three different bank groups. The value of significant tests is displayed in the sixth column with the heading Z-stat. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests.

Event window	Mean (%)	Std.	Min (%)	Max (%)	Z-test
120-day Estimation Period: (-20, -139)					
CAR (-1; +1)	0.190%**	0.031	-11.886%	10.261%	1.871
CAR (-2; +2)	0.204%**	0.032	-13.610%	11.660%	1.733
CAR (-3; +3)	0.101%	0.039	-14.739%	13.673%	1.272
180-day Estimation Period: (-20, -199)					
CAR (-1; +1)	0.202%**	0.031	-11.452%	10.695%	1.961
CAR (-2; +2)	0.213%**	0.032	-13.485%	11.901%	1.828
CAR (-3; +3)	0.126%*	0.038	-14.395%	15.026%	1.384

Table A.4.8 Cumulative Abnormal Return of Sub-samples upon Website-Launching Announcements, using alternative benchmark.

This table reports the values of Cumulative Abnormal Returns (displayed in percentage) and their descriptive statistical characteristics to stockholders upon the website launch announcement of sample banks classified into three size-based portfolios. The sample consists of website launch announcements of 307 US banks between 1996 and 2010. Daily Abnormal Return is obtained using the market model with the 120-day estimation period (-20; -219) and different event windows *(-1+1 window; -2+2 window; -3+3 window*). Sample banks fall in the three same size quantiles based on their market values. MV1 includes banks with the smallest market value, and MV3 includes banks with the largest market value. The market index used is a banking index. All data of Market Index and Price Indices of 307 banks are collected daily during 3238 days (about 9 years) from 05/02/1996 to 20/7/2010 for the 120-day estimation period and seven-day event window. The number of daily stocks index will differ slightly between the different lengths of windows and estimation. The source of market index and price indices is at the source Thompson Securities Data. The statistical significance of CAR is tested by using the formula of Amici et al. (2013) and Boehmer et al. (1991), which is produced to capture the event-induced increase in return volatility. Three significant tests have proceeded individually for three size-based portfolios. The values of significant tests are displayed in the sixth column with the heading Z-stat. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests.

Event window	120-day	Mean	Std.	Min	Max	Z-test
(-1; +1)	Small Bank	0.027%	0.032	-11.886%	8.696%	1.013
	Medium Bank	0.190%***	0.033	-9.475%	10.261%	3.533
	Large Bank	0.354%***	0.026	-5.482%	9.547%	5.128
(-2; +2)	Small Bank	0.409%***	0.030	-6.283%	8.369%	4.526
	Medium Bank	-0.074%	0.032	-13.610%	11.660%	1.093
	Large Bank	0.126%***	0.033	-10.199%	8.456%	2.351
(-3; +3)	Small Bank	0.359%***	0.041	-13.517%	13.673%	3.498
	Medium Bank	0.510%***	0.037	-14.739%	9.209%	4.814
	Large Bank	-0.569%***	0.038	-10.718%	9.298%	-3.351

Table A.4.9 CAR(%) of Cumulative Abnormal Return of Sub-samples upon Website-Launching Announcements, using alternative benchmark.

This table reports the values of Cumulative Abnormal Returns (displayed in percentage) and their descriptive statistical characteristics to stockholders upon the website launch announcement of sample banks classified into three size-based portfolios. The sample consists of website launch announcements of 307 US banks between 1996 and 2010. Daily Abnormal Return is obtained using the market model with the 120-day estimation period (-20; -219) and different event windows *(-1+1 window; -2+2 window; -3+3 window*). The cut-off years are also inspired by the arguments of Furst et al. (2002) who describes the banks who launched transactional website by 1998 as "first movers"; by authors who describe the period of 1999- 2000 as hot bubble period (Lee, 1998; Ofek and Richardson, 2003; Singhania and Girish, 2015; Walden and Browne, 2008) and authors who describe the period after 2000 as information avalanche (Dehning et al., 2004; Lee, 1998). The market index used is a banking index. All data of Market Index and Price Indices of 307 banks are collected daily during 3238 days (about 9 years) from 05/02/1996 to 20/7/2010 for the 120-day estimation period and seven-day event window. The number of daily stocks index will differ slightly between the different lengths of windows and estimation. The source of market index and price indices is at the source Thompson Securities Data. The statistical significance of CAR is tested by using the formula of Amici et al. (2013) and Boehmer et al. (1991), which is produced to capture the event-induced increase in return volatility. Three significant tests have proceeded individually for three size-based portfolios. The values of significant tests are displayed in the sixth column with the heading Z-stat. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests.

Event window	120-day	Mean	Std.	Min	Max	Z-test
(-1; +1)	First-mover	0.529%***	0.0248	-4.538%	8.796%	7.918
	Second-mover	-0.239%	0.0343	-11.886%	9.547%	-1.028
	Laggard	0.274%**	0.0320	-8.298%	10.261%	2.279
(-2; +2)	First-mover	0.252%***	0.0286	-10.199%	7.878%	4.708
	Second-mover	0.177%	0.0338	-13.610%	8.456%	1.194
	Laggard	0.184%**	0.0325	-7.567%	11.660%	2.551
(-3; +3)	First-mover	0.064%*	0.0342	-10.718%	9.209%	1.529
	Second-mover	0.079%	0.0452	-14.739%	13.673%	0.293
	Laggard	0.268%**	0.0364	-9.997%	10.920%	2.552

Appendix B - Additional Analyses for Models in Chapter 5

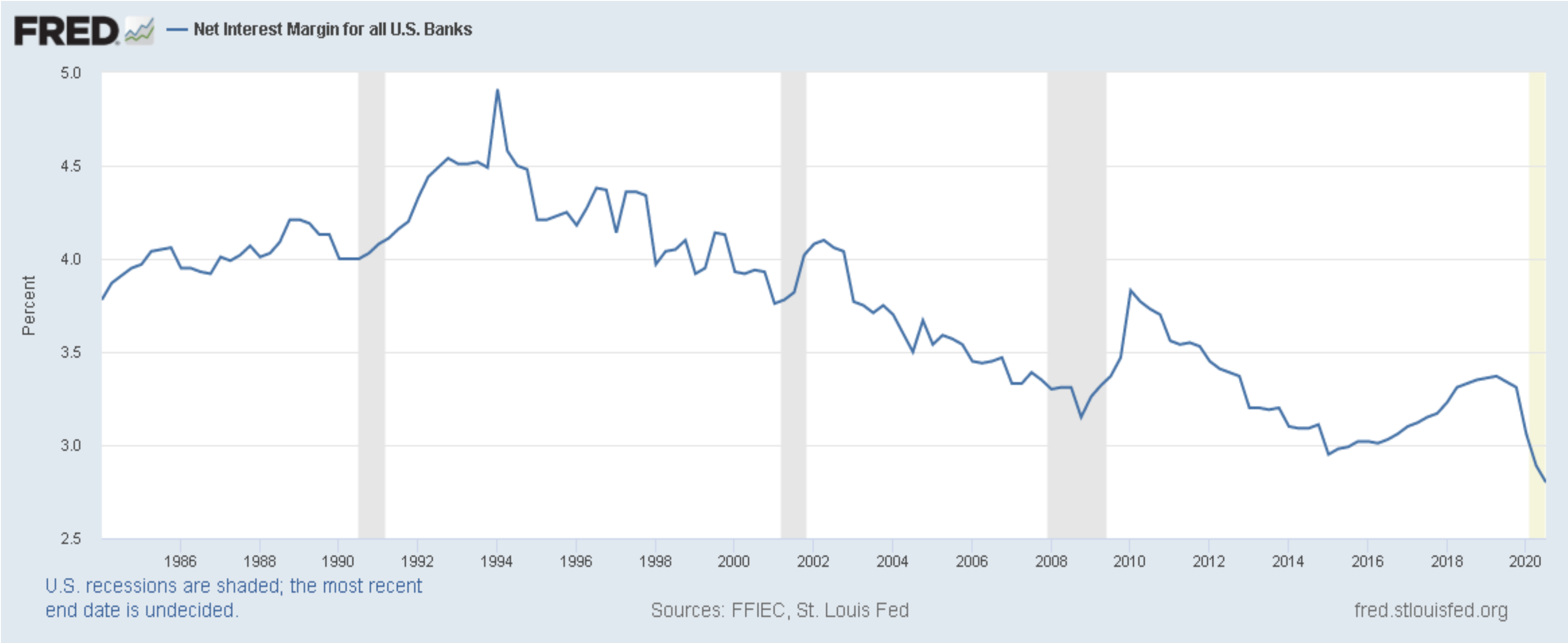
This section presents:

- Results of transformation in financial performance.

- Results of robustness test related to the dynamic impacts of the transactional website on banks' performance.
- Results of the robustness test, using three size quantiles: small-sized, medium-sized and large-sized groups.

- Results of all main equations, using year and states fixed effect.
- Results of all main equations, using year, state and bank-level fixed effect.
- Descriptive Statistics of Learning by Observing behaviour

Figure A.5.4 Net Interest Margin for all U.S Banks from 1986 to 2020



Source: Federal Reserve Bank of St. Louis (FRED), 2020.

Table A.5.11 Transformation in Financial Performance of 307 US Banks since the Transactional Website Adoption.

This table contains difference means with p-values in parentheses, which are calculated based on the change in performance ratios one, two, and three years after the announcement year of the sample banks. More specifically, the year of the website launching announcement of each targeted $bank_i$ is set to 0 ($t_{banki} = 0$). Subsequently, the mean difference in the accounting performance of each $bank_i$ is compared between sets of two different times ($t_{banki} = 1$ and $t_{banki} = 0$); ($t_{banki} = 2$ and $t_{banki} = 0$); ($t_{banki} = 3$ and $t_{banki} = 0$). The set-up of three- year horizon is based on the approach of some authors (DeLong and DeYoung, 2007; Hernando and Nieto, 2007). All the data are annualized and collected from SNL Financial, FDIC and some other sources. Performance Measurements: ROA = Net income after taxes and extraordinary items (annualized) as a percent of average total assets. ROE = Annualized net income as a percent of average total equity. NOIA = Net operating income (annualized) as a percent of average total assets. NIIA = Income derived from bank services and sources other than interest-bearing assets (annualized) as a percent of average total assets. NIEA = Salaries and employee benefits, expenses of premises and fixed assets, and other noninterest expenses (annualized) as a percent of average total assets. EFFR = Noninterest expense less amortization of intangible assets as a percent of net interest income plus noninterest income. Test statistics are based on a comparison of the mean between two different periods. The p-value appears in parentheses.

Performance Measurement	Change in performance after one year(t_1-t_0)	Change in performance after two years (t_2-t_0)	Change in performance after three years (t_3-t_0)
Return on Assets (ROA)	0.1845*** *(0.0004)*	0.4824** *(0.0162)*	0.533** *(0.0329)*
Return on Equity (ROE)	0.7382*** *(0.0039)*	1.9877*** (0.0006)	2.327** *(0.0247)*
Net operating income to assets (NOIA)	0.1779*** *(0.0005)*	0.4771** *(0.017)*	0.5274** (0.0342
Non-interest income to assets (NIIA)	.0703967** *(0.0454)*	0.391* *(0.0914)*	0.7947 *(0.1143)*
Non-interest expense to assets (NIEA)	-0.1319*** *(0.0056)*	-0.1454* *(0.0661)*	0.095 *(0.3971)*
Efficiency Ratio (EFFR)	-7.309*** *(0.0005)*	-8.639*** *(0.0003)*	-9.053*** *(0.0002)*

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Table A.5.12 Dynamic Impacts of Transactional Website Adoption on Banks' Performance

This table reports the ordinary least squares regression results for Equation 5.8 based on the sample of 307 web- launching announcements of publicly traded US banks during the 1993-2018 period. In each regression, the dependent variable is PERFORMANCE, which can be any of the accounting ratios mentioned in Table 5.1; including *ROA; ROE; Net Interest Margin; Net operating income to assets; Noninterest income to assets; Noninterest expense to assets;* and *Efficiency Ratio during 1996-2013 horizon*. The main independent variables are $\text{Transactional\_website\_adoption0}_{i,t}$, $\text{Transactional\_website\_adoption1}_{i,t}$, $\text{Transactional\_website\_adoption2}_{i,t}$, $\text{Transactional\_website\_adoption3}_{i,t}$, $\text{Transactional\_website\_adoption4}_{i,t}$, $\text{Transactional\_website\_adoption5}_{i,t}$. $\text{Transactional\_website\_adoption6}_{i,t}$. The set of control variables is also employed to control for exogenous cross-sectional differences in market structures and bank characteristics and are all observed annually during the 1993-2013 period. The sources for this table are mainly from FDIC, SNL Financial, Thomson Financial Securities Data, the author's calculations and some other sources. Standard errors in parentheses. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests. Equation 5.8 is estimated with robust standard errors clustered at bank level to account for serial correlation of the error term.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	ROA	ROE	Net Interest Margin	Net Operating Income	Non-interest Income	Non-interest Expense	Cost efficiency
Transactional_ website_adoption$(0+1)_{i,t}$	0.554**	2.055**	0.200***	0.583**	2.167***	1.510***	-8.612**
	(0.2592)	(0.8600)	(0.0742)	(0.2626)	(0.8052)	(0.4884)	(4.0777)
Transactional_ website_adoption$(2+3)_{i,t}$	1.592*	5.835**	0.270**	1.626*	4.617**	2.764**	-17.126***
	(0.8370)	(2.3911)	(0.1192)	(0.8394)	(2.1857)	(1.1941)	(6.3333)
Transactional_ website_adoption$(4+5)_{i,t}$	1.985**	7.582***	0.383***	2.019**	5.587**	3.316**	-19.247***
	(0.9608)	(2.6486)	(0.1386)	(0.9634)	(2.4520)	(1.3340)	(7.2717)
Transactional_ website_adoption (6 and onwards) $_{i,t}$	2.291**	9.750***	0.481***	2.340**	6.737**	4.173***	-21.018**
	(0.9494)	(2.7073)	(0.1807)	(0.9522)	(2.7149)	(1.5978)	(8.3882)
$\text{Bank\_Funding}_{i,t}$	-0.008*	-0.017	0.001	-0.008*	-0.019	-0.009	0.001
	(0.0042)	(0.0108)	(0.0012)	(0.0042)	(0.0124)	(0.0071)	(0.0436)
$\text{Bank\_Leverage}_{i,t}$	0.173**	0.053	-0.022***	0.172**	0.725**	0.428**	1.414
	(0.0817)	(0.1460)	(0.0049)	(0.0818)	(0.2938)	(0.1659)	(1.0012)
$\text{Bank\_Size}_{i,t}$	0.066*	0.807***	-0.058**	0.067*	0.098	-0.107	-3.219***
	(0.0366)	(0.1556)	(0.0227)	(0.0365)	(0.0933)	(0.0657)	(0.5372)
$\text{HHI}_{i,t}$	-0.025***	-0.136***	-0.011***	-0.025***	-0.077***	-0.049***	0.242***
	(0.0089)	(0.0263)	(0.0018)	(0.0089)	(0.0266)	(0.0158)	(0.0931)

Constant	34.866***	194.972***	21.126***	34.166***	102.781***	70.104***	-248.870**
	(12.3276)	(37.1333)	(2.5332)	(12.3525)	(36.0609)	(21.3336)	(125.7057)
Observations	7,597	7,597	7,597	7,597	7,597	7,597	7,597
R-squared	0.210	0.161	0.151	0.211	0.381	0.387	0.085
Year Fixed Effect	YES	YES	YES	YES	YES	YES	YES

Table A.5.13 The magnitude effect in transactional website adoption, using three size-based quantiles.

This table reports the ordinary least squares regression results for Equation 5.6, based on the sample of 307 web- launching announcements of publicly traded US banks during the 1993-2018 period. In each regression, the dependent variable is PERFORMANCE, which can be any of the accounting ratios mentioned in Table 5.1; including ROA; ROE; Net Interest Margin; Net operating income to assets; Noninterest income to assets; Noninterest expense to assets; and Efficiency Ratio during 1996-2013 horizon. The main independent variables are $Small\_Bank_{i,t}$ and the interaction with $Transactional\_website\_adoption_{i,t}$. The set of control variables is also employed to control for exogenous cross-sectional differences in market structures and bank characteristics and are all observed annually during the 1993-2013 period. The sources for this table are mainly from FDIC, SNL Financial, Thomson Financial Securities Data, the author's calculations and some other sources. Standard errors in parentheses. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests. Equation 5.6 is estimated with robust standard errors clustered at bank level to account for serial correlation of the error term.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	ROA	ROE	Net Interest Margin	Net Operating Income	Non-interest Income	Non-interest Expense	Cost efficiency
$Transactional\_website\_adoption_{i,t}$	0.516**	2.224**	0.098	0.542**	1.673***	0.980**	-9.615**
	(0.2249)	(1.0995)	(0.1039)	(0.2272)	(0.6199)	(0.3888)	(4.1899)
$Small\_Bank_{i,t}$	-1.182***	-6.210***	-0.032	-1.197***	-3.034**	-1.305	22.255***
	(0.4009)	(1.0432)	(0.1380)	(0.4017)	(1.3842)	(0.8037)	(4.9783)
$Medium\_Bank_{i,t}$	-0.258**	-2.255***	-0.000	-0.268**	-1.092**	-0.586*	0.191
	(0.1287)	(0.7181)	(0.1105)	(0.1296)	(0.4935)	(0.3205)	(2.1057)
Small $Bank_{i,t}$ x $Transactional\_website\_adoption_{i,t}$	0.925*	2.630**	0.194	0.929*	2.859*	1.851*	-11.132**
	(0.5160)	(1.2658)	(0.1182)	(0.5174)	(1.6863)	(0.9673)	(5.2994)
Medium $Bank_{i,t}$ x $Transactional\_website\_adoption_{i,t}$	0.152	0.780	0.082	0.158	0.775	0.673**	5.660***
	(0.1471)	(0.7579)	(0.1020)	(0.1481)	(0.5253)	(0.3271)	(2.1419)
$Bank\_Funding_{i,t}$	-0.008*	-0.020*	0.001	-0.009*	-0.021	-0.011	-0.001
	(0.0047)	(0.0120)	(0.0013)	(0.0047)	(0.0135)	(0.0077)	(0.0438)
$Bank\_Leverage_{i,t}$	0.172**	0.038	-0.020***	0.172**	0.722**	0.429**	1.458
	(0.0833)	(0.1534)	(0.0050)	(0.0834)	(0.2985)	(0.1682)	(1.0008)
$HHI_{i,t}$	-0.010**	-0.057***	-0.009***	-0.009**	-0.038***	-0.028***	0.084

	(0.0042)	(0.0142)	(0.0010)	(0.0042)	(0.0127)	(0.0073)	(0.0550)
Constant	14.905***	97.475***	18.052***	13.924**	49.756***	40.119***	-75.716
	(5.5533)	(19.8127)	(1.4286)	(5.5872)	(16.2085)	(9.4117)	(74.2198)
Observations	7,597	7,597	7,597	7,597	7,597	7,597	7,597
R-squared	0.204	0.153	0.144	0.205	0.377	0.383	0.088
Year Fixed Effect	YES	YES	YES	YES	YES	YES	YES
Reference Variable	Large Bank	Large_Bank	Large_Bank	Large_Bank	Large_Bank	Large_Bank	Large_Bank

Table A.5.14 The magnitude effect in transactional website adoption, using three size-based quantiles.

This table reports the ordinary least squares regression results for Equation 5.1, based on the sub-sample of small-sized banks (Panel A), medium-sized banks (Panel B) and larger-sized banks (Panel C). The original data sample includes 307 web-launching announcements of publicly traded US banks during the 1993-2018 period based on the sample of 307 web-launching announcements of publicly traded US banks during the 1996-2013 period. In each regression, the dependent variable is PERFORMANCE, which can be any of the accounting ratios mentioned in Table 5.1; including *ROA, ROE, Net Interest Margin, Net operating income to assets, Noninterest income to assets, Noninterest expense to assets,* and *Efficiency Ratio*. The set of control variables is also employed to control for exogenous cross-sectional differences in market structures and bank characteristics and are all observed annually during the 1993-2013 period. The sources for this table are SNL Financial, FIDC, Thomson Financial Securities Data, the author's calculations, and other sources. Equation 5.1 is estimated with robust standard errors clustered at bank level to account for serial correlation of the error term.

Panel A: Small-sized banks

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	ROA	ROE	Net Interest Margin	Net Operating Income	Non-interest Income	Non-interest Expense	Cost efficiency
Transactional_ website_adoption$_{i,t}$	2.294**	6.917*	0.412**	2.331**	5.594**	3.242**	-44.454***
	(1.1365)	(3.7437)	(0.2057)	(1.1472)	(2.7697)	(1.5683)	(12.5386)
Bank_Funding$_{i,t}$	-0.023**	-0.059**	0.003	-0.023**	-0.058*	-0.028	0.091
	(0.0116)	(0.0283)	(0.0024)	(0.0116)	(0.0322)	(0.0182)	(0.1205)
Bank_Leverage$_{i,t}$	0.189***	0.171***	-0.028***	0.189***	0.781***	0.450***	1.143
	(0.0558)	(0.0545)	(0.0070)	(0.0558)	(0.2271)	(0.1353)	(1.1933)
Bank_Size$_{i,t}$	0.323	3.190*	0.049	0.320	-0.442	-0.852	-22.831***
	(0.6077)	(1.6583)	(0.1207)	(0.6044)	(1.2240)	(0.6752)	(5.8248)
HHI$_{i,t}$	-0.024***	-0.123***	-0.012***	-0.023***	-0.037***	-0.016*	0.780***
	(0.0058)	(0.0230)	(0.0028)	(0.0058)	(0.0140)	(0.0091)	(0.1831)
Constant	30.387***	150.723***	21.097***	28.713***	53.727***	32.838***	-790.060***
	(7.2501)	(36.9945)	(3.3509)	(7.3671)	(17.1528)	(10.7003)	(209.2299)
Observations	2,539	2,539	2,539	2,539	2,539	2,539	2,539
R-squared	0.241	0.106	0.162	0.243	0.447	0.464	0.117
Year Fixed Effect	YES	YES	YES	YES	YES	YES	YES
Reference Variable	Large Bank	Large Bank	Large Bank	Large Bank	Large Bank	Large Bank	Large Bank

Panel B: Medium-sized banks

	(1)	(2)	(3)	(4)	(5)	(6)	(7)

	ROA	ROE	Net Interest Margin	Net Operating Income	Non-interest Income	Non-interest Expense	Cost efficiency
Transactional_ website_adoption$_{i,t}$	0.090	1.055	0.274**	0.108	0.192*	0.302*	1.500
	(0.0668)	(0.8761)	(0.1338)	(0.0748)	(0.1022)	(0.1538)	(2.0833)
Bank_Funding$_{i,t}$	-0.000	0.001	0.003	-0.001	0.001	0.002	0.001
	(0.0007)	(0.0076)	(0.0028)	(0.0007)	(0.0017)	(0.0031)	(0.0381)
Bank_Leverage$_{i,t}$	0.068***	-0.127	0.058**	0.061***	-0.005	-0.028	-1.368***
	(0.0112)	(0.1115)	(0.0226)	(0.0114)	(0.0126)	(0.0202)	(0.2621)
Bank_Size$_{i,t}$	0.098*	0.923*	-0.042	0.109**	0.148*	-0.094	-4.117***
	(0.0503)	(0.5398)	(0.1016)	(0.0512)	(0.0819)	(0.1167)	(1.3537)
HHI$_{i,t}$	-0.005***	-0.058***	-0.010***	-0.004***	-0.004*	-0.003	0.124***
	(0.0013)	(0.0150)	(0.0025)	(0.0013)	(0.0024)	(0.0031)	(0.0329)
Constant	6.396***	85.003***	18.186***	5.556***	4.557*	8.167**	-51.179
	(1.4420)	(17.2642)	(2.5361)	(1.5007)	(2.5573)	(3.1842)	(36.6010)
Observations	2,534	2,534	2,534	2,534	2,534	2,534	2,534
R-squared	0.221	0.187	0.183	0.209	0.025	0.024	0.152
Year Fixed Effect	YES	YES	YES	YES	YES	YES	YES
Reference Variable	Large Bank	Large Bank	Large Bank	Large Bank	Large Bank	Large Bank	Large Bank

Panel C: Large-sized banks

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	ROA	ROE	Net Interest Margin	Net Operating Income	Non-interest Income	Non-interest Expense	Cost efficiency
Transactional_ website_adoption$_{i,t}$	0.113	1.208	0.237**	0.150*	0.952	0.811*	1.433
	(0.0817)	(0.8885)	(0.1117)	(0.0843)	(0.5757)	(0.4810)	(1.7098)
Bank_Funding$_{i,t}$	-0.001	0.001	-0.002**	-0.001	-0.002	-0.004*	-0.063***
	(0.0007)	(0.0078)	(0.0011)	(0.0007)	(0.0028)	(0.0024)	(0.0202)
Bank_Leverage$_{i,t}$	0.047***	-0.477***	0.056***	0.046***	0.089	0.078	-0.538**
	(0.0162)	(0.1363)	(0.0191)	(0.0158)	(0.1323)	(0.1066)	(0.2590)

$Bank\_Size_{i,t}$	0.005	0.138	-0.098***	-0.000	0.222***	0.076*	0.166
	(0.0160)	(0.1830)	(0.0345)	(0.0167)	(0.0410)	(0.0416)	(0.3838)
$HHI_{i,t}$	-0.002	-0.035**	-0.012***	-0.002	-0.022*	-0.022**	-0.026
	(0.0015)	(0.0161)	(0.0018)	(0.0016)	(0.0122)	(0.0099)	(0.0280)
Constant	4.187**	66.470***	21.965***	3.669*	28.489*	33.346**	104.994***
	(2.0492)	(22.5750)	(2.2974)	(2.0537)	(15.9215)	(12.8957)	(36.0571)
Observations	2,524	2,524	2,524	2,524	2,524	2,524	2,524
R-squared	0.244	0.274	0.277	0.234	0.070	0.062	0.103
Year Fixed Effect	YES	YES	YES	YES	YES	YES	YES
Reference Variable	Large Bank	Large Bank	Large Bank	Large Bank	Large Bank	Large Bank	Large Bank

Table A.5.15 Variation in "Learning by Behaviour" Variable

This table describes how the "learning by observation" proxy varies over the study period, based on the construction of DeLong and DeYoung (2007). Three "learning by observing" variables- LBOY1, LBOY2, LBOY3 are estimated, in turn representing the number of banks who adopted transactional websites within one, two or three years before.

Event year	LBOY1	LBOY2	LBOY3
1996	0	0	0
1997	29	29	29
1998	14	43	43
1999	55	69	98
2000	32	87	101
2001	67	99	154
2002	56	123	155
2003	25	81	148
2004	12	37	93
2005	8	20	45
2006	1	9	21
2008	0	4	5
2009	2	2	6
2010	1	3	3

Table A.5.16 Re-estimation of Equation 5.1, using Year and State Fixed Effects

This table reports the ordinary least squares regression results for Equation 5.1, using year and state fixed effects. The sample includes 307 web-launching announcements of publicly traded US banks during the 1993-2018 period. In each regression, the dependent variable is PERFORMANCE, which can be any of the accounting ratios mentioned in Table 5.1, including *ROA, ROE, Net Interest Margin, Net operating income to assets, Noninterest income to assets; Noninterest expense to assets;* and *Efficiency Ratio during 1996-2013 horizon*. Independent variables consist of the variable Transactional website adoption, which equals 1 since the year banks adopt transactional websites and 0 if otherwise. The set of control variables is also employed to control for exogenous cross-sectional differences in market structures and bank characteristics and are all observed annually during the 1993-2018 period. The sources for this table are mainly from FDIC, SNL Financial, Thomson Financial Securities Data, the author's calculations and some other sources. Standard errors in parentheses. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests. Equation 5.1 is estimated with robust standard errors clustered at bank level to account for serial correlation of the error term.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	ROA	ROE	Net Interest Margin	Net Operating Income	Non-interest Income	Non-interest Expense	Cost efficiency
Transactional_ website_adoption$_{i,t}$	0.791**	2.886**	0.216***	0.822**	2.576***	1.682***	-10.527**
	(0.3527)	(1.1168)	(0.0749)	(0.3559)	(0.9779)	(0.5708)	(4.4696)
Bank_Funding$_{i,t}$	-0.007**	-0.019**	0.001	-0.007**	-0.015	-0.007	-0.010
	(0.0034)	(0.0092)	(0.0012)	(0.0034)	(0.0103)	(0.0061)	(0.0472)
Bank_Leverage$_{i,t}$	0.148**	-0.014	-0.025***	0.148**	0.659***	0.391***	1.623*
	(0.0592)	(0.0889)	(0.0035)	(0.0592)	(0.2295)	(0.1330)	(0.9273)
Bank_Size$_{i,t}$	0.075	0.901***	-0.048**	0.077	0.085	-0.118	-3.648***
	(0.0492)	(0.1775)	(0.0186)	(0.0491)	(0.1198)	(0.0747)	(0.6404)
HHI$_{i,t}$	-0.010***	-0.068***	-0.009***	-0.010***	-0.035***	-0.024***	0.140***
	(0.0025)	(0.0105)	(0.0009)	(0.0025)	(0.0084)	(0.0053)	(0.0519)
Constant	13.312***	99.271***	19.408***	12.380***	40.716***	33.968***	-113.931*
	(3.3335)	(15.0637)	(1.2278)	(3.3624)	(10.0785)	(6.3680)	(66.2903)
Observations	7,597	7,597	7,597	7,597	7,597	7,597	7,597
R-squared	0.241	0.187	0.336	0.241	0.419	0.426	0.106
Year Fixed Effect	YES	YES	YES	YES	YES	YES	YES
State Fixed Effect	YES	YES	YES	YES	YES	YES	YES
Bank Fixed Effect	NO	NO	NO	NO	NO	NO	NO

Table A.5.17 Re-estimation of Equation 5.2, using Year and State Fixed Effect

This table reports the ordinary least squares regression results for Equation 5.2, using year and state fix effects. The sample includes 307 web-launching announcements of publicly traded US banks during the 1993-2018 period. In each regression, the dependent variable is PERFORMANCE, which can be any of the accounting ratios mentioned in Table 5.1, including *ROA, ROE; Net Interest Margin; Net operating income to assets; Noninterest income to assets; Noninterest expense to assets;* and *Efficiency Ratio during 1993-2018 horizon*. Independent variables consist of the variable "$Transactional\_website\_experience_{i,t}$" *which* equals 0 before and at the time that banks adopt their transactional websites and equals 1,2,3,4… at year 1, 2,3,4… after banks have adopted the transactional websites. The set of control variables is also employed to control for exogenous cross-sectional differences in market structures and bank characteristics and are all observed annually during the 1993-2018 period. The sources for this table are mainly from FDIC, SNL Financial, Thomson Financial Securities Data, the author's calculations and some other sources. Standard errors in parentheses. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests. Equation 5.2 is estimated with robust standard errors clustered at bank level to account for serial correlation of the error term.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	ROA	ROE	Net Interest Margin	Net Operating Income	Non-interest Income	Non-interest Expense	Cost efficiency
Transactional_ website_experience$_{i,t}$	0.004**	0.010	0.004***	0.004**	0.015**	0.011**	-0.015
	(0.0018)	(0.0128)	(0.0014)	(0.0018)	(0.0074)	(0.0047)	(0.0772)
Bank_Funding$_{i,t}$	-0.007**	-0.019**	0.001	-0.007**	-0.015	-0.007	-0.010
	(0.0034)	(0.0092)	(0.0012)	(0.0034)	(0.0103)	(0.0061)	(0.0472)
Bank_Leverage$_{i,t}$	0.146**	-0.020	-0.025***	0.146**	0.653***	0.387***	1.647*
	(0.0595)	(0.0905)	(0.0037)	(0.0595)	(0.2308)	(0.1340)	(0.9387)
Bank_Size$_{i,t}$	0.088**	0.951***	-0.045**	0.091**	0.128	-0.091	-3.835***
	(0.0439)	(0.1668)	(0.0185)	(0.0439)	(0.1089)	(0.0701)	(0.6475)
HHI$_{i,t}$	-0.003**	-0.041***	-0.007***	-0.002	-0.011***	-0.008***	0.041
	(0.0013)	(0.0067)	(0.0007)	(0.0013)	(0.0033)	(0.0023)	(0.0262)
Constant	2.718	60.603***	16.545***	1.378	6.261	11.481***	27.331
	(1.9816)	(9.3570)	(0.8854)	(1.9834)	(5.6586)	(3.5426)	(25.8782)
Observations	7,597	7,597	7,597	7,597	7,597	7,597	7,597
R-squared	0.236	0.183	0.334	0.237	0.414	0.419	0.103
Year Fixed Effect	YES	YES	YES	YES	YES	YES	YES
State Fixed Effect	YES	YES	YES	YES	YES	YES	YES
Bank Fixed Effect	NO	NO	NO	NO	NO	NO	NO

Table A.5.18 Re-estimation of Equation 5.3, using Year and State Fixed Effects

This table reports the ordinary least squares regression results for Equation 5.3, using year and state level fixed effects. The sample includes 307 web-launching announcements of publicly traded US banks. In each regression, the dependent variable is PERFORMANCE, which can be any of the accounting ratios mentioned in Table 5.1, including *ROA; ROE, Net Interest Margin; Net operating income to assets; Noninterest income to assets; Noninterest expense to assets;* and *Efficiency Ratio during 1993-2018 horizon*. Independent variables consist of the variable Mobile website adoption$_{i,t}$, which equals 1 since banks introduced mobile website version and 0 if otherwise. The set of control variables is also employed to control for exogenous cross-sectional differences in market structures and bank characteristics and are all observed annually during the 1993-2018 period. The sources for this table are mainly from FDIC, SNL Financial, Thomson Financial Securities Data, the author's calculations and some other sources. two-sided tests. Equation 5.3 is estimated with robust standard errors clustered at bank level to account for serial correlation of the error term.

VARIABLES	(1) ROA	(2) ROE	(3) Net Interest Margin	(4) Net Operating Income	(5) Noninterest Income	(6) Noninterest Expense	(7) Cost efficiency
Mobile_website_adoption$_{i,t}$	2.271**	10.017***	1.544***	2.301***	2.914**	1.189	-75.546
	(0.8891)	(2.4493)	(0.5561)	(0.8579)	(1.1766)	(0.8218)	(57.1192)
Bank_Funding$_{i,t}$	-0.007**	-0.019**	0.001	-0.007**	-0.015	-0.007	-0.008
	(0.0034)	(0.0092)	(0.0012)	(0.0034)	(0.0103)	(0.0061)	(0.0471)
Bank_Leverage$_{i,t}$	0.146**	-0.020	-0.025***	0.146**	0.654***	0.387***	1.643*
	(0.0594)	(0.0904)	(0.0037)	(0.0595)	(0.2309)	(0.1341)	(0.9370)
Bank_Size$_{i,t}$	0.089**	0.954***	-0.044**	0.092**	0.132	-0.088	-3.842***
	(0.0439)	(0.1673)	(0.0185)	(0.0438)	(0.1078)	(0.0694)	(0.6478)
HHI$_{i,t}$	-0.025***	-0.139***	-0.022***	-0.024***	-0.039***	-0.020**	0.776
	(0.0084)	(0.0241)	(0.0055)	(0.0081)	(0.0108)	(0.0080)	(0.5568)
Constant	33.682***	197.226***	37.584***	32.743***	45.878***	27.605***	-1,003.582
	(11.7183)	(33.8049)	(7.6786)	(11.2711)	(13.4327)	(10.3297)	(780.0206)
Observations	7,597	7,597	7,597	7,597	7,597	7,597	7,597
R-squared	0.236	0.184	0.335	0.237	0.413	0.419	0.105
Year Fixed Effect	YES	YES	YES	YES	YES	YES	YES
State Fixed Effect	YES	YES	YES	YES	YES	YES	YES
Bank Fixed Effect	NO	NO	NO	NO	NO	NO	NO

Table A.5.19 Re-estimation of Equation 5.4, using Year and State Fixed Effects

This table reports the ordinary least squares regression results for Equation 5.4, using year and state-level fixed effects. The sample includes 307 web-launching announcements of publicly traded US banks during the 1993-2018 period. In each regression, the dependent variable is PERFORMANCE, which can be any of the accounting ratios mentioned in Table 5.1, including *ROA; ROE; Net Interest Margin; Net operating income to assets; Noninterest income to assets; Noninterest expense to assets;* and *Efficiency Ratio during 1993-2018 horizon*. Independent variables consist of the variable $Low\_Gap_{i,t}$, $High\_Gap_{i,t}$, $Mobile\_website\_adoption_{i,t}$ and the interaction between them. The set of control variables is also employed to control for exogenous cross-sectional differences in market structures and bank characteristics and are all observed annually during the 1993-2018 period. The sources for this table are mainly from FDIC, SNL Financial, Thomson Financial Securities Data, the author's calculations and some other sources. Standard errors in parentheses. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests. Equation 5.4 is estimated with robust standard errors clustered at bank level to account for serial correlation of the error term.

VARIABLES	(1) ROA	(2) ROE	(3) Net Interest Margin	(4) Net Operating Income	(5) Non-interest Income	(6) Non-interest Expense	(7) Cost efficiency
Mobilewebsite _adoption $_{i,t}$	2.022**	8.501***	1.365**	2.038**	1.714	0.240	-77.228
	(0.8958)	(2.5665)	(0.5667)	(0.8662)	(1.1183)	(0.7534)	(56.8908)
$Low\_Gap_{i,t}$	-0.349**	-1.805***	-0.269***	-0.376**	-1.679***	-1.350***	-3.344
	(0.1449)	(0.5854)	(0.0810)	(0.1458)	(0.4710)	(0.3190)	(2.5305)
Low Gap x Mobile_Website_ Adoption	0.200***	1.410**	0.133*	0.206***	0.963***	0.750***	0.752
	(0.0761)	(0.6014)	(0.0707)	(0.0783)	(0.2833)	(0.2117)	(2.0825)
$Bank\_Funding_{i,t}$	31.446***	185.868***	35.849***	30.328***	35.112***	18.935**	-1,025.683
	(11.9117)	(35.2532)	(7.7681)	(11.4909)	(12.5845)	(9.3517)	(777.2502)
$Bank\_Leverage_{i,t}$	2.022**	8.501***	1.365**	2.038**	1.714	0.240	-77.228
	(0.8958)	(2.5665)	(0.5667)	(0.8662)	(1.1183)	(0.7534)	(56.8908)
$Bank\_Size_{i,t}$	-0.349**	-1.805***	-0.269***	-0.376**	-1.679***	-1.350***	-3.344
	(0.1449)	(0.5854)	(0.0810)	(0.1458)	(0.4710)	(0.3190)	(2.5305)
$HHI_{i,t}$	0.200***	1.410**	0.133*	0.206***	0.963***	0.750***	0.752
	(0.0761)	(0.6014)	(0.0707)	(0.0783)	(0.2833)	(0.2117)	(2.0825)
Constant	31.446***	185.868***	35.849***	30.328***	35.112***	18.935**	-1,025.683
	(11.9117)	(35.2532)	(7.7681)	(11.4909)	(12.5845)	(9.3517)	(777.2502)
Observations	7,597	7,597	7,597	7,597	7,597	7,597	7,597

R-squared	0.239	0.188	0.346	0.240	0.420	0.432	0.106
Year Fixed Effect	YES	YES	YES	YES	YES	YES	YES
State Fixed Effect	YES	YES	YES	YES	YES	YES	YES
Bank fixed effect	NO	NO	NO	NO	NO	NO	NO
Reference Variable	High_Gap	High_Gap	High_Gap	High_Gap	High_Gap	High_Gap	High_Gap

Table A.5.20 Re-estimation of Equation 5.5, using Year and State Fixed Effects

This table reports the ordinary least squares regression results for Equation 5.5, using year, state, and bank-level fixed effects. The sample includes 307 web-launching announcements of publicly traded US banks during the 1993-2018 period. In each regression, the dependent variable is PERFORMANCE, which can be any of the accounting ratios mentioned in Table 5.1, including *ROA, ROE; Net Interest Margin; Net operating income to assets; Noninterest income to assets; Noninterest expense to assets;* and *Efficiency Ratio during 1993-2018 horizon*. The main independent variable is "Learning by observing" ($LBOY_{i,t}$) which is estimated as the number of the cumulative number of sample banks that adopted transactional websites during three years before the transactional website of $bank_i$. The set of control variables is also employed to control for exogenous cross-sectional differences in market structures and bank characteristics and are all observed annually during the 1993-2018 period. The sources for this table are mainly from FDIC, SNL Financial, Thomson Financial Securities Data, the author's calculations and some other sources. Standard errors in parentheses. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests. Equation 5.5 is estimated with robust standard errors clustered at bank level to account for serial correlation of the error term.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	ROA	ROE	Net Interest Margin	Net Operating Income	Non-interest Income	Non-interest Expense	Cost efficiency
$LBOY_{i,t}$	-0.004	-0.019	0.001	-0.004	-0.023**	-0.017**	-0.033
	(0.0036)	(0.0140)	(0.0013)	(0.0036)	(0.0112)	(0.0076)	(0.0346)
$Bank\_Funding_{i,t}$	-0.009**	-0.027***	0.001	-0.009**	-0.020*	-0.010	0.057*
	(0.0039)	(0.0100)	(0.0012)	(0.0039)	(0.0122)	(0.0072)	(0.0334)
$Bank\_Leverage_{i,t}$	0.227***	0.103	-0.015**	0.227***	0.919***	0.544***	0.131
	(0.0514)	(0.0661)	(0.0068)	(0.0516)	(0.2191)	(0.1259)	(0.2419)
$Bank\_Size_{i,t}$	0.036	0.692***	-0.051***	0.035	-0.062	-0.213**	-3.248***
	(0.0640)	(0.2199)	(0.0186)	(0.0641)	(0.1588)	(0.0980)	(0.6010)
$HHI_{i,t}$	-0.004	0.047	0.011***	-0.005	0.020	0.024	-0.019
	(0.0172)	(0.0334)	(0.0023)	(0.0172)	(0.0409)	(0.0200)	(0.0438)
Constant	4.583	-68.471	-10.706***	5.583	-38.794	-35.894	130.379*
	(26.3800)	(52.5610)	(3.6348)	(26.3711)	(61.5000)	(30.0124)	(69.4742)
Observations	5,855	5,855	5,855	5,855	5,855	5,855	5,855
R-squared	0.349	0.190	0.307	0.350	0.555	0.568	0.125
Year Fixed Effect	YES	YES	YES	YES	YES	YES	YES
State Fixed Effect	YES	YES	YES	YES	YES	YES	YES
Bank Fixed Effect	NO	NO	NO	NO	NO	NO	NO

Table A.5.21 Re-estimation of Equation 5.6, using Year and State Fixed Effects

This table reports the ordinary least squares regression results for Equation 5.6, using year and state-level fixed effects. The sample includes 307 web-launching announcements of publicly traded US banks during the 1993-2018 period. In each regression, the dependent variable is PERFORMANCE, which can be any of the accounting ratios mentioned in Table 5.1; including *ROA; ROE; Net Interest Margin; Net operating income to assets; Noninterest income to assets; Noninterest expense to assets;* and *Efficiency Ratio during 1996-2013 horizon*. The main independent variables are $Small\_Bank_{i,t}$ and the interaction with $Transactional\_website\_adoption_{i,t}$. The set of control variables is also employed to control for exogenous cross-sectional differences in market structures and bank characteristics and are all observed annually during the 1993-2013 period. The sources for this table are mainly from FDIC, SNL Financial, Thomson Financial Securities Data, the author's calculations and some other sources. Please note that the results in this table only display the coefficients of $Small\_Bank_{i,t}$ and $Small_Bank_{i,t}$x $Transactional\_website\_adoption_{i,t}$. $Large\_Bank_{i,t}$ is treated as a reference category. Therefore, the coefficients shown $Small\_Bank_{i,t}$ and $Small_Bank_{i,t}$x $Transactional\_website\_adoption_{i,t}$ variables present the comparison to $Large\_Bank_{i,t}$ and $Large_Bank_{i,t}$x $Transactional\_website\_adoption_{i,t}$. The *small-sized bank* group comprises 50% of sample banks with the smallest asset values each year, and the *large-sized bank* group includes the remaining 50% of banks with the largest market capitalization. Standard errors in parentheses. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests. Equation 5.6 is estimated with robust standard errors clustered at bank level to account for serial correlation of the error term.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	ROA	ROE	Net Interest Margin	Net Operating Income	Non-interest Income	Non-interest Expense	Cost efficiency
Transactional_ website_adoption$_{i,t}$	0.366**	1.378	0.127	0.400**	1.238***	0.846***	-5.471
	(0.1824)	(0.9125)	(0.0825)	(0.1852)	(0.4382)	(0.2835)	(3.9380)
Small_Bank$_{i,t}$	-0.574**	-2.546***	-0.207**	-0.584**	-1.697*	-1.031*	6.833**
	(0.2907)	(0.7354)	(0.0985)	(0.2910)	(0.9275)	(0.5348)	(3.0121)
Small_Bank$_{i,t}$x Transactional_ website_adoption$_{i,t}$	0.730**	2.560***	0.148*	0.723**	2.304**	1.441**	-8.681**
Bank_Funding$_{i,t}$	(0.3233)	(0.7974)	(0.0820)	(0.3244)	(1.1017)	(0.6411)	(3.7125)
Bank_Leverage$_{i,t}$	-0.007**	-0.019**	0.001	-0.007**	-0.016	-0.007	-0.009
	(0.0034)	(0.0091)	(0.0012)	(0.0034)	(0.0103)	(0.0061)	(0.0470)
HHI$_{i,t}$	0.150**	-0.007	-0.024***	0.150**	0.666***	0.395***	1.599*
	(0.0589)	(0.0870)	(0.0035)	(0.0590)	(0.2290)	(0.1326)	(0.9179)
Constant	0.083	0.813***	-0.066**	0.081	0.135	-0.081	-3.740***

	(0.0578)	(0.2065)	(0.0259)	(0.0576)	(0.1404)	(0.0864)	(0.9907)
Observations	7,597	7,597	7,597	7,597	7,597	7,597	7,597
R-squared	0.244	0.190	0.338	0.245	0.424	0.431	0.108
Year Fixed Effect	YES	YES	YES	YES	YES	YES	YES
State Fixed Effect	YES	YES	YES	YES	YES	YES	YES
Bank Fixed Effect	NO	NO	NO	NO	NO	NO	NO
Reference Category	Large-sized Banks	Large-sized Banks	Large-sized Banks	Large-sized Banks	Large-sized Banks	Large-sized Banks	Large-sized Banks

Table A.5.22 Re-estimation of Sub-samples, based on their size, using year and state fixed effects

This table reports the ordinary least squares regression results for Equation 5.1, based on the sub-sample of small-sized banks (Panel A) and larger-sized banks (Panel B). Those regressions applied year and state fixed effects. The original data sample includes 307 web-launching announcements of publicly traded US banks during the 1993-2018 period based on the sample of 307 web-launching announcements of publicly traded US banks during the 1996-2013 period. In each regression, the dependent variable is PERFORMANCE, which can be any of the accounting ratios mentioned in Table 5.1, including *ROA, ROE, Net Interest Margin, Net operating income to assets, Noninterest income to assets, Noninterest expense to assets,* and *Efficiency Ratio*. The set of control variables is also employed to control for exogenous cross-sectional differences in market structures and bank characteristics and are all observed annually during the 1993-2013 period. The sources for this table are SNL Financial, FIDC, Thomson Financial Securities Data, the author's calculations, and other sources. Standard errors in parentheses. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests. Equation 5.1 is estimated with robust standard errors clustered at bank level to account for serial correlation of the error term.

Panel A: Small-sized bank sub sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	ROA	ROE	Net Interest Margin	Net Operating Income	Non-interest Income	Non-interest Expense	Cost efficiency
Transactional_ website_adoption$_{i,t}$	0.986**	3.750**	0.345***	1.015**	2.180*	1.369*	-23.364**
	(0.4645)	(1.6187)	(0.1311)	(0.4672)	(1.2167)	(0.6966)	(9.0525)
Bank_Funding$_{i,t}$	-0.012**	-0.037**	0.003	-0.012**	-0.024	-0.008	0.013
	(0.0053)	(0.0150)	(0.0016)	(0.0053)	(0.0154)	(0.0091)	(0.1060)
Bank_Leverage$_{i,t}$	0.024	-0.198	-0.025***	0.023	0.296	0.180	2.556**
	(0.0913)	(0.2610)	(0.0094)	(0.0913)	(0.2316)	(0.1278)	(1.0844)
Bank_Size$_{i,t}$	0.075	2.505**	0.053	0.075	-0.831	-0.953**	-15.517***
	(0.4482)	(1.2546)	(0.0747)	(0.4462)	(0.8849)	(0.4613)	(3.7092)
HHI$_{i,t}$	-0.006	-0.084***	-0.011***	-0.005	0.007	0.007	0.455***
	(0.0101)	(0.0231)	(0.0018)	(0.0101)	(0.0243)	(0.0126)	(0.1141)
Constant	9.361	105.011***	21.699***	7.806	0.491	5.641	-413.931***
	(8.6604)	(20.9655)	(2.0810)	(8.5999)	(23.4542)	(12.3485)	(132.0927)
Observations	3,805	3,805	3,805	3,805	3,805	3,805	3,805
R-squared	0.415	0.220	0.381	0.417	0.614	0.622	0.169
Year Fixed Effect	YES	YES	YES	YES	YES	YES	YES
State Fixed Effect	YES	YES	YES	YES	YES	YES	YES

Bank Fixed Effect	NO	NO	NO	NO	NO	NO	NO

Panel B: Large-sized bank sub sample							
VARIABLES	ROA	ROE	Net Interest Margin	Net Operating Income	Non-interest Income	Non-interest Expense	Cost efficiency
Transactional_ website_adoption$_{i,t}$	0.047	0.622	0.138*	0.088	0.592	0.523*	1.426
	(0.0669)	(0.7451)	(0.0818)	(0.0775)	(0.3643)	(0.3031)	(1.7092)
Bank_Funding$_{i,t}$	-0.001	-0.000	0.000	-0.001*	-0.000	-0.001	-0.031
	(0.0005)	(0.0061)	(0.0014)	(0.0005)	(0.0015)	(0.0020)	(0.0221)
Bank_Leverage$_{i,t}$	0.063***	-0.266**	0.051***	0.061***	0.083	0.050	-1.000***
	(0.0145)	(0.1210)	(0.0142)	(0.0144)	(0.0981)	(0.0783)	(0.2197)
Bank_Size$_{i,t}$	0.031***	0.430***	-0.101***	0.032**	0.172***	-0.011	-1.017**
	(0.0120)	(0.1333)	(0.0241)	(0.0129)	(0.0498)	(0.0461)	(0.4099)
HHI$_{i,t}$	-0.003***	-0.043***	-0.010***	-0.003**	-0.015**	-0.014**	0.028
	(0.0011)	(0.0117)	(0.0012)	(0.0012)	(0.0072)	(0.0059)	(0.0238)
Constant	4.467***	72.262***	20.795***	4.198***	18.907**	23.545***	49.372
	(1.4143)	(16.4387)	(1.5637)	(1.5186)	(8.7802)	(7.1953)	(30.3377)
Observations	3,792	3,792	3,792	3,792	3,792	3,792	3,792
R-squared	0.272	0.279	0.406	0.265	0.252	0.239	0.201
Year Fixed Effect	YES	YES	YES	YES	YES	YES	YES
State Fixed Effect	YES	YES	YES	YES	YES	YES	YES
Bank Fixed Effect	NO	NO	NO	NO	NO	NO	NO

Table A.5.23 Re-estimation of Equation 5.7, using Year and State Fixed Effects

This table reports the ordinary least squares regression results for Equation 5.7, using year and state-level fixed effects. The sample includes 307 web-launching announcements of publicly traded US banks during the 1993-2018 period. In each regression, the dependent variable is PERFORMANCE, which can be any of the accounting ratios mentioned in Table 5.1, including *ROA, ROE, Net Interest Margin, Net operating income to assets, Noninterest income to assets, Noninterest expense to assets,* and *Efficiency Ratio during 1993-2018 horizon*. Independent variables consist of three dummy variables: $First\_mover_{i,t}$, $Second\_mover_{i,t}$, and their interactions with $Transactional\_website\_adoption_{i,t}$. The set of control variables is also employed to control for exogenous cross-sectional differences in market structures and bank characteristics and are all observed annually during the 1993-2018 period. The sources for this table are mainly from FDIC, SNL Financial, Thomson Financial Securities Data, the author's calculations and some other sources. Please note that the results in the table only display the coefficients of $First\_mover_{i,t}$, $Second\_mover_{i,t}$, and their interactions with $Transactional\_website\_adoption_{i,t}$. $Laggard_{i,t}$ is treated as a reference category. Therefore, the coefficients shown in $First\_mover_{i,t}$, $Second\_mover_{i,t}$, and their interactions with $Transactional\_website\_adoption_{i,t}$ would reveal the comparison to $Laggard_{i,t}$ and $Transactional\_website\_adoption_{i,t} \times Laggards_{i,t}$. Standard errors in parentheses. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests. Equation 5.7 is estimated with robust standard errors clustered at bank level to account for serial correlation of the error term.

VARIABLES	(1) ROA	(2) ROE	(3) Net Interest Margin	(4) Net Operating Income	(5) Non-interest Income	(6) Non-interest Expense	(7) Cost efficiency
$Transactional\_website\_adoption_{i,t}$	0.597**	1.848*	0.207**	0.632**	1.814**	1.153***	-12.627**
	(0.2748)	(1.0493)	(0.0811)	(0.2783)	(0.7006)	(0.4095)	(5.2130)
$First\_mover_{i,t}$	0.157	1.499**	0.375***	0.203	0.364	0.371	1.607
	(0.1238)	(0.6929)	(0.1157)	(0.1278)	(0.4518)	(0.3171)	(6.4539)
$Second\_mover_{i,t}$	0.117	1.127*	0.321***	0.179	-0.106	-0.119	-5.845
	(0.1258)	(0.6787)	(0.1153)	(0.1278)	(0.4147)	(0.2938)	(3.9275)
$Transactional\_website\_adoption_{i,t}$ x $First\_mover_{i,t}$	0.211	0.566	-0.229**	0.187	0.926	0.531	-0.092
	(0.2335)	(0.7345)	(0.1033)	(0.2369)	(0.8621)	(0.5481)	(6.2582)
$Transactional\_website\_adoption_{i,t}$ x $Second\_mover_{i,t}$	0.018	0.062	-0.166*	-0.034	0.326	0.247	5.377
	(0.1196)	(0.6866)	(0.0987)	(0.1222)	(0.3669)	(0.2468)	(4.0892)
$Bank\_Funding_{i,t}$	-0.006**	-0.016*	0.001	-0.007**	-0.013	-0.006	-0.007
	(0.0032)	(0.0087)	(0.0012)	(0.0031)	(0.0095)	(0.0057)	(0.0465)
$Bank\_Leverage_{i,t}$	0.147**	-0.019	-0.025***	0.147**	0.654***	0.387***	1.615*

	(0.0580)	(0.0853)	(0.0036)	(0.0581)	(0.2259)	(0.1308)	(0.9299)
$Bank\_Size_{i,t}$	0.039	0.711***	-0.061***	0.039	-0.047	-0.213**	-3.859***
	(0.0644)	(0.1979)	(0.0203)	(0.0643)	(0.1672)	(0.1042)	(0.7042)
Constant	-0.008***	-0.056***	-0.007***	-0.007***	-0.029***	-0.019***	0.149***
	(0.0021)	(0.0098)	(0.0009)	(0.0021)	(0.0074)	(0.0049)	(0.0547)
Observations	7,597	7,597	7,597	7,597	7,597	7,597	7,597
R-squared	0.243	0.192	0.345	0.244	0.423	0.431	0.107
Year Fixed Effect	YES	YES	YES	YES	YES	YES	YES
State Fixed Effect	YES	YES	YES	YES	YES	YES	YES
Bank Fixed Effect	NO	NO	NO	NO	NO	NO	NO
Reference Variable	Laggards	Laggards	Laggards	Laggards	Laggards	Laggards	Laggards

Table A.5.24 Re-estimation of Equation 5.1, using Year, State and Bank Fixed Effects

This table reports the ordinary least squares regression results for Equation 5,1 using year, state, and bank-level fixed effects. The sample includes 307 web-launching announcements of publicly traded US banks during the 1993-2018 period. In each regression, the dependent variable is PERFORMANCE, which can be any of the accounting ratios mentioned in Table 5.1, including *ROA, ROE, Net Interest Margin, Net operating income to assets, Noninterest income to assets; Noninterest expense to assets;* and *Efficiency Ratio during 1996-2013 horizon.* Independent variables consist of the variable Transactional website adoption, which equals 1 since the year banks adopt transactional websites and 0 if otherwise. The set of control variables is also employed to control for exogenous cross-sectional differences in market structures and bank characteristics and are all observed annually during the 1993-2018 period. The sources for this table are mainly from FDIC, SNL Financial, Thomson Financial Securities Data, the author's calculations and some other sources. Standard errors in parentheses. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests. Equation 5.1 is estimated with robust standard errors clustered at bank level to account for serial correlation of the error term.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	ROA	ROE	Net Interest Margin	Net Operating Income	Non-interest Income	Non-interest Expense	Cost efficiency
Transactional_	-0.035	0.674	0.136**	-0.020	-0.059	0.072	-6.001
website_adoption$_{i,t}$	(0.1739)	(0.6027)	(0.0542)	(0.1719)	(0.3754)	(0.2040)	(4.0120)
Bank_Funding$_{i,t}$	-0.000	0.009	0.001	-0.000	0.002	0.002	-0.117*
	(0.0011)	(0.0080)	(0.0012)	(0.0012)	(0.0019)	(0.0016)	(0.0628)
Bank_Leverage$_{i,t}$	-0.127*	-0.583*	-0.014	-0.128*	-0.109	-0.021	4.335***
	(0.0768)	(0.3038)	(0.0115)	(0.0771)	(0.0989)	(0.0444)	(1.0040)
Bank_Size$_{i,t}$	-0.062	0.121	0.033	-0.051	-0.722	-0.675**	-15.359***
	(0.2886)	(0.6419)	(0.0430)	(0.2870)	(0.6375)	(0.3254)	(3.9226)
HHI$_{i,t}$	0.006	-0.018	-0.010***	0.007	0.022	0.011	0.296***
	(0.0105)	(0.0240)	(0.0012)	(0.0105)	(0.0231)	(0.0115)	(0.0967)
Constant	-5.266	43.179*	19.325***	-6.202	-20.423	-3.422	-198.702**
	(10.6689)	(24.3731)	(1.3812)	(10.6235)	(24.3180)	(12.2509)	(93.6730)
Observations	7,597	7,597	7,597	7,597	7,597	7,597	7,597
R-squared	0.571	0.369	0.621	0.574	0.766	0.771	0.315
Year Fixed Effect	YES	YES	YES	YES	YES	YES	YES
State Fixed Effect	YES	YES	YES	YES	YES	YES	YES
Bank Fixed Effect	YES	YES	YES	YES	YES	YES	YES

Table A.5.25 Re-estimation of Equation 5.2, using Year, State and Bank Fixed Effects

This table reports the ordinary least squares regression results for Equation 5.2, using year, state, and bank-level fixed effects. The sample includes 307 web-launching announcements of publicly traded US banks during the 1993-2018 period. In each regression, the dependent variable is PERFORMANCE, which can be any of the accounting ratios mentioned in Table 5.1, including *ROA, ROE; Net Interest Margin; Net operating income to assets; Noninterest income to assets; Noninterest expense to assets;* and *Efficiency Ratio during 1993-2018 horizon*. Independent variables consist of the variable "$Transactional\_website\_experience_{i,t}$", *which* equals 0 before and at the time that banks adopt their transactional websites and equals 1,2,3,4… at year 1, 2,3,4… after banks have adopted the transactional websites. The set of control variables is also employed to control for exogenous cross-sectional differences in market structures and bank characteristics and are all observed annually during the 1993-2018 period. The sources for this table are mainly from FDIC, SNL Financial, Thomson Financial Securities Data, the author's calculations and some other sources. The sources for this table are mainly from FDIC, SNL Financial, Thomson Financial Securities Data, the author's calculations and some other sources. Standard errors in parentheses. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests. Equation 5.2 is estimated with robust standard errors clustered at bank level to account for serial correlation of the error term.

VARIABLES	(1) ROA	(2) ROE	(3) Net Interest Margin	(4) Net Operating Income	(5) Non-interest Income	(6) Non-interest Expense	(7) Cost efficiency
Transactional_ website_experience$_{i,t}$	-0.002*	-0.024*	0.001	-0.003*	0.003	0.004	0.051
	(0.0014)	(0.0131)	(0.0011)	(0.0014)	(0.0034)	(0.0023)	(0.0789)
Bank_Funding$_{i,t}$	-0.000	0.010	0.002	-0.000	0.002	0.002	-0.121*
	(0.0011)	(0.0081)	(0.0012)	(0.0011)	(0.0018)	(0.0016)	(0.0631)
Bank_Leverage$_{i,t}$	-0.127*	-0.588*	-0.015	-0.128*	-0.108	-0.022	4.382***
	(0.0755)	(0.3014)	(0.0115)	(0.0758)	(0.0962)	(0.0431)	(1.0049)
Bank_Size$_{i,t}$	-0.062	0.110	0.032	-0.052	-0.721	-0.675**	-15.300***
	(0.2875)	(0.6391)	(0.0433)	(0.2859)	(0.6346)	(0.3239)	(3.9236)
HHI$_{i,t}$	0.006	-0.011	-0.008***	0.007	0.021	0.012	0.235***
	(0.0089)	(0.0208)	(0.0012)	(0.0089)	(0.0197)	(0.0100)	(0.0829)
Constant	-4.828	33.325*	17.443***	-5.976	-19.538	-4.342	-114.278*
	(8.4331)	(19.7574)	(1.2705)	(8.4171)	(19.4978)	(10.0406)	(68.9526)
Observations	7,597	7,597	7,597	7,597	7,597	7,597	7,597
R-squared	0.571	0.369	0.620	0.574	0.766	0.771	0.315
Year Fixed Effect	YES	YES	YES	YES	YES	YES	YES
State Fixed Effect	YES	YES	YES	YES	YES	YES	YES
Bank Fixed Effect	YES	YES	YES	YES	YES	YES	YES

Table A.5.26 Re-estimation of Equation 5.3, using Year, State and Bank Fixed Effects

This table reports the ordinary least squares regression results for Equation 5.3, using year, state, and bank-level fixed effects. The sample includes 307 web-launching announcements of publicly traded US banks. In each regression, the dependent variable is PERFORMANCE, which can be any of the accounting ratios mentioned in Table 5.1, including *ROA; ROE, Net Interest Margin; Net operating income to assets; Noninterest income to assets; Noninterest expense to assets;* and *Efficiency Ratio during 1993-2018 horizon*. Independent variables consist of the variable Mobile website adoption$_{i,t}$, which equals 1 since banks introduced mobile website version and 0 if otherwise. The set of control variables is also employed to control for exogenous cross-sectional differences in market structures and bank characteristics and are all observed annually during the 1993-2018 period. The sources for this table are mainly from FDIC, SNL Financial, Thomson Financial Securities Data, the author's calculations and some other sources. Standard errors in parentheses. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests. Equation 5.3 is estimated with robust standard errors clustered at bank level to account for serial correlation of the error term.

VARIABLES	(1) ROA	(2) ROE	(3) Net Interest Margin	(4) Net Operating Income	(5) Noninterest Income	(6) Noninterest Expense	(7) Cost efficiency
Mobilewebsite adoption$_{i,t}$	0.631	3.109	0.124	0.657	-0.310	-1.131***	-56.336
	(0.6391)	(2.2429)	(0.5774)	(0.6188)	(0.2616)	(0.3770)	(56.5783)
Bank_Funding$_{i,t}$	-0.000	0.009	0.002	-0.000	0.002	0.002	-0.120*
	(0.0011)	(0.0081)	(0.0012)	(0.0011)	(0.0018)	(0.0016)	(0.0629)
Bank_Leverage$_{i,t}$	-0.127*	-0.588*	-0.015	-0.128*	-0.108	-0.022	4.375***
	(0.0756)	(0.3017)	(0.0115)	(0.0759)	(0.0961)	(0.0431)	(1.0053)
Bank_Size$_{i,t}$	-0.061	0.114	0.032	-0.051	-0.721	-0.675**	-15.294***
	(0.2874)	(0.6391)	(0.0433)	(0.2857)	(0.6351)	(0.3242)	(3.9334)
HHI$_{i,t}$	-0.000	-0.041	-0.010	0.000	0.024	0.023**	0.785
	(0.0123)	(0.0349)	(0.0058)	(0.0122)	(0.0217)	(0.0114)	(0.5558)
Constant	3.296	75.150*	16.776**	2.497	-24.584	-21.820*	-885.380
	(13.9747)	(42.1702)	(8.0437)	(13.8016)	(22.6544)	(12.4507)	(775.2592)
Observations	7,597	7,597	7,597	7,597	7,597	7,597	7,597
R-squared	0.571	0.368	0.620	0.574	0.766	0.771	0.315
Year Fixed Effect	YES	YES	YES	YES	YES	YES	YES
State Fixed Effect	YES	YES	YES	YES	YES	YES	YES
Bank Fixed Effect	YES	YES	YES	YES	YES	YES	YES

Table A.5.27 Re-estimation of Equation 5.4, using Year, State and Bank Fixed Effects

This table reports the ordinary least squares regression results for Equation 5.4, using year, state, and bank-level fixed effect. The sample includes 307 web-launching announcements of publicly traded US banks during the 1993-2018 period. In each regression, the dependent variable is PERFORMANCE, which can be any of the accounting ratios mentioned in Table 5.1,, including *ROA; ROE; Net Interest Margin; Net operating income to assets; Noninterest income to assets; Noninterest expense to assets;* and *Efficiency Ratio during 1993-2018 horizon*. Independent variables consist of the variable $Low\_Gap_{i,t}$, $High\_Gap_{i,t}$, $Mobile\_website\_adoption_{i,t}$, and the interaction between them. The set of control variables is also employed to control for exogenous cross-sectional differences in market structures and bank characteristics and are all observed annually during the 1993-2018 period. The sources for this table are mainly from FDIC, SNL Financial, Thomson Financial Securities Data, the author's calculations and some other sources. Standard errors in parentheses. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests. Equation 5.4 is estimated with robust standard errors clustered at bank level to account for serial correlation of the error term.

VARIABLES	(1) ROA	(2) ROE	(3) Net Interest Margin	(4) Net Operating Income	(5) Non-interest Income	(6) Non-interest Expense	(7) Cost efficiency
$Mobile\_website\_adoption_{i,t}$	0.787	2.317	-0.069	0.809	-0.111	-1.229***	-58.805
	(0.6174)	(2.1676)	(0.5794)	(0.5964)	(0.4824)	(0.4443)	(56.6473)
$Low\_Gap_{i,t}$	-0.280**	-1.190*	-1.224***	-0.279**	-2.289***	-2.865***	-19.703**
	(0.1193)	(0.6950)	(0.1180)	(0.1168)	(0.3075)	(0.1897)	(9.5596)
$Low_Gap_{i,t}$x	-0.164	0.836	0.204***	-0.161	-0.209	0.104	2.608
$Mobile\_website\_adoption_{i,t}$	(0.2681)	(0.7358)	(0.0733)	(0.2692)	(0.6768)	(0.3588)	(2.2766)
$Bank\_Funding_{i,t}$	-0.000	0.009	0.002	-0.000	0.002	0.002	-0.120*
	(0.0011)	(0.0081)	(0.0011)	(0.0011)	(0.0019)	(0.0016)	(0.0630)
$Bank\_Leverage_{i,t}$	-0.129	-0.580*	-0.013	-0.129	-0.110	-0.021	4.402***
	(0.0781)	(0.3069)	(0.0117)	(0.0784)	(0.1026)	(0.0464)	(1.0100)
$Bank\_Size_{i,t}$	-0.069	0.155	0.042	-0.059	-0.731	-0.670**	-15.168***
	(0.2994)	(0.6606)	(0.0423)	(0.2977)	(0.6641)	(0.3377)	(3.9110)
$HHI_{i,t}$	-0.001	-0.039	-0.009	-0.000	0.024	0.023**	0.792
	(0.0117)	(0.0339)	(0.0058)	(0.0116)	(0.0200)	(0.0107)	(0.5564)
Constant	4.521	72.812*	18.281**	3.713	-22.965	-20.294*	-895.588
	(12.9554)	(40.2021)	(8.0065)	(12.7681)	(19.6510)	(11.1488)	(775.6881)
Observations	7,597	7,597	7,597	7,597	7,597	7,597	7,597
R-squared	0.572	0.369	0.623	0.575	0.766	0.771	0.316

Year Fixed Effect	YES	YES	YES	YES	YES	YES	YES
State Fixed Effect	YES	YES	YES	YES	YES	YES	YES
Bank fixed effect	YES	YES	YES	YES	YES	YES	YES
Reference Variable	High_Gap	High_Gap	High_Gap	High_Gap	High_Gap	High_Gap	High_Gap

Table A.5.28 Re-estimation of Equation 5.5, using Year, State and Bank Fixed Effects

This table reports the ordinary least squares regression results for Equation 5.5, using year, state, and bank-level fixed effects. The sample includes 307 web-launching announcements of publicly traded US banks during the 1993-2018 period. In each regression, the dependent variable is PERFORMANCE, which can be any of the accounting ratios mentioned in Table 5.1, including *ROA, ROE; Net Interest Margin; Net operating income to assets; Noninterest income to assets; Noninterest expense to assets;* and *Efficiency Ratio during 1993-2018 horizon*. The main independent variable is "Learning by observing" ($LBOY_{i,t}$) which is estimated as the number of the cumulative number of sample banks that adopted transactional websites during three years before the transactional website of $bank_i$. The set of control variables is also employed to control for exogenous cross-sectional differences in market structures and bank characteristics and are all observed annually during the 1993-2018 period. The sources for this table are mainly from FDIC, SNL Financial, Thomson Financial Securities Data, the author's calculations and some other sources. Standard errors in parentheses. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests. Equation 5.5 is estimated with robust standard errors clustered at bank level to account for serial correlation of the error term.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	ROA	ROE	Net Interest Margin	Net Operating Income	Non-interest Income	Non-interest Expense	Cost efficiency
$LBOY_{i,t}$	1.460***	6.523***	-0.924***	1.581***	1.035	-1.665***	-66.218***
	(0.2902)	(0.8044)	(0.0917)	(0.2856)	(0.8313)	(0.4255)	(4.0225)
$Bank\_Funding_{i,t}$	0.002	0.015	-0.001	0.002	0.006	0.002	0.019
	(0.0032)	(0.0129)	(0.0012)	(0.0032)	(0.0052)	(0.0028)	(0.0275)
$Bank\_Leverage_{i,t}$	-0.187	-0.844	0.038***	-0.189	-0.164	-0.013	0.914
	(0.1347)	(0.5585)	(0.0113)	(0.1349)	(0.1536)	(0.0721)	(0.6294)
$Bank\_Size_{i,t}$	-0.220	-0.503	0.017	-0.217	-0.933	-0.720**	-6.586***
	(0.3619)	(0.8029)	(0.0541)	(0.3579)	(0.7299)	(0.3479)	(2.0607)
$HHI_{i,t}$	-0.036	-0.043	0.016***	-0.036	-0.085	-0.038	-0.152**
	(0.0371)	(0.0755)	(0.0028)	(0.0369)	(0.0804)	(0.0379)	(0.0604)
Constant	-19.923	-264.140*	31.588***	-25.726	87.101	163.188***	4,014.633***
	(48.5743)	(138.1989)	(4.0862)	(48.6931)	(92.7123)	(45.7408)	(151.4736)
Observations	5,855	5,855	5,855	5,855	5,855	5,855	5,855
R-squared	0.654	0.385	0.661	0.659	0.857	0.862	0.367
Year Fixed Effect	YES	YES	YES	YES	YES	YES	YES
State Fixed Effect	YES	YES	YES	YES	YES	YES	YES
Bank Fixed Effect	YES	YES	YES	YES	YES	YES	YES

Table A.5.29 Re-estimation of Equation 5.6, using Year, State and Bank Fixed Effects

This table reports the ordinary least squares regression results for Equation 5.6, using year, state, and bank-level fixed effects. The sample includes 307 web-launching announcements of publicly traded US banks during the 1993-2018 period. In each regression, the dependent variable is PERFORMANCE, which can be any of the accounting ratios mentioned in Table 5.1; including ROA; ROE; Net Interest Margin; Net operating income to assets; Noninterest income to assets; Noninterest expense to assets; and Efficiency Ratio during 1996-2013 horizon. The main independent variables are $Small\_Bank_{i,t}$ and the interaction with $Transactional\_website\_adoption_{i,t}$. The set of control variables is also employed to control for exogenous cross-sectional differences in market structures and bank characteristics and are all observed annually during the 1993-2013 period. The sources for this table are mainly from FDIC, SNL Financial, Thomson Financial Securities Data, the author's calculations and some other sources. Please note that the results in this table only display the coefficients of $Small\_Bank_{i,t}$ and $Small_Bank_{i,t}$x Transactional_website_adoption$_{i,t}$. $Large\_Bank_{i,t}$ is treated as a reference category. Therefore, the coefficients shown $Small\_Bank_{i,t}$ and $Small_Bank_{i,t}$x Transactional_website_adoption$_{i,t}$ variables present the comparison to $Large\_Bank_{i,t}$ and $Large_Bank_{i,t}$x Transactional_website_adoption$_{i,t}$. The *small-sized bank* group comprises 50% of sample banks with the smallest asset values each year, and the *large-sized bank* group includes the remaining 50% of banks with the largest market capitalization. Standard errors in parentheses. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests. Equation 5.6 is estimated with robust standard errors clustered at bank level to account for serial correlation of the error term.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	ROA	ROE	Net Interest Margin	Net Operating Income	Non-interest Income	Non-interest Expense	Cost efficiency
Transactional_ website_adoption$_{i,t}$	-0.044 (0.1149)	-0.087 (0.5924)	-0.005 (0.0650)	-0.023 (0.1137)	-0.168 (0.4157)	-0.094 (0.2484)	-3.615 (4.0287)
$Small\_Bank_{i,t}$	-0.238 (0.1911)	-1.620*** (0.5868)	-0.213** (0.0942)	-0.242 (0.1905)	-0.859 (0.6473)	-0.630* (0.3733)	0.585 (3.8081)
$Small_Bank_{i,t}$x Transactional_ website_adoption$_{i,t}$	0.013 (0.1510)	1.334 (0.8581)	0.250*** (0.0745)	0.003 (0.1496)	0.184 (0.1255)	0.286** (0.1353)	-4.245 (3.3383)
$Bank\_Funding_{i,t}$	-0.000 (0.0011)	0.008 (0.0080)	0.001 (0.0012)	-0.000 (0.0011)	0.001 (0.0017)	0.001 (0.0015)	-0.117* (0.0624)
$Bank\_Leverage_{i,t}$	-0.128 (0.0790)	-0.571* (0.3135)	-0.011 (0.0114)	-0.129 (0.0792)	-0.109 (0.0998)	-0.019 (0.0445)	4.281*** (1.0050)
$HHI_{i,t}$	0.007 (0.0118)	-0.016 (0.0265)	-0.010*** (0.0013)	0.008 (0.0117)	0.025 (0.0255)	0.013 (0.0126)	0.311*** (0.0962)
Constant	-6.470 (11.7718)	41.275 (26.8169)	17.095*** (1.4454)	-7.456 (11.7168)	-23.154 (26.2308)	-6.377 (13.0926)	-210.428** (94.4053)

Observations	7,597	7,597	7,597	7,597	7,597	7,597	7,597
R-squared	0.572	0.370	0.624	0.575	0.767	0.772	0.316
Year Fixed Effect	YES	YES	YES	YES	YES	YES	YES
State Fixed Effect	YES	YES	YES	YES	YES	YES	YES
Bank Fixed Effect	YES	YES	YES	YES	YES	YES	YES
Reference Category	Large-sized Banks	Large-sized Banks	Large-sized Banks	Large-sized Banks	Large-sized Banks	Large-sized Banks	Large-sized Banks

Table A.5.30 Re-estimation of Sub-samples, based on their size, using year, state and bank fixed effects.

This table reports the ordinary least squares regression results for Equation 5.1, based on the sub-sample of small-sized banks (Panel A) and larger-sized banks (Panel B). Those regressions applied year, state and bank-level fixed effects. The original data sample includes 307 web-launching announcements of publicly traded US banks during the 1993-2018 period based on the sample of 307 web-launching announcements of publicly traded US banks during the 1996-2013 period. In each regression, the dependent variable is PERFORMANCE, which can be any of the accounting ratios mentioned in Table 5.1, including ROA, ROE, Net Interest Margin, Net operating income to assets, Noninterest income to assets, Noninterest expense to assets, and Efficiency Ratio. The set of control variables is also employed to control for exogenous cross-sectional differences in market structures and bank characteristics and are all observed annually during the 1993-2013 period. The sources for this table are SNL Financial, FIDC, Thomson Financial Securities Data, the author's calculations, and other sources. Standard errors in parentheses. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests. Equation 5.1 is estimated with robust standard errors clustered at bank level to account for serial correlation of the error term.

Panel A: Sub-sample- Small Banks

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	ROA	ROE	Net Interest Margin	Net Operating Income	Non-interest Income	Non-interest Expense	Cost efficiency
Transactional_ website_adoption$_{i,t}$	0.083	0.987	0.153	0.098	-0.280	-0.067	-12.044
	(0.2004)	(1.0559)	(0.1119)	(0.1968)	(0.4724)	(0.2368)	(9.0732)
Bank_Funding$_{i,t}$	0.001	0.000	0.003**	0.000	0.005	0.006**	-0.160
	(0.0040)	(0.0188)	(0.0015)	(0.0040)	(0.0050)	(0.0026)	(0.1005)
Bank_Leverage$_{i,t}$	-0.183	-0.573	-0.022	-0.183	-0.206	-0.078	4.690***
	(0.1187)	(0.4796)	(0.0164)	(0.1190)	(0.1591)	(0.0673)	(1.3083)
Bank_Size$_{i,t}$	-0.626	0.877	0.084	-0.608	-2.402	-1.810*	-22.813***
	(1.0907)	(2.9660)	(0.0969)	(1.0863)	(2.0475)	(0.9448)	(5.7784)
HHI$_{i,t}$	0.014	-0.026	-0.009***	0.015	0.056	0.035	0.486***
	(0.0234)	(0.0537)	(0.0022)	(0.0232)	(0.0499)	(0.0239)	(0.1280)
Constant	-9.624	43.841	18.227***	-11.047	-47.042	-22.130	-376.371***
	(18.9925)	(38.5341)	(2.2751)	(18.8710)	(44.7099)	(22.0613)	(142.6355)
Observations	3,805	3,805	3,805	3,805	3,805	3,805	3,805
R-squared	0.599	0.364	0.666	0.602	0.779	0.792	0.544
Year Fixed Effect	YES	YES	YES	YES	YES	YES	YES
State Fixed Effect	YES	YES	YES	YES	YES	YES	YES
Bank Fixed Effect	YES	YES	YES	YES	YES	YES	YES

Panel B: Sub-sample- Large Banks							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	ROA	ROE	Net Interest Margir	Net Operating Inco	Non-interest Incon	Non-interest Exper	Cost efficiency
Transactional_ website_adoption$_{i,t}$	-0.018	0.005	0.094	0.014	0.340	0.316*	1.517
	(0.0585)	(0.7203)	(0.0643)	(0.0670)	(0.2144)	(0.1876)	(1.4302)
Bank_Funding$_{i,t}$	0.000	0.008	-0.001	0.000	0.001	-0.001	-0.046***
	(0.0007)	(0.0089)	(0.0013)	(0.0007)	(0.0019)	(0.0018)	(0.0161)
Bank_Leverage$_{i,t}$	0.064***	-0.172	0.074***	0.062***	0.109	0.097	-0.434**
	(0.0180)	(0.1520)	(0.0190)	(0.0180)	(0.1064)	(0.0848)	(0.2089)
Bank_Size$_{i,t}$	-0.070	-0.655	-0.124*	-0.066	-0.401	-0.477*	-3.510***
	(0.0544)	(0.6075)	(0.0669)	(0.0528)	(0.3189)	(0.2579)	(1.1111)
HHI$_{i,t}$	0.000	-0.016	-0.010***	0.000	-0.001	-0.004	0.062**
	(0.0012)	(0.0150)	(0.0015)	(0.0011)	(0.0023)	(0.0025)	(0.0301)
Constant	1.687	47.572***	21.693***	1.286	6.176**	15.014***	26.099
	(1.3246)	(17.4377)	(1.5868)	(1.3175)	(2.8175)	(2.8374)	(32.2847)
Observations	3,792	3,792	3,792	3,792	3,792	3,792	3,792
R-squared	0.395	0.392	0.665	0.399	0.584	0.597	0.558
Year Fixed Effect	YES	YES	YES	YES	YES	YES	YES
State Fixed Effect	YES	YES	YES	YES	YES	YES	YES
Bank Fixed Effect	YES	YES	YES	YES	YES	YES	YES

Table A.5.31 Re-estimation of Equation 5.7, using Year, State and Bank Fixed Effects

This table reports the ordinary least squares regression results for Equation 5.7, using year, state, and bank-level fixed effects. The sample includes 307 web-launching announcements of publicly traded US banks during the 1993-2018 period. In each regression, the dependent variable is PERFORMANCE, which can be any of the accounting ratios mentioned in Table 5.1, including ROA, ROE, Net Interest Margin, Net operating income to assets, Noninterest income to assets, Noninterest expense to assets, and Efficiency Ratio during 1993-2018 horizon. Independent variables consist of three dummy variables: $First\_mover_{i,t}$, $Second\_mover_{i,t}$, and their interactions with $Transactional\_website\_adoption_{i,t}$. The set of control variables is also employed to control for exogenous cross-sectional differences in market structures and bank characteristics and are all observed annually during the 1993-2018 period. The sources for this table are mainly from FDIC, SNL Financial, Thomson Financial Securities Data, the author's calculations and some other sources. Please note that the results in the table only display the coefficients of $First\_mover_{i,t}$, $Second\_mover_{i,t}$, and their interactions with $Transactional\_website\_adoption_{i,t}$. $Laggard_{i,t}$ is treated as a reference category. Therefore, the coefficients shown in $First\_mover_{i,t}$, $Second\_mover_{i,t}$, and their interactions with $Transactional\_website\_adoption_{i,t}$ would reveal the comparison to $Laggard_{i,t}$ and $Transactional\_website\_adoption_{i,t} \times Laggards_{i,t}$. Standard errors in parentheses. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests. Equation 5.7 is estimated with robust standard errors clustered at bank level to account for serial correlation of the error term.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	ROA	ROE	Net Interest Margin	Net Operating Income	Non-Interest Income	Non-interest Expense	Cost efficiency
$Transactional\_website\_adoption_{i,t}$	-0.031 (0.2211)	0.681 (0.6990)	0.245*** (0.0737)	0.003 (0.2212)	-0.212 (0.5291)	-0.035 (0.2928)	-9.108* (4.8779)
$First\_mover_{i,t}$	-0.157 (0.3316)	-1.028 (0.8167)	1.115*** (0.1000)	-0.128 (0.3353)	-0.637 (1.0263)	0.293 (0.6078)	79.661*** (5.7807)
$Second\_mover_{i,t}$	1.223*** (0.3808)	3.980*** (1.1844)	-1.582*** (0.1495)	1.375*** (0.3859)	-1.065 (0.8928)	-4.009*** (0.5078)	-158.928*** (11.9794)
$Transactional\_website\_adoption_{i,t}$ x $First\_mover_{i,t}$	0.226 (0.3305)	0.505 (0.8392)	-0.316*** (0.1050)	0.203 (0.3353)	1.030 (1.0010)	0.558 (0.5898)	3.045 (6.3555)
$Transactional\_website\_adoption_{i,t}$ x $Second\_mover_{i,t}$	-0.160 (0.0990)	-0.349 (0.6392)	-0.191* (0.0979)	-0.212** (0.1056)	-0.105 (0.1278)	0.028 (0.1195)	9.245** (4.1613)
$Bank\_Funding_{i,t}$	0.000 (0.0013)	0.009 (0.0081)	0.001 (0.0012)	0.000 (0.0013)	0.003 (0.0023)	0.002 (0.0018)	-0.116* (0.0646)
$Bank\_Leverage_{i,t}$	-0.128	-0.586*	-0.013	-0.129*	-0.112	-0.023	4.343***

	(0.0779)	(0.3059)	(0.0116)	(0.0782)	(0.1020)	(0.0462)	(1.0047)
$Bank\_Size_{i,t}$	-0.075	0.092	0.046	-0.064	-0.774	-0.702**	-15.404***
	(0.3037)	(0.6656)	(0.0431)	(0.3022)	(0.6828)	(0.3505)	(3.7835)
Constant	2.395	14.809	7.208***	2.074	12.403	16.789***	372.389***
	(4.7762)	(11.5913)	(0.6327)	(4.7604)	(9.9950)	(5.0554)	(57.0550)
Observations	7,597	7,597	7,597	7,597	7,597	7,597	7,597
R-squared	0.572	0.369	0.624	0.575	0.767	0.771	0.317
Year Fixed Effect	YES	YES	YES	YES	YES	YES	YES
State Fixed Effect	YES	YES	YES	YES	YES	YES	YES
Bank Fixed Effect	YES	YES	YES	YES	YES	YES	YES
Reference Variable	Laggards	Laggards	Laggards	Laggards	Laggards	Laggards	Laggards

Appendix C - Additional Analyses for Models in Chapter 6

This section presents the results of the Robustness test section, including:

- Results of regression on the impact of transactional website adoption on BHARs over three holding periods", using alternative benchmarks.
- Results of regression on the impact of "Learning-by-Observing" BHARs since the transactional website adoption, using the alternative "Learning-by-Observing" variable.
- Results of regression on the impact of size effect over both ex-ante and ex-post periods of transactional website launching events.
- Results of regression on the impact of the timing effect over the ex-post period of transactional website launch events.
- Results of all main equations in Section 6.4, using year fixed effect
- Results of all main equations in Section 6.4, using year and state fixed effect
- Results of all main equations in Section 6.4, using year, state and bank-level fixed effect

Table A.6.11 The impact of transactional website adoption on BHARs over three holding periods, using alternative benchmarks.

This table reports the ordinary least square regression results for Equation 6.10, based on the sample of 307 web-launching announcements of publicly traded U.S. banks. In each regression, the dependent variable is BHAR which are estimated as the difference between the compounded returns of sample banks, and the benchmark returns over the holding periods. The holding periods used to estimate BHAR are over both ex-ante and ex-post period of the website-activated events, including (-12; -1); (0; 11); (-24;-1); (0; 23); (-36;-1); (0;35). Two alternative benchmarks used to estimate BHAR are Ex-ante Buy and Hold and Equally Market Index. Main independent variable is the variable "*Transactional website adoption" which* equals 0 if the holding periods are ex-ante (-12; -1); (-24;-1); (-36;-1), equals 1 if the holding periods are ex-post (0; 11); (0; 23); (0;35). The control variables are also employed to control for exogenous cross-sectional differences in market structures and bank characteristics and are all observed annually. The sources for this table are FDIC, SNL Financial, Wayback Machine U.S. Census Bureau of Economic (BEA), U.S. Bureau of Labor Statistics, the World Bank, Thomson Financial Securities Data, and the author's calculations. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests.

	12-month		24-month		36-month	
VARIABLES	BHR	BHAR Equally-weighted Market Index	BHR	BHAR Equally-weighted Market Index	BHR	BHAR Equally-weighted Market Index
Transactional_ website_adoption$_{i,t}$	0.060**	0.068*	0.192***	0.618***	0.251***	0.724***
	(0.0250)	(0.0381)	(0.0600)	(0.0706)	(0.0712)	(0.0822)
Bank_Size$_{i,t}$	0.020***	0.009	0.012	-0.029	0.006	-0.059***
	(0.0076)	(0.0116)	(0.0197)	(0.0203)	(0.0210)	(0.0218)
Bank_Leverage$_{i,t}$	0.002	0.002	-0.012	-0.005	-0.008	-0.003
	(0.0019)	(0.0029)	(0.0073)	(0.0061)	(0.0084)	(0.0100)
Bank_Funding$_{i,t}$	0.000	-0.000	0.002**	0.001	0.002*	0.002*
	(0.0004)	(0.0006)	(0.0009)	(0.0010)	(0.0009)	(0.0011)
HHI$_{i,t}$	-0.001***	0.000**	-0.004***	-0.000	-0.003***	-0.001**
	(0.0001)	(0.0002)	(0.0005)	(0.0005)	(0.0005)	(0.0006)
ΔROA$_{i,t}$	0.014	-0.010	0.183***	-0.004	0.144***	-0.000
	(0.0192)	(0.0229)	(0.0508)	(0.0122)	(0.0460)	(0.0105)
Constant	1.885***	-0.902**	6.621***	0.396	5.707***	2.335**
	(0.2927)	(0.4305)	(0.8379)	(0.8662)	(0.9460)	(1.0081)
Observations	506	576	335	570	334	534
R-squared	0.108	0.020	0.210	0.145	0.134	0.157

Table A.6.12 The impact of "Learning-by-Observing" from 2-year Information Spillover on BHARs since the transactional website adoption.

This table reports the ordinary least square regression results for Equation 6,7, based on the sample of 307 web-launching announcements of publicly traded U.S. banks. In each regression, the dependent variable is $BHAR_{i,t}$, which are estimated as the difference between the compounded returns of sample banks, and the benchmark returns over the post-adoption holding period. The holding periods used to estimate $BHAR_{i,t}$, are ex-post period of the website-activated events, including (0, 11); (0, 23); (0, 35). Three benchmarks used to estimate BHAR are Ex-ante Buy and Hold and Equally Market Index. The main independent variable is $LBOY(2)_{i,t}$, representing "learning-by-observing" behaviour, or more specifically, for the amount of observable information spillover from previous website-adopted events from which bank investors can potentially learn. This variable is estimated by the number of the cumulative number of sample banks that adopted transactional websites during one years before the transactional website of $bank_t$. The sources for this table are FDIC, SNL Financial, Wayback Machine U.S. Census Bureau of Economic (BEA), U.S. Bureau of Labor Statistics, the World Bank, Thomson Financial Securities Data, and the author's calculations. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests.

	12-month period			24-month period			36-month period		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
VARIABLES	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio
$LBOY(2)_{i,t}$	0.003***	0.004***	0.001	0.006***	0.007***	0.002***	0.006***	0.007***	0.003***
	(0.0004)	(0.0006)	(0.0005)	(0.0005)	(0.0007)	(0.0007)	(0.0005)	(0.0007)	(0.0008)
$Bank\_Size_{i,t}$	0.006	-0.001	-0.009	-0.011	-0.030	-0.017	-0.053***	-0.104***	-0.002
	(0.0114)	(0.0183)	(0.0132)	(0.0173)	(0.0238)	(0.0190)	(0.0200)	(0.0258)	(0.0246)
$Bank\_Leverage_{i,t}$	0.003	0.006	0.005	-0.006	-0.007	-0.011	-0.013	-0.016	-0.032*
	(0.0027)	(0.0043)	(0.0042)	(0.0063)	(0.0087)	(0.0124)	(0.0085)	(0.0110)	(0.0177)
$Bank\_Funding_{i,t}$	0.000	0.001	0.000	0.000	0.001	-0.000	0.000	0.001	0.001
	(0.0005)	(0.0008)	(0.0007)	(0.0008)	(0.0011)	(0.0010)	(0.0009)	(0.0012)	(0.0014)
$HHI_{i,t}$	-0.001***	-0.002***	-0.000	-0.002***	-0.002***	-0.001	-0.004***	-0.004***	-0.003**
	(0.0002)	(0.0004)	(0.0003)	(0.0004)	(0.0005)	(0.0006)	(0.0005)	(0.0007)	(0.0012)
$\Delta ROA_{i,t}$	0.010	0.015	-0.016	0.011	0.018	0.012	0.010	0.011	0.019
	(0.0198)	(0.0316)	(0.0287)	(0.0088)	(0.0121)	(0.0116)	(0.0080)	(0.0103)	(0.0115)
Constant	1.792***	2.984***	0.795	303	303	228	6.519***	8.127***	4.388**
	(0.4510)	(0.7208)	(0.5610)	0.344	0.297	0.069	(0.9474)	(1.2176)	(1.9948)
Observations	303	303	217	303	303	228	303	303	236

R-squared	0.264	0.259	0.047	0.344	0.297	0.069	0.387	0.388	0.096

Table A.6.13 The impact of "Learning-by-Observing" from 3-year Information Spillover on BHARs since the transactional website adoption.

This table reports the ordinary least square regression results for Equation 6.7, based on the sample of 307 web-launching announcements of publicly traded U.S. banks. In each regression, the dependent variable is $BHAR_{i,t}$, which are estimated as the difference between the compounded returns of sample banks, and the benchmark returns over the post-adoption holding period. The holding periods used to estimate $BHAR_{i,t}$ are ex-post period of the website-activated events, including (0; 11); (0; 23); (0;35). Three benchmarks used to estimate BHAR are Ex-ante Buy and Hold and Equally Market Index. The main independent variable is $LBOY(3)_{i,t}$, representing "learning-by-observing" behaviour, or, for the amount of observable information spillover from previous website-adopted events from which bank investors can potentially learn. This variable is estimated by the number of the cumulative number of sample banks that adopted transactional websites one year before the transactional website of $\boldsymbol{bank_t}$. The sources for this table are FDIC, SNL Financial, Wayback Machine U.S. Census Bureau of Economic (BEA), U.S. Bureau of Labor Statistics, the World Bank, Thomson Financial Securities Data, and the author's calculations. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests

	12-month period			24-month period			36-month period		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
VARIABLES	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR Size-matched portfolio
$LBOY(3)_{i,t}$	0.002***	0.004***	0.001*	0.005***	0.006***	0.002***	0.006***	0.007***	0.003***
	(0.0003)	(0.0004)	(0.0004)	(0.0004)	(0.0006)	(0.0006)	(0.0005)	(0.0007)	(0.0008)
$Bank\_Size_{i,t}$	0.009	0.005	-0.009	-0.016	-0.035	-0.020	-0.053***	-0.104***	-0.002
	(0.0112)	(0.0177)	(0.0132)	(0.0171)	(0.0235)	(0.0191)	(0.0200)	(0.0258)	(0.0246)
$Bank\_Leverage_{i,t}$	0.003	0.005	0.005	-0.007	-0.009	-0.012	-0.013	-0.016	-0.032*
	(0.0026)	(0.0042)	(0.0042)	(0.0063)	(0.0087)	(0.0126)	(0.0085)	(0.0110)	(0.0177)
$Bank\_Funding_{i,t}$	0.000	0.001	0.000	-0.000	0.001	-0.000	0.000	0.001	0.001
	(0.0005)	(0.0008)	(0.0007)	(0.0008)	(0.0011)	(0.0010)	(0.0009)	(0.0012)	(0.0014)
$HHI_{i,t}$	-0.001***	-0.002***	-0.000	-0.002***	-0.002***	-0.001	-0.004***	-0.004***	-0.003**
	(0.0002)	(0.0003)	(0.0003)	(0.0004)	(0.0005)	(0.0006)	(0.0005)	(0.0007)	(0.0012)
$\Delta ROA_{i,t}$	0.009	0.014	-0.014	0.012	0.018	0.013	0.010	0.011	0.019
	(0.0193)	(0.0306)	(0.0287)	(0.0088)	(0.0120)	(0.0117)	(0.0080)	(0.0103)	(0.0115)
Constant	1.726***	2.816***	0.715	3.047***	3.957***	1.499	6.519***	8.127***	4.388**
	(0.4404)	(0.6982)	(0.5639)	(0.7195)	(0.9874)	(1.0498)	(0.9474)	(1.2176)	(1.9948)
Observations	303	303	217	303	303	228	303	303	236
R-squared	0.294	0.301	0.049	0.353	0.305	0.062	0.387	0.388	0.096

Table A.6.14 The magnitude effect on BHAR upon ex-ante and ex-post period of the transactional website adoption

This table reports the ordinary least square regression results for Equation 6.11, based on the sample of 307 web-launching announcements of publicly traded U.S. banks. In the regression, the dependent variable is BHAR, which are estimated as the difference between the compounded returns of sample banks, and the benchmark returns over the post-adoption holding period. The holding periods used to estimate BHAR are over both ex-ante and ex-post period of the website-activated events, including (-12; -1); (0; 11); (-24; -1); (0; 23); (-36; -1); (0; 35). Three benchmarks used to estimate BHAR are S&P500, Nasdaq, and matched-bank portfolio. The main independent variables are Small-sized bank, Large-sized bank, and their interaction with the transactional website adoption. The control variables are also employed to control for exogenous cross-sectional differences in market structures and bank characteristics and are all observed annually. The sources for this table are FDIC, SNL Financial, Wayback Machine U.S. Census Bureau of Economic (BEA), U.S. Bureau of Labor Statistics, the World Bank, Thomson Financial Securities Data, and the author's calculation. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests.

	Panel A: 12-month period			Panel B:24-month period			Panel C: 36-month period		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
VARIABLES	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio
$Transactional\_website\_adoption_{i,t}$	0.072*	0.083	-0.034	0.378***	0.543***	0.035	0.740***	0.958***	0.098
	(0.0436)	(0.0653)	(0.0533)	(0.0680)	(0.0934)	(0.0781)	(0.0916)	(0.1214)	(0.1130)
$Largebank_{i,t}$	-0.051	-0.088	-0.084	0.000	-0.015	-0.051	-0.003	-0.034	-0.014
	(0.0452)	(0.0677)	(0.0526)	(0.0672)	(0.0924)	(0.0714)	(0.0882)	(0.1170)	(0.1005)
$Largebank_{i,t} \times Transactional\_website\_adoption_{i,t}$	0.003	-0.003	0.051	-0.188**	-0.281**	-0.031	-0.290**	-0.403***	-0.138
	(0.0611)	(0.0915)	(0.0712)	(0.0912)	(0.1253)	(0.0963)	(0.1170)	(0.1552)	(0.1320)
$Bank\_Leverage_{i,t}$	0.004	0.004	0.009**	0.001	-0.002	0.003	-0.000	-0.001	0.004
	(0.0023)	(0.0035)	(0.0037)	(0.0043)	(0.0059)	(0.0071)	(0.0084)	(0.0112)	(0.0131)
$Bank\_Funding_{i,t}$	0.000	0.001	0.000	0.001	0.001	0.001	0.002*	0.002	0.002
	(0.0004)	(0.0007)	(0.0006)	(0.0007)	(0.0010)	(0.0008)	(0.0009)	(0.0012)	(0.0012)
$HHI_{i,t}$	-0.000	0.000	-0.000	-0.000	-0.000	-0.000	-0.001*	-0.001*	-0.001
	(0.0002)	(0.0003)	(0.0002)	(0.0003)	(0.0004)	(0.0004)	(0.0005)	(0.0007)	(0.0007)
$\Delta ROA_{i,t}$	-0.007	-0.019	0.002	-0.002	0.002	0.001	-0.004	-0.008	0.001
	(0.0186)	(0.0278)	(0.0236)	(0.0085)	(0.0117)	(0.0092)	(0.0088)	(0.0117)	(0.0100)
Constant	0.298	-0.071	0.066	0.450	0.198	0.610	0.993	1.465	1.793
	(0.2686)	(0.4020)	(0.3356)	(0.4713)	(0.6478)	(0.6157)	(0.7318)	(0.9704)	(1.1129)
Observations	576	576	411	570	570	424	534	534	408

R-squared	0.023	0.017	0.026	0.076	0.088	0.010	0.163	0.155	0.022
Reference variable	Small Banks	Small Banks	Small Banks	Small Banks	Small Banks	Small Banks	Small Banks	Small Banks	Small Banks

Table A.6.15 The timing effect on BHAR upon ex-ante and ex-post period of the transactional website adoption

This table reports the ordinary least square regression results for Equation 6.12 based on the sample of 307 web-launching announcements of publicly traded U.S. banks. In the regression, the dependent variable is BHAR, which are estimated as the difference between the compounded returns of sample banks, and the benchmark returns over the post-adoption holding period. The holding periods used to estimate BHAR are over both ex-ante and ex-post period of the website-activated events, including (-12; -1); (0; 11); (-24; -1); (0; 23); (-36;-1); (0;35). Three benchmarks used to estimate BHAR are S&P500, Nasdaq, and matched-bank portfolio. The leading independent variables are $First\_movers_{i,t}$, $Second\_movers_{i,t}$, and $Laggards_{i,t}$ as well as their interactions with the variable $Transactional\ website\ adoption_{i,t}$". The control variables are also employed to control for exogenous cross-sectional differences in market structures and bank characteristics and are all observed annually. The sources for this table are FDIC, SNL Financial, Wayback Machine U.S. Census Bureau of Economic (BEA), U.S. Bureau of Labor Statistics, the World Bank, Thomson Financial Securities Data, and the author's calculations. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests.

	Panel A: 12-month period			Panel B:24-month period			Panel C: 36-month period		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
VARIABLES	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio
$Transactional\_website\_adoption_{i,t}$	-0.042	-0.244***	0.000	-0.103	-0.249***	-0.154*	0.143	-0.070	-0.175
	(0.0481)	(0.0626)	(0.0564)	(0.0699)	(0.0800)	(0.0869)	(0.1080)	(0.1267)	(0.1460)
$Second\_movers_{i,t}$	-0.132***	-0.461***	-0.021	-0.237***	-0.736***	-0.132	-0.252**	-0.919***	-0.044
	(0.0501)	(0.0652)	(0.0595)	(0.0699)	(0.0800)	(0.0840)	(0.0986)	(0.1157)	(0.1226)
$Laggards_{i,t}$	0.415***	0.708***	0.058	0.515***	0.797***	-0.151	0.439***	0.545***	-0.181
	(0.0583)	(0.0758)	(0.0894)	(0.0805)	(0.0921)	(0.1236)	(0.1096)	(0.1286)	(0.1685)
$Secondmovers_{i,t} \times Transactional\_website\_adoption_{i,t}$	0.454***	1.199***	0.012	1.160***	2.210***	0.211**	1.276***	2.369***	0.206
	(0.0672)	(0.0873)	(0.0787)	(0.0918)	(0.1051)	(0.1043)	(0.1280)	(0.1502)	(0.1524)
$Laggards_{i,t} \times Transactional\_website\_adoption_{i,t}$	-0.020	-0.037	-0.003	0.320***	0.274**	0.436***	0.476***	0.566***	0.675***
	(0.0699)	(0.0909)	(0.1148)	(0.0943)	(0.1079)	(0.1503)	(0.1246)	(0.1462)	(0.1912)
$Bank\_Size_{i,t}$	0.012	0.019*	-0.024**	0.018	0.016	-0.022	-0.004	-0.029	-0.011
	(0.0087)	(0.0114)	(0.0116)	(0.0120)	(0.0137)	(0.0156)	(0.0163)	(0.0192)	(0.0212)
$Bank\_Funding_{i,t}$	-0.000	-0.001	0.000	0.000	0.000	0.001	0.001	0.001	0.002
	(0.0004)	(0.0005)	(0.0006)	(0.0006)	(0.0007)	(0.0009)	(0.0008)	(0.0009)	(0.0012)
$Bank\_Leverage_{i,t}$	0.003	0.004	0.010***	-0.001	-0.003	0.004	-0.007	-0.009	0.004

	(0.0021)	(0.0027)	(0.0037)	(0.0035)	(0.0040)	(0.0070)	(0.0072)	(0.0085)	(0.0130)
$HHI_{i,t}$	-0.001***	-0.002***	-0.000	-0.002***	-0.003***	-0.000	-0.003***	-0.003***	-0.001
	(0.0002)	(0.0002)	(0.0003)	(0.0003)	(0.0004)	(0.0005)	(0.0005)	(0.0006)	(0.0009)
$\Delta ROA_{i,t}$	0.005	0.012	-0.005	0.004	0.011	0.002	0.004	0.004	0.002
	(0.0166)	(0.0216)	(0.0239)	(0.0069)	(0.0079)	(0.0091)	(0.0076)	(0.0089)	(0.0099)
Constant	1.526***	2.484***	0.589	2.954***	4.367***	0.691	3.721***	5.293***	2.394*
	(0.3364)	(0.4373)	(0.4860)	(0.5388)	(0.6166)	(0.8878)	(0.8399)	(0.9856)	(1.4155)
Observations	576	576	411	570	570	424	534	534	408
R-squared	0.237	0.421	0.034	0.391	0.583	0.046	0.402	0.527	0.066
Reference variable	First Movers	First Movers	First Movers	First Movers	First Movers	First Movers	First Movers	First Movers	First Movers

Table A.6.16 Re-estimation of Equation 6.6, using fixed effects

This table reports the ordinary least square regression results for Equation 6.6, based on the sample of 307 web-launching announcements of publicly traded U.S. banks. In each regression, the dependent variable is BHAR, which is estimated as the difference between the compounded returns of sample banks, and the benchmark returns over the holding periods The holding periods used to estimate BHAR are over both ex-ante and ex-post period of the website-activated events, including (-12, -1) and (0, 11)-Panel A; (-24, -1) and (0, 23)-Panel B; (-36, -1) and (0,35)-Panel C. In each panel, equation 5.6 is estimated using state fixed effect; or year and state fixed effects; or state year and bank-level fixed effects. Three benchmarks used to estimate BHAR are S&P500, Nasdaq, and matched-bank portfolio The main independent variable is the variable Transactional_website_adoption$_{i,t}$ which equals 0 if the holding periods are ex-ante (-12, -1); (-24, -1); (-36, -1), equals 1 if the holding periods are ex-post (0; 11); (0; 23); (0;35). The control variables are also employed to control for exogenous cross-sectional differences in market structures and bank characteristics and are all observed annually. The sources for this table are FDIC, SNL Financial, Wayback Machine U.S. Census Bureau of Economic (BEA), U.S. Bureau of Labor Statistics, the World Bank, Thomson Financial Securities Data, and the author's calculations. Standard errors in parentheses. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests.

Panel A: 12-month period

	A.1 State fixed effect			A.2 State and year fixed effects			A.3 State, year, and bank-level f effects		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
VARIABLES	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio
Transactional_website_ adoption$_{i,t}$	0.080**	0.090*	0.003	0.095***	0.112***	0.013	0.069**	0.050	0.014
	(0.0313)	(0.0470)	(0.0370)	(0.0279)	(0.0403)	(0.0379)	(0.0319)	(0.0514)	(0.0340)
Bank_Size$_{i,t}$	-0.001	-0.002	-0.019	0.007	0.007	-0.017	-0.002	0.054	-0.055
	(0.0102)	(0.0153)	(0.0120)	(0.0099)	(0.0142)	(0.0129)	(0.0482)	(0.0776)	(0.0411)
Bank_Leverage$_{i,t}$	0.005**	0.006	0.011***	0.003	0.002	0.009**	0.004	-0.003	0.014
	(0.0025)	(0.0038)	(0.0039)	(0.0023)	(0.0033)	(0.0040)	(0.0095)	(0.0153)	(0.0090)
Bank_Funding$_{i,t}$	0.000	0.000	0.000	-0.000	-0.000	-0.000	0.005**	0.009***	0.002
	(0.0005)	(0.0008)	(0.0007)	(0.0005)	(0.0007)	(0.0008)	(0.0018)	(0.0030)	(0.0018)
HHI$_{i,t}$	-0.000	-0.000	-0.000	-0.001***	-0.001*	-0.000	-0.001***	-0.001**	-0.000
	(0.0002)	(0.0003)	(0.0002)	(0.0002)	(0.0003)	(0.0003)	(0.0002)	(0.0004)	(0.0002)
ΔROA$_{i,t}$	0.002	-0.008	0.009	0.014	0.013	0.009	-0.032	-0.047	-0.077**
	(0.0203)	(0.0305)	(0.0264)	(0.0187)	(0.0270)	(0.0267)	(0.0396)	(0.0637)	(0.0370)
Constant	0.352	-0.025	0.009	0.707*	0.710	0.149	-0.018	-1.383	0.987
	(0.4167)	(0.6259)	(0.5022)	(0.4051)	(0.5845)	(0.5258)	(0.9815)	(1.5800)	(0.8402)
Observations	576	576	411	576	576	411	576	576	411

R-squared	0.086	0.074	0.139	0.296	0.341	0.158	0.589	0.521	0.738
State Fixed Effect	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effect	NO	NO	NO	YES	YES	YES	YES	YES	YES
Bank Fixed Effect	NO	NO	NO	NO	NO	NO	YES	YES	YES

Panel B: 24-month period									
	B.1 State fixed effect			B.2 State and year fixed effects			B.3 State, year, and bank-level fixed effects		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
VARIABLES	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio
Transactional_website_ adoption$_{i,t}$	0.294***	0.412***	0.024	0.193***	0.295***	-0.023	0.555***	0.727***	0.324
	(0.0507)	(0.0702)	(0.0571)	(0.0434)	(0.0538)	(0.0609)	(0.1584)	(0.1734)	(0.2198)
Bank_Size$_{i,t}$	-0.022	-0.033	-0.028*	0.001	-0.016	-0.022	0.064	0.064	-0.011
	(0.0155)	(0.0214)	(0.0162)	(0.0133)	(0.0165)	(0.0168)	(0.0591)	(0.0647)	(0.0703)
Bank_Leverage$_{i,t}$	0.002	-0.001	0.007	-0.003	-0.006	0.009	-0.015	-0.019	-0.014
	(0.0046)	(0.0064)	(0.0078)	(0.0038)	(0.0047)	(0.0079)	(0.0109)	(0.0119)	(0.0145)
Bank_Funding$_{i,t}$	0.001	0.001	0.001	0.000	0.000	0.001	0.003	0.003	0.006*
	(0.0009)	(0.0012)	(0.0010)	(0.0007)	(0.0009)	(0.0010)	(0.0023)	(0.0025)	(0.0032)
HHI$_{i,t}$	-0.001	-0.000	-0.001	-0.000	0.001**	0.000	-0.002*	-0.003***	-0.000
	(0.0003)	(0.0005)	(0.0004)	(0.0005)	(0.0006)	(0.0007)	(0.0011)	(0.0012)	(0.0014)
ΔROA$_{i,t}$	-0.001	0.003	-0.001	0.003	0.006	-0.003	-0.009	-0.010	-0.002
	(0.0089)	(0.0123)	(0.0098)	(0.0074)	(0.0092)	(0.0100)	(0.0094)	(0.0103)	(0.0575)
Constant	1.236*	1.208	1.050	0.931	-0.996	0.259	3.075	5.743***	0.947
	(0.7059)	(0.9770)	(0.8594)	(0.7766)	(0.9638)	(1.1196)	(1.9858)	(2.1726)	(2.4933)
Observations	570	570	424	570	570	424	570	570	424
R-squared	0.113	0.112	0.115	0.431	0.542	0.146	0.741	0.838	0.605
State Fixed Effect	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effect	NO	NO	NO	YES	YES	YES	YES	YES	YES
Bank Fixed Effect	NO	NO	NO	NO	NO	NO	YES	YES	YES

Panel C: 36-month period									
	C.1 State fixed effect			C.2 State and year fixed effects			C.3 State, year, and bank-level fixed effects		
36-month period	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
VARIABLES	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio
Transactional_website_ adoption$_{i,t}$	0.641***	0.845***	0.023	0.673***	0.800***	0.018	1.220***	1.497***	0.959**
	(0.0717)	(0.0944)	(0.0881)	(0.0706)	(0.0932)	(0.1040)	(0.3098)	(0.3503)	(0.4510)
Bank_Size$_{i,t}$	-0.070***	-0.116***	-0.031	-0.023	-0.059**	-0.019	0.071	0.061	0.062
	(0.0201)	(0.0265)	(0.0218)	(0.0180)	(0.0238)	(0.0229)	(0.0736)	(0.0832)	(0.0931)
Bank_Leverage$_{i,t}$	-0.002	-0.000	0.002	-0.012	-0.015	0.006	-0.019	-0.023	0.003
	(0.0093)	(0.0122)	(0.0150)	(0.0080)	(0.0106)	(0.0151)	(0.0303)	(0.0342)	(0.0497)
Bank_Funding$_{i,t}$	0.002	0.002	0.004**	0.002	0.001	0.004***	0.003	0.003	0.008*
	(0.0011)	(0.0015)	(0.0014)	(0.0010)	(0.0013)	(0.0014)	(0.0029)	(0.0032)	(0.0044)
HHI$_{i,t}$	-0.001**	-0.002***	-0.001	-0.005***	-0.005***	-0.002*	-0.002	-0.001	-0.003
	(0.0005)	(0.0007)	(0.0008)	(0.0009)	(0.0012)	(0.0013)	(0.0022)	(0.0025)	(0.0030)
ΔROA$_{i,t}$	0.001	-0.002	0.003	0.008	0.005	0.000	0.108*	0.136**	0.125
	(0.0096)	(0.0127)	(0.0109)	(0.0084)	(0.0111)	(0.0112)	(0.0563)	(0.0637)	(0.0756)
Constant	2.872***	4.661***	1.634	7.233***	7.843***	2.887	3.402	3.614	3.560
	(0.9652)	(1.2705)	(1.3178)	(1.3980)	(1.8445)	(1.9063)	(3.5482)	(4.0117)	(4.7936)
Observations	534	534	408	534	534	408	534	534	408
R-squared	0.212	0.216	0.129	0.449	0.449	0.169	0.786	0.843	0.647
State Fixed Effect	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effect	NO	NO	NO	YES	YES	YES	YES	YES	YES
Bank Fixed Effect	NO	NO	NO	NO	NO	NO	YES	YES	YES

Table A.6.17 Re-estimation of Equation 6.7, using fixed effects

This table reports the ordinary least square regression results for Equation 6.7, based on the sample of 307 web-launching announcements of publicly traded U.S. banks. In each regression, the dependent variable is BHAR, which are estimated as the difference between the compounded returns of sample banks, and the benchmark returns over the post-adoption holding period. The holding periods used to estimate BHAR are ex-post period of the website-activated events, including (0, 11)- Panel A; (0, 23)-Panel B; (0, 35)-Panel C. In each panel, Equation 6.7 is estimated using state fixed effect; or year and state fixed effects; or state year and bank-level fixed effects. Three benchmarks used to estimate BHAR are S&P500, Nasdaq, and matched-bank portfolio. The main independent variable is $LBOY(1)_{i,t}$, representing "learning-by-observing" behaviour, or for the amount of observable information spillover from previous website-adopted events from which bank investors can potentially learn. This variable is estimated by the number of the cumulative number of sample banks that adopted transactional websites during one years before the transactional website of bank t The sources for this Table are FDIC, SNL Financial, Wayback Machine U.S. Census Bureau of Economic (BEA), U.S. Bureau of Labor Statistics, the World Bank, Thomson Financial Securities Data, and the author's calculations. Standard errors in parentheses. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests.

Panel A: 12-month period

	A.1 State fixed effect			A.2 State and year fixed effects			A.3 State, year, and bank-level fixed effects		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
VARIABLES	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio
$LBOY(1)_{i,t}$	0.004***	0.006***	0.002**	-0.158	-0.163	0.002	0.002	0.006	0.002
	(0.0006)	(0.0009)	(0.0008)	(0.3023)	(0.3559)	(0.0012)	(0.0000)	(0.0000)	(0.0000)
$Bank\_Size_{i,t}$	0.014	0.012	0.010	0.014	0.014	0.011	0.271	0.329	-0.158
	(0.0125)	(0.0200)	(0.0146)	(0.0107)	(0.0126)	(0.0148)	(0.0000)	(0.0000)	(0.0000)
$Bank\_Leverage_{i,t}$	0.003	0.007	0.005	-0.001	-0.002	0.006	-0.015	-0.036	-0.128
	(0.0029)	(0.0047)	(0.0048)	(0.0026)	(0.0030)	(0.0049)	(0.0000)	(0.0000)	(0.0000)
$Bank\_Funding_{i,t}$	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.006	-0.013
	(0.0006)	(0.0009)	(0.0008)	(0.0005)	(0.0006)	(0.0009)	(0.0000)	(0.0000)	(0.0000)
$HHI_{i,t}$	-0.001***	-0.002***	-0.000	0.001	0.001	-0.001	-0.002	-0.000	0.017
	(0.0002)	(0.0004)	(0.0003)	(0.0030)	(0.0036)	(0.0024)	(0.0000)	(0.0000)	(0.0000)
$\Delta ROA_{i,t}$	0.040*	0.061*	-0.001	0.021	0.029	0.009	0.060	0.160	0.068
	(0.0224)	(0.0358)	(0.0380)	(0.0198)	(0.0234)	(0.0389)	(0.0000)	(0.0000)	(0.0000)
Constant	1.553***	2.311**	-0.469	-1.565	-1.611	0.725	-1.374	-5.698	-22.062
	(0.5702)	(0.9112)	(0.7188)	(4.5897)	(5.4031)	(3.6251)	(0.0000)	(0.0000)	(0.0000)

Observations	303	303	217	303	303	217	303	303	217
R-squared	0.383	0.379	0.274	0.584	0.773	0.293	1.000	1.000	1.000
State Fixed Effect	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effect	NO	NO	NO	YES	YES	YES	YES	YES	YES
Bank Fixed Effect	NO	NO	NO	NO	NO	NO	YES	YES	YES

Panel B: 24-month period									
	B.1 State fixed effect			B.2 State and year fixed effects			B.3 State, year, and bank-level fixed effects		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
VARIABLES	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio
$LBOY(1)_{i,t}$	0.009***	0.011***	0.004***	0.011***	0.012***	0.009	0.002	-0.020	0.108
	(0.0009)	(0.0012)	(0.0012)	(0.0037)	(0.0041)	(0.0067)	(0.0000)	(0.0000)	(0.0000)
$Bank\_Size_{i,t}$	-0.008	-0.026	-0.006	0.007	-0.004	0.000	0.167	0.091	-0.000
	(0.0192)	(0.0256)	(0.0207)	(0.0169)	(0.0185)	(0.0214)	(0.0000)	(0.0000)	(0.0000)
$Bank\_Leverage_{i,t}$	-0.008	-0.010	-0.024	-0.016**	-0.019***	-0.018	0.119	0.145	-0.307
	(0.0070)	(0.0093)	(0.0148)	(0.0062)	(0.0068)	(0.0154)	(0.0000)	(0.0000)	(0.0000)
$Bank\_Funding_{i,t}$	0.001	0.002	0.000	0.001	0.001	0.001	-0.032	-0.039	-0.017
	(0.0009)	(0.0012)	(0.0012)	(0.0008)	(0.0009)	(0.0013)	(0.0000)	(0.0000)	(0.0000)
$HHI_{i,t}$	-0.001***	-0.002***	-0.001	-0.001	-0.001	-0.003	-0.012	-0.020	-0.011
	(0.0004)	(0.0005)	(0.0006)	(0.0012)	(0.0013)	(0.0021)	(0.0000)	(0.0000)	(0.0000)
$\Delta ROA_{i,t}$	0.015	0.022*	0.020	0.019**	0.022**	0.020	-0.557	-0.651	0.414
	(0.0097)	(0.0130)	(0.0132)	(0.0090)	(0.0098)	(0.0142)	(0.0000)	(0.0000)	(0.0000)
Constant	2.493***	2.980**	1.461	1.912	1.047	3.612	16.149	29.319	19.812
	(0.8983)	(1.1983)	(1.2760)	(1.7786)	(1.9476)	(3.1903)	(0.0000)	(0.0000)	(0.0000)
Observations	303	303	217	303	303	217	303	303	217
R-squared	0.383	0.379	0.274	0.584	0.773	0.293	1.000	1.000	1.000
State Fixed Effect	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effect	NO	NO	NO	YES	YES	YES	YES	YES	YES
Bank Fixed Effect	NO	NO	NO	NO	NO	NO	YES	YES	YES

Panel B: 36-month period									
	C.1 State fixed effect			C.2 State and year fixed effects			C.3 State, year, and bank-level fixed effects		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
VARIABLES	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio
$LBOY(1)_{i,t}$	0.011***	0.015***	0.006***	0.013***	0.009**	0.004	-0.117	-0.103	0.668
	(0.0010)	(0.0013)	(0.0015)	(0.0040)	(0.0043)	(0.0070)	(0.0000)	(0.0000)	(0.0000)
$Bank\_Size_{i,t}$	-0.036*	-0.079***	0.011	0.005	0.005	0.014	0.327	0.333	-0.013
	(0.0215)	(0.0272)	(0.0268)	(0.0197)	(0.0212)	(0.0278)	(0.0000)	(0.0000)	(0.0000)
$Bank\_Leverage_{i,t}$	-0.018**	-0.017	-0.052**	-0.031***	-0.034***	-0.042**	-0.058	-0.053	-0.531
	(0.0091)	(0.0115)	(0.0206)	(0.0082)	(0.0088)	(0.0210)	(0.0000)	(0.0000)	(0.0000)
$Bank\_Funding_{i,t}$	0.002	0.002	0.003*	0.002**	0.002**	0.003**	0.012	0.007	-0.157
	(0.0011)	(0.0014)	(0.0016)	(0.0010)	(0.0011)	(0.0016)	(0.0000)	(0.0000)	(0.0000)
$HHI_{i,t}$	-0.002***	-0.002***	-0.002	-0.003*	-0.002	0.000	-0.073	-0.068	-0.184
	(0.0005)	(0.0007)	(0.0012)	(0.0019)	(0.0020)	(0.0035)	(0.0000)	(0.0000)	(0.0000)
$\Delta ROA_{i,t}$	0.013	0.011	0.027**	0.021**	0.023***	0.024*	0.048	0.022	1.591
	(0.0085)	(0.0108)	(0.0128)	(0.0080)	(0.0086)	(0.0136)	(0.0000)	(0.0000)	(0.0000)
Constant	4.209***	5.116***	2.753	4.612	2.682	-1.031	105.030	96.761	303.023
	(1.1254)	(1.4199)	(2.2091)	(2.9447)	(3.1712)	(5.5895)	(0.0000)	(0.0000)	(0.0000)
Observations	303	303	217	303	303	217	303	303	217
R-squared	0.383	0.379	0.274	0.584	0.773	0.293	1.000	1.000	1.000
State Fixed Effect	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effect	NO	NO	NO	YES	YES	YES	YES	YES	YES
Bank Fixed Effect	NO	NO	NO	NO	NO	NO	YES	YES	YES

Table A.6.18 Re-estimation of Equation 6.8, using fixed effects

This table reports the ordinary least square regression results for Equation 6.8, based on the sample of 307 web-launching announcements of publicly traded U.S. banks. In the regression, the dependent variable is BHAR, which is estimated as the difference between the compounded returns of sample banks, and the benchmark returns over the post-adoption holding period. The holding periods used to estimate BHAR are ex-post period of the website-activated events, including (0, 11)- Panel A; (0, 23)-Panel B; (0, 35)-Panel C. In each panel, Equation 6.8 is estimated using state fixed effect; or year and state fixed effects; or state year and bank-level fixed effects. Three benchmarks used to estimate BHAR are S&P500, Nasdaq, and matched-bank portfolio. The main independent variables are $Smallbank_{i,t}$ and $Largebank_{i,t}$. The control variables are also employed to control for exogenous cross-sectional differences in market structures and bank characteristics and are all observed annually. The sources for this table are FDIC, SNL Financial, Wayback Machine U.S. Census Bureau of Economic (BEA), U.S. Bureau of Labor Statistics, the World Bank, Thomson Financial Securities Data, and the author's calculations. Standard errors in parentheses. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests.

Panel A: 12-month period

	A.1 State fixed effect			A.2 State and year fixed effects			A.3 State, year, and bank-level fixed effects		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
VARIABLES	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio
$Largebank_{i,t}$	-0.083**	-0.155**	-0.032	0.010	-0.009	0.001	0.324	0.675	-0.834
	(0.0419)	(0.0673)	(0.0476)	(0.0345)	(0.0398)	(0.0509)	(0.0000)	(0.0000)	(0.0000)
$Bank\_Leverage_{i,t}$	0.004	0.007	0.005	-0.002	-0.003	0.004	0.028	-0.005	-0.083
	(0.0032)	(0.0051)	(0.0048)	(0.0026)	(0.0030)	(0.0051)	(0.0000)	(0.0000)	(0.0000)
$Bank\_Funding_{i,t}$	0.001	0.001	0.000	0.000	0.001	0.000	-0.013	-0.002	-0.017
	(0.0006)	(0.0010)	(0.0008)	(0.0005)	(0.0006)	(0.0008)	(0.0000)	(0.0000)	(0.0000)
$HHI_{i,t}$	-0.002***	-0.002***	-0.000	-0.001*	-0.000	-0.000	-0.014	-0.005	0.011
	(0.0003)	(0.0004)	(0.0003)	(0.0004)	(0.0005)	(0.0005)	(0.0000)	(0.0000)	(0.0000)
$\Delta ROA_{i,t}$	0.025	0.038	-0.001	0.023	0.040*	0.007	-0.134	0.087	-0.022
	(0.0242)	(0.0389)	(0.0381)	(0.0197)	(0.0228)	(0.0388)	(0.0000)	(0.0000)	(0.0000)
Constant	2.695***	3.942***	-0.401	1.229*	0.373	-0.012	21.798	8.794	-16.222
	(0.4756)	(0.7634)	(0.6307)	(0.6576)	(0.7600)	(0.8766)	(0.0000)	(0.0000)	(0.0000)
Observations	303	303	217	303	303	217	303	303	217
R-squared	0.270	0.259	0.250	0.576	0.777	0.291	1.000	1.000	1.000
State Fixed Effect	YES	YES	YES	YES	YES	YES	YES	YES	YES

Year Fixed Effect	NO	NO	NO	YES	YES	YES	YES	YES	YES
Bank Fixed Effect	NO	NO	NO	NO	NO	NO	YES	YES	YES
Reference variable	Small Bank	Small Bank	Small Bank	Small Bank	Small Bank	Small Bank	Small Bank	Small Bank	Small Bank

Panel B: 24-month period									
	B.1 State fixed effect			B.2 State and year fixed effects			B.3 State, year, and bank-level fixed effects		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
VARIABLES	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio
$Largebank_{i,t}$	-0.213***	-0.332***	-0.060	0.040	0.007	0.024	-0.515	-0.982	-0.000
	(0.0719)	(0.0934)	(0.0695)	(0.0556)	(0.0610)	(0.0745)	(0.0000)	(0.0000)	(0.0000)
$Bank\_Leverage_{i,t}$	-0.003	-0.003	-0.016	-0.018***	-0.021***	-0.019	0.244	0.289	-0.307
	(0.0083)	(0.0108)	(0.0150)	(0.0062)	(0.0068)	(0.0154)	(0.0000)	(0.0000)	(0.0000)
$Bank\_Funding_{i,t}$	0.001	0.001	0.001	0.001	0.001	0.001	-0.065	-0.077	-0.017
	(0.0011)	(0.0014)	(0.0012)	(0.0008)	(0.0009)	(0.0013)	(0.0000)	(0.0000)	(0.0000)
$HHI_{i,t}$	-0.002***	-0.002***	0.000	0.001	0.002*	-0.000	-0.032	-0.038	0.024
	(0.0005)	(0.0006)	(0.0006)	(0.0010)	(0.0010)	(0.0012)	(0.0000)	(0.0000)	(0.0000)
$\Delta ROA_{i,t}$	0.003	0.007	0.014	0.021**	0.025**	0.021	-1.078	-1.291	0.414
	(0.0115)	(0.0149)	(0.0134)	(0.0091)	(0.0100)	(0.0142)	(0.0000)	(0.0000)	(0.0000)
Constant	3.550***	4.012***	0.029	-1.130	-2.462	-0.016	50.063	57.722	-30.298
	(0.8295)	(1.0771)	(1.1111)	(1.4356)	(1.5742)	(1.8902)	(0.0000)	(0.0000)	(0.0000)
Observations	303	303	228	303	303	228	303	303	228
R-squared	0.190	0.221	0.225	0.595	0.722	0.288	1.000	1.000	1.000
State Fixed Effect	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effect	NO	NO	NO	YES	YES	YES	YES	YES	YES
Bank Fixed Effect	NO	NO	NO	NO	NO	NO	YES	YES	YES
Reference variable	Small Bank	Small Bank	Small Bank	Small Bank	Small Bank	Small Bank	Small Bank	Small Bank	Small Bank

Panel C: 36-month period									
	C.1 State fixed effect			C.2 State and year fixed effects			C.3 State, year, and bank-level fixed effects		
36-month period	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
VARIABLES	BHAR S&P500	BHAR Index Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio
$Largebank_{i,t}$	-0.311***	-0.426***	-0.132	-0.002	-0.007	0.017	1.204	1.229	-0.026
	(0.0859)	(0.1115)	(0.0893)	(0.0653)	(0.0694)	(0.0941)	(0.0000)	(0.0000)	(0.0000)
$Bank\_Leverage_{i,t}$	-0.010	-0.005	-0.037*	-0.034***	-0.037***	-0.042**	-0.008	-0.001	-0.527
	(0.0112)	(0.0146)	(0.0210)	(0.0083)	(0.0088)	(0.0210)	(0.0000)	(0.0000)	(0.0000)
$Bank\_Funding_{i,t}$	0.001	0.001	0.003**	0.002**	0.003**	0.004**	-0.001	-0.005	-0.156
	(0.0013)	(0.0017)	(0.0016)	(0.0010)	(0.0011)	(0.0016)	(0.0000)	(0.0000)	(0.0000)
$HHI_{i,t}$	-0.003***	-0.003***	-0.001	-0.000	-0.000	0.002	0.073	0.035	0.128
	(0.0007)	(0.0009)	(0.0012)	(0.0017)	(0.0018)	(0.0025)	(0.0000)	(0.0000)	(0.0000)
$\Delta ROA_{i,t}$	0.002	-0.005	0.019	0.023***	0.025***	0.025*	0.011	-0.015	1.585
	(0.0104)	(0.0135)	(0.0130)	(0.0081)	(0.0086)	(0.0135)	(0.0000)	(0.0000)	(0.0000)
Constant	5.749***	6.260***	1.201	0.355	-0.169	-3.189	-114.703	-55.713	-179.697
	(1.1527)	(1.4955)	(2.1451)	(2.6299)	(2.7973)	(3.9481)	(0.0000)	(0.0000)	(0.0000)
Observations	303	303	236	303	303	236	303	303	236
R-squared	0.244	0.231	0.245	0.634	0.749	0.331	1.000	1.000	1.000
State Fixed Effect	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effect	NO	NO	NO	YES	YES	YES	YES	YES	YES
Bank Fixed Effect	NO	NO	NO	NO	NO	NO	YES	YES	YES
Reference variable	Small Bank	Small Bank	Small Bank	Small Bank	Small Bank	Small Bank	Small Bank	Small Bank	Small Bank

Table A.6.19 Re-estimation of Equation 6.9, using fixed effects

This table reports the ordinary least square regression results for Equation 6.9, based on the sample of 307 web-launching announcements of publicly traded U.S. banks In the regression, the dependent variable is BHAR which is estimated as the difference between the compounded returns of sample banks, and the benchmark returns over the post-adoption holding period. The holding periods used to estimate BHAR are the ex-post periods of the website-activated events, including (0, 11)-Panel A; (0, 23)-Panel B; (0, 35)-Panel C. In each panel, Equation 6.9 is estimated using state fixed effect; or year and state fixed effects; or state year and bank-level fixed effects. Three benchmarks used to estimate BHAR are S&P500, Nasdaq, and matched-bank portfolio. The leading independent variables are $First\_movers_{i,t}$, $Second\_movers_{i,t}$, and $Laggards_{i,t}$. The control variables are also employed to control for exogenous cross-sectional differences in market structures and bank characteristics and are all observed annually. The sources for this table are FDIC, SNL Financial, Wayback Machine U.S. Census Bureau of Economic (BEA), U.S. Bureau of Labor Statistics, the World Bank, Thomson Financial Securities Data, and the author's calculations. Standard errors in parentheses. The superscripts ***, **, and * indicate a statistically significant difference from zero at the 1, 5, and 10 percent levels of significance in two-sided tests.

Panel A: 12-month period

	A.1 State fixed effect			A.2 State and year fixed effects			A.3 State, year and bank-level fixed effects		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
VARIABLES	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio
$Second\_movers_{i,t}$	0.410***	0.917***	0.038	0.100	0.372***	-0.120	2.282	0.693	1.851
	(0.0483)	(0.0693)	(0.0655)	(0.1061)	(0.1208)	(0.1370)	(0.0000)	(0.0000)	(0.0000)
$Laggards_{i,t}$	0.461***	0.784***	0.123*	0.159	0.375**	-0.074	2.715	0.490	2.243
	(0.0447)	(0.0641)	(0.0731)	(0.1354)	(0.1542)	(0.1801)	(0.0000)	(0.0000)	(0.0000)
$Bank\_Size_{i,t}$	0.018	0.029*	0.001	0.012	0.007	0.011	0.078	0.162	-0.158
	(0.0109)	(0.0157)	(0.0142)	(0.0109)	(0.0124)	(0.0151)	(0.0000)	(0.0000)	(0.0000)
$Bank\_Funding_{i,t}$	0.001	0.004	0.005	-0.002	-0.003	0.005	0.033	0.006	-0.128
	(0.0027)	(0.0038)	(0.0049)	(0.0026)	(0.0030)	(0.0052)	(0.0000)	(0.0000)	(0.0000)
$Bank\_Leverage_{i,t}$	-0.000	0.000	0.000	-0.000	0.000	0.001	-0.015	-0.007	-0.013
	(0.0005)	(0.0007)	(0.0009)	(0.0005)	(0.0006)	(0.0009)	(0.0000)	(0.0000)	(0.0000)
$HHI_{i,t}$	-0.002***	-0.004***	0.000	-0.001*	-0.002**	0.000	-0.011	0.001	-0.005
	(0.0002)	(0.0003)	(0.0004)	(0.0006)	(0.0007)	(0.0008)	(0.0000)	(0.0000)	(0.0000)
$\Delta ROA_{i,t}$	0.030	0.056*	-0.008	0.024	0.038*	0.014	-0.212	-0.074	0.068
	(0.0202)	(0.0291)	(0.0387)	(0.0198)	(0.0225)	(0.0396)	(0.0000)	(0.0000)	(0.0000)
Constant	2.978***	4.990***	-0.482	1.531	2.415**	-1.047	15.495	-4.339	11.767

	(0.4807)	(0.6898)	(0.7713)	(0.9365)	(1.0664)	(1.2524)	(0.0000)	(0.0000)	(0.0000)
Observations	303	303	217	303	303	217	303	303	217
R-squared	0.499	0.594	0.261	0.580	0.786	0.298	1.000	1.000	1.000
State Fixed Effect	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effect	NO	NO	NO	YES	YES	YES	YES	YES	YES
Bank Fixed Effect	NO	NO	NO	NO	NO	NO	YES	YES	YES
Reference variable	First Movers	First Movers	First Movers	First Movers	First Movers	First Movers	First Movers	First Movers	First Movers

Panel B: 24-month period									
	B.1 State fixed effect			B.2 State and year fixed effects			B.3 State, year, and bank-level fixed effects		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
VARIABLES	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio
$Second\_movers_{i,t}$	0.954***	1.498***	0.145	0.710***	1.146***	0.296	-0.557	-1.212	1.911
	(0.0686)	(0.0781)	(0.0901)	(0.1513)	(0.1566)	(0.2006)	(0.0000)	(0.0000)	(0.0000)
$Laggards_{i,t}$	0.913***	1.146***	0.320***	0.704***	0.988***	0.367	-0.659	-2.277	3.578
	(0.0668)	(0.0761)	(0.0986)	(0.1900)	(0.1967)	(0.2494)	(0.0000)	(0.0000)	(0.0000)
$Bank\_Size_{i,t}$	0.002	0.001	-0.009	0.011	0.005	0.002	0.523	0.597	-0.000
	(0.0160)	(0.0182)	(0.0204)	(0.0166)	(0.0171)	(0.0215)	(0.0000)	(0.0000)	(0.0000)
$Bank\_Funding_{i,t}$	-0.011*	-0.012*	-0.019	-0.016***	-0.018***	-0.019	-0.030	-0.067	-0.307
	(0.0060)	(0.0068)	(0.0149)	(0.0060)	(0.0062)	(0.0155)	(0.0000)	(0.0000)	(0.0000)
$Bank\_Leverage_{i,t}$	-0.000	0.000	0.000	0.000	0.001	0.001	0.008	0.017	-0.017
	(0.0008)	(0.0009)	(0.0012)	(0.0008)	(0.0009)	(0.0013)	(0.0000)	(0.0000)	(0.0000)
$HHI_{i,t}$	-0.003***	-0.004***	-0.000	-0.003**	-0.004***	-0.002	0.015	0.022	-0.000
	(0.0003)	(0.0004)	(0.0007)	(0.0013)	(0.0013)	(0.0018)	(0.0000)	(0.0000)	(0.0000)
$\Delta ROA_{i,t}$	0.009	0.014	0.015	0.018**	0.021**	0.021	-0.002	0.138	0.414
	(0.0082)	(0.0093)	(0.0132)	(0.0087)	(0.0091)	(0.0142)	(0.0000)	(0.0000)	(0.0000)
Constant	5.200***	6.235***	0.810	4.180**	6.517***	2.637	-30.950	-43.253	3.877
	(0.7261)	(0.8266)	(1.3018)	(1.8736)	(1.9399)	(2.7342)	(0.0000)	(0.0000)	(0.0000)
Observations	303	303	228	303	303	228	303	303	228
R-squared	0.594	0.700	0.275	0.630	0.773	0.299	1.000	1.000	1.000
State Fixed Effect	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effect	NO	NO	NO	YES	YES	YES	YES	YES	YES
Bank Fixed Effect	NO	NO	NO	NO	NO	NO	YES	YES	YES§
Reference variable	First Movers	First Movers	First Movers	First Movers	First Movers	First Movers	First Movers	First Movers	First Movers

Panel C: 36-month period									
	C.1 State fixed effect			C.2 State and year fixed effects			C.3 State, year, and bank-level fixed effects		
36-month period	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
VARIABLES	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio	BHAR S&P500	BHAR Nasdaq	BHAR matched portfolio
$Second\_movers_{i,t}$	1.000***	1.401***	0.230**	0.862***	1.011***	0.296	-13.549	-11.360	1.325
	(0.0826)	(0.1050)	(0.1080)	(0.1986)	(0.2095)	(0.3365)	(0.0000)	(0.0000)	(0.0000)
$Laggards_{i,t}$	1.080***	1.180***	0.571***	1.273***	1.393***	0.638	-25.194	-21.276	1.898
	(0.0894)	(0.1137)	(0.1298)	(0.3340)	(0.3523)	(0.5744)	(0.0000)	(0.0000)	(0.0000)
$Bank\_Size_{i,t}$	-0.028	-0.068***	-0.001	0.008	0.012	0.015	0.327	0.333	-0.013
	(0.0196)	(0.0249)	(0.0261)	(0.0195)	(0.0206)	(0.0279)	(0.0000)	(0.0000)	(0.0000)
$Bank\_Funding_{i,t}$	-0.023***	-0.020*	-0.045**	-0.032***	-0.034***	-0.043**	-0.058	-0.053	-0.531
	(0.0084)	(0.0106)	(0.0204)	(0.0080)	(0.0085)	(0.0210)	(0.0000)	(0.0000)	(0.0000)
$Bank\_Leverage_{i,t}$	0.001	0.000	0.003*	0.002*	0.002**	0.003**	0.012	0.007	-0.157
	(0.0010)	(0.0013)	(0.0016)	(0.0010)	(0.0010)	(0.0016)	(0.0000)	(0.0000)	(0.0000)
$HHI_{i,t}$	-0.005***	-0.005***	-0.003**	-0.009***	-0.010***	-0.003	0.254	0.219	0.104
	(0.0006)	(0.0007)	(0.0013)	(0.0026)	(0.0028)	(0.0051)	(0.0000)	(0.0000)	(0.0000)
$\Delta ROA_{i,t}$	0.010	0.007	0.022*	0.021***	0.022***	0.025*	0.048	0.022	1.591
	(0.0078)	(0.0099)	(0.0126)	(0.0079)	(0.0083)	(0.0136)	(0.0000)	(0.0000)	(0.0000)
Constant	8.592***	9.206***	4.567**	13.633***	14.742***	3.677	-399.886	-346.835	-143.294
	(1.0661)	(1.3555)	(2.3063)	(4.0945)	(4.3186)	(8.0181)	(0.0000)	(0.0000)	(0.0000)
Observations	303	303	236	303	303	236	303	303	236
R-squared	0.590	0.599	0.314	0.661	0.772	0.337	1.000	1.000	1.000
State Fixed Effect	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effect	NO	NO	NO	YES	YES	YES	YES	YES	YES
Bank Fixed Effect	NO	NO	NO	NO	NO	NO	YES	YES	YES
Reference variable	First Movers	First Movers	First Movers	First Movers	First Movers	First Movers	First Movers	First Movers	First Movers