IT adoption and bank performance during the Covid-19 pandemic

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Abstract

This paper examines the impact of pre-2020 information technology (IT) adoption on bank performance during the initial stages of the Covid-19 pandemic. We show that high IT adopters performed better in terms of market returns, Tobin's *q* and lending. Our findings also suggest that higher pre-crisis IT investments are associated with more loans issued under the US Paycheck Protection Program, and lower rates of loan modifications due to Covid-19. This study corroborates other recent findings that technology adoption partly shields banks from the impact of crises, ultimately enhancing financial stability.

Keywords: Covid-19; Banking; IT Adoption; Technology.

Highlights

- We study banks' market and accounting performance during Covid-19
- Banks with high IT-adoption had milder stock price declines
- IT-adoption is positively linked to loan growth
- IT-investments increased banks' resiliency to the Covid-19 shock

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1 Introduction

In recent years, information technology (IT) has transformed the banking industry and the outbreak of the Covid-19 accelerated the trend making the issue of IT adoption more relevant than ever. In this study, we exploit the Covid-19 exogenous shock to investigate causal links between the degree of banks' pre-2020 IT spending and their market and accounting performance during the unfolding of the pandemic.

First, we argue that the nature of the shock – unexpected and exogenous to the financial system – led the market to react to pre-existing features of banks that affected their capacity to weather this unprecedented crisis. Our hypothesis is that a high degree of pre-shock IT spending positively affected investors' perceptions of the ability of these banks to create shareholder value in the future despite the pandemic, resulting in milder reductions in market returns. In doing so, we contribute to the literature on organisational resilience by investigating how pre-shock banks' features shape their subsequent ability to endure a shock (van der Vegt et al., 2015, Buyl et al., 2019).

Secondly, we argue that technology boosts banks' performance by: (i) enhancing their monitoring and screening abilities (Berg et al., 2020), (ii) improving their lending decisions, by facilitating the selection of the best borrowers, thus reducing the likelihood of loans defaulting. For example, Pierri and Timmer (2020*b*) show that high IT-adopters recorded lower levels of non-performing loans and higher credit growth during the Global Financial Crisis.[1] IT influences banks performance also via customer relationships. Investments in communications channels generate "spatial capture" (Boot et al., 2020) providing a comparative advantage via improved knowledge of customers' needs, higher customer satisfaction and retention (Mithas et al., 2012), ultimately ensuring cheaper and more stable deposit funding. Moreover, established online sales channels facilitate the extraction of rents via the cross-selling of products, boosting revenues (Pierri and Timmer, 2020*a*). IT-intensive banks may also be superior in expanding their customer base, as banks' digital platforms can drastically reduce the costs for customers to search and switch banks. In addition, technology increases banks' market power via adverse selection for competitors when the cost of acquiring private information on customers is too high. Finally, IT investments create value for firms – enhancing strategic flexibility (e.g., preparedness to transition to digital remote setups) and risk avoidance (e.g., cybersecurity concerns) – and their shareholders – contributing to the long-run performance (e.g., lower production costs) (Bharadwaj et al., 1999).[2]

[1] However, a reliance on "hard information" provided by IT solutions may also lead to worsened borrowing terms for opaque customers (e.g., SMEs or start-ups) or excessive securitization associated with lowered lending standards (Boot et al., 2020).

[2] However, Beccalli (2007) finds a non-significant relationship between investments in IT and cost-efficiency for European banks between 1995 and 2000.

2 Data and Methodology

To examine the impact of IT adoption on market returns, we collect stock price data for commercial banks (SIC Code 6020) traded on the NYSE, AMEX and NASDAQ (Compustat codes 11, 12, 14) from Compustat Capital IQ North America Daily, and we match them with balance sheet data from SNL Financials. Following Albuquerque et al. (2020) and Ding et al. (2021), we estimate the following regression:

$$\begin{aligned} Performance_{it} = \beta_0 + \beta_1 Tech_i \times Covid_t + \beta_2 Tech_i \times Fiscal_t \\ + BankFE + DayFE + Controls + \epsilon_{it} \end{aligned} \tag{1}$$

Where *Performance* is daily abnormal returns (*AR*) or market adjusted returns (*MAR*) during the first quarter of 2020. *AR* are estimated using a market model with day dummies for 2017 and 2019. *MAR* are defined as the difference between the log return and the log of the market return. We measure IT adoption (*Tech*) as a dummy, taking the value of 1(0) if the bank is above (below) the median of the ratio of tech and communication expenses to total operating expenses for 2018, and these banks are henceforth denoted 'high (low) IT-adopters'. *Covid* takes the value of 1(0) from February 24 to March 31, 2020 (otherwise) – when the stock market decline accelerated after several municipalities in northern Italy entered lockdown; *Fiscal* takes the value of 1(0) from March 18 to March 31, 2020 (otherwise), when the US administration's second Coronavirus Emergency Aid Package (CEAP) was signed. Finally, we include bank and day fixed effects (FE). In the above specification, β_1 captures the effect of past IT spending decisions on stock performance during the Covid crisis.

3 Results and Discussion

First, we test for the parallel trends assumption to ensure the results are not driven by high IT-adopters behaving systematically differently from low IT-adopters in the period preceding the pandemic. In untabulated results, we regress *AR* and *MAR* from January 2 to February 21, on the dummy for high IT-adopters, and consistently find *Tech* insignificant, supporting our difference- in-differences framework.

The results of Eq.(1) are reported in Table 1. From February 24 to March 17, pre-2020 high IT-adopters had milder stock price declines than low IT-adopters (columns (1)-(4)). These findings are robust to the set of controls and the measure of market performance. Additionally, we change the *Covid* dummy to January 30, when the World Health Organization declared Covid-19 a pandemic, and the results are consistent (columns (5)-(8)).[3] This evidence supports our view that IT investments acted as a shield during the market turmoil, as investors perceived them to be

[3]These findings hold also when assessing market reactions at the announcement of the first case and first death in the US (January 20 and February 29, respectively) (untabulated results).

a source of resiliency in relation to firms' current performance and as a key strategic differentiator for long-term success.

[INSERT TABLE 1 HERE]

3.1 Additional Measures of Bank Performance

We complement our analysis by exploiting cross-sectional regressions and we examine whether pre-2020 IT spending contributes to i) long-run firms' value (Tobin's *q*), ii) credit growth (*LoanGr*) and iii) profitability (*NIM*). The results are reported in Table 2. Focusing on the change between 2020Q2 and 2020Q1, we show that high IT-adopters benefited from larger increases in market valuations after the Covid shock (columns (1)-(2)), in line with the argument that IT investments add value to firms in the form of expected future streams of profitability (i.e., long-term growth) and risk avoidance. High IT-adopters also reported higher loan growth than low IT-adopters (columns (3)-(4)). Amid the pandemic, the ability of these banks to select the best borrowers and to "capture" existing and new borrowers may have supported their credit supply. Finally, we do not find evidence that the level of IT adoption affected *NIM* , which may be explained by the fact that the pandemic was still unravelling and, unlike stock returns, profitability accounting metrics are slower at incorporating information (in untabulated regressions, we find similar results when using ROE and ROA).

[INSERT TABLE 2 HERE]

3.2 Bank Lending and Loan Modifications

As a final set of analyses, we restrict our sample to institutions participating in the Paycheck Protection Program (PPP) and we investigate the relationship between IT spending and i) the credit issued under this facility (*PPP* loans as a percentage of net loans (%)) and ii) the loan modification rate (*LMR*, loans modified because of Covid-19 as a percentage of net loans (%)).[4] As before, we run cross-sectional regressions and find that, on average, high IT-adopters issued more PPP loans, and fewer of their existing loans were subject to renegotiation because of Covid-19 (Table 3, columns (1)-(2) and (3)-(4), respectively). This last result is consistent with the argument that IT adoption enhances banks' ex-ante screening ability, ultimately promoting their resiliency by reducing the likelihood of loans defaulting.

[INSERT TABLE 3 HERE]

[4]The PPP, established in the US by the Coronavirus Aid, Relief, and Economic Security Act (CARES Act), provides US small businesses with funds to pay up to eight weeks of payroll costs, including benefits.

4 Conclusion

We analyse the effects of pre-2020 IT spending on banks' performance during the Covid-19 crisis. We build on Pierri and Timmer (2020*b*) but take a broader approach, and show that higher pre-Covid IT investments were associated with better market performance, greater credit supply, and lower rates of loan renegotiation during the initial stages of the pandemic. Our findings are consistent with the view that technology can foster financial stability by boosting bank performance and resiliency. Future research that explores the mechanism of how IT investments promote banks' resilience will be of great value.

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Tables

Table 1: Daily Abnormal Returns and Market Adjusted Returns

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Covid=1 for February 24 to March 31				*Covid*=1 for January 30 to March 31			
	AR	*AR*	*MAR*	*MAR*	*AR*	*AR*	*MAR*	*MAR*
Tech × *Covid*	0.0036**	0.0039**	0.0024*	0.0028**	0.0019**	0.0020**	0.0013*	0.0014*
	(0.001)	(0.0016)	(0.0014)	(0.0014)	(0.0009)	(0.0009)	(0.0007)	(0.0008)
Tech × *Fiscal*	-0.0017	-0.0024	-0.0002	-0.0010	-0.0000	-0.0005	0.0009	0.0003
	(0.0026)	(0.0027)	(0.0024)	(0.0012)	(0.002)	(0.0021)	(0.00195)	(0.002)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Adj R-sq	0.2316	0.2381	0.2351	0.2458	0.2313	0.2378	0.235	0.2457
Observations	14,136	13,751	14,136	13,751	14,136	13,751	14,136	13,751

Standard errors in parentheses (clustered at bank level). * p<0.10, ** p<0.05, *** p<0.01.
Controls include: *volatility* (daily price range defined as daily high-daily low scaled by the midpoint of high and low daily prices) and *Amihud liquidity*. Regression constant not reported for brevity.

Table 2: Cross-sectional Regressions for Bank Performance

	(1)	(2)	(3)	(4)	(5)	(6)
	ΔTobin's *q*	ΔTobin's *q*	*LoanGr*	*LoanGr*	Δ*NIM*	Δ*NIM*
Tech	0.0020*	0.0017*	0.0341*	0.0349**	-0.0002	-0.0001
	(0.0011)	(0.0010)	(0.0186)	(0.0176)	(0.0003)	(0.0003)
Controls	No	Yes	No	Yes	No	Yes
Adj R-sq	0.014	0.093	0.013	0.062	0.000	0.051
Observations	226	226	226	226	226	226

Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Tobin's *q* is *equity market value + liabilities book value/asset book value*. *LoanGr* refers to net loans growth between 2020Q2 and 2020Q1. *NIM* is net interest margin (%). Δ refers to the change between 2020Q2 and 2020Q1. Pre-crisis (2019Q4) controls include: *non − performing loans*, *log of assets*, *return on equity* (excluding columns (5)-(6)), *equity to asset ratio* and country dummies. Regression constant not reported for brevity.

Table 3: Cross Sectional Regressions for PPP Loans and Loans Modifications

	(1)	(2)	(3)	(4)
	PPP_{q2}	$\overline{PPP}$	LMR_{q2}	$\overline{LMR}$
Tech	1.5184**	1.5997**	-1.8910**	-1.4313*
	(0.7191)	(0.7105)	(0.9065)	(0.8632)
Controls	Yes	Yes	Yes	Yes
Adj R-sq	0.101	0.099	0.134	0.143
Observations	213	217	202	209

Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01. The dependent variables are: PPP_{q2} for 2020Q2; $\overline{PPP}$ (2020Q2-2020Q3 average); LMR_{q2} for 2020Q2; $\overline{LMR}$ (2020Q2-2020Q3 average). Pre-crisis (2019Q4) controls include: *non –performing loans*, *log of assets*, *return on equity*, *equity to asset ratio*. Regression constant not reported for brevity.