

# Low IT spending by banks: Reason for concern?

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## **Abstract**

We collect data on IT spending as reported by banks directly supervised by the ECB in their 2020 annual reports. Slightly more than 50% of these banks report their IT spending. Our analysis, using data for those banks that do report IT expenditure, suggests that the distribution of IT expenses as share of operating income, operating expenses or total assets is uneven. We identify banks that score low on one or more of these ratios. It turns out that this group is very diverse. We argue that these banks are not necessarily in the danger zone with regard to future profitability as high IT spending is no guarantee for good performance.

This document was provided/prepared by Economic Governance Support Unit at the request of the ECON Committee.

This document was requested by the European Parliament's Committee on Economic and Monetary Affairs.

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Manuscript completed in June 2021

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## LIST OF ABBREVIATIONS

<b>ATM</b>	Automated Teller Machine
<b>ECB</b>	European Central Bank
<b>EU</b>	European Union
<b>GDP</b>	Gross Domestic Product
<b>IFRS</b>	International Financial Reporting Standards
<b>IT</b>	Information technology
<b>GFC</b>	Global financial crisis
<b>OI</b>	Operating Income
<b>ROA</b>	Return on Assets
<b>ROE</b>	Return on Equity
<b>SREP</b>	Supervisory Review and Evaluation Process

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## EXECUTIVE SUMMARY

### Background

The ECB's 2020 Supervisory Review and Evaluation Process (SREP) noted that as a consequence of the COVID-19 pandemic, about four-fifths of institutions directly supervised by the ECB have pressed ahead with their digital transformation plans, such as investing in digital and direct banking services, artificial intelligence, new digital platforms, automation of existing processes, innovation projects, remote working arrangements, etc. However, some 20% of these banks seem to be falling behind in the digitalisation process, spending less than 3% of their total operating income on their information technology (IT) infrastructure.

### Aim

The purpose of this analysis is to shed some light on these figures. First, we discuss why IT spending is important. For that purpose, we provide a conceptual framework, focusing on the recent challenges that banks face from fintech. Both established trends and new developments with respect to information and communications are discussed. The scant academic research on the impact of IT spending on bank efficiency and profitability is discussed. Although this research suggests that IT spending may enhance efficiency and increase profitability, some studies suggest that it may take time for these effects to materialise. Furthermore, research on Asian banks suggests that a bank's high IT expenditures do not always correlate with superior performance.

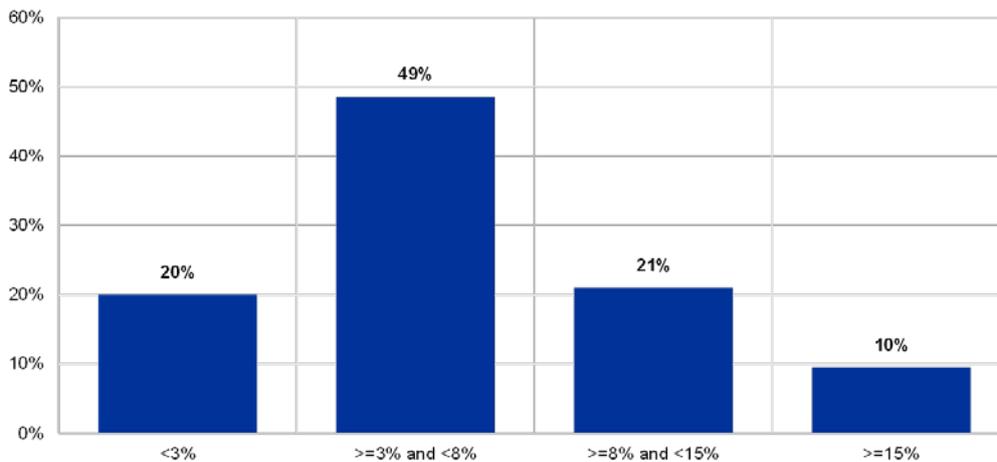
Next, we collect data on IT spending as reported by banks directly supervised by the ECB in their 2020 annual reports. Slightly more than 50% of these banks report their IT spending. Our analysis, using data for those banks that do report IT expenditure, suggests that the distribution of IT expenses as share of operating income, operating expenses or total assets is uneven. We identify banks that score low on one or more of these ratios. It turns out that this group is very diverse. We argue that these banks are not necessarily in the danger zone with regard to future profitability as high IT spending is no guarantee for good performance.

## 1. INTRODUCTION

The ECB's 2020 Supervisory Review and Evaluation Process (SREP) noted that as a consequence of the COVID-19 pandemic, about four-fifths of institutions directly supervised by the ECB have pressed ahead with their digital transformation plans, such as investing in digital and direct banking services, artificial intelligence, new digital platforms, automation of existing processes, innovation projects, remote working arrangements, etc. However, some 20% of these banks seem to be falling behind in the digitalisation process, spending less than 3% of their total operating income on their information technology (IT) infrastructure (see Figure 1). Although the ECB reports that diversified lenders and universal banks are among those with the lowest share of IT spending, it does not set out which banks are falling behind, not for what reasons.

This position paper first discusses why IT spending by banks matters, summarising academic research on this topic. Subsequently, it offers a data analysis of IT spending in 2019 and 2020 by banks supervised by the ECB. The data has been hand collected using banks' annual reports. By doing so, we are able to identify banks that, according to our data, are in the left-side (i.e. low spending) of the distribution of three ratios: IT spending to operating income, IT spending to operation expenses, and IT spending to total assets. It turns out that these banks are very diverse in terms of size and business mode.

**Figure 1: Distribution of IT costs as a share of total operating income**



Source: ECB 2020 SREP aggregate results.

## 2. WHY IS IT SPENDING IMPORTANT?

### *Conceptual framework*

Drawing heavily on Martin-Oliver and Salas-Fumas (2008) and Boot et al. (2021), the importance of IT for banks can be understood using the following conceptual framework. The output of banks includes all activities that provide services consumers are willing to pay for: 1. direct services (such as liquidity provision, payments, asset management, etc.) and 2. services from intermediation (i.e., raising and lending funds). In their role as financial intermediaries, banks focus on overcoming information (moral hazard and adverse selection) and communication (match-making) frictions that can hamper the efficient allocation of resources. To resolve informational frictions, banks screen and monitor risky investments on behalf of savers who lack the capacity to do so. To resolve communication frictions, financial intermediaries invest in the creation and maintenance of customer relationships and product distribution channels.

Technological change may increase the value of banks' services and as a result increase customers' willingness to pay for them. For instance, by expanding the scope of services that a customer can get from a bank branch, IT capital may facilitate one-stop banking that increases customer value.

But technological advances also enable the entry of new competitors. A good case in point is the introduction of internet banking. Drawing on Boot et al. (2021), this may be explained as follows. Historically, banks relied on physical branches to interact with customers. While early technological innovations, such as the automatic teller machine (ATMs), increased convenience for customers and reduced costs for banks, banking largely remained a brick-and-mortar business. The diffusion of internet enabled the adoption of online banking<sup>1</sup>, which brought convenience benefits to customers and increased bank efficiency.<sup>2</sup> However, it also enabled the entry of direct banks that operated without a physical branch network and relied on third-party ATMs.

The financial industry has already experienced many waves of technological innovation. Boot et al. (2021) distinguish between the continuation of established trends (which may be accelerating) and genuinely new developments (see Figure 2). The upper part of the figure shows the roles of information and communication in financial intermediation. The lower parts indicate key technology-induced changes in each of those fields, distinguishing between what is old and what is new. Among the established trends, Boot et al. (2021) mention the proliferation of hard information and the change in financial sector communication from branch-based interaction to more distant links. Regarding new developments in the information domain, they point to the growth of the digital economy which gives rise to new types of data, often non-financial in nature. This abundance of data enables the use of big data analytics such as machine learning and artificial intelligence. New developments in the

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<sup>1</sup> The use of online banking services in the EU-15 stood at only 19% in 2003, but increased steadily to 59% in 2018. By contrast, the number of branches declined drastically, from 540 branches per 1 million inhabitants in 1997 to only 331 in 2018 (Boot et al., 2021).

<sup>2</sup> Hernando and Nieto (2007) examine the introduction of the use of internet among Spanish banks. Their main conclusions are that the internet delivery channel seems to serve as complementary means of transacting with customers rather than a substitute for physical branches. The adoption of internet banking has a positive impact on profitability, but only becomes significant three years after adoption. The profitability gains associated with internet banking are mainly explained by a significant reduction in overhead expenses.

communication domain give rise to the dominance of digital platforms and mobile devices that take over an increasing share of customer communication.

Since the global financial crisis, disruptive new start-ups and established technology companies have begun to deliver financial products and services directly to businesses and the general public, often focusing on a single-purpose solution, designed to offer better consumer satisfaction in just one product or service. Due to fintech and techfin<sup>3</sup>, banks not only face competition from their incumbent rivals but also from challengers, which do so either by reimagining conventional products and services – such as payment services and loans – in ways that offer superior value and user experience; or by using technology to build a market around responding to needs that conventional financial services providers had left unmet (Consumers International, 2017). At the same time, banks utilise these new technologies to upgrade and update their systems and communication and information processes. This involves upgrading outdated systems and processes, shifting to cloud computing, and developing new, digital-oriented financial products and services that match customer needs. Banks can also collaborate with fintech firms as a client, backer, or partner of a fintech enterprise – i.e. purchasing, investing in, or co-developing products in order to modernise their services, or to offer new ones. They may also acquire promising fintech companies.

These developments will change the way banks operate. According to Boot et al. (2021: 6), *“There is little doubt that the days of brick-and-mortar banking – and the associated opportunities for cross-selling through a “first point of contact” advantage of branch banking – are largely over. Today, new entrants can set up efficient communication channels via web portals and mobile apps at very low cost, and reach targeted audiences via direct marketing tools, including social media. Moreover, the ability to source IT infrastructure through cloud services considerably lowers the barriers to entry. Consistent with this, so-called “neo banks”, such as Axos, Revolut, and N26, are challenging incumbents by offering customer-friendly interfaces and employing more efficient IT processes.”* Furthermore: *“Ultimately, technological progress may lead to the ... disintegration of the traditional bank business model. Specialized service providers can chip away services that do not rely on access to deposit funding, such as payments and asset management services. And digital platforms can become the new middlemen between banks and their customers (borrowers and depositors). In the extreme, this could relegate banks to upstream providers of maturity transformation services – engendering a fundamental transformation in the structure of the financial system.”* (p. 2).

**Figure 2: Technological progress: established trends and new developments**

Technological progress and financial intermediation.

	Information	Communication
Role in financial intermediation	Collect and process data for screening and monitoring	Establish relationships and distribution networks
Established Trends	Codification of soft information	Move from in-person to distant (telephone and online) interactions
New developments	New types of (non-financial) data; Data abundance enables AI & machine learning	Low-cost search, matching, and distribution through digital platforms and mobile devices

Source: Boot et al. (2021).

<sup>3</sup> Fintechs are companies embedding technology to make their own products/services more attractive and whose business model depends on the profitability of those financial products/services. Techfins are technology companies embedding financial services to make their own products/services more attractive but whose business model does not depend on the profitability of those financial services.

*Research on IT spending and bank performance*

Despite its importance, there is only scant research on the impact of IT spending by banks on their performance. This section provides an overview of relevant research.

One of the earlier studies conducted by Haynes and Thompson (2000) who analyse the productivity effects of introducing ATMs across an unbalanced panel of UK building societies. Their results suggest that the introduction of an ATM system was rapidly followed by productivity gains, such that adopters enjoyed a reasonably large productivity advantage over non-adopters by the end of the 1980s.

Using a sample of 737 European banks over the period 1995–2000, Beccali (2007) analyses whether IT investment is reflected in improved performance (measured using both standard accounting ratios and cost and alternative profit efficiency measures). She finds little relationship between total IT investment and improved bank profitability or efficiency. Whereas investment in IT services from external providers (consulting services, implementation services, training and education, support services) appears to have a positive influence on profits and efficiency, the acquisition of hardware and software seems to reduce banks' performance.

Very different results are reported by Casolaro and Gobbi (2007) who estimate profit and cost functions for a panel of 600 Italian banks during 1989–2000. These authors find that shifts of individual bank's cost and profit frontier towards the sector's best practice are strongly correlated with IT capital accumulation. On average the shifts in best practice due to IT capital accumulation can be quantified in a reduction of costs of 0.8 per cent per year and in an increase of short-run profits of 0.7 per cent.

Martin-Oliver and Salas-Fumas (2008) examine the contribution of IT investments to the output and profits of Spanish banks in the period 1983–2003. They report that the growth in the stock of IT capital explains one third of output growth of banks. However, these authors find no empirical evidence that IT capital increases demand for banking services. They conclude that banks' investments in IT have not increased customers' willingness to pay for services, even though IT capital has contributed significantly to the production of these services. Furthermore, Martin-Oliver and Salas-Fumas (2008) find that the return from investment in IT capital is just equal to the user cost of the capital input which implies that their evidence does not support the hypothesis that IT capital allows banks to gain a competitive advantage and earn extraordinary profits.

Koetter and Noth (2013) generate bank-specific estimates of productivity conditional on the use of IT across banks to test explicitly whether IT-augmented productivity relates positively to the market power of banks. Their sample comprises all 457 German savings banks between 1996 and 2006. These authors conclude that higher IT use positively contributes to bank productivity. Regressing IT-augmented productivity measures on market power indices, suggests that higher productivity is both statistically and economically significantly related to these Lerner indices, which indicate the degree to which a firm can set prices above marginal costs (a higher Lerner index hence implies a better competitive stance of a bank).

Scott et al. (2017) examine the impact on bank performance of the adoption of SWIFT, a network-based technological infrastructure for worldwide interbank telecommunication using a dataset of 6,848 banks in 29 countries in Europe and the Americas. Their results suggest that the adoption of SWIFT (1) has large effects on profitability in the long term; (2) is greater for small than for large banks; and (3) exhibits significant network effects on performance. Additionally, the profitability effects of SWIFT

derive mainly from an increase in sales, not just a fall in long-term operating expenses (due to fewer employees per unit of capital).

Finally, although most research discussed above suggests that IT capital increases bank performance, albeit possibly with a (long) lag, the study by Gopalan et al. (2012) on Asian banks offers a clear warning that there is no simple linear relationship. These authors find that a bank's high IT expenditures do not always correlate with superior performance. Some banks with large IT budgets often have trouble generating high revenue growth and operational efficiency. Their survey data suggest that 66 percent of banks with higher-than-average IT spending relative to income generated lacklustre results, with revenue growth 0.4 percentage points lower than the industry standard and a cost-income (C/I) ratio 2.5 percentage points higher. By contrast, 23 percent of the 44 banks surveyed outperformed the market on both revenue growth (up 10.9 percentage points) and C/I ratio (down 4.6 percentage points), while spending 29 percent less on IT than other banks in the study.

### 3. DATA ANALYSIS

We downloaded annual reports for 2019 and 2020 of banks being directly supervised by the ECB.<sup>4</sup> Not all banks report their IT spending. Figure 3 shows the number of banks for which we have or do not have data on their IT spending. It is quite remarkable that a large share of banks does not inform their stakeholders on how much they spend on IT (although it is not required to report these data under IFRS).

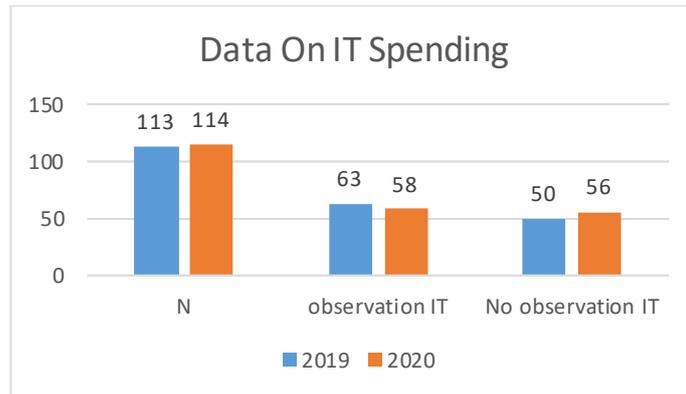
Figure 4 shows the density distributions of the banks for which we have data on their IT spending in 2019 and 2020. We not only scale IT spending by operating income (IT\_OI) as indicator of the spending power, but also by total assets (IT\_TA) as indicator of size and other operating expenses (IT\_GA) as indicator of the relative importance of IT. The distributions in 2019 and 2020 are very similar. As banks do not consistently report their operating income, we have defined it as the sum of interest income, net fee and commission income, income from stock trading, derivatives trading and hedging and gains/losses on capital investments. Most banks report their IT expenditure under operating expenses, but may not do so in a consistent way. In calculating the ratio of IT spending to other operating expenses, we have used the banks' own classification.

The figure offers a snapshot of the situation in two years. As shown by Figure 4, for all ratios there is a large group of banks that are fairly similar (the "bumps" in the figures), although there are also banks to the left and to the right of these "bumps"; banks to the left spend less on IT and those to the right spend more.

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<sup>4</sup> A list of banks supervised by the ECB is available here: <https://www.bankingsupervision.europa.eu/banking/list/html/index.en.html>.

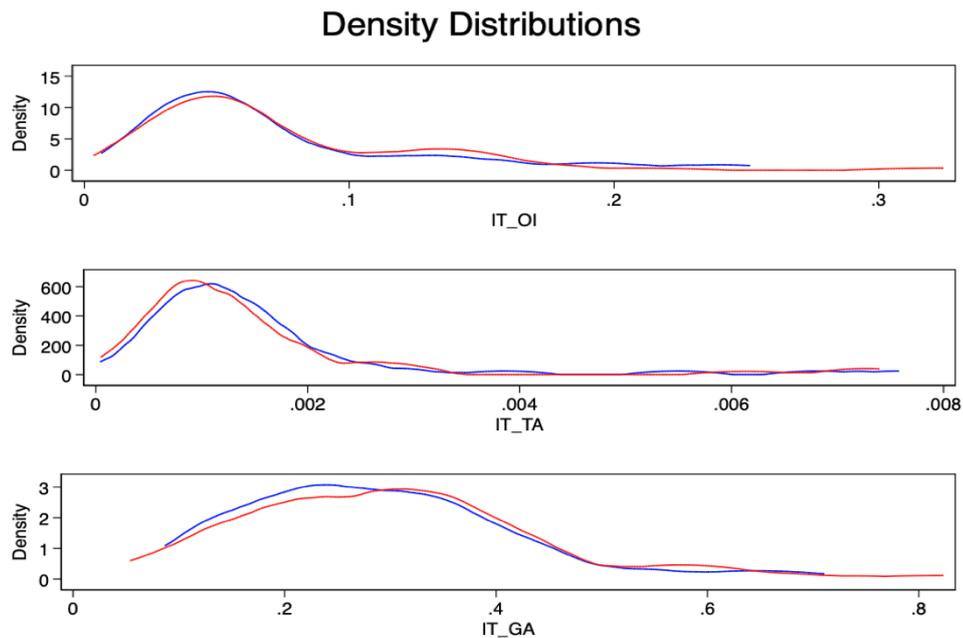
**Figure 3: Number of banks for which we have/do not have IT spending**



Source: own calculations.

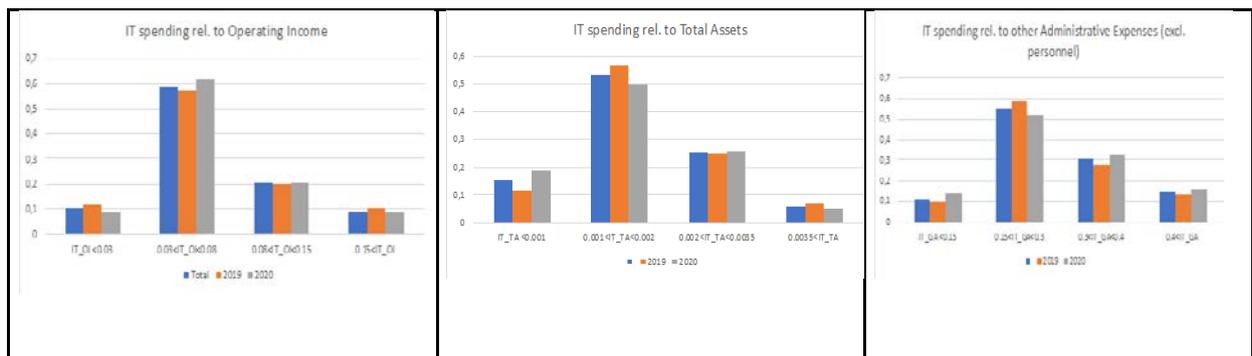
Figure 5 presents the data in a similar way as the ECB (2021) does, i.e. by grouping banks into different bins, based on their scaled level of IT spending. The length of the bars indicates the share of banks that fall in a particular bin. We find a similar pattern for the ratio of IT spending to operating income as the ECB, although the share of banks in the first bin is lower (around 10% instead of 20%). This may, of course, reflect the lack of data for all banks directly supervised by the ECB.

Figure 4: Density distributions based on scaled IT spending, 2019 and 2020



Note: the figure shows density distributions for IT expenses scaled to operating income (IT\_OI), total assets (IT\_TA) and other operating expenses (IT\_GA). The blue line refers to data for 2019 and the red line refers to data for 2020. Source: own calculations.

Figure 5: Distribution of IT spending relative to operating income, total assets and other expenses



Source: own calculations.

Finally, Table 1 shows the banks that are on the left-hand side of one or more of these diagrams (for 2019 and/or 2020). It is clear that the scaling factor used in several cases affects the classification of banks. Some banks belong to the group of banks with a relatively low level of IT expenses according to one criterion, but not according to the other one. However, several banks receive the same classification on two or even three of these criteria.

The main conclusion that follows from Table 1 is that the group of banks that, according to one or more of these criteria, spends relatively little on IT is a very mixed bag. It includes several relatively small banks and also some specialised banks. However, a few large universal banks are also included. In the

Netherlands, for instance, a small bank specialised in lending to local government (Nederlandse Waterschapsbank) is in this group, as is the Volksbank, which is the Dutch state-owned banking organization behind ASN Bank, BLG Wonen, RegioBank and SNS. It is much smaller than ING, ABN-AMRO and RABO bank. The latter is also in this group, as it has a relatively low IT spending to total assets ratio.

Table 2: Banks with relatively low levels of IT spending

Name:	Country:	Total assets (mln. EUR; 2020):	Low IT_OI	Low IT_TA	Low IT_GA
Swedbank AS	Latvia	7,695			X
AS SEB Pank	Estonia	7,489	X	X	X
Banca Monte Dei Paschi di Siena	Italy	150,356	X		X
BFA Tenedora De Acciones	Spain	206,497	X		
BPER Banca S.p.A.	Italy	93,051			X
Banco Comercial Português, SA	Portugal	85,813	X	X	X
Banco de Crédito Social Cooperativo	Spain	47,406 (2019)	X		
Bankinter	Spain	83,732 (2019)	X	X	
Caixa Geral de Depósitos	Portugal	91,375		X	
Cooperatieve Rabobank	Netherlands	632,258		X	
DZ Bank	Germany	594,573			X
Deka group	Germany	85,509	X	X	X
Kuntarahoitus Oyj	Finland	44,042		X	
Liberbank	Spain	47,510		X	
Nederlandse Waterschapsbank N.V.	Netherlands	106,882	X	X	
Unicaja Banco, S.A.	Spain	65,544		X	
Volksbank N.V.	Netherlands	67,484		X	
Swedbank AB	Lithuania	14,014		X	X

Notes: the three columns at the right-hand side of the table indicate whether a bank is in the category of banks with the lowest level of IT spending; the categories are shown in Figure 5.

Source: own calculations.

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## 4. CONCLUSIONS

We have collected data on IT spending as reported by banks directly supervised by the ECB. It is quite remarkable that almost half of these banks do not report their IT spending in their annual reports. Our analysis using data for those banks that do report IT expenditure suggests that the distribution of IT expenses as share of operating income, operating expenses or total assets is uneven. We identified banks that score low on one or more of these ratios. It turns out that this group of banks is very diverse.

Are banks with relatively low IT spending in the danger zone when it comes to their profitability and the sustainability of their business model in view of new competitors? Not necessarily. The first factor to take into account is a bank's business model. The more specialised the bank is, the less likely it is to face competitive pressure from fintech disruptors. Likewise, the more universal a bank is, the more likely it is that it will face external competitive pressure and the more important a proper IT strategy will become. That brings us to the second factor: the effectiveness of high IT spending. The experience of Asian banks as reported by Gopoloan et al. (2012) shows that high IT spending is no guarantee for superior performance. Several banks with low IT spending outperformed banks which spent more on IT. This suggests that how IT expenses are used may be more important than the level of IT spending as such. Our data do not allow to examine this issue in more detail.

Finally, IT spending may not only be needed for their potential efficiency and profit enhancing effects, but also for security reasons, like protection against cyberattacks. Whereas underspending by banks on IT in general may not necessarily be problematic, when banks are underspending on IT security measures this is likely to become problematic. Our data do also not allow to examine for which purpose banks spend on IT.

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