Contemporary Accounting Case Studies

Vol. 2, No. 2, September 2023 Article 14

PRODUCTIVITY ANALYSIS OF TWO BANKS AS A RESULT OF ADOPTION OF NEW TECHNOLOGY AND BUSINESS PROCESSES

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Contemporary Accounting Case Studies,
September 2023, Vol. 2, No. 2, pg. 261-279

BANK PRODUCTIVITY ANALYSIS IN RELATION TO ADOPTION OF NEW TECHNOLOGY AND BUSINESS PROCESSES: CASE STUDY OF TWO BANKS IN INDONESIA

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ABSTRACT

Complementary investments required in the adoption of new technology and business processes often are intangibles and poorly measured in the financial statements and national accounts. Unmeasured outputs and unmeasured inputs can lead to underestimation of productivity growth in early periods of the adoption of new technology and business processes and overestimation of productivity growth in later periods when the benefits of the intangible investments are harvested. As technological innovations radically change the competitive environment and challenge traditional business processes across the entire value chain of banking sector, this case study evaluates whether similar patterns can be observed in two banks in Indonesia. The study examines the relationship between costs related to investments in new technology, business processes and improvement in human resources with the productivity measures of the banks based on financial information published by the banks for the period of 2011 to 2020. The study finds that, based on various productivity measures observed, the productivity of the banks either declined, relatively remained at the same level or slightly increased linearly. As such, significant improvement in productivity measures in the later periods as compared to the early periods were not observed in both banks in the period of 2011 to 2020, indicating the banks were in the early stages in the process of adopting new technology and business processes. Expanding the study to the periods beyond 2020 may provide further observation on whether the investments in new technology and business processes will result to significant increase in productivity measures in the later periods of an extended period.

Keywords: bank; intangible; new technology and business processes; productivity

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1. INTRODUCTION

Banking sector is experiencing significant changes arising from the arrival of new technologies. Digitalization and technological innovations create both opportunities and competitive threats to banks that necessitate reevaluation of business model and strategy. This trend is likely to accelerate in the near future, shifting the drivers of profitability. Banking sector generally responses to these challenges with investments in adoption of new technology and business processes as well as aligning the skills and capability of human resources with the new business model and processes.

Most of such investments produce intangibles which are expected to improve competitiveness and productivity. The nature of these intangibles presents significant challenge in their measurement. It has been recognized that book assets understate corporate intangible assets due to these issues (Eisfeldt & Papanikolaou, 2014). These measurement issues may result to unmeasured output when these intangibles are being developed and, on the other hand, unmeasured inputs when the organizations reap the benefits from these intangibles. One of the impacts of such mismeasurement is on productivity growth statistics which follows a J-curve shape, when it is initially dipping while investments in intangible capital development is larger than the unmeasured contribution of intangibles and then rising as growing intangible capital begins to contribute to measured production (Brynjolfsson, Rock & Syverson, 2020).

Financial accounting frameworks, such as Indonesian Financial Accounting Standards and International Financial Reporting Standards, provide guidance for measurement and presentation of intangible assets for financial reporting purposes. PSAK 19 “Intangible Assets” (PSAK 19), which was initially issued by the Financial Accounting Standard Board of the Institute of Indonesian Chartered Accountants in 2000, addresses variety of treatment for particular types of intangible assets as a result of financial reporting standard development on an issue-by-issue basis prior to the issuance of IAS 38 “Intangible Assets” (IAS 38) by the International Accounting Standard Board. PSAK 19 recognizes two different types of intangible assets, i.e. (i) internally generated intangible assets; and (ii) intangible assets acquired separately or as part of business combination. PSAK 19 establishes the main guidance and requirements to measure, present and disclose internally generated intangible assets in financial reporting, although voluntary additional disclosures by entities may provide meaningful information to obtain better understanding of the investments related to new technology and business processes.

This case study evaluates whether the productivity measures of two banks in Indonesia for the period from 2011 to 2020 experienced significant increases in the later periods as compared to the earlier periods of the observation in relation to the adoption of new technology and business processes. The selected banks, which are both listed in the Indonesia Stock Exchange, each represents state-owned bank and privately owned bank. This study reviews and analyzes the published financial information by the selected banks and other publicly available information for 2011 to 2020. The study also analyzes the relationship between the investments and the productivity measures of the banks to obtain understanding on the stage of the adoption of new technology and business processes.

2. LITERATURE REVIEW

Traditional banking business model is radically challenged by new technology. Technological innovations are challenging traditional processes across the entire value chain, from interaction with customers to back office operations.

These challenges forces banks to revisit their strategic business model and take the necessary actions (Kobler, Bucherer, Schlotmann, 2016). Meaningful shift in the drivers of profitability due to technological innovations is also observed in Indonesia banking sector (J.P. Morgan, 2021).

The enhancement of competitive environment in the banking sectors which drives those changes is expected to improve the efficiency and productivity of the banks. From the macroeconomics perspective, the improved efficiency and productivity of the banking sector are envisaged to reduce the costs of financial intermediation and strengthen the overall stability of the financial system, resulting to a better allocation of financial resources and increased investments that propel economic growth (Maradin, Prohaska & Nikolaj, 2019).

To be successful, the implementation of strategy needs to be integrated with and linked to excellent operational processes (Kaplan & Norton, 2008). Accordingly, the successful implementation of the strategic initiatives by the banks ought to be measured by improved productivity and efficiency.

The investments necessary in implementing the strategy to response to challenges created by technological innovations often produce intangible capital as a result of improved business processes and human resources. The measurement of this intangible capital has been a challenge, resulting to

understatement of corporate intangible assets in the financial statements (Eisfeldt & Papanikolaou, 2014).

The productivity paradox observed by Robert Solow was, in the most part, caused by challenges in measurement of intangible capital and its contribution to the economic performance when such intangible capital provides benefits to entities' performances. It raises productivity measurement issues since intangible investments are not readily tallied to financial statements. In the early periods of the adoption of new technology, possibly of considerable length, measurable resources are committed and measurable output foregone to develop unmeasured intangible capital. While in the later periods, measurable outputs are produced partly by benefitting from unmeasured inputs from the intangible capital.

This phenomenon creates productivity J-curve, as productivity growth is initially underestimated when unmeasured investment in intangibles is greater than unmeasured input and later overestimated when unmeasured inputs from the intangible capital begin to contribute to production of measured outputs (Brynjolfsson, Rock & Syverson, 2020).

Maradin, Prohaska & Nikolaj (2019) conducted productivity literature review of relevant studies of the European banking sector published after year 2000.

This study produced comparative analysis of different empirical scientific studies concerning banking sector productivity evaluation. From those studies, the one carried out by Epure, Kerstens and Prior (2011) analyzed changes in productivity and efficiency of Spanish private banks over the period of 1998-2006 based on empirical research on three inputs, i.e. operating assets (defined as total assets – financial assets), labour (number of employees) and other administrative expenses, and three outputs, i.e. deposits, loans and fee-generated income. Another study by Casu and Girardone (2005) argued on the importance to include off-balance sheet business as part of the banks' outputs in estimating changes in productivity.

PSAK 19 "Intangible Assets" (PSAK 19) issued by the Institute of Indonesian Chartered Accountants defines an intangible asset as an identifiable non-monetary asset without physical substance (IAI, 2021). This definition is so broad that

the standard has to exclude certain assets and items of expenditure that would otherwise fall within it because the definition can include assets generated by other standards (e.g. deferred tax assets and leases).

PSAK 19, which adopts similar principles of IAS 38 (IASB, 2021), provides guidance for recognition and measurement of intangible assets as well as

the disclosure requirements. The requirements differ depending on whether an intangible asset is acquired separately, acquired as part of a business combination, or is internally developed by an entity. The recognition and measurement issues faced by entities adopting new technology and business processes are mostly related to internally generated intangible assets where identification of the asset and reliable measurement of the costs can be a challenge. The critical issue is identifying whether, when and how much of these costs should be recognized as assets, and how much should be recognized immediately as expenses.
PSAK 19 requires that certain costs must be recognized as an expense by an entity, such as training and start–up costs. PSAK 19 also prohibits the recognition of internally-generated goodwill because it is not possible to distinguish these costs, such as those related to development of brand or adoption of new business processes, from costs of developing business as a whole. This remains a difficult and controversial area in the standard.

3. RESEARCH METHODS

This case study relied on secondary data from published information by the selected banks over the period of 2011 – 2020 to perform longitudinal study in order to evaluate changes in productivity based on various measures. The data were mainly collected from published annual reports and consolidated financial statements of the selected banks over the period under study.

The two banks selected for this case study each represents a large state-owned bank and a large privately-owned bank with relatively comparable size. Both banks are listed in Indonesia Stock Exchange and have sizable operations in every provinces in Indonesia.

This longitudinal study is a panel study that took successive measures of yearly productivity of the same selected banks based on information as of the end of each year. The study analyzed the relationship of data and information which were grouped into inputs and outputs over the period. Changes of those relationship over the period were observed to obtain understanding of the patterns of the changes in productivity. The longitudinal study has the ability to establish causality and to make inferences. This study can also combine numerical and qualitative data (Cohen, Manion dan Morrison, 2007).

Data collection also focused on information related to investments in new technology and business processes regardless of whether such costs were capitalized or expensed immediately based on financial accounting standards.

Such costs include investments in software development and learning and development programs for the banks' personnel.

The study collected and analyzed data and information related to productivity measures usually presented by banks and analysts, such as return on assets and returns on equity. The study also observed revenue per employee and revenue per branch as common productivity measures. Referring to study by Epure, Kerstens and Prior (2011), this study looked at the banks' output as the aggregate of deposits, loans and fee-generated income. Such outputs were compared to inputs, i.e. operating assets (defined as total assets minus financial assets) and number of employees, by analyzing the ratio of output to operating assets and output per employee. With reference to study conducted by Casu and Girardone (2005), this study added further off-balance sheet items disclosed as commitment and contingencies in the banks' consolidated financial statements as part of the banks' output. The ratio of output (including off-balance sheet items) to operating assets and output (including off-balance sheet items) per employee were also analyzed in this case study.

The longitudinal research observed the patterns of changes in productivity measures analyzed in this case study over the period of 2011 – 2020. The study evaluated whether the productivity measures increased significantly in the later periods as compared to the earlier periods. The study also analyzed whether a pattern of relationship between the productivity measures and costs incurred in relation to software and human resources development can be inferred.

4. RESULTS AND DISCUSSIONS

4.1. THE SELECTED BANKS

This case study analyzed published information of two banks listed in Indonesia Stock Exchange for the period of 2011 – 2020. The selected banks each represents a state-owned bank (referred to as "State-owned Bank") and a privately-owned bank (referred to as "Private Bank") with relatively comparable size, having sizable operations in every provinces in Indonesia.

Since 2005, the state-owned bank has implemented transformation program in relation to its strategies concerning, among others, transformation of corporate culture, above-average business growth and improved inter-departmental alliances. In the period of 2012-2014, the state-owned bank continued its business transformation in the areas of wholesale transactions, retail deposit and payment dan retail financing. The state-owned bank aims to

be a respectable regional bank with sound competitive position in ASEAN market.

To achieve that goal, the state-owned bank expands its retail and corporate financial services through its extensive networks and operations, including through development and expansion of digital banking services. The digital banking services offerings include online banking, e-money, chatbanking, e-commerce, QRIS, customer service machine, application programming interface, dan digital lending for value chain business.

To support and sustain such strategy and development, the bank implements leadership development program and technical development program for its personnel. The leadership development program is designed for certain level within the organization, including for fresh graduates meeting the criteria. Technical development program covers technical and digital capability development programs to enhance knowledge and skills of personnel. Most recently,
the bank conducted digital learning transformation program to convert training and learning modules to virtual learning for more accessible training and learning for its personnel.

The private bank had been expanding its networks and banking services rapidly since the banking sector deregulation in 1980s. The bank was a pioneer in introducing EDC and automated teller machine in Indonesia. The bank continued to expand and develop its electronic banking services since year 2000 by introducing internet banking, mobile banking, prepaid cards and digital banking outlets. The bank developed various electronic payment methods, including online payments, peer to peer transfer based on QR code and online merchant. To align with the development in e-commerce and fintech, the bank recently developed application programming interface technology to enhance connectivity between parties in digital transactions. The bank considered such development was crucial to response to the era of open banking.

To ensure the reliability of the banking services and minimize the operational risks, the bank developed mirroring IT system and Data Recovery Center.
The bank applied data protection strategy through Data Loss Prevention, data classification, 2-Factor Authentication and upgrading Security Information and Event Management devices to detect potential fraud. The bank obtained ISO 27001 certification in relation to information security management system in its network and data center system as recognition of its consistent efforts to improve its network and infrastructure security.

The bank utilizes optical character recognition, artificial intelligence, and robotic process automation technology to improve productivity of its human resources. Branches had been equipped with automated and electronic devices to enable customers to perform transactions and obtain banking services by themselves, freeing time for frontline staff to have more meaningful interactions with customers.

The bank's human capital management has been an integral part of the development of digital banking services initiatives. To enhance digital capability and nurture innovations, the bank conducted training programs in 2020 focusing on low code programming, design thinking, data analytic, machine learning, and updated the ways of working. The bank also conducted digital buddy program to support the digital transformation.

During the Covid-19 pandemic, the bank adjusted working procedures to maintain productivity without compromising the health and safety of its personnel. The initiatives include virtual learning and development programs, work-from-home protocols, split operations and flexible working hours. Access to digital and online banking services reached record level during the pandemic.

4.2. INFORMATION ON ADOPTION OF NEW TECHNOLOGY AND BUSINESS PROCESSES

The selected banks adopted similar accounting policies on recognition and measurement of software development costs which were presented as part of intangibles. Such accounting policies were in accordance with the Indonesian Financial Accounting Standards, specifically PSAK 19 "Intangible Assets". The useful lives of software estimated by both banks were relatively similar, around 4 to 5 years. However, the banks adopted different amortization methods for the software costs. The state-owned bank adopted straight-line method, while the private bank adopted double-declining balance method. As amortization is a means to allocate the costs of software systematically over the useful life, PSAK 19 requires that amortization method shall reflect the pattern in which the assets' future economic benefits are expected to be consumed by an entity. Further study may need to be performed to assess whether there are differences in the pattern of consumption of software's future economic benefit in the selected banks.

The selected banks provided information on strategy, initiatives, activities and investments in new technology in their annual reports. However, the challenges were to obtain accurate financial information on total expenditures spent in adopting new technology and busines processes considering that some

expenditures that did not meet the criteria for capitalization required by PSAK 19 might have to be immediately expensed. The state-owned bank provided information on additional costs capitalized to software as part of intangible assets since 2012.
The private bank presented similar information on costs capitalized to software since 2018. However, the private bank also presented computer and software expenses charged to profit and loss since 2011. Voluntary disclosure, however, was not available to separate routine maintenance expenses of computer and software and non-routine expenses which might be related to adoption of new technology and business processes.

The study had similar challenges in learning and development expenses which are required to be expensed by the accounting standards. Voluntary disclosure to identify routine learning and development expenses and those related to the adoption of new technology and business processes was not available.

Cognizant of those constraints, the financial information published by the banks indicated increasing trends in investments in software as well as learning and development expenses, especially in most recent years. Significant increases of the expenditures in most recent years may indicate that the banks were still in the early stage in the adoption of new technology and business processes. An exception was noted in 2020 when learning and development expenses decreased significantly due to Covid-19 pandemic. Most productivity measures, however, continued to increase in 2020, indicating that investments that had been made might be beneficial to response to sudden changes imposed by Covid-19 pandemic.

The following graphs summarize the available information on software costs and expenses as well as learning and development expenses of the selected banks.

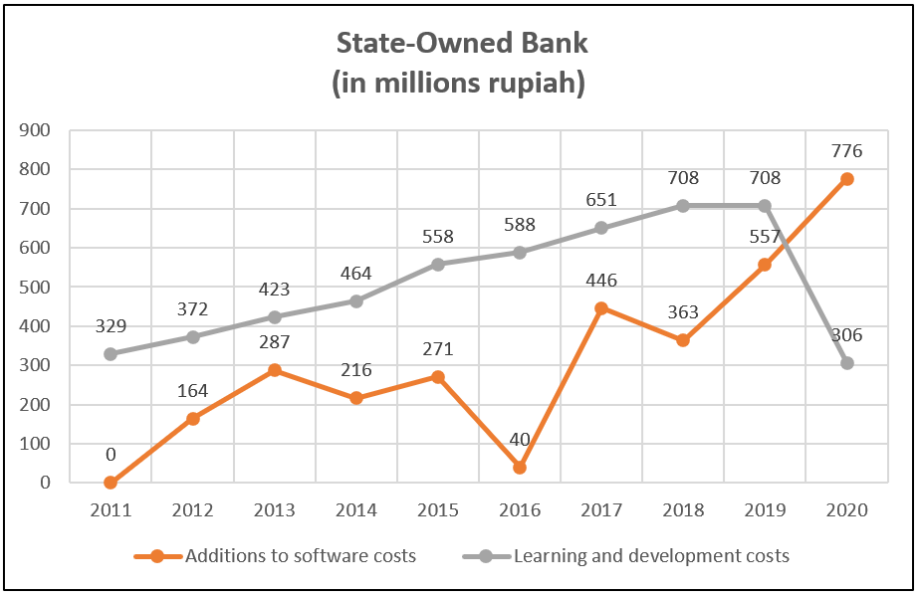

Figure 1. Software costs and learning and development expenses of the State-Owned Bank
Source: Annual Reports of the State-Owned Bank 2011-2020, processed by the authors

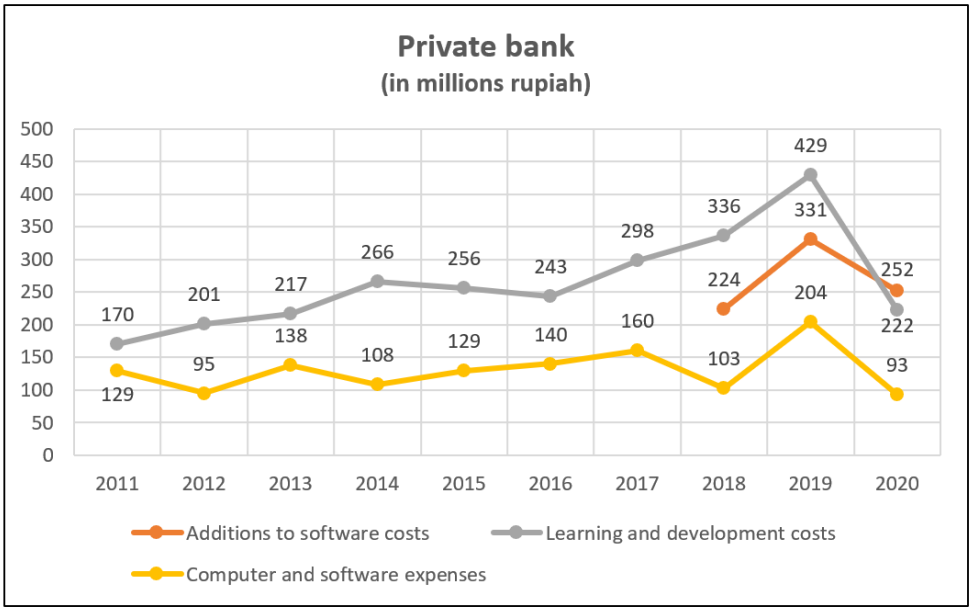

Figure 2. Software costs and expenses and learning and development expenses of the Private Bank
Source: Annual Reports of the State-Owned Bank 2011-2020, processed by the authors

4.3. PRODUCTIVITY MEASURES

Referring to productivity literature review of relevant studies of the European banking sector published after year 2000 conducted by Maradin, Prohaska & Nikolaj (2019), this case study observed several productivity measures based on 'output' and 'input' suggested in the studies. A study conducted by Epure, Kerstens and Prior (2011) suggested measuring banks' outputs in terms of the aggregate of deposits, loans and fee-generated income. For this study, the productivity measures are expressed as ratio of such outputs to inputs, such as operating assets or number of employees.

In this case study, also referring to the study by Maradin, Prohaska & Nikolaj (2019), operating assets are defined as total assets less financial assets. Comparing two monetary information lessens the effects of volatility in financial market to the productivity measures. Ratios of output to operating assets of the two banks for the periods of 2011 – 2020 are summarized in the following graph.

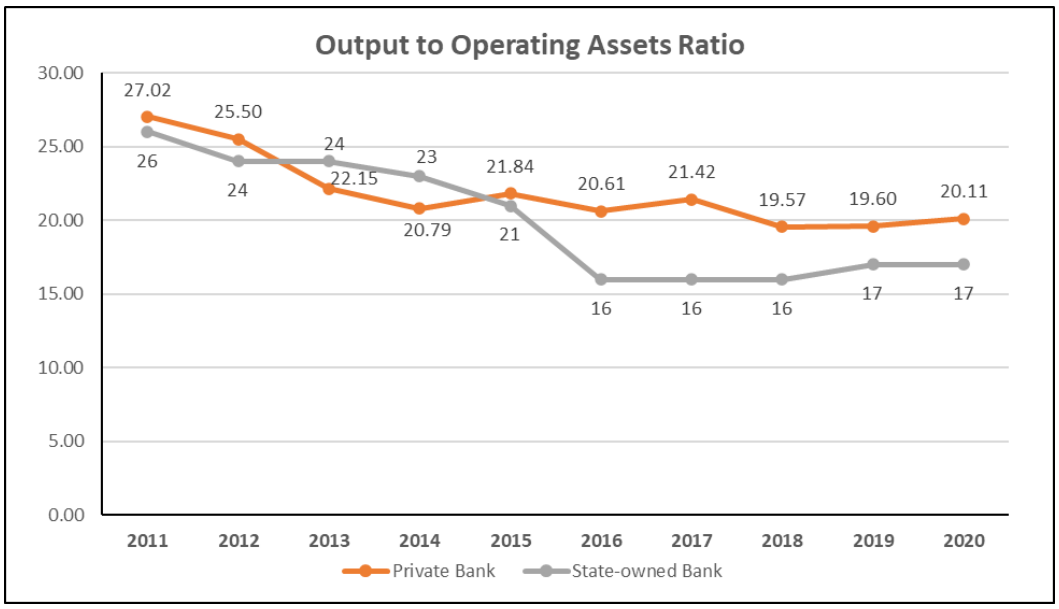

Figure 3. Output to Operating Assets of State-Owned Bank and Private Bank
Source: Annual Reports of the State-Owned Bank 2011-2020, processed by the authors

The movements of ratios of output to operating assets of the two banks during the observed period exhibited similar patterns. The ratios of output to operating assets for both banks tended to decrease over such periods at varied

rates. This declining trend suggested lower output growth compared to the growth of operating assets.

It indicates that both banks were investing significantly in operating assets in the periods. This is consistent with the information on software costs and learning and development costs of both banks discussed earlier. Significant increases in expenditures related to software costs as well as learning and development costs in the later part of the periods further suggested that both banks were in the early stages of adoption of new technology and business processes in the periods of 2011 – 2020.

This case study further included off-balance sheet items in the forms of commitments and contingencies as part of the outputs as suggested by the study conducted by Casu and Girardone (2005). The ratios of outputs (including the off-balance sheet items) to operating assets of the two banks over the periods of 2011 – 2020 are summarized in the following graph.

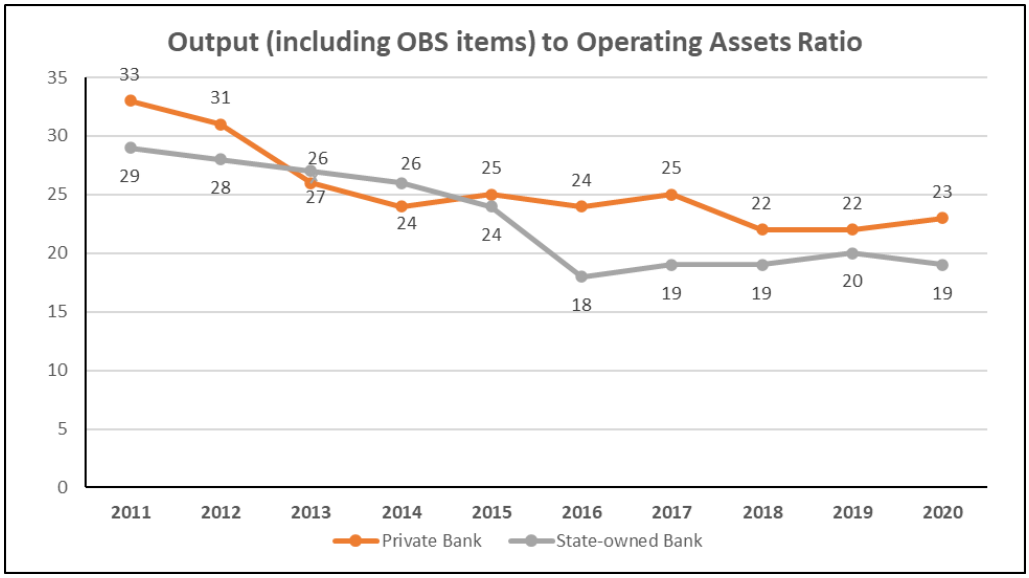

Figure 4. Output (including OBS items) to Operating Assets Ratios of State-Owned Bank and Private Bank

Source: Annual Reports of the State-Owned Bank 2011-2020, processed by the authors

Similar patterns were observed in the ratios of output (including off-balance sheet items) to operating assets of both banks. The decreasing trends of ratios of output to operating assets, even after off-balance sheet items were included as part of outputs, over the periods further exhibited that the growth of

investment in operating assets outpaced the growth of output. This phenomenon may also indicate that the banks were in the early stage of the adoption of new technology and business processes, which are consistent with the facts that expenditures for software costs as well as learning and development costs increased significantly in the later part of 2011 – 2020 period.

This case study also observed productivity measures which apply non-monetary information as inputs, such as number of employees and number of branches. Figure 5 summarizes ratios of outputs in terms of deposits, loans and fee-generated income per employee and the growth over the periods of 2011 – 2020.

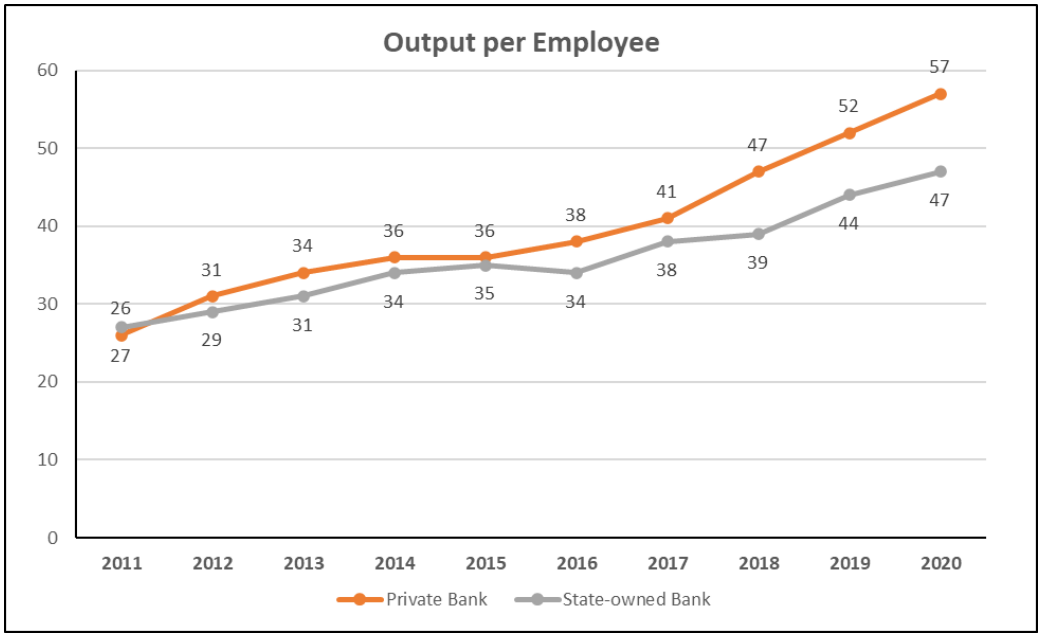

Figure 5. Output per Employee of State-Owned Bank and Private Bank
Source: Annual Reports of the State-Owned Bank 2011-2020, processed by the authors

Output per employee exhibited increasing trend over the periods. However, the increase tended to be linear rather than growing faster in the later periods as discussed in the study conducted by Brynjolfsson, Rock and Syverson (2020). Moreover, the private bank reported descreasing numbers of employees from 2018 to 2020 while outputs continued to grow. This fact indicated efficiency improvement achieved by the human resources.

Similar patterns were observed if the outputs include off-balance sheet items as suggested by the study of Casu and Girardone (2005). The ratios exhibited

linear increases over the periods observed. Significant increase in the later periods compared to the earlier periods was also not observed.

Figure 6 summarizes the ratios of output (including off-balance sheet items) per employee for the periods of 2011 – 2020.

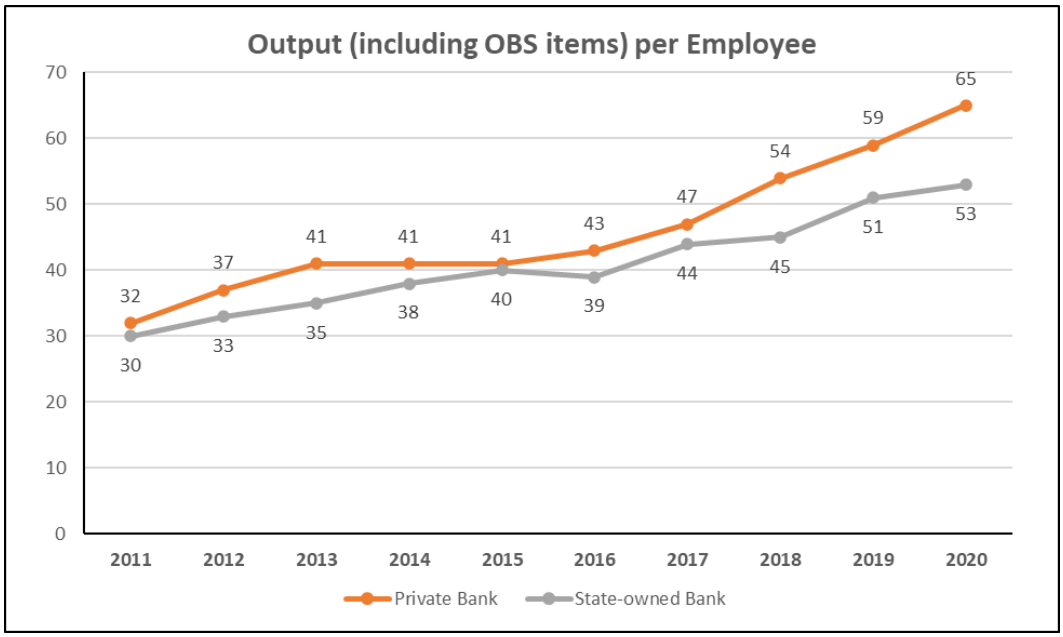

Figure 6. Output (including OBS items) per Employee of State-Owned Bank and Private Bank

Source: Annual Reports of the State-Owned Bank 2011-2020, processed by the authors

The case study also observed other common measure of output, namely, revenue. Specifically this study observed revenue per employee and revenue per branch as productivity measures. These productivity measures indicated increasing productivity trends over the period of 2011 – 2020. However, as shown in the following graphs, the increase tended to be in similar patterns with ratios of output per employee rather than exhibited significant improvement in the later part of the period. The following graphs summarize the revenue per employee and revenue per branch of both banks in the periods of 2011 – 2020.

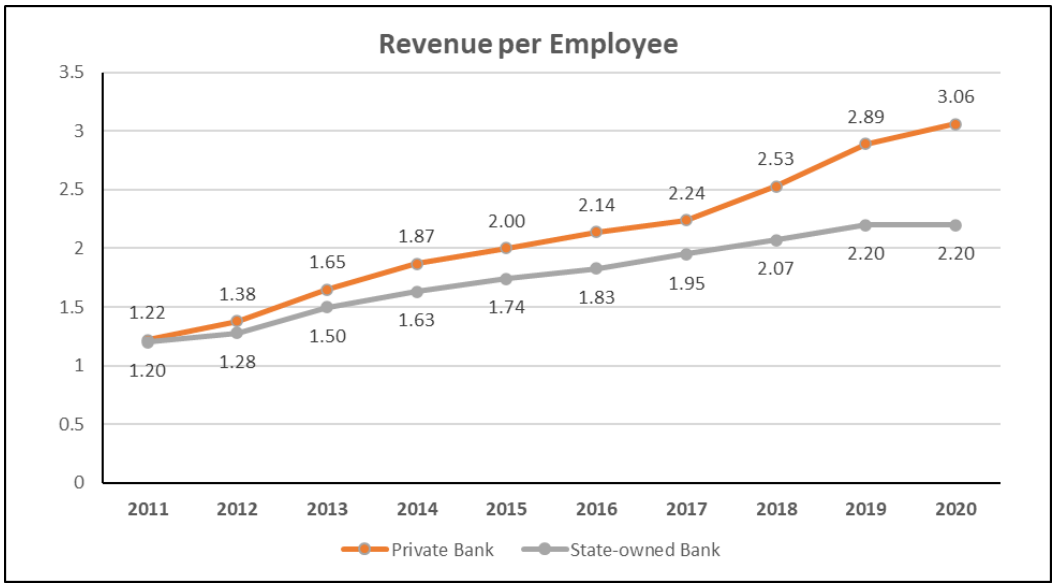

Figure 7. Revenue per Employee of State-Owned Bank and Private Bank
Source: Annual Reports of the State-Owned Bank 2011-2020, processed by the authors

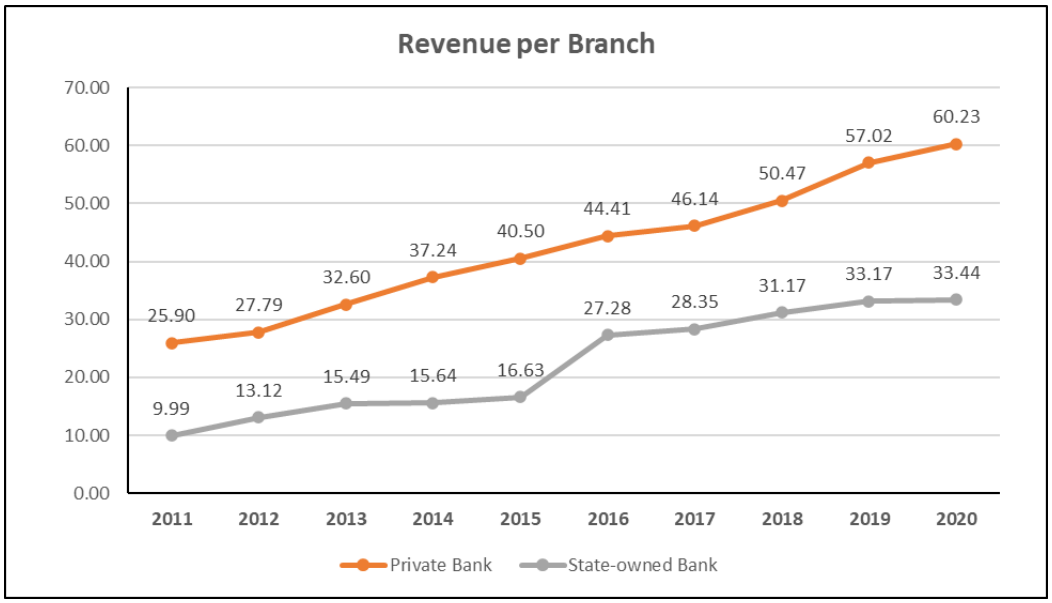

Figure 8. Revenue per Branch of State-Owned Bank and Private Bank
Source: Annual Reports of the State-Owned Bank 2011-2020, processed by the authors

Significant improvement in productivity measures in the later periods compared to the earlier periods of 2011 – 2020 was not observed.

The observed productivity measures revealed mixed results. Productivity measures applying non-monetary information as inputs, such as revenue per employee, revenue per branch and output per employee exhibited linear increases over the period. However, ratios based on wholly monetary information, such as ratios of outputs to operating assets, including if the outputs include off-balance sheet items, appeared to decrease over the same period.

The decreasing trends of both ratios of output to operating assets over the period may indicate that the growth of investment in operating assets outpaced the growth of output. This phenomenon may also indicate that the banks were in the early stage of the adoption of new technology and business processes.

5. CONCLUSION

This case study aimed to investigate the investments related to the adoption of new technology and business processes of the selected banks and their relationship with productivity. Specifically, this study evaluated whether productivity dipped or remained flat in the early stages of such investments and then significantly increased in the later periods as suggested by research conducted by Brynjolfsson, Rock & Syverson (2020). This phenomenon partly reflects the challenges in the measurement of intangible capital produced by innovations and adoptions of new technology and business processes as the current financial accounting standards tend to understate such intangible capital in the financial statements.

The productivity measures of the selected two banks over the periods of 2011 – 2020 did not exhibit flat or decreasing trends in the earlier periods of observation followed by significant increase in the later periods in relation to the adoption of new technology and business processes, as discussed in the study by Brynjolfsson, Rock and Sylverson (2020). This result was consistent in every productivity measures observed in this study. However, the observed productivity measures exhibited different trends during the period.

Productivity measured based on the number of employees and the number of branches showed increasing trends, however, the increases over the period appeared to be linear. On the other hand, ratios of output to operating assets, including if off-balance-sheet items were added as part of the banks' output, tended to decline over the period.

It appeared that the growth of operating assets outpaced the the growth of productivity as reflected by the declining trends in both ratios of output to operating assets over the period under study.This phenomenon might support

the indication that the banks were in the early stage of the adoption of new technology and business processes.

Bearing in mind the limitations of available information related to the adoption of new technology and business processes, learning and development expenses as well as additions to capitalized software costs and computer and software expenses exhibited increasing trends over the period. Significant increases of these expenditures in the most recent years may also support the indication that the banks were in the early stages of the adoption of new technology and business processes. Hence, significant improvement in productivity may be expected in the future period.

The increase in output or revenue per employee indicated the improvement in productivity of human resources over the period. The decrease in the number of employees of the Private Bank in the later periods while output and revenue continued to increase demonstrated of improvement in the quality and productivity of the human resources.

The sudden decline in learning and development expenses in 2020 due to Covid-19 pandemic while some productivity measures continued to improve might indicate that the previous investments that had been made in the adoption of new technology and business processes might be beneficial in responding to changes imposed by Covid-19 pandemic. This indication was further supported by the fact that access to digital and online banking services reached record level during the pandemic.

Rethinking on how investments in internally generated intangibles, such as those related to the adoption of new technology and business process, are measured and reported as prescribed by financial accounting standards or other regulatory requirements may contribute to improvement in measurement of productivity and forecasting productivity growth. Further study on this matter may be beneficial to enhance the value of financial reporting.

Both banks may consider to provide more details and comprehensive information relating to expenditures and investments in the adoption of new technology and business processes. Such information may include non-routine expenditures in relation to the adoption of new technology and business processes which are expensed in the financial statements in accordance with the Financial Accounting Standards, such as expenditures related to software development which do not meet the capitalization criteria under the Financial Accounting Standards or learning and development expenses to align the skills and capabilities of the human resources to the new technology and business processes. The information may enable the users of the financial statements to

have better analysis of the banks' productivity and the potential of productivity growth in the future.

As this case study only covers the period of 2011 – 2020 and it appeared that significant investments in the adoption of new technology and business processes might be made in the later part of that period, further study over an extended period which is in line with the time of the investments in the adoption of new technology and business processes may be necessary to evaluate whether productivity improvement in the future will exhibit patterns as discussed in the study by Brynjolfsson, Rock and Syverson (2020).

REFERENCES

Brynjolfsson, Erik, Rock, Daniel & Syverson, Chad (2020). The Productivity J-Curve: How Intangibles Complement General Purpose Technologies, *National Bureau of Economic Research,* 25148

Casu, Barbara and Girardone, Claudia (2005). An Analysis of the Relevance of Off-Balance Sheet Items in Explaining Productivity Change in European Banking. *Applied Financial Economics,* 15 (15): 1053-1061

Cohen, Louis, Manion, Lawrence and Morrison, Keith (2007). Research Methods in Education, sixth edition

Epure, Mircea, Kerstens, Kristiaans dan Prior, Diego (2011). Bank Productivity and Performance Groups: A Decomposition Approach based upon the Luenberger Productivity Indicator. *European Journal of Operational Research,* 211 (3): 630-641

Eisfeldt, Andrea L. & Papanikolaou, Dimitris (2014). The Value and Ownership of Intangible Capital, *American Economic Review,* 104(5), 189-194

Ikatan Akuntan Indonesia/ IAI (2021), PSAK 19 "Aset Takberwujud"

International Accounting Standard Board (2021), IAS 38 "Intangible Assets"

J.P. Morgan (2021). Indonesia Banks, Sector Outlook 2022, *Asia Pacific Equity Research,* 22 December 2021

Kaplan, Robert S. & Norton, David P. (2008), The Execution Premium

Kobler, Daniel, Bucherer, Stefan & Schlotmann, Johannes (2016). Banking Business Models of the Future, *Deloitte*

Maradin, Dario, Prohaska, Zdenko & Nikolaj, Stella Suljic (2019). The Productivity of European Banking Sector: A Review of Post-2000 Literature, *UTMS Journal of Economics,* 10 (2): 249-257