



## ORIGINAL ARTICLE

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## Did the COVID-19 pandemic amplify the positive impact of income diversification on the profitability of European banks?

**JEL Classification:** E44; G01; G21; O12; O47

**Keywords:** banks; banking income; income diversification; COVID-19

### Abstract

**Research background:** The contribution of banks' non-interest income to the total income becomes particularly important in the face of a severe financial crisis, usually accompanied by burdensome restrictions in economic activity, insolvencies of enterprises and households and low interest rates of central banks.

**Purpose of the article:** This study investigates banks in 40 European countries to determine whether non-interest income had a significant impact on the bank's profitability and whether the severity of the COVID-19 pandemic influences the form of this relationship.

**Methods:** This study used a linear cross-section model using bank-level data. In the model, the bank's profitability was regressed with the measure of income diversification, controlling for the pandemic's intensity and the state of the country's economy and bank characteristics. Banking data were obtained from the S&P Global MI. The Oxford COVID-19 Government Response Tracker (Hale *et al.*, 2021, pp. 529–538) was the source of pandemic-related variables.

**Findings & value added:** The obtained results indicate that the increases in non-interest income share in the bank's total income have a statistically significant positive impact on profitability for the European banking sector. The dependence of profitability on diversification was stronger with the growing adverse effects of the pandemic. Our results are in line with those for the US banks (Li *et al.*, 2021) and the European Central Bank Banking Supervision's assessment that higher

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non-interest income has allowed banks' profitability in the euro area to be maintained at a pre-pandemic level (ECB, 2021). In addition, the study contributes to previous literature by testing the impact of the severity of the COVID-19 pandemic on the relationship between income diversification and bank profitability in 40 European countries.

## **Introduction**

The COVID-19 pandemic has caused one of the worst economic crises since the 2007–2009 global financial crisis, resulting in huge economic losses worldwide. The International Monetary Fund (IMF, 2021) estimated that the pandemic reduced the global GDP by 3.2% in 2020, including 4.6% in advanced economies and 2.1% in emerging markets. As a result, the pandemic significantly worsened the financial situation of banks and contributed to the tightening of lending policies. It also worsened the creditworthiness of individual and corporate borrowers, mainly from the small and medium enterprise sector (ECB, 2020a). The uncertainty regarding the pandemic's growth dynamics resulted in declining demand from the non-financial sector to finance investments, working capital and consumer goods and services (NBP, 2020). The prospect of significant losses for banks contributed to a 35% decline in the Dow Jones Euro STOXX Banks stock index and Standard & Poor downgrading the credit ratings of one-third of banks in emerging market (EM) countries to a negative outlook (S&P's Global Ratings, 2020) between February 28 and March 12, 2020, when the World Health Organisation announced the pandemic.

The worsening prospects for economic development motivated central banks to maintain and lower already historically poor interest rates in some countries, including Czechia, Hungary, Iceland, Norway, Poland and Romania, which further reduced the banks' chances of improving their net interest income. The European Central Bank (ECB) (2020b), assessing the level of financial stability in the euro area, indicated that the environment of low interest rates, expected credit losses, the tightening of lending policy and the end of public support programmes significantly reduce the banks' ability to generate profits. This situation motivated banks to increase non-credit activities and the share of non-interest income in the total banking income.

To the best of the authors' knowledge, the research conducted thus far has focused on the assessment of the impact of non-interest income and income diversification on, inter alia, the risk reduction (Gallo *et al.*, 1996, pp. 1775–1791; Rogers & Sinkey, 1999, pp. 25–39; DeYoung & Torna, 2013, pp. 397–421) and profitability of banks (Landskroner *et al.*, 2005, pp. 27–49; Stiroh & Rumble, 2006, pp. 2131–2161; Fang *et al.*, 2011, pp. 5–

25; Capraru *et al.*, 2020; Huang, 2018, pp. 9–15; Calmes & Theoret, 2020, pp. 112–132) and bank market value (Campa & Kedia, 2002, pp. 1731–1762). However, the studies did not explicitly and unequivocally consider the additional impact of a crisis in the financial sector. Regarding the COVID-19 pandemic, the recent publications focused on assessing its impact on banks' market valuation (Simoens & Vander Vennet, 2021), capital position and financial stability (Catalan *et al.*, 2021, pp. 250–260; Wang & Lin, 2021) or profitability (Borri & di Giorgio, 2021). Additionally, studies are limited on the impact of an increase in non-interest income on banks' profitability during the COVID-19 pandemic, including the research of Li *et al.* (2021) only for US banks.

Therefore, our study is motivated by these knowledge gaps and investigates whether, during the COVID-19 pandemic, non-interest income improved bank profitability and whether the development of the pandemic strengthens this relationship after controlling for other bank- and country-specific factors. We believe that, despite the passage of the first extraordinary global COVID-19 pandemic wave, successive local waves are highly probable. Understanding how banks' incomes are shaped in times of pandemic crisis is critical for efficiently monitoring their profitability and stability. Thus, the results of the study are important for research on the financial stability of banks during the crisis and can be used by financial regulators to monitor the behaviour of banks during the financial crisis, as well as by academics and financial market participants. Our research is also proven relevant because, in recent years, policymakers and bank supervisors have repeatedly recommended banks to increase income diversification through increasing fee and commission-based activities (ECB, 2016; ECB, 2018). The importance of non-interest income for the banking sector's stability is also emphasised by the opinion of the ECB Banking Supervision, which stated that non-interest income helped maintain the profitability of the euro area banks in the first half of 2021 at the pre-pandemic level (ECB, 2021).

This article follows the idea of Li *et al.* (2021), as we also consider investigating the impact of a bank's non-interest income sources on bank profitability during the economic crisis brought on by the COVID-19 pandemic. However, we do not stop at checking how income diversification affects bank profits during the pandemic. The cross-country sample of 40 European countries allows us to investigate the severity of the COVID-19 pandemic's impact and government responses on this relationship. Furthermore, using European data instead of American contributes to the literature by showing whether the bank profit-diversification relationship during the pandemic also holds outside the US.

The rest of the article is structured as follows. The next section presents the literature review results, followed by the description of the research methods, the results and the discussion. The entire study is summarised in the conclusions.

## **Literature review — the finance-growth relationship**

The economic literature distinguishes three basic diversification methods in the activities of banks, i.e., geographic, lending and functional.

Geographic diversification is carried out through the location of branches and subsidiaries in different countries through cross-border mergers and acquisitions. The effects of such diversification are often assessed negatively. The long distances between subsidiaries and bank headquarters and the excessive growth of assets, which in many cases is the result of the managers' strategy for empire building, often exacerbate the agency problem and reduce the effectiveness of bank management. In the long run, this leads to a reduction in the bank's market value (Goetz *et al.*, 2013, pp. 1787–1823; Laeven & Levine, 2007, pp. 331–367).

Lending diversification is implemented by dispersing the loan portfolio into loans to households and financial and non-financial enterprises, typically having a positive effect on bank performance. The study of Zhang *et al.* (2020) showed benefits of diversification coming from various borrowers. However, Demsetz and Strahan (1997, pp. 300–313) stated that diversification leads to excessive lending to commercial and industrial customers and deteriorates capital ratios.

Functional diversification consists of dispersing into interest and non-interest income. The economic literature provides multi-directional assessments of its effects on banks' profitability, risk level and financial stability. Excessive involvement in non-interest activities is a source of higher unsystematic and systematic risks (DeYoung & Roland, 2001, pp. 54–84), deterioration in the quality of management and bank's market value (Houston *et al.*, 2001, pp. 285–331; Scharfstein & Stein, 2000, pp. 2537–2564). Additionally, Rajan *et al.* (2000, pp. 35–80) and Lamont (1997, pp. 83–109) noticed that to ensure uninterrupted provision of a wide range of financial services, the more effective and profitable banking conglomerate entities subsidise the less effective ones, lowering the overall profitability of the capital group.

Conversely, Saunders *et al.* (2020, pp. 1–24) noticed that better income diversification helped banks to improve profitability, downsize bankruptcy risk (DeYoung & Torna, 2013, pp. 397–421) and credit risk (Abedifar *et*

*al.*, 2018, pp. 411–426; Rogers & Sinkey, 1999, pp. 25–39). In the European banking sector, Cornett *et al.* (2002, pp. 501–521), Drucker and Puri (2005, pp. 2763–2799), Kohler (2014, pp. 182–193), Mergaerts and Vander Vennet (2016, pp. 57–75) found that greater income diversification improves profitability and stability of retail-oriented banks, such as savings, cooperative and other banks. Using the economy of scope, a broader range of non-interest services positively affects banks' franchise value (Baele *et al.*, 2007, pp. 1999–2023) and market value (Elsas *et al.*, 2010, pp. 1274–1287).

The positive impact of the diversification of banks' results on their profitability, market value and risk was confirmed by studies conducted for banking sectors of Germany (Busch & Kick, 2009), Australia (Williams & Prather, 2010, pp. 220–244; Williams, 2016, pp. 16–37), Canada (Calmes & Theoret, 2010, pp. 1719–1728), China (Zhou, 2014, pp. 201–213; Wang & Lin, 2021) and emerging economies (Pennathur *et al.*, 2012, pp. 2203–2215).

To the best of the authors' knowledge, there are limited studies on the impact of income diversification on banks' income during the COVID-19 pandemic. Functional diversification acted as a buffer absorbing adverse pandemic shocks for European banks (Simoens & Vander Vennet, 2021) and a tool for lowering the overall bank risk (Wang & Lin, 2021). Li *et al.* (2021) stated that the pandemic-induced reduction in lending and tightening lending policy forced US banks to increase fees and commission income to remain profitable.

Based on this literature background, the following hypotheses were formulated:

Hypothesis 1: *Diversifying a bank's income helps improve its profitability.*

Hypothesis 2: *The escalation of the COVID-19 pandemic strengthens the positive impact of the diversification of a bank's income on its profitability.*

## **Research methods**

We estimate a linear cross-section model based on the bank-level data to determine the impact of the COVID-19 pandemic and income diversification on bank profitability. In the model, the bank profitability measure (*prof*) is regressed with its lag, bank income diversification (*diver*), macro-economic variables or measures of pandemic intensity in a country (*covid*)

and a vector of bank-specific characteristics (*bank\_char*), according to the following formula:

$$\begin{aligned} prof_{ijt} = & \alpha_0 + \alpha_1 prof_{ijt-1} + \alpha_2 diver_{ijt} + \alpha_3 covid_{jt} + \\ & + \alpha_4 bank\_char_{ijt} + \varepsilon_{ijt} \end{aligned} \quad (1)$$

for bank *i*, country *j*, time  $t=2020$ .

We estimate coefficients  $\alpha_0, \alpha_1, \alpha_2, \dots$  using OLS regression with White's (1980, pp. 817–838) heteroscedasticity-consistent standard errors. Our research argues for the usage of lagged dependent variable in the estimation, explaining it with the fact that bank profits tend to persist over time due to market competition barriers, informational opacity and sensitivity to regional/macroeconomic shocks to the extent that these are serially correlated (Berger *et al.*, 2000, pp. 1203–1235). Some studies also explicitly concentrate on profit persistence in banking (Eichengreen & Gibson, 2001; Goddard *et al.*, 2004; pp. 363–381). Thus, many previous papers studying determinants of bank profitability implemented a methodology including a lagged dependent variable among the regressors (e.g., Athanasoglou *et al.*, 2008, pp. 411–426; Kanga *et al.*, 2020, pp. 1–22; Le & Ngo, 2020; Dang & Nguyen, 2022, pp. 119–134).

Furthermore, we introduce the interaction terms between the income diversification and COVID-19-related variables to check for the impact of the pandemic intensity on the relationship between income diversification and profitability. We investigate the interaction in two options:

$$\begin{aligned} prof_{ijt} = & \beta_0 + \beta_1 prof_{ijt-1} + \beta_2 diver_{ijt} * covid_{jt} + \\ & + \beta_3 bank\_char_{ijt} + \epsilon_{ijt} \end{aligned} \quad (2)$$

$$\begin{aligned} prof_{ijt} = & \gamma_0 + \gamma_1 prof_{ijt-1} + \gamma_2 diver_{ijt} + \gamma_3 diver_{ijt} * covid_{jt} + \\ & + \gamma_4 covid_{jt} + \gamma_5 bank\_char_{ijt} + e_{ijt} \end{aligned} \quad (3)$$

This study uses bank-level data for 2019 and 2020 from 40 European countries (563 bank observations), including 27 EU and 13 non-EU members. The bank-level data were obtained from the S&P Global Market Intelligence. The Oxford COVID-19 Government Response Tracker (Hale *et al.*, 2021, pp. 529–538) was the source of pandemic-related variables. Table 1 presents definitions of variables used in the study, and Table 2 holds the descriptive statistics.

The outlier observations for profitability data were identified as 1.5 times the interquartile range of the data. All observations below the first

quartile, minus 1.5 times interquartile range ( $Q1 - 1.5IQR$ ) and above the third quartile, plus 1.5 times interquartile range ( $Q3 + 1.5IQR$ ), were discarded, leaving 516 observations.

The statistical tests of our models reveal that they do not fulfil conditions of homoscedasticity and normality of residuals. The former problem might result in biased standard errors that lead to incorrect conclusions about the significance of the regression coefficients. We corrected this bias by using White's (1980) heteroscedasticity-consistent standard errors. For the latter problem, Woodridge (2012, p. 168) states that even without the normality assumption, t and F statistics have approximately t and F distributions. Thus, we consider it a minor problem in our model.

## **Results and discussion**

The obtained results do not enable us to reject *Hypothesis 1*, as diversification has a statistically significant positive impact on bank profitability (see Table 3). During the pandemic, banks improved their profitability by increasing the share of non-interest income, i.e. by increasing income diversification. Especially at the time of economic crisis, like the COVID-19 pandemic, which brought a fall in demand for all types of loans and tightening credit standards, banks that expanded their activity beyond traditional lending-related services could better stabilise their income. Our results are consistent with the study of the US banks by Li *et al.* (2021) and the assessment of ECB Banking Supervision for the euro area banking sector in the first half of 2021 (ECB, 2021).

Some bank characteristics also play an essential role. First, 2020 bank profits positively relate to the previous year's values. This relationship indicates that better-performing banks in the pre-pandemic year also performed well after the COVID-19 outbreak. Generally, smaller banks fared better in 2020 than larger banks, which can be explained with better accommodative capacities of smaller business units. Finally, increasing the loan-to-asset ratio, i.e., the share of loans in the bank's assets, helps banks improve profitability. In the case of the euro area banking sector, despite the increase in banks' engagement in the non-interest services, in 2021, the net interest income still accounts for around 60% of banking income (ECB, 2021).

The economic situation in a country is also vital for bank profitability. As might be expected, banks fared better in countries where GDP growth was higher in 2020. However, the interest rate levels do not appear to affect bank earnings in the pandemic year. The negative sign of the *Infections*

coefficient indicates that the growing intensity of pandemic destroyed banks' profitability, as with a rising number of infections, governments introduced stringency measures, resulting in economic activity limitations.

As Table 4 shows, stricter lockdown measures and workplace closures negatively affected banks' profitability. The negative sign of the coefficient on government economic support measures introduced to ease the impact of the pandemic on companies and households is somewhat surprising. However, such direction of the relationship might result because the values of public aid programmes were appropriate to the intensity of the pandemic. A similar explanation could be referred to as the measure of *Debt relief*, as an increase in the number of infections resulted in an increase in absenteeism and unemployment and a temporary reduction in economic activity. Such circumstances led to more frequent insolvencies of corporate and individual borrowers, requiring banks to apply some extraordinary measures, such as credit holidays, payment shifts, or reductions of the total debt obligation, among other things. From the banks' perspective, the borrowers' insolvency meant a fall in paid-back loans, establishing additional provisions, and thus lower profitability.

Finally, which has been overlooked by the studies mentioned above, we test how the positive impact of income diversification on banks' profitability depends on a country's pandemic situation and government measures (see Tables 5 and 6). The estimation results for the interactions of the diversification with the COVID-19-related variables partially do not enable us to reject *Hypothesis 2*. The results (see Table 5) reveal that higher-income diversification has a stronger positive impact on bank profitability when the number of infections and closure of workplaces in a country increases. The government introduces more stringent lockdown measures and provides higher-income support. Therefore, it seems that the weaker dependence of banks' profits on the income from traditional lending activities is particularly significant in a crisis, such as the spread of the pandemic and the decline in economic activity. The country's public support funds also enhanced the positive impact of bank income diversification on bank profits. However, the interaction coefficients presented in Table 6 are not statistically significant based on the models we also control for diversification and COVID-related variables.

## **Conclusions**

The contribution of non-interest income to banks' total income becomes significant in the face of the severe financial crisis, usually accompanied by



burdensome restrictions in economic activity, insolvencies of enterprises and households and low interest rates of central banks.

The obtained results indicate that during the COVID-19 pandemic, the increase in non-interest income share in the total income had a statistically significant positive impact on the profitability of the European banks. Additionally, they partially proved that this dependence was stronger in the case of the pandemic's increasing adverse effects. These findings may motivate banks to expand the offer of services generating non-interest income for adequate preparation for the macroeconomic shocks, and financial authorities to formulate supervisory recommendations, emphasizing the need to increase income diversification in order to maintain the bank's stability in crisis periods.

The conclusions of our study fill the gap in research on the activity of the European banking sector in the pandemic period, as it is one of the few that examines the impact of non-interest income on banks' profitability in a period of severe economic crisis. It thus provides implications going beyond the present pandemic. We believe understanding this relationship is crucial for financial stability. With the novelty of the study covering 40 European countries, both EU and non-EU, the results can be used by financial regulators in all European countries to monitor the behaviour of banks during the financial crisis and for academics and financial market participants.

This study is not free from potential caveats. Data limitations prevent us from applying other measures of bank income diversity that reflect details of non-interest income sources, in particular fees and commissions, and financial operations income. In addition, the use of quarterly, rather than annual, data could help provide a more detailed picture of the relationship between income diversification and bank profitability in the environment of the severe pandemic crisis.

Finally, the article opens up opportunities for future research to explore how the impact of income diversification on bank profitability has changed in the wake of a potential crisis stemming from geopolitical tensions between Russia and Ukraine. Relating the studied dependence to banks located in different parts of the world may be another extension of this study.

## References

- Abedifar, P., Molyneux, P., & Tarazi, A. (2018). Non-interest income and bank lending. *Journal of Banking & Finance*, 87(C), 411–426. doi: 10.1016/j.jbankfin.2017.11.003.
- Athanasoglou, P., Brissimis, S. N., & Delis, M. D. (2008). Bank-specific, industry-specific and macroeconomic determinants of bank profitability. *International Financial Markets, Institutions and Money*, 18, 121–136. doi: 10.1016/j.intfin.2006.07.001.
- Baele, L., De Jonghe, O., & Vennet, R.V. (2007). Does the stock market value bank diversification? *Journal of Banking & Finance*, 31(7), 1999–2023. doi: 10.1016/j.jbankfin.2006.08.003.
- Berger, A., Bonime, S., Covitz, D., & Hancock, D. (2000). Why are bank profits so persistent? The roles of product market competition, informational opacity, and regional/macroeconomic shocks. *Journal of Banking and Finance*, 24, 1203–1235. doi: 10.1016/S0378-4266(99)00124-7.
- Borri, N., & di Giorgio, G. (2021). Systemic risk and the COVID challenge in the European banking sector. *Journal of Banking & Finance*, 106073. doi: 10.1016/j.jbankfin.2021.106073.
- Busch, R., & Kick, T. (2009). Income diversification in the German banking industry. *SSRN Electronic Journal*, February. doi: 10.2139/ssrn.1342282.
- Calmes, C., & Theoret, R. (2010). The impact of off-balance-sheet activities on banks returns: an application of the ARCH-M to Canadian data. *Journal of Banking & Finance*, 34(7), 1719–1728. doi: 10.1016/j.jbankfin.2010.03.017.
- Calmes, C., & Theoret, R. (2020). Portfolio analysis of big US banks' performance: the fee business lines factor. *Journal of Banking Regulation*, 22, 112–132. doi: 10.1057/s41261-020-00131-3.
- Campa, J., & Kedia, S. (2002). Explaining the diversification discount. *Journal of Finance*, 57(4), 1731–1762. doi: 10.1111/1540-6261.00476.
- Capraru, B., Ihnatov, I., & Pintilie, N. (2020). Competition and diversification in the European banking sector. *Research in International Business and Finance*, 51, 100963. doi: 10.1016/j.ribaf.2018.09.014.
- Catalan, F., di Pietro, F., & Ponce, A. (2021). Post-COVID-19 SME financing constraints and the credit guarantee scheme solution in Spain. *Journal of Banking Regulation*, 22, 250–260. doi: 10.1057/s41261-021-00143-7.
- Cornett, M., Ors, E., & Tehranian, H. (2002). Bank performance around the introduction of a section 20 subsidiary. *Journal of Finance*, 57(1), 501–521. doi: 10.1111/1540-6261.00430.
- Dang, V., & Nguyen, H. (2022). Bank profitability under uncertainty. *Quarterly Review of Economics and Finance*, 83, 119–134. doi: 10.1016/j.qref.2021.12.001.
- Demsetz, R., & Strahan, P. (1997). Diversification, size, and risk at bank holding companies. *Journal of Money, Credit and Banking*, 29(3), 300–313. doi: 10.2307/2953695.

- DeYoung, R., & Roland, K. (2001). Product mix and earning volatility at commercial banks: evidence from a degree of leverage model. *Journal of Financial Intermediation*, 10(1), 54–84. doi: 10.1006/jfin.2000.0305.
- DeYoung, R., & Torna, G. (2013). Nontraditional banking activities and bank failures during the financial crisis. *Journal of Financial Intermediation*, 22(3), 397–421. doi: 10.1016/j.jfi.2013.01.001.
- Drucker, S., & Puri, M. (2005). On the benefits of concurrent lending and underwriting. *Journal of Finance*, 60(6), 2763–2799. doi: 10.1111/j.1540-6261.2005.00816.x.
- ECB (2016). Financial stability review, November 2016. European Central Bank. Retrieved from <https://www.ecb.europa.eu/pub/pdf/fsr/financialstabilityreview201611.en.pdf> (02.11.2021).
- ECB (2018). Financial stability review, November 2018. European Central Bank. Retrieved from <https://www.ecb.europa.eu/pub/pdf/fsr/ecb.fsr201811.en.pdf> (10.11.2021).
- ECB (2020a). Financial stability review, November 2020. European Central Bank. Retrieved from <https://www.ecb.europa.eu/pub/pdf/fsr/ecb.fsr202011~b7be9ae1f1.en.pdf> (11.11.2021).
- ECB (2020b). The euro area bank lending survey. Fourth quarter of 2020. European Central Bank, Frankfurt a/M, Germany. Retrieved from [https://www.ecb.europa.eu/stats/ecb\\_surveys/bank\\_lending\\_survey/html/ecb.blssurvey2020q4~e89c77d212.en.html](https://www.ecb.europa.eu/stats/ecb_surveys/bank_lending_survey/html/ecb.blssurvey2020q4~e89c77d212.en.html) (25.10.2021).
- ECB (2021). Banks back to pre-pandemic profitability, but will it last? European Central Bank-Banking Supervision Newsletter, 16 November 2021. Retrieved from [https://www.bankingsupervision.europa.eu/press/publications/newsletter/2021/html/ssm.nl211116\\_1.en.html](https://www.bankingsupervision.europa.eu/press/publications/newsletter/2021/html/ssm.nl211116_1.en.html) (22.11.2021).
- Eichengreen, B., & Gibson, H. D. (2001). Greek banking at the dawn of the new millennium. *CEPR Discussion Paper*, 2791.
- Elsas, R., Hackethal, A., & Holzhäuser, M. (2010). The anatomy of bank diversification. *Journal of Banking & Finance*, 34(6), 1274–1287. doi: 10.1016/j.jbankfin.2009.11.024.
- Fang, Y., Hasan, I., & Marton, K. (2011). Institutional development and its impact on the performance effect of bank diversification: evidence from transition economies. *Emerging Markets Finance and Trade*, 47(4), 5–22. doi: 10.2307/41343430.
- Gallo, J., Apilado, V., & Kolari, J. (1996). Commercial bank mutual fund activities: implications for bank risk and profitability. *Journal of Banking & Finance*, 20(10), 1775–1791. doi: 10.1016/S0378-4266(96)00024-6.
- Goddard, J., Molyneux, P., & Wilson, J. (2004). The profitability of European banks: a cross-sectional and dynamic panel analysis. *Manchester School*, 72, 363–381. doi: 10.1111/j.1467-9957.2004.00397.x.
- Goetz, M., Laeven, L., & Levine, R. (2013). Identifying the valuation effects and agency costs of corporate diversification: evidence from the geographic diversification of U.S. Banks. *Review of Financial Studies*, 26(7), 1787–1823. doi: 10.1093/rfs/hht021.

- Hale, T., Angrist, N., Goldszmidt, R., Kira, B., Petherick, A., Phillips, T., Webster, S., Cameron-Blake, E., Hallas, L., Majumdar, S., & Tatlow, H. (2021). A global panel database of pandemic policies (Oxford COVID-19 Government Response Tracker). *Nature Human Behaviour*, 5, 529–538. doi: 10.1038/s41562-021-01079-8.
- Houston, J., James, C., & Ryngaet, M. (2001). Where do merger gains come from? Bank mergers from the perspective of insiders and outsiders. *Journal of Financial Economics*, 60(2-3), 285–331. doi: 10.1016/S0304-405X(01)00046-0.
- Huang, G. (2018). Non-interest income, diversification and bank performance based on Chinese banking with GMM/DPD technique. *Theory and Practice of Finance and Economics*, 39(2), 9–15.
- IMF (2021). *World economic outlook 2021*. International Monetary Fund: Washington DC, USA,
- Kanga, D., Murinde, V., & Soumaréc, I. (2020). Capital, risk and profitability of WAEMU banks: does bank ownership matter? *Journal of Banking and Finance*, 114, 1–22. doi: 10.1016/j.jbankfin.2020.105814.
- Kohler, M. (2014). Does non-interest income make banks more risky? Retail-versus investment-oriented banks. *Review of Financial Economics*, 23(4), 182–193. doi: 10.1016/j.rfe.2014.08.001.
- Laeven, L., & Levine, R. (2007). Is there a diversification discount in financial conglomerates? *Journal of Financial Economics*, 85(2) 331–367. doi: 10.1016/j.jfineco.2005.06.001.
- Lamont, O. (1997). Cashflow and investment: evidence from internal capital markets. *Journal of Finance*, 52(1), 83–109. doi: 10.1111/j.1540-6261.1997.tb03809.x.
- Landskroner, Y., Ruthenberg, D., & Zaken, D. (2005). Diversification and performance in banking: the Israeli case. *Journal of Financial Services Research*, 27(1), 27–49. doi: 10.2139/ssrn.675230.
- Le, T., & Ngo, T. (2020). The determinants of bank profitability: a cross-country analysis. *Central Bank Review*, 20(2), 65–73. doi: 10.1016/j.cbrev.2020.04.001.
- Li, X, Feng, H., Zhao, S., & Carter, D. (2021). The effect of revenue diversification on bank profitability and risk during the COVID-19 pandemic. *Finance Research Letters*, 43, 101957. doi: 10.1016/j.frl.2021.101957.
- Mergaerts, F., & Vennet, R.V. (2016). Business models and bank performance: a long-term perspective. *Journal of Financial Stability*, 22(C), 57–75. doi: 10.116/j.jfs.2015.12.002.
- NBP (2020). *Senior loan officer opinion survey on bank lending practices and credit conditions. 3rd quarter 2020*. Warsaw: Narodowy Bank Polski.
- Pennathur, A., Subrahmanyam, V., & Vishwasrao, S. (2012). Income diversification and risk: does ownership matter? An empirical examination of Indian banks. *Journal of Banking & Finance*, 36(8), 2203–2215. doi: 10.1016/j.jbankfin.2012.03.021.

- Rajan, R., Servaes, H., & Zingales, L. (2000). The cost of diversity: the diversification discount and inefficient investment. *Journal of Finance*, 55(1), 35–80. doi: 10.1111/0022-1082.00200.
- Rogers, K., & Sinkey, J. (1999). An analysis of nontraditional activities at U.S. commercial banks. *Review of Financial Economics*, 8(1). doi: 10.1016/S1058-3300(99)00005-1.
- S&Ps Global Ratings (2020). *Banks in emerging markets. Countries, three COVID-19 shocks*. Standard & Poor's Financial Services LLC. Retrieved from <https://www.spglobal.com/ratings/en/research/pdf-articles/2020-05-26-banks-in-emerging-markets-15-countries-three-covid-19-shocks> (21.1.2021).
- Saunders, A., Schmid, M., & Walter, I. (2020). Strategic scope and bank performance. *Journal of Financial Stability*, 46, 100715. doi: 10.1016/j.jfs.2019.100715.
- Scharfstein, D., & Stein, J. (2000). The dark side of internal capital markets: divisional rent-seeking and inefficient investment. *Journal of Finance*, 55(6), 2537–2564. doi: 10.1111/0022-1082.00299.
- Simoens, M., & Vennet, R.V. (2021). Does diversification protect European banks' market valuations in a pandemic? *Finance Research Letters*, 44, 102093. doi: 10.1016/j.frl.2021.102093.
- Stiroh, K., & Rumble, A. (2006). The dark side of diversification: the case of US financial holding companies. *Journal of Banking & Finance*, 30(8), 2131–2161. doi: 10.1016/j.jbankfin.2005.04.030.
- Wang, C., & Lin, Y. (2021). Income diversification and bank risk in Asia Pacific North American *Journal of Economics and Finance*, 57, 101448. doi: 10.1016/j.najef.2021.101448.
- White, H. (1980). A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. *Econometrica*, 48(4), 817–838. doi: 10.2307/1912934.
- Williams, B. (2016). The impact of non-interest income on bank risk in Australia. *Journal of Banking & Finance*, 73, 16–37. doi: 10.1016/j.jbankfin.2016.07.019.
- Williams, B., & Prather, L. (2010). Bank risk and return: the impact of bank non-interest income, *International Journal of Managerial Finance*, 6(3), 220–244. doi: 10.1108/17439131011056233.
- Wooldridge, J. M. (2012). *Introductory econometrics: a modern approach*. Boston: Cengage Learning.
- Zhang, A., Wang, S., Liu, B., & Fu, J. (2020). The double-edged sword effect of diversified operation on pre- and post-loan risk in the government-led Chinese commercial banks. *North American Journal of Economics and Finance*, 54, 101246. doi: 10.1016/j.najef.2020.101246.
- Zhou, K. (2014). The effect of income diversification on bank risk: evidence from China. *Emerging Markets Finance Trade*, 50(3), 201–213. doi: 10.2753/REE1540-496X5003S312.

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## Annex

**Table 1.** Variables and their definitions

<b>Variable</b>	<b>Description</b>	<b>Source</b>
Profitability	Return on assets: net profit to the average total assets (%)	S&P GMI
Diversification	Income diversification: non-interest income to operating income	S&P GMI
Size	Bank size: natural logarithm of total assets	S&P GMI
Asset growth	Annual growth in bank assets (%)	S&P GMI
Loan-to-asset Tier 1	Loans to non-financial sector to total assets	S&P GMI
Tier 1	Capital adequacy: tier 1 capital ratio	S&P GMI
GDP growth	GDP growth rate in a country in 2020 (%)	World Bank
Interest rate	Policy interest rate in a country in 2020 (%)	National central banks
Lockdown	Stringency index: strictness of 'lockdown style' policies	(Hale <i>et al.</i> , 2021)
Job closure	Workplace closure indicator	(Hale <i>et al.</i> , 2021)
Economic support	Governmental support and debt relief indicator	(Hale <i>et al.</i> , 2021)
Income support	Income support policies indicator	(Hale <i>et al.</i> , 2021)
Debt relief	Debt relief measures indicator	(Hale <i>et al.</i> , 2021)
Infections	Total number of Covid-19 infections at the end of 2020 per 1000 people	(Hale <i>et al.</i> , 2021)

**Table 2.** Descriptive statistics and correlations across variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Descriptive statistics														
Median	0.343	0.504	0.359	16.966	15.522	66.003	17.355	-4.897	0.000	51.217	1.601	55.328	1.568	0.913	17.427
Mean	0.395	0.637	0.365	17.033	14.340	62.039	18.828	-5.485	0.339	49.586	1.516	52.963	1.407	0.932	17.244
St. Dev.	0.386	0.591	0.213	1.864	14.783	18.122	10.818	3.063	1.334	6.503	0.294	16.967	0.336	0.545	0.512
	Correlations														
1	1														
2	0.68*	1													
3	0.02	-0.02	1												
4	-0.33*	-0.29*	0.05	1											
5	0.02	0.05	0.16*	0.16*	1										
6	0.03	-0.06	-0.57*	-0.07	-0.09*	1									
7	0.01	-0.03	0.002	-0.09*	-0.16*	-0.10*	1								
8	0.31*	0.24*	-0.21*	-0.30*	-0.07	0.04	0.03	1							
9	0.19*	0.25*	-0.04	-0.27*	-0.33*	-0.16*	-0.08	0.12*	1						
10	-0.38*	-0.34*	0.14*	0.34*	0.03	-0.06	-0.002	-0.68*	-0.15*	1					
11	-0.34*	-0.32*	0.16*	0.33*	-0.00	-0.05	0.01	-0.50*	-0.15*	0.79*	1				
12	-0.23*	-0.17*	0.10*	0.299*	0.03	-0.12*	0.06	-0.51*	-0.26*	0.42*	0.31*	1			
13	-0.23*	-0.31*	-0.05	0.28*	0.14*	0.11*	0.08	-0.09*	-0.62*	0.09*	0.05	0.41*	1		
14	-0.08	0.04	0.08	0.12*	-0.06	-0.21*	0.02	-0.43*	0.08	0.34*	0.25*	0.85*	-0.08	1	
15	-0.17*	-0.08	0.11*	0.21*	0.06	-0.12*	0.01	-0.42*	-0.13*	0.26*	0.29*	0.41*	0.04	0.44*	1

Note: 1 – Profitability, 2 – L. Profitability, 3 – Diversification, 4 – Size, 5 – Asset growth, 6 – Loan-to-asset, 7 – Tier 1, 8 – GDP growth, 9 – Interest rate, 10 – Lockdown, 11 – Job closure, 12 – Economic support, 13 – Income support, 14 – Debt relief, 15 – Infections, \* denotes statistical significance at 5% level.



**Table 3.** Impact of bank characteristics, macroeconomic variables, and strength of the COVID-19 pandemic on bank profitability

<b>Dependent variable: Profitability</b>				
	<b>(1)</b>	<b>(2)</b>	<b>(3)</b>	<b>(4)</b>
L.Profitability	0.433*** (0.047)	0.414*** (0.047)	0.427*** (0.047)	0.451*** (0.041)
Diversification	0.191** (0.082)	0.256*** (0.087)	0.197** (0.082)	0.204** (0.081)
Size	-0.030** (0.008)	-0.022** (0.009)	-0.030*** (0.008)	-0.026*** (0.008)
Asset growth	0.002 (0.002)	0.002 (0.002)	0.002 (0.002)	0.002 (0.002)
Loan-asset ratio	0.003*** (0.001)	0.003*** (0.001)	0.003*** (0.001)	0.003*** (0.001)
L.Tier 1	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
GDP growth		0.020*** (0.007)		
Interest rate			0.006 (0.019)	
Infections				-0.078*** (0.022)
Constant	0.345* (0.197)	0.290 (0.201)	0.338 (0.206)	1.603*** (0.388)
Number of obs	443	441	435	431
R-squared	0.500	0.520	0.502	0.540

Note: robust standard error in brackets, \*\*\*, \*\*, \* represent 1%, 5% and 10% significance level.

**Table 4.** Impact of bank characteristics and strength of the COVID-19 pandemic on bank profitability

<b>Dependent variable: Profitability</b>					
	<b>(5)</b>	<b>(6)</b>	<b>(7)</b>	<b>(8)</b>	<b>(9)</b>
L.Profitability	0.433*** (0.042)	0.438*** (0.042)	0.449*** (0.041)	0.462*** (0.039)	0.459*** (0.042)
Diversification	0.235*** (0.087)	0.238*** (0.089)	0.197** (0.082)	0.197** (0.084)	0.186** (0.082)
Size	-0.022*** (0.008)	-0.023*** (0.008)	-0.026*** (0.009)	-0.031*** (0.008)	-0.028*** (0.008)
Asset growth	0.001 (0.002)	0.001 (0.002)	0.001 (0.002)	0.001 (0.002)	0.001 (0.002)
Loan-asset ratio	0.003*** (0.001)	0.003*** (0.001)	0.003*** (0.001)	0.003*** (0.001)	0.003*** (0.001)
L.Tier 1	0.002 (0.001)	0.002 (0.001)	0.002 (0.002)	0.001 (0.001)	0.001 (0.001)
Lockdown	-0.008*** (0.003)				
Job closure		-0.139** (0.064)			
Economic support			-0.002** (0.001)		

**Table 4.** Continued

	Dependent variable: Profitability				
	(5)	(6)	(7)	(8)	(9)
Income support				0.032 (0.051)	
Debt relief					-0.063** (0.025)
Constant	0.542** (0.215)	0.388** (0.201)	0.355** (0.196)	0.280 (0.208)	0.366** (0.197)
Number of obs	439	439	437	437	437
R-squared	0.542	0.538	0.535	0.529	0.536

Note: robust standard error in brackets, \*\*\*, \*\*, \* represent 1%, 5% and 10% significance level.

**Table 5.** Impact of diversity and COVID-19 pandemic on bank profitability

	Dependent variable: Profitability					
	(10)	(11)	(12)	(13)	(14)	(15)
L.Profitability	0.454*** (0.042)	0.458*** (0.041)	0.458*** (0.041)	0.456*** (0.041)	0.461*** (0.041)	0.452** *
Diversification*Infections	0.011** (0.005)					
Diversification*Lockdown		0.002* (0.001)				
Diversification*Job closure			0.072** (0.040)			
Diversification*Economic support				0.001 (0.001)		
Diversification*Income support					0.106** (0.050)	
Diversification*Debt relief						0.013 (0.051)
Size	-0.031*** (0.008)	-0.031*** (0.008)	-0.032*** (0.008)	-0.032*** (0.008)	-0.032*** (0.008)	-0.031*** (0.008)
Asset growth	0.002 (0.002)	0.002 (0.002)	0.002 (0.002)	0.002 (0.002)	0.001 (0.002)	0.002 (0.002)
Loan-asset ratio	0.003*** (0.001)	0.003*** (0.001)	0.002*** (0.001)	0.002** (0.001)	0.003*** (0.001)	0.002** (0.001)
L.Tier 1	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
Constant	0.338** (0.200)	0.390** (0.193)	0.406** (0.190)	0.432** (0.187)	0.375* (0.191)	0.478** (0.185)
Number of obs	431	439	439	437	437	437
R-squared	0.529	0.524	0.524	0.523	0.527	0.521

Note: robust standard error in brackets, \*\*\*, \*\*, \* represent 1%, 5% and 10% significance level.

**Table 6.** Impact of diversity and COVID-19 pandemic on bank profitability controlling for variable levels

	Dependent variable: Profitability					
	(16)	(17)	(18)	(19)	(20)	(21)
L.Profitability	0.451*** (0.042)	0.433*** (0.041)	0.438*** (0.042)	0.449*** (0.041)	0.464*** (0.039)	0.459** *
Diversification	0.627 (1.626)	0.263 (0.226)	0.255 (0.233)	0.239 (0.189)	0.507 (0.446)	0.105 (0.111)
Size	-0.026*** (0.008)	-0.022*** (0.008)	-0.023*** (0.008)	-0.026*** (0.009)	-0.030*** (0.008)	-0.027*** (0.008)
Asset growth	0.002 (0.002)	0.001 (0.002)	0.001 (0.002)	0.001 (0.002)	0.001 (0.002)	0.001 (0.002)
Loan-asset ratio	0.003*** (0.001)	0.003*** (0.001)	0.003*** (0.001)	0.003** (0.001)	0.003*** (0.001)	0.003** *
L.Tier 1	0.001 (0.001)	0.002 (0.001)	0.002 (0.001)	0.002 (0.001)	0.001 (0.001)	0.001 (0.001)
Infections	-0.069* (0.040)					
Lockdown		-0.007** (0.003)				
Job closure			-0.135* (0.070)			
Economic support				-0.002 (0.001)		
Income support					0.507 (0.136)	
Debt relief						-0.089** (0.038)
Diversification*Infections	-0.024 (0.095)					
Diversification*Lockdown		-0.001 (0.005)				
Diversification*Job closure			-0.011 (0.131)			
Diversification*Economic support				-0.001 (0.003)		
Diversification*Income support					-0.221 (0.285)	
Diversification*Debt relief						0.082 (0.101)
Constant	1.457** (0.676)	0.532** (0.220)	0.382* (0.208)	0.343* (0.1896)	0.166 (0.281)	0.381** (0.193)
Number of obs	431	439	439	437	437	437
R-squared	0.540	0.542	0.538	0.535	0.531	0.536

Note: robust standard error in brackets, \*\*\*, \*\*, \* represent 1%, 5% and 10% significance level.