

Article

Achieving Financial Sustainability through Revenue Diversification: A Green Pathway for Financial Institutions in Asia

Zhikang Xie ¹, Xinglin Liu ^{1,*}, Hina Najam ², Qinghua Fu ³, Jawad Abbas ⁴, Ubaldo Comite ⁵, Laura Mariana Cismas ⁶  and Andra Miculescu ⁶

¹ School of Public Administration, Zhongnan University of Economics and Law, Wuhan 430073, China; 201801100002@stu.zuel.edu.cn

² Department of Business Administration, Iqra University, Islamabad 44090, Pakistan; hinanajam786@yahoo.com

³ Department of Business Administration, Moutai Institute, Renhuai 564507, China; 2016101050084@whu.edu.cn

⁴ Faculty of Management Sciences, University of Central Punjab, Lahore 54590, Pakistan; jawad.abbas@ymail.com

⁵ Department of Business Sciences, University Giustino Fortunato, 82100 Benevento, Italy; u.comite@unifortunato.eu

⁶ Faculty of Economics and Business Administration, West University of Timisoara, 300006 Timisoara, Romania; laura.cismas@e-uvv.ro (L.M.C.); andra.miculescu@e-uvv.ro (A.M.)

* Correspondence: 202001090009@stu.zuel.edu.cn

Abstract: Establishing balanced and sustainable development is critical for improving banks' capability and performance. Financial development has enormous significance in an environment of increasingly contestable international markets, and can be achieved by enhancing banking efficiency and performance. The bank efficiency is estimated through data envelopment analysis (DEA). By applying the quantile regression technique, this research examines the impact of revenue diversification (RD) on the bank efficiency (BE) of seven Asian emerging economies over 2008–2019. In this regard, non-performing loans (NPLs), non-interest income, capitalization, and gross domestic product (GDP) are taken as control variables. The empirical findings indicate that RD, market capitalization, non-interest income, and GDP have a significant positive impact on BE, whereas NPLs have a significant negative relationship with BE. These results have significant strategic implications for managers, regulators, and policymakers, who share a common interest in boosting financial sustainability and performance.

Keywords: sustainable development; bank efficiency; revenue diversification; quantile regression; data envelopment analysis



Citation: Xie, Z.; Liu, X.; Najam, H.; Fu, Q.; Abbas, J.; Comite, U.; Cismas, L.M.; Miculescu, A. Achieving Financial Sustainability through Revenue Diversification: A Green Pathway for Financial Institutions in Asia. *Sustainability* **2022**, *14*, 3512. <https://doi.org/10.3390/su14063512>

Academic Editor: Marek Vochozka

Received: 15 February 2022

Accepted: 10 March 2022

Published: 17 March 2022

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2022 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

The concept of development was reduced to economic growth in the early 1950s [1]; the understanding that development will only occur with economic growth dominated this period [2]. In the 1970s, the idea that the high growth rate achieved by Western countries did not bring development, and that this type of growth had adverse effects on human and environmental factors, led to the emergence of the concept of sustainable development [3]. It is understood that solutions should be sought to realize sustainable development for problems such as the waste of non-renewable resources, environmental pollution [4], energy crises, bank performance, and poverty problems [5].

Financial development is critically important for developing renewable energy and preserving the environment [2]. Ecological challenges have already become impediments to further economic and financial growth. Financial sustainability is a financial activity that

aims to enhance the environment, increase resource usage, and address climate change [6]. For the transformation of green consumption to be accelerated, the financial industry must develop green features in its operations [7]. This relies on financial innovation channels to change the investment orientation of firms, which is made possible through diversification [8].

The role of banks in sustainable economic growth cannot be overestimated [9]. Banks are widely acknowledged as the backbone of most nations' financial infrastructures [10]. Their lending activities, which function as a conduit between savers and investors, substantially influence resource allocation, sustainability, and financial success [11]. The outcomes of these financing choices significantly impact the allocation of resources and economic success [12]. Likewise, these factors influence financial institutions due to the banks' bad debt [13]. In this perspective, their long-term sustainability relies heavily on the viability of the businesses to which they lend [14]. Sustainability reports are being published by an increasing number of enterprises worldwide. The world has realized that reporting environmental and social concerns may help a company's bottom line [15]. However, along with social and ecological aspects, financial sustainability and bank efficiency (BE) are also prime concerns for businesses. Most of the time, businesses focus only on this aspect [16,17].

The diversification of bank risks is one of the most important techniques for ensuring the long-term development of banks in the global economy [10]. In this situation, risk diversification management in financial institutions necessitates a new strategy. The diversification of loan portfolio hazards allows for increased profits while lowering overall bank risks [18]. Financial sustainability from the perspective of green recovery is possible by diversifying bank risk through investing in different types of revenue-generating activities, including interest and non-interest.

Estimating the efficiency is relatively easy in the case of only one input and output [19]. In contrast, on the other side, this estimation process becomes difficult when there are multiple inputs and outputs. Several studies have been conducted to provide sufficient measures of the efficiency of the banking system [8,10]. Among many, the BE can be measured through Data Envelopment Analysis (DEA) and Stochastic Frontier Analysis (SFA), as renowned measurement techniques. The supremacy of one approach over the other has long been debated. However, generally, it is believed that DEA gives better results than SFA [20]. Thus, it is an effective method that measures the efficiency of banks.

The Asian crisis distressed the financial condition of Asian countries such as China, India, Indonesia, Malaysia, Pakistan, the Philippines, and Korea, presenting significant regulatory challenges (Appendix A Tables A1–A6). Hence, banks in these economies have turned to revenue diversification (RD) strategies to offer a more comprehensive range of financial products and services (non-interest business) to boost profits after the crisis period. Considering that many of the world's growing economies are located in Asia, a study of Asian banks becomes relevant.

Khan, Yu, Belhadi, and Mardani [21] suggested that banks should operate exclusively or diversify their business across different products and services. Two views of diversification hold in this case. First, through diversification, they can achieve maximum economies of scale, and reduce the chances of bank default. Second, the diversification process increases the agency problems between the shareholders and management; in this way, conflicts of interest arise [22,23]. The primary purpose is to reduce the confusion, and fill the gaps in the previous studies. Therefore, it is imperative to understand the significance of bank diversification.

One of the novelties of this study is that it takes the undesirable outputs in the DEA model, and estimates BE. On the other side, this study considers RD, and examines its impact on BE in Asian countries through quantile regression, which is a contextual contribution in this regard. This study also discusses the financial sustainability of banks, which is possible through diversifying their business to different types of activities that play a major role in green recovery, or address climate change.

This research suggests that banks can minimize the chances of bankruptcy by diversifying business activities to different products, services, and economic surroundings. Diversified companies can benefit from leveraging product management skills, and diversifying their organizations. This research examines the relationship between RD by banks, and its impact on their efficiency, by focusing on seven emerging economies in the Asian region. The data is collected from 2008 to 2019, the post-crisis period, and analyzed through the quantile regression technique. This technique provides a better and more diverse range of efficiency across different geographical zones. In this regard, non-performing loans (NPLs), non-interest income (NII), capitalization, and gross domestic product (GDP) are taken as control variables.

2. Literature Review and Hypothesis Development

2.1. Revenue Diversification and Bank Efficiency

Diversification can improve a bank's profitability and ability to withstand financial crises. RD does not reduce shareholders' value, but improves bank profitability. Babu's study [24] found that Indian banks' profitability grew throughout the 1998–2014 period by shifting to non-traditional banking activities, using random effects, fixed effects, and a two-step generalized method of moment estimator system. He concluded that diversification leads to higher profits for international and domestic banks, since foreign banks have more sophisticated technical and managerial capabilities than their domestic counterparts.

Malik et al. [11] conducted a study to investigate whether the income system impacts the performance of European banks. They used a set of European banks' data to estimate the income structure for the period 2005–2017 with the quantile regression and fixed-effect model. The main objective was to determine whether there is a difference between investment-oriented banks and banks that focus on financial intermediation [25]. They stated that non-interest financial gains harm profitability, although this impact exists at a marginal point. However, analyzing the effect of corporate banking distinctly, the effect on the interest rate on banks is negative and significant. Still, the effect is not substantial for banks with more varied business zones. It was stated that a boost in the margin of non-interest income enhances the risk, which ultimately decreases the BE.

Bhuiyan et al. [26] studied bioenergy investments' efficiency to create environmentally and sustainable development. In their study, economic indicators are identified, and an integrated evaluation has been done on the developed economies. The findings of their study indicated that macroeconomic factors and unemployment play a major role in the supply of bioenergy supply forecast. Additionally, research by An and Mikhaylov [27] has been done on the green recovery of Russian energy projects in South Africa. They looked at the cost of a kilowatt of electricity generated by coal power projects in South Africa, and compared it to other sources of green energy. This strategy must aid in the improvement of South Africa's management decision-making process for energy exports to get financial sustainability.

Tariq et al. [28] found that diversification has a significant positive impact on the operational efficiency of Vietnamese commercial banks (input/output). Bank NII's trading and non-trading revenue components positively and significantly impact bank risk [29]. Moreover, NII and the loan-to-deposit ratio negatively affected the return on assets (ROA). Banks' ROA improved with NII, and it appeared to be adversely and significantly correlated with risk. Another study by Goodwin et al. [30] argued that banks that engage in more trading operations have better risk-adjusted profits when NII is a more significant portion of total income. For banks with low asset quality, NII is more profitable. This study claimed that the more diversified channels of income a bank has, the better it will perform concerning ROA, particularly in the Asian region. Thus, the following hypothesis is proposed:

Hypothesis 1: *Revenue diversification is a significant positive predictor of bank efficiency in the Asian region.*

2.2. Control Variables and Bank Efficiency

Early studies [22,31] on bank financial performance indicated that bank-related antecedents (such as board size, bank size, bank age, and capitalization) are the main antecedents that control the company's financial status. Similarly, subsequent studies [32,33] examined the impact of industry-related and macroeconomic aspects on banks' performance. It has been observed that the main factors of a bank's financial performance change with samples and periods [34]. The nature of the association between bank samples and performance is different in each sample. One of the reasons could be the variation in the structure of the banking industry from country to country.

Chupradit et al. [35] studied the efficiency of Mexican banks after the financial crisis period. In the first phase, the study estimated the efficiency through DEA. Later, they checked the impact of bank-related factors on the efficiency of Mexican banks using the Tobit regression. The findings indicated that bank capital, size, and GDP significantly affect efficiency, whereas inflation negatively affects bank performance. Another study by Salem [36] was conducted on Arabian banks' efficiency and productivity during 2000–2014. Their study also used the non-parametric approach of DEA to estimate the BE. The study revealed that bank size, economic growth, and equity ratio are the essential factors to boost the performance of Arab banks.

Pang and Lu [26] focused on bank financial performance in their study. They indicated that bank-related antecedents (bank size, diversification, and bank age) are the main aspects that control a company's financial status. Similarly, a subsequent study by Malik et al. [11] examined the impact of industry-related and macroeconomic aspects on a bank's performance. They observed that the main factors of a bank's financial performance change with time and situation. The nature of the association between bank samples and performance is different in each sample [37]. It is understood that the banking industry structure varies from country to country. Based on these arguments, it is argued that bank-specific variables, such as NPL, market capitalization, GDP, and net non-interest income (NNIM), affect BE in the Asian region. Thus, the following hypothesis is proposed:

Hypothesis 2: *There is a significant relationship between bank-specific variables (NPLs, capitalization, NNIM, and GDP) and bank efficiency.*

3. Research Methodology

3.1. Data Description

The study sample consists of data on variables of interest from commercial banks of China (80), India (71), Indonesia (65), Malaysia (50), Pakistan (30), Philippines (95), and Korea (74) over the period 2008–2019. The data have been collected from BankFocus, a global database for financial institutions and World Development Indicators (WDI).

3.2. Research Technique

3.2.1. Data Envelopment Analysis

Efficiency measurement can be performed by parametric, that is, SFA and non-parametric method, that is DEA approach. Parametric methods are related to production or cost function libraries. All decision-making units (DMUs) are functioning effectively; they are used to estimate the characteristics of functions, and measure economies of scale. Fare et al. [38] consider the DEA using DMU efficiency boundaries to construct efficiency measures. This approach considers the extent to which the overall efficiency of the banks can be enhanced, and ranks the DMU's efficiency score. This metric is derived by analyzing the observations from the DMU used to describe the production units in which multiple inputs and outputs are considered. The most common measure of efficiency is the DEA. The current study uses the Directional Distance Function (DDF) model using the DEA technique. The DDF model deals with different vectors in accordance with study inputs and outputs. These vectors are explained below.

The important study vectors used in this research are given below.

$x_{ij} \in \mathcal{R}^+$: i th input taken by the j th DMU, $i = 1, 2 \dots m; j = 1, 2 \dots n$.
 $y_{rj} \in \mathcal{R}^+$: r th desirable output which produces by j th DMU, $r = 1, 2 \dots q; j = 1, 2 \dots n$.
 $y_{kj} \in \mathcal{R}^+$: k th undesirable output produced by j th DMU, $k = 1, 2 \dots I; j = 1, 2 \dots n$.
 Accordingly, the DEA function can be defined as follows (Equation (1)):

$$F = \{(x, y^d, y^u) : \begin{aligned} &\sum z_k y_{qk} \geq y_m, q = 1 \dots q, \\ &\sum z_k y_{rk} = y_{uj}, r = 1 \dots J, \sum z_k x_{nk} \leq x_n, n = 1 \dots N, z_k \geq 0, k \\ &= 1 \dots K \} \end{aligned} \quad (1)$$

The above equation shows the function model of DEA in which different inputs and outputs are given in the form of study vectors. z_k shows all variables used to enlarge or squeeze the possible combination of the DMUs to create the possible inputs and outputs. x shows the study inputs, y^d indicates the desirable outputs, and y^u indicates the undesirable study output in the DEA function above.

This study uses the DDF model to deal with the negative information additionally referred to as undesirable output. This model is presented by Aparico et al. [39]. This version offers an innovative DDF that measures the BE simultaneously, focusing on undesirable outputs. It is difficult to estimate the efficiency in cases of undesirable output. Thus, following Partovi and Matousek's [40] method, the authors used multiple inputs and outputs. Capital and deposits are the two main inputs used to calculate the BE. Accordingly, the ideal output would be total loans and receivables, total securities, and non-interest income. NPLs are undesirable output in the DEA method. This DEA analysis has been done through MATLAB, and BE's value has been driven out. BE is measured using the following Equation (2):

$$D(x, y^d, y^u; g) = \max \rho \quad (2)$$

Equation (2) is the DDF model in which X shows the inputs, Y^d shows the desirable outputs, Y^u reports the undesirable output, and g is the number of DMUs. On the other side, ρ indicates the maximum possible increase of desirable outputs/inputs from the maximum possible decrease of undesirable outputs/inputs to calculate the BE in DMUs accurately. Table 1 gives the descriptive statistics of the DEA with two inputs (capital and deposits) and four outputs (net loans, total securities, non-interest income, NPL). The total number of observations is 7140. The minimum values of capital and deposits are -0.111 and 0.000 , respectively. The minimum value of NII is $-42,015.886$, whereas its maximum value is 5971.009 . The mean and SD values have also been presented in Table 1.

Table 1. Descriptive Statistics for DEA Inputs and Outputs.

	Mean	Median	Max	Mini	SD	N
Capital	8012.001	6039.617	446,755.256	-0.111	24,128.062	7140
Deposits	50,212.575	9465.144	3,288,629.567	0.000	211,319.875	7140
Net Loans	38,197.904	7282.178	2,405,188.184	0.000	146,042.574	7140
Total Securities	15,956.646	2365.470	1,094,477.877	-5.443	67,706.882	7140
Non-interest income	-759.189	-141.144	5971.009	$-42,015.886$	2916.818	7140
NPLs	662.110	70.965	44,457.811	0.000	2537.697	7140

Note: This table shows the mean, SD, minimum and maximum values of DEA inputs and outputs.

3.2.2. Quantile Regression

The quantile regression technique is widely employed in finance and banking literature strands. It is an extended form of linear regression which assesses the conditional median of the output variable when the assumptions of the linear regression do not meet. This type of regression results in a different form of quantile through which different variations can get in the better form [41]. When there is a lot of heterogeneity in the data, quantile regression becomes a more suitable technique for inefficiency-related research [42]. Adopting quantile regression over the other techniques presents a more precise picture of efficiency distribution across the banks at different periods [43].

In the current study, quantile regression is preferable because it lets the data be displayed with varied conditions. It also helps in estimating the quantile of the response variable. Quantile regression has the advantage over other techniques, as it provides a more accurate depiction of efficiency dispersion among banks across time. It also allows data to be modeled with heterogeneous distributions. To examine the impact of RD on the BE of emerging economies, this study takes the bank-specific variables such as NPLs, capitalization, NNIM, and GDP. The authors performed the quantile regression through Eviews and SPSS with the following equation;

$$BE_{i,t} = \beta_0 + \beta_1 RD_{i,t} + \beta_2 NPLs_{i,t} + \beta_3 Cap_{i,t} + \beta_4 NNIM_{i,t} + \beta_5 GDP_{i,t} + e \quad (3)$$

BE shows the bank efficiency, and is estimated through the DEA method. β is the coefficient in the set of independent variables, and the RD is measured through NII/operating revenue. NPLs are the non-performing loans of the countries. Cap shows the market capitalization of the banks, which has been estimated through the capital-to-assets ratio. NNIM is calculated as net NII to total assets. GDP is the country's gross domestic product, and e is the random error. The specific bank that operates in a particular year can be described by the subscripts i and t .

3.3. Conceptualization of the Variables

3.3.1. Bank Efficiency

A bank's efficiency is defined as the variance between the number of observed information and output variables relative to the optimal number of input and output variables [35]. Compared with low-efficiency libraries, high-efficiency libraries can reach the maximum value of 1, and low-efficiency libraries can be reduced to zero. BE measures that the bank successfully selects the best input condition under the given input price condition [44]. BE is the efficiency in which a particular input generates the specific output [20]. If a company produces the maximum achievable result, it is technically effective given the available resources, such as labor and capital, and the best available technology. Therefore, BE measures a company's skill to efficiently use good practices and knowledge [9].

3.3.2. Revenue Diversification (RD)

Diversity is a highly controversial topic in corporate strategy [44]. In the financial sector, diversification reduces risks by investing in different types of assets. If the asset's value cannot fluctuate perfectly, the risk of diversifying the portfolio will be less than the weighted average risk of its components [45]. Therefore, banks will engage in a wide range of economic operations, and ultimately improve business performance. Diversification mainly deals with ambiguity, and improves the bank's future performance. RD states all the operations of the banks that are above the range of a single financial product line [46]. RD in emerging countries means that banks can participate in various NII activities, such as securities underwriting, insurance, and real estate investment.

In modern years, financial institutions have gradually generated income from "off-balance-sheet" business and fee income. The decline in interest rates has compelled banks to examine other sources of income, leading to the diversification of transaction activities, other services, and non-traditional financial businesses. The concept of RD follows the idea of portfolio theory, which states that individuals can minimize company-specific risks by diversifying their investment portfolios. The debates about the benefits and costs of diversification in banking literature have an extended history. Lee et al. [47] empirically proved that efficiency could be attained by merging NII and interest income from European banks. They said that NII activities could stabilize bank income, maximize banking performance, and reduce risks.

Diversification can provide stable and less volatile income, economies of scope, and the capability to manage between products efficiently [10]. It decreases the overall risk because the income from NII activities is not related to the income from charging activities. Such diversification should stabilize the operating income, and generate a more stable profit

stream [11]. The argument against the diversification of activities hints at increased agency costs, more incredible structural difficulty, and possible risks for bank executives [44].

Chupradit et al. [35] termed diversification as the degree to which corporations classified in one business turn out products classified in another business. Altogether these early definitions, and business or market boundaries were assumed. By diversifying risks, the danger management returns of such money corporations are improved to an exact extent. Additionally, some existing theories recommend that the rise in returns to scale is expounded to diversification [31]. Banks get client information within issuing loans to facilitate the adequate provision of alternative money services and securities underwriting.

Similarly, securities and insurance underwriting will generate information that improve loan production [48]. Therefore, banks will engage in a wide range of economic operations, and ultimately improve business performance [49]. Diversification mainly deals with ambiguity, and enhances the bank's future performance. RD states all the functions of the banks that are above the range of a single financial product line. RD in emerging countries means that banks can participate in various NII activities, such as securities underwriting, insurance, and real estate investment.

3.3.3. Bank Specific Variables

This study takes the NPLs, NNIM, capitalization, and GDP as control variables. Many researchers [35,50] looked at the effects of capitalization on the performance of the banking industry. They concluded that the most influential banks could sustain their capital with a high level of assets. When banks shift from interest income to NII to reduce the risk and boost the bank performance, NII plays a vital role. When the loan cannot be recovered within the specified time, it becomes NPL [51]. The value of bank properties is an important sign of insolvency signs, and will affect efficiency and stability. Fallanca et al. [51] discussed the importance of NPLs. They found that they negatively affect the performance and stability of banks because NPLs will reduce the quality of bank assets. Research on BE has considered asset quality in recent years, especially NPLs. Omitting this variable may lead to erroneous BE measures. Therefore, the inefficiency of banks may lead to an increase in NPLs.

Banks with large capital are unlikely to go bankrupt and engage in low-risk investments. In theory, well-capitalized banks are more attractive than under-capitalized banks because they can attract more customers. Efficient banks may also generate higher profits, enhancing their capital position [52]. When banks shift from interest income to NII to reduce the risk and boost the bank performance, NII plays a vital role. This is considered a significant means of diversification. Hence, all of these stated variables contribute a lot towards the financial development and sustainability of the banking performance and efficiency.

4. Data Analyses and Results

The study results have been presented in descriptive and inferential statistics. Country-wise descriptive statistics are reported in Table 2, whereas the country-wise inferential statistics are provided further.

The descriptive statistics of China are given in which mean, median, maximum, minimum values, SD, skewness, kurtosis, probability, and numbers of observations are reported. Descriptive statistics of other countries are also available. Table 3 presents results for the correlation coefficient for ASEAN-7 countries, and shows the beta results of how much BE is affected due to the stated variables.

The results in Table 3 show that the beta value between RD and BE is 0.44 **, and both are directed in the same direction. On the other side, NPLs have a negative beta value (−0.055 **) with BE. Capitalization has been found to have a significant positive relationship with BE, with a beta value of 0.064 **. The beta value between NNIM and BE is 0.444 **, which means both are going in the same direction. GDP is also positively significant with BE with a beta value of 0.405 **.

Table 2. Descriptive Statistics for China.

	BE	RD	NPLs	Cap	NNIM	GDP
Mean	0.923	30.444	34.433	24.439	−0.322	4.493
Median	0.990	23.249	29.499	33.394	−3.339	4.400
Maximum	3.000	329.499	90.439	293.490	29.299	4.434
Minimum	-2.04×10^{-34}	−34.324	4.929	0.339	−39.424	3.949
Std. Dev.	0.203	29.443	39.034	44.292	3.344	0.933
Skewness	−2.490	3.323	3.344	4.243	3.903	0.094
Kurtosis	30.990	3.999	3.992	20.043	22.343	2.944
Jarque–Bera	3332.339	244.339	234.433	32,900.03	34,339.92	3.422
Probability	0.000	0.000	0.000	0.000	0.000	0.000
Obs.	880	880	880	880	880	880

Note: This table shows the summary details of all study variables in the context of China.

Table 3. Correlation Coefficients results for ASEAN-7.

	BE	RD	NPLs	Cap	NNIM	GDP
BE	1					
RD	0.440 **	1				
NPLs	−0.055 **	0.458 **	1			
Cap	0.064 **	0.484 **	0.450 **	1		
NNIM	0.444 **	0.098 **	0.044 *	0.044	1	
GDP	0.405 **	−0.484 **	−0.448 **	−0.089 **	−0.084 **	1

Note: ** correlation is significant at the level 0.01, * correlation is significant at the 0.05 level.

Table 4 shows the quantile regression findings in the form of four quantiles. These results stated that RD has a significant positive impact on the BE of Chinese banks. It means they should diversify and enhance the NII activities to boost their financial development. The 0.75 quantile describes the beta value of 0.107 ** as a positive sign. On the other side, it has been seen that NPLs have a significant negative impact on BE, with a beta value of -0.007 ***. It means this is not in favor of bank performance. Capitalization has a significant positive relationship with BE, which means that the banks in China should enhance their capitalization sources to strengthen their banking profitability. NNIM has a significant positive relationship with BE. Finally, the GDP indicated positive relation with banking efficiency.

Table 4. Main results in the case of China.

Model	Q0.25	Q0.50	Q0.75	Q0.95
DV	BE	BE	BE	BE
RD	0.007 *** (0.000)	0.007 *** (0.000)	0.107 ** (0.000)	8.77×10^{-5} (8.87×10^{-5})
NPLs	−0.007 *** (0.000)	−0.007 *** (0.000)	−0.087 *** (0.000)	−0.007 *** (0.000)
Cap	0.007 *** (0.000)	0.007 *** (0.000)	0.007 *** (4.47×10^{-5})	0.087 *** (5.58×10^{-5})
NNIM	0.005 ** (0.007)	7.85×10^{-5} (0.007)	0.087 (0.000)	0.007 ** (0.000)
GDP	0.047 *** (0.077)	0.055 *** (0.005)	0.054 *** (0.005)	0.075 *** (0.005)
Constant	3.45	3.313	3.456	3.88
R-sq	0.343	0.587	0.451	0.345
p-value	0	0	0	0

Note: *** $p < 0.001$, ** $p < 0.05$.

Table 5 reports the results of Indian banks. The quantile 0.75 shows that RD has a strong positive significant impact on the BE of the Indian banks, with a beta value of 0.008 **. On the other side, NPLs have been found to have a significant negative relationship with

BE. At the same time, NNIM, capitalization, and GDP of the Indian banks have seen a significant positive relationship with BE, boosting banking performance and stability.

Table 5. Main results in the case of India.

Model	Q0.25	Q0.50	Q0.75	Q0.95
DV	BE	BE	BE	BE
RD	8.85×10^{-5} (0.000)	0.008 *** (0.000)	0.008 *** (0.000)	0.008 ** (0.000)
NPLs	-0.008 ** (0.000)	-0.008 (0.000)	-0.008 *** (0.000)	-0.005 * (0.000)
Cap	0.007 *** (0.008)	0.005 *** (0.008)	0.005 (0.000)	6.88×10^{-5} (0.000)
NNIM	0.008 (0.085)	0.008 ** (0.000)	0.008 *** (0.000)	0.008 (0.005)
GDP	0.080 (0.088)	0.089 *** (0.080)	0.085 *** (0.005)	0.088 *** (0.005)
Constant	0.985	8.585	8.085	8.068
R-sq	0.998	0.188	0.680	0.550
p-value	0	0	0	0

Note: *** $p < 0.001$, ** $p < 0.05$, * $p < 0.1$.

Table 6 shows the results of Indonesian banks. The quantile regression findings indicate that RD favors banking performance and sustainability. A significant positive relationship has been found between the RD and BE in all the quantiles. The same is the case with capitalization, NNIM, and the GDP of the banks, as these variables have been found to have a significant positive relationship with BE. A significant negative relationship has been found between NPLs and BE of the banks.

Table 6. Main results in the case of Indonesia.

Model	Q0.25	Q0.50	Q0.75	Q0.95
DV	BE	BE	BE	BE
RD	5.87×10^{-5} (6.77×10^{-5})	5.85×10^{-5} (8.65×10^{-5})	8.56×10^{-5} (0.000)	7.67×10^{-5} (0.000)
NPLs	-0.005 (0.000)	-0.007 ** (0.000)	-0.007 ** (0.000)	-0.007 (0.000)
Cap	0.007 ** (0.007)	0.000 (0.000)	0.007 * (0.000)	0.007 * (0.000)
NNIM	0.007 (0.007)	0.000 (0.007)	0.007 (0.007)	0.007 (0.007)
GDP	0.070 ** (0.007)	0.005 ** (0.005)	0.007 ** (0.007)	0.006 ** (0.007)
Constant	7.776	7.077	7.777	7.070
R-sq	0.777	0.550	0.757	0.777
p-value	0	0	0	0

Note: ** $p < 0.05$, * $p < 0.1$.

Table 7 shows that all the quantile levels of RD show a significant positive relationship with the BE of the Malaysian banks. Revenue-enhancing activities are boosting banking performance. The same positive significant relationship of BE has been found with capitalization, NNIM, and the GDP of the banks. The higher the NPLs, the lower the banking performance and stability because a significant negative relationship has been found between NPLs and BE, with a beta value of -0.007 **.

Table 7. Main results in the case of Malaysia.

Model	Q0.25	Q0.50	Q0.75	Q0.95
DV	BE	BE	BE	BE
RD	0.003 (0.000)	0.000 (0.000)	4.07×10^{-7} (0.000)	0.002 ** (0.000)
NPLs	−0.007 ** (0.003)	−0.003 *** (0.000)	−0.003 (0.000)	−0.007 ** (0.000)
Cap	0.003 (0.002)	0.002 *** (0.000)	0.002 (0.000)	0.003 ** (0.000)
NNIM	0.003 (0.042)	0.003 (0.008)	0.003 (0.004)	0.004 (0.002)
GDP	0.077 * (0.033)	0.077 *** (0.034)	0.080 *** (0.033)	0.043 *** (0.008)
Constant	0.837	0.880	3.202	3.223
R-sq	0.332	0.343	0.330	0.430
p-value	0	0	0	0

Note: *** $p < 0.001$, ** $p < 0.05$, * $p < 0.1$.

Table 8 shows the results of banks in Pakistan. Usually, it has to be seen that diversification favors Pakistan's banking profitability. RD has been found to have a significant positive relationship with the BE of the Pakistani banks. The other thing is that banks in Pakistan should lower the degree of NPLs because a significant negative relationship has been found between NPLs and BE of the Pakistani banks. A significant positive relationship has been found between capitalization and BE, with a beta value of 0.004 *** in quantile 0.75. In the 0.5 quantile level, NNIM and GDP have been found to have a significant positive relationship with BE, carrying the beta values of 0.03 *** and 0.033 **, respectively.

Table 8. Main results in the case of Pakistan.

Model	Q0.25	Q0.50	Q0.75	Q0.95
DV	BE	BE	BE	BE
RD	0.003 *** (0.000)	0.003 *** (0.000)	0.003 ** (0.000)	0.003 (0.003)
NPLs	−0.004 *** (0.003)	−0.004 *** (0.000)	−0.003 *** (0.000)	−0.007 (0.000)
Cap	0.008 *** (0.003)	0.008 *** (0.003)	0.004 *** (0.003)	4.78×10^{-4} (0.003)
NNIM	0.039 *** (0.007)	0.030 *** (0.003)	0.030 (0.030)	0.003 (0.034)
GDP	0.079 ** (0.037)	0.033 ** (0.034)	0.030 (0.037)	0.037 (0.033)
Constant	0.073	0.373	0.473	3.083
R-sq	0.733	0.773	0.430	0.773
p-value	0	0	0	0

Note: *** $p < 0.001$, ** $p < 0.05$.

Table 9 shows the Philippines bank results. These findings indicated that RD has a significant positive impact on the BE of the banks, with a beta value of 0.007 **. The same positive relationship has been found in the case of Cap, NNIM, and GDP. On the other side, NPLs have a significant negative impact on the banking efficiency of the Philippines banks, with a beta value of −0.006 *** in 0.75 quantiles.

Table 9. Main results in the case of Philippines.

Model	Q0.25	Q0.50	Q0.75	Q0.95
DV	BE	BE	BE	BE
RD	0.006 *** (0.000)	0.006 *** (0.000)	0.006 ** (0.000)	0.007 ** (0.006)
NPLs	−0.006 *** (0.006)	−0.006 *** (0.000)	−0.006 *** (0.000)	−0.007 * (0.000)
Cap	0.008 *** (0.006)	0.008 *** (0.006)	0.006 *** (0.006)	6.78×10^{-6} (0.006)
NNIM	0.069 *** (0.007)	0.060 *** (0.006)	0.060 (0.060)	0.006 (0.066)
GDP	0.079 ** (0.067)	0.066 ** (0.066)	0.060 (0.067)	0.067 (0.066)
Constant	0.076	0.676	0.676	6.086
R-sq	0.766	0.776	0.660	0.776
p-value	0	0	0	0

Note: *** $p < 0.001$, ** $p < 0.05$, * $p < 0.1$.

Table 10 shows the Korean bank results. RD has a significant positive impact on the banking efficiency of Korean banks, with a beta value of 0.005 ** in 0.75 quantiles. NPLs have a significant negative impact on the efficiency of Korean banks, with a value of −0.005 ***. Cap, NNIM, and GDP have a positive relationship with the efficiency of banks, so Korean banks should enhance their Cap, non-interest generating activities, and GDP of the country.

Table 10. Korea results.

Model	Q0.25	Q0.50	Q0.75	Q0.95
DV	BE	BE	BE	BE
RD	0.005 *** (0.000)	0.005 *** (0.000)	0.005 ** (0.000)	0.005 * (0.005)
NPLs	−0.005 *** (0.005)	−0.005 *** (0.000)	−0.005 *** (0.000)	−0.005 (0.000)
Cap	0.008 *** (0.005)	0.008 *** (0.005)	0.005 *** (0.005)	5.58×10^{-5} (0.005)
NNIM	0.059 *** (0.005)	0.050 *** (0.005)	0.050 (0.050)	0.005 (0.055)
GDP	0.079 ** (0.055)	0.055 ** (0.055)	0.050 (0.057)	0.057 (0.055)
Constant	0.055	0.555	0.555	5.085
R-sq	0.555	0.555	0.550	0.555
p-value	0	0	0	0

Note: *** $p < 0.001$, ** $p < 0.05$, * $p < 0.1$.

Robustness Check

Banks can decide whether or not to diversify, and the literature has examined the issue of endogeneity between bank diversification and performance [2]. As a result, we performed the robustness test to verify the accuracy of the data. Z-score, an alternative measure of banks' risk, is first used in this analysis. The lower the Z-score ratio, the less risky the AEE banks are. We operationalized the Herfindahl Hirschman Index (HHI) to obtain an alternate RD measure.

Table 11 shows that these robustness results are also rectified in the analysis above. The robustness test is done to verify whether ASEAN-7 bank's profitability is positively correlated with revenue/income-generating activities, Cap, NNIM, and the country's GDP. On the other hand, NPL has been found to have a significant negative relationship with banking efficiency in both the HHI and Z-score tests.

Table 11. Robustness Results.

Model	HHI	Z-score
DV	BE	BE
RD	0.019 *	0.500 ***
NPLs	−0.055 **	−0.050 *
Cap	0.075 **	0.075 *
NNIM	0.556 **	0.558 **
GDP	0.566 **	0.595 **

Note: This table shows the robustness results, *** $p < 0.001$, ** $p < 0.05$, * $p < 0.1$.

5. Discussion and Implications

This study examines the impact of RD and other bank-specific variables, i.e., NPLs, capitalization, NNIM, and GDP, on the BE of seven emerging countries in the Asian region. Banks build and modify their business model to compete and succeed in the market. For a bank to make a healthy and long-term profit, it must adapt its business strategy. In light of banks' unique social and economic significance, and the possibility that disparities in their business models could be linked to variances in their performance, banks are interested in business models that diversify their revenue.

The findings indicated that RD, Cap, NNIM, and GDP of the Asian banks have a significant positive relationship with BE. On the other side, a significant negative association has been found between NPLs and BE of the Asian banks. To strengthen credit institutions and the overall stability of the financial system, management should construct a prudential framework by taking into account the bank's vulnerabilities and supporting sustainability in terms of the bank's business model [53].

According to the findings of this study, banks can achieve favorable results by diversifying their revenue streams to include a more significant share of NII. The constant development of new financial services and products increases fees and communication, while boosting the market's competitiveness to meet a wide range of customer demands for financial services, investment advice, etc. There should be an increase in commercial banks' financial market investments to generate income from the sale of bonds and stock.

The examination of Asian bank diversification reveals that, in practice, a set of risk management strategies and methodologies should be used to accomplish long-term financial system development regarding green recovery. Studying bank clients and their demands in modern society necessitates ongoing international communication and partnerships to establish the circumstances required for safe financial services and the long-term success of banks.

6. Conclusions

In the past three decades, many regulators and scholars have become interested in the issue of financial sustainability, and have started highlighting the need for non-interest-based income. NII refers to any revenue that a bank receives that is not derived from interest payment. Banks worldwide have seen a significant increase in their off-balance-sheet activities, showing that they are expanding their revenue streams beyond interest. There has been a shift away from relying solely on interest income, as interest margins have shrunk in many banks worldwide. It was also found that the BE of ASEAN-7 countries is negatively correlated with NPLs, and positively correlated with RD, Cap, NNIM, and GDP of the banks. This means they should enhance their non-interest revenue so that financial sustainability can increase by covering the financial aspect of CSR, that is, green recovery.

The diversification of Asian banks in sustainable financing has a favorable influence on bank capitalization. Banks can enhance cash flows and earn more money by diversifying their risks. The diversification of banking processes is vital for the development of socio-economic activity, since it creates new economic relationships, and stimulates financial development and sustainable goals.

Banks can adopt diversification policies to safeguard the effective use of resources to boost their potential income. The results offer valuable understandings for bank organizations and supervisory agencies in developing economies. For example, management can emphasize the impact of diversification on bank performance. This will provide the basis for the strategic decision of the best model to boost the NII-generating activities.

Author Contributions: All authors (Z.X.; X.L.; H.N.; Q.F.; J.A.; U.C.; L.M.C.; A.M.) contributed to conceptualization, formal analysis, investigation, methodology, and writing and editing of the original draft. All authors (Z.X.; X.L.; H.N.; Q.F.; J.A.; U.C.; L.M.C.; A.M.) have read and agreed to the published version of the manuscript. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data will be made available on request from the corresponding author.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Descriptive Statistics: India.

	BE	RD	NPLs	Cap	NNIM	GDP
Mean	0.783	38.422	13.107	18.332	−2.339	6.531
Median	0.849	28.170	7.924	14.655	−1.811	6.714
Maximum	1.000	444.058	99.672	142.980	13.890	8.497
Minimum	-3.34×10^{-16}	−316.787	0.244	−1.830	−174.232	3.086
Std. Dev.	0.230	55.931	17.839	12.434	9.044	1.553
Skewness	−1.738	3.923	3.393	4.001	−15.712	−0.639
Kurtosis	5.724	25.955	14.556	24.452	271.151	2.612
Jarque–Bera	750.905	22,659.08	6914.932	20,183.53	2,806,376.1	68.76474
Probability	0.000	0.000	0.000	0.000	0.000	0.000
Obs.	924	924	924	924	924	924

Note: This table shows the summary details of all study variables in the context of India.

Table A2. Descriptive Statistics: Indonesia.

	BE	RD	NPLs	Cap	NNIM	GDP
Mean	0.881	32.881	22.445	20.364	−2.902	5.401
Median	0.918	23.447	20.955	17.855	−2.839	5.119
Maximum	1.000	466.792	93.433	84.680	6.213	6.223
Minimum	-1.89×10^{-16}	−127.231	2.430	6.552	−22.016	4.628
Std. Dev.	0.142	41.833	11.887	9.872	2.441	0.543
Skewness	−3.874	4.319	2.538	3.308	−0.559	0.352
Kurtosis	21.771	32.353	13.442	17.154	10.963	1.552
Jarque–Bera	12,750.47	28,946.49	4167.975	7544.306	1999.514	80.229
Probability	0.000	0.000	0.000	0.000	0.000	0.000
Obs.	742	742	742	742	742	742

Note: This table shows the summary details of all study variables in the context of Indonesia.

Table A3. Descriptive Statistics: Malaysia.

	BE	RD	NPLs	Cap	NNIM	GDP
Mean	0.746	53.668	28.363	18.401	0.160	4.713
Median	0.763	44.968	27.067	15.499	−0.472	4.961
Maximum	1.000	173.191	86.269	88.400	22.295	7.424
Minimum	0.000	6.637	0.095	11.000	−5.839	−1.513
Std. Dev.	0.184	28.380	14.324	11.535	2.523	2.045
Skewness	−0.859	0.988	0.795	4.717	4.342	−2.123
Kurtosis	4.018	3.505	4.731	26.199	26.962	7.455
Jarque–Bera	97.847	101.937	135.499	15,367.74	15,915.29	928.364
Probability	0.000	0.000	0.000	0.000	0.000	0.000
Obs.	588	588	588	588	588	588

Note: This table shows the summary details of all study variables in the context of Malaysia.

Table A4. Descriptive Statistics: Pakistan.

	BE	RD	NPLs	Cap	NNIM	GDP
Mean	0.703	29.306	38.950	15.830	−4.392	3.675
Median	0.763	26.918	39.329	14.895	−2.171	3.951
Maximum	0.999	145.247	93.455	43.920	2.267	5.836
Minimum	0.000	−188.207	0.168	1.080	−49.375	0.988
Std. Dev.	0.218	23.979	15.046	5.843	7.463	1.615
Skewness	−1.557	−0.102	−0.400	1.895	−3.481	−0.232
Kurtosis	5.303	22.834	3.507	9.675	15.543	1.662
Jarque–Bera	262.763	6885.425	15.707	1031.243	3602.213	35.060
Probability	0.000	0.000	0.000	0.000	0.000	0.000
Obs.	420	420	420	420	420	420

Note: This table shows the summary details of all study variables in the context of Pakistan.

Table A5. Descriptive Statistics: Philippines.

	BE	RD	NPLs	Cap	NNIM	GDP
Mean	0.810	42.247	33.045	19.461	−145.140	5.819
Median	0.955	39.075	29.344	16.420	−1.693	6.348
Maximum	1.000	91.804	98.246	77.900	2349.618	7.334
Minimum	0.003	0.339	2.084	11.000	−15,919.65	1.448
Std. Dev.	0.259	16.647	17.948	7.532	1079.617	1.663
Skewness	−1.675	0.693	0.821	2.636	−9.896	−1.521
Kurtosis	4.554	2.618	3.311	13.016	133.550	4.294
Jarque–Bera	687.126	104.370	140.957	6454.857	878,296.8	550.792
Probability	0.000	0.000	0.000	0.000	0.000	0.000
Obs.	1209	1209	1209	1209	1209	1209

Note: This table shows the summary details of all study variables in the context of the Philippines.

Table A6. Descriptive Statistics: Korea.

	BE	RD	NPLs	Cap	NNIM	GDP
Mean	0.462	40.170	25.630	15.530	−1.045	3.056
Median	0.284	27.857	15.915	14.475	−1.368	2.979
Maximum	1.000	131.518	97.299	40.670	6.372	6.804
Minimum	-1.15×10^{-16}	−22.477	0.0004	10.040	−4.277	0.792
Std. Dev.	0.325	31.863	3.631	5.376	1.476	1.334
Skewness	0.149	1.069	1.770	3.663	2.368	1.403
Kurtosis	1.356	3.216	4.763	16.420	10.531	5.944
Jarque–Bera	61.358	101.731	344.247	5143.780	1741.491	364.074
Probability	0.000	0.000	0.000	0.000	0.000	0.000
Obs.	528	528	528	528	528	528

Note: This table shows the summary details of all study variables in the context of Korea.

References

- Ji, Q.; Zhang, H.Y. How Much Does Financial Development Contribute to Renewable Energy Growth and Upgrading of Energy Structure in China? *Energy Policy* **2019**, *128*, 114–124. [[CrossRef](#)]
- Awais Baloch, M.; Ozturk, I.; Festus, I.; Bekun, V.; Khan, D. Modeling the Dynamic Linkage between Financial Development, Energy Innovation, and Environmental Quality: Does Globalization Matter? *Wiley Online Libr.* **2020**, *30*, 176–184.
- Abbas, J.; Sağsan, M. Impact of Knowledge Management Practices on Green Innovation and Corporate Sustainable Development: A Structural Analysis. *J. Clean. Prod.* **2019**, *229*, 611–620. [[CrossRef](#)]
- Fu, Q.; Abdul Rahman, A.A.; Jiang, H.; Abbas, J.; Comite, U. Sustainable Supply Chain and Business Performance: The Impact of Strategy, Network Design, Information Systems, and Organizational Structure. *Sustainability* **2022**, *14*, 1080. [[CrossRef](#)]
- Bhammar, H.; Li, W.; Molina, C.M.M.; Hickey, V.; Pendry, J.; Narain, U.; Bosak, K.; Mccool, S.F. Framework for Sustainable Recovery of Tourism in Protected Areas. *Sustainability* **2021**, *13*, 2798. [[CrossRef](#)]
- Hou, T.C. The Relationship between Corporate Social Responsibility and Sustainable Financial Performance: Firm-level Evidence from Taiwan. *Corp. Soc. Responsib. Environ. Manag.* **2019**, *26*, 19–28. [[CrossRef](#)]
- Abdul, S.; Khan, R.; Zhang, Y.; Kumar, A.; Zavadskas, E.; Streimikiene, D. Measuring the Impact of Renewable Energy, Public Health Expenditure, Logistics, and Environmental Performance on Sustainable Economic Growth. *Wiley Online Libr.* **2020**, *28*, 833–843.
- Githaiga, P.N. Revenue Diversification and Financial Sustainability of Microfinance Institutions. *Asian J. Account. Res.* **2021**. [[CrossRef](#)]
- Abbas, J. HEISQUAL: A Modern Approach to Measure Service Quality in Higher Education Institutions. *Stud. Educ. Eval.* **2020**, *67*, 100933. [[CrossRef](#)]
- Najam, H.; Riaz Malik, I. Nexus between Diversification and Banking Efficiency in Developing Economies. *J. Bus. Econ.* **2021**, *13*, 34–49.
- Malik, A.; Butt, B.Z.; Din, S.U.; Aziz, H. Impact of Earnings Variability and Regulatory Measures on Income Smoothing in Islamic Banks: Evidence from an Emerging Market. *Public Financ. Q.* **2020**. [[CrossRef](#)]
- Ali, M.; Egbetokun, A.; Memon, M. Human Capital, Social Capabilities and Economic Growth. *Economies* **2018**, *6*, 2. [[CrossRef](#)]
- Suryaningtyas, D.; Sudiro, A.; Eka, A.T.; Dodi, W.I. Organizational Resilience and Organizational Performance: Examining the Mediating Roles of Resilient Leadership and Organizational Culture. *Acad. Strateg. Manag. J.* **2019**, *18*, 20.
- Abbas, J.; Hussain, I.; Hussain, S.; Akram, S.; Shaheen, I.; Niu, B. The Impact of Knowledge Sharing and Innovation upon Sustainable Performance in Islamic Banks: A Mediation Analysis through an SEM Approach. *Sustainability* **2019**, *11*, 4049. [[CrossRef](#)]
- Abbas, J.; Sagsan, M. Identification of Key Employability Attributes and Evaluation of University Graduates' Performance: Instrument Development and Validation. *High. Educ. Ski. Work-Based Learn.* **2020**, *10*, 449–466. [[CrossRef](#)]
- Abbas, J.; Alturki, U.; Habib, M.; Aldraiweesh, A.; Al-Rahmi, W.M. Factors Affecting Students in the Selection of Country for Higher Education: A Comparative Analysis of International Students in Germany and the UK. *Sustainability* **2021**, *131*, 10065. [[CrossRef](#)]
- Safdar, B.; Habib, A.; Amjad, A.; Abbas, J. Treating Students as Customers in Higher Education Institutions and Its Impact on Their Academic Performance. *Int. J. Acad. Res. Progress. Educ. Dev.* **2020**, *9*, 176–191. [[CrossRef](#)]
- Lu, L.; Zheng, H.; Chen, M.; Najam, H. Tackling Carbon Intensity with Green Finance in COVID-19: Recommendations for OECD Economies. *Clim. Chang. Econ.* **2022**, *11*, 12–38. [[CrossRef](#)]
- Abbas, J. Service Quality in Higher Education Institutions: Qualitative Evidence from the Students' Perspectives Using Maslow's Hierarchy of Needs. *Int. J. Qual. Serv. Sci.* **2020**, *12*, 371–384. [[CrossRef](#)]
- Iqbal, N.; Mohsin, M. Assessing Social and Financial Efficiency: The Evidence from Microfinance Institutions in Pakistan. *Pak. J. Soc. Sci.* **2019**, *39*, 149–161.
- Khan, S.A.R.; Yu, Z.; Belhadi, A.; Mardani, A. Investigating the Effects of Renewable Energy on International Trade and Environmental Quality. *J. Environ. Manag.* **2020**, *272*, 1–7. [[CrossRef](#)] [[PubMed](#)]
- Olalere, O.E.; Islam, M.A.; Yusof, W.S.; Ariffin, K.H.K.; Kamruzzaman, M. The Moderating Role of Financial Innovation on Financial Risks, Business Risk and Firm Value Nexus: Empirical Evidence from Nigeria. *AIP Conf. Proc.* **2021**, 2339. [[CrossRef](#)]
- Kazmi, S.J.A.; Abbas, J. Examining the Impact of Industry 4.0 on Labor Market in Pakistan. In *Handbook of Smart Materials, Technologies, and Devices*; Hussain, C.M., Sia, P.D., Eds.; Springer: Berlin, Germany, 2021; pp. 1–11.
- Rajesh Babu, D. Behavioural Finance Heuristic Driven Factors Impact on Indian Stock Market Investors Investment Decisions: A Review. *Asia Pac. J. Res.* **2020**, *1*, 16–19.
- Imran, M.; Abbas, J. The Role of Strategic Orientation in Export Performance of China Automobile Industry. In *Handbook of Research on Managerial Practices and Disruptive Innovation in Asia*; de Pablos, P.O., Chui, K.T., Eds.; IGI Global: Hershey, PA, USA, 2020; pp. 249–263.
- Bhuiyan, M.A.; Dinçer, H.; Yüksel, S.; Mikhaylov, A.; Danish, M.S.S.; Pinter, G.; Stepanova, D. Economic Indicators and Bioenergy Supply in Developed Economies: QROF-DEMATEL and Random Forest Models. *Energy Rep.* **2022**, *8*, 561–570. [[CrossRef](#)]
- An, J.; Mikhaylov, A. Russian Energy Projects in South Africa. *J. Energy S. Afr.* **2020**, *31*, 58–64. [[CrossRef](#)]
- Tariq, W.; Usman, M.; Tariq, A.; Rashid, R.; Yin, J.; Memon, A.; Ashfaq, M. Nexus between Bank Capital and Risk-Taking Behaviour: Empirical Evidence from US Commercial Banks. *Taylor Fr.* **2021**. [[CrossRef](#)]

29. Shakoor, F.; Fakhar, A.; Abbas, J. Impact of Smartphones Usage on the Learning Behaviour and Academic Performance of Students: Empirical Evidence from Pakistan. *Int. J. Acad. Res. Bus. Soc. Sci.* **2021**, *11*, 862–881. [CrossRef]
30. Goodwin, D.; Holman, I.; Pardthaisong, L.; Visessri, S.; Ekkawatpanit, C.; Rey Vicario, D. What Is the Evidence Linking Financial Assistance for Drought-Affected Agriculture and Resilience in Tropical Asia? A Systematic Review. *Reg. Environ. Chang.* **2022**, *22*, 12. [CrossRef]
31. Buch, C.M.; Goldberg, L.S. International Banking and Liquidity Risk Transmission: Lessons from across Countries. *IMF Econ. Rev.* **2015**, *63*, 377–410. [CrossRef]
32. Malliet, P.; Reynès, F.; Landa, G.; Hamdi-Cherif, M.; Saussay, A. Assessing Short-Term and Long-Term Economic and Environmental Effects of the COVID-19 Crisis in France. *Environ. Resour. Econ.* **2020**, *76*, 867–883. [CrossRef]
33. John, A.; McGregor, J.; Fone, D.; Dunstan, F.; Cornish, R.; Lyons, R.A.; Lloyd, K.R. Case-Finding for Common Mental Disorders of Anxiety and Depression in Primary Care: An External Validation of Routinely Collected Data. *BMC Med. Inform. Decis. Mak.* **2016**, *16*. [CrossRef] [PubMed]
34. Abbas, J.; Kumari, K. Examining the Relationship between Total Quality Management and Knowledge Management and Their Impact on Organizational Performance. *J. Econ. Adm. Sci.* **2021**. [CrossRef]
35. Chupradit, S.; Yannan, D.; Kamran, H.W.; Soudagar, S.S.; Shoukry, A.M.; Khader, J.A. Measuring Technical Efficiency Associated with Environmental Investment: Does Market Competition and Risk Matters in Banking Sector. *Environ. Sci. Pollut. Res.* **2021**, *28*, 66575–66588. [CrossRef] [PubMed]
36. Salem, M.I. Building an Entrepreneurial Economy: Evidence from Developing Countries. *Int. Bus. Econ. Res. J.* **2014**, *13*, 629–636. [CrossRef]
37. Abbas, J.; Muzaffar, A.; Mahmood, H.K.; Ramzan, M.A.; Rizvi, S.S. ul H. Impact of Technology on Performance of Employees (A Case Study on Allied Bank Ltd., Pakistan). *World Appl. Sci. J.* **2014**, *29*, 271–276.
38. Färe, R.; Grosskopf, S.; Whittaker, G. Network DEA. In *Modeling Data Irregularities and Structural Complexities in Data Envelopment Analysis*, 1st ed.; Zhu, J., Cook, W.D., Eds.; Springer: Boston, MA, USA, 2007; pp. 209–240.
39. Aparicio, J.; Pastor, J.T.; Zofio, J.L. How to Properly Decompose Economic Efficiency Using Technical and Allocative Criteria with Non-Homothetic DEA Technologies. *Eur. J. Oper. Res.* **2015**, *240*, 882–891. [CrossRef]
40. Partovi, E.; Matousek, R. Bank Efficiency and Non-Performing Loans: Evidence from Turkey. *Res. Int. Bus. Financ.* **2019**, *48*, 287–309. [CrossRef]
41. Abbas, J. Impact of Total Quality Management on Corporate Green Performance through the Mediating Role of Corporate Social Responsibility. *J. Clean. Prod.* **2019**, *242*, 1–12. [CrossRef]
42. Abbas, J. Impact of Total Quality Management on Corporate Sustainability through the Mediating Effect of Knowledge Management. *J. Clean. Prod.* **2020**, *244*, 118806. [CrossRef]
43. Habib, M.; Abbas, J.; Noman, R. Are Human Capital, Intellectual Property Rights, and Research and Development Expenditures Really Important for Total Factor Productivity? An Empirical Analysis. *Int. J. Soc. Econ.* **2019**, *46*, 756–774. [CrossRef]
44. Wang, R.; Liu, J.; Luo, H. Fintech Development and Bank Risk Taking in China. *Eur. J. Financ.* **2021**, *27*, 397–418. [CrossRef]
45. Li, X.; Feng, H.; Zhao, S.; Carter, D.A. The Effect of Revenue Diversification on Bank Profitability and Risk during the COVID-19 Pandemic. *Financ. Res. Lett.* **2021**, *43*, 101957. [CrossRef]
46. Šeho, M.; Ibrahim, M.H.; Mirakhor, A. Does Sectoral Diversification of Loans and Financing Improve Bank Returns and Risk in Dual-Banking Systems? *Pac. Basin Financ. J.* **2021**, *68*, 101619. [CrossRef]
47. Lee, C.C.; Li, X.; Yu, C.H.; Zhao, J. Does Fintech Innovation Improve Bank Efficiency? Evidence from China’s Banking Industry. *Int. Rev. Econ. Financ.* **2021**, *74*, 468–483. [CrossRef]
48. Alam, S.; Albareti, F.D.; Prieto, C.A.; Anders, F.; Anderson, S.F.; Anderton, T.; Andrews, B.H.; Armengaud, E.; Aubourg, É.; Bailey, S. The Eleventh and Twelfth Data Releases of the Sloan Digital Sky Survey: Final Data from SDSS-III. *Astrophys. J. Suppl. Ser.* **2015**, *219*, 12. [CrossRef]
49. Abbas, J.; Kumari, K.; Al-Rahmi, W.M. Quality Management System in Higher Education Institutions and Its Impact on Students’ Employability with the Mediating Effect of Industry–Academia Collaboration. *JEAS* **2021**. [CrossRef]
50. The Impact of Inflation and Economic Growth on Unemployment. Available online: <http://escholar.umt.edu.pk:8080/jspui/bitstream/123456789/928/1/IC3-Dec-2012-083.pdf> (accessed on 10 November 2020).
51. Fallanca, M.; Forgione, A.F.; Otranto, E. Do the Determinants of Non-Performing Loans Have a Different Effect over Time? A Conditional Correlation Approach. *J. Risk Financ. Manag.* **2021**, *14*, 21–37. [CrossRef]
52. Mao, H.; Cheng, J. Optimal Capitalization and Deposit Insurance Strategies with Regard to Moral Hazard. *J. Econ. Bus.* **2020**, *108*, 105885. [CrossRef]
53. Sadiq, M.; Nonthapot, S.; Mohamad, S.; Ehsanullah, S.; Iqbal, N. Does Green Finance Matter for Sustainable Entrepreneurship and Environmental Corporate Social Responsibility during COVID-19? *China Financ. Rev. Int.* **2021**. [CrossRef]