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**-University of Central Punjab**

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## Issue 1

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## Editorial

I am pleased to present Volume 3, Issue 1 of the UCP Journal of Business Perspectives. This issue features a diverse collection of empirical and theoretical studies that explore the pressing challenges and emerging opportunities in technology adoption, organizational behavior, and economic growth. The research included offers valuable insights into the dynamic business environment, highlighting the importance of innovation, human factors, and strategic policy in shaping future business practices. A recurring theme throughout this issue is the link between technology and organizational performance. The adoption of advanced technologies such as AI, Blockchain, and Machine Learning is transforming fields like forensic accounting and fraud detection. These developments not only improve accuracy and efficiency but also emphasize the need for ongoing training and cybersecurity investments to address implementation challenges. Additionally, the issue examines how employee personality traits influence organizational behavior, illustrating how traits like conscientiousness and honesty-humility affect organizational commitment and reduce cynicism. These findings are particularly useful for HR professionals and policymakers seeking to foster a positive work environment. The issue also investigates the key motivational and social factors that motivate entrepreneurial intentions, highlighting the importance of family support and peer encouragement in developing new ventures. The connection between financial development and economic prosperity is also explored, focusing on how microfinance and improvements in the financial sector can boost growth in emerging markets. Lastly, the issue discusses the role of FDI and technology transfer in enhancing innovation among European developing nations, stressing the need for strategic investments in human capital and R&D to promote innovation. Collectively, these studies underscore the value of taking a multidimensional approach to strategic decision-making—integrating technological innovation, organizational behavior, and economic development—to foster sustained growth and resilience in an increasingly complex global economy. We sincerely thank the authors for their valuable contributions, the reviewers for their insightful feedback, and the editorial team for their unwavering commitment to maintaining high academic standards. We invite scholars and practitioners to build on these insights, driving innovation and sustainable growth in a constantly evolving business landscape.


**Dr. Muhammad Athar Siddiqui**
Editor-in-Chief
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## Disclaimer

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# The Impact of Technology on Forensic Accounting and Fraud Detection: A Case Study of Omani Firms

Arwa Ibrahim Al-Balushi[1*]

## ABSTRACT

Rapid technological improvements have revolutionised several businesses, affecting financial fraud and accounting detection. Fraud practices are increasing and becoming more complicated nowadays, whereas the traditional methods of investigating and detecting fraud meet challenges in keeping pace. This study aims to improve forensic accounting efficiency by increasing accuracy and reliability, reducing task time, and adapting to technological advancement. Hence, the study objectives are to explore the impact of cutting-edge technology on forensic accounting and fraud detection within Omani firms, its applications, integration challenges, and solutions to overcome them. The research uses a mixed-method approach, using both quantitative and qualitative data. An online questionnaire is distributed to a sample of 30 forensic accountants and auditors across various Omani firms, focusing on their perspectives regarding the impact and challenges of technology in this field. Using Microsoft Excel, data are analysed through different statistical analyses like descriptive, correlation, regression, and ANOVA analyses. The findings demonstrate that forensic accounting efficiency is directly related to technology adoption and organisational challenges. However, organisational challenges do not correlate with technology adoption. The research suggests that continuous education and training for employees and targeted investments in cybersecurity are crucial for addressing these obstacles. This research enhances fraud detection techniques and increases trust in financial systems, benefiting regulators, organisations, and stakeholders.

**Keywords:** Artificial Intelligence, Blockchain, Forensic Accounting, Fraud Detection, Machine Learning, Technology

## 1. INTRODUCTION

Technological advances over the decades have had a significant role in shaping the development of forensic accounting processes. Frank Wilson, recognised as the "father of forensic accounting," employed early forensic methods that manually analysed fraud cases in the early 20th century. In 1930, these methods were primarily helpful in the tax evasion conviction of Al Capone, an infamous mobster (Adebayo et al., 2023). Since then, there has been a significant shift in the

accounting field, with more sophisticated forensic accountant techniques, high-tech tools, and data analysis programs to examine vast amounts of information, determine trends, and identify abnormalities. According to Li (2010), Enron was established in 1985 and emerged as a prominent entity in the electricity, natural gas, communications, and pulp and paper industries before declaring bankruptcy in late 2001. Its annual revenues escalated from over $9 billion in 1995 to over $100 billion in 2000. The company's stated financial situation was controlled mainly by systematic, institutionalised, and creatively planned accounting fraud, which came to light at the end of 2001. Enron's stock price went from $90 per share in the middle of 2000 to under $1 per share by the end of 2001, resulting in a loss of approximately $11 billion for shareholders. For the five years before that, Enron looked at its financial statements again and found that it had lost $586 million. On December 2, 2001, the Enron scandal appeared as it declared its bankruptcy.

The increasing amount of financial fraud scandals nowadays has further emphasised the importance of technology in forensic accounting, as they have revealed weaknesses in conventional auditing practices. Patel et al. (2021) pointed out that auditors and forensic accountants have had to enhance their abilities to spot early indications of fraud due to these scandal incidents. Financial fraud is the leading cause of economic and financial disasters as it directly affects how well the stock, debt, and capital markets perform. Javaid (2024) sees that advancements in fraud detection technology have developed from simple rule-based systems to the integration of machine learning, artificial intelligence (AI), and data analytics. The forensic accountant conducts investigations of fraud and theft by using their expertise in auditing, accounting, and investigation. Alongside technological advancements, the responsibilities of a forensic accountant have expanded to include tracking money laundering and examining theft and evasion of tax practices (Rohmah et al., 2022). The escalating complexity of financial crimes in the contemporary digital age has revolutionised forensic accounting, where technology plays a pivotal role in augmenting fraud detection and prevention (Whitehouse, 2022). Contemporary forensic accounting incorporates innovative techniques like AI, data analytics, and blockchain technologies to detect and examine fraudulent activities efficiently. Hence helping forensic accountants manage large datasets and find complex fraud schemes that conventional approaches may miss.

Daraojimba et al. (2023) highlighted that forensic accounting now encompasses business management, psychology, crime science, and traditional financial analysis elements. Also, forensic accountants are now essential in court cases as they provide expert opinions and evidence to settle financial disputes and bring financial crimes to justice. Fraud theories establish a fundamental framework for perceiving the motivations and events that result in fraudulent activities. The Fraud Triangle, which identifies pressure, opportunity, and rationalisation as critical components of

fraud, emphasises the significance of technology in the early detection of these aspects. Sophisticated instruments like data analytics and artificial intelligence can detect irregularities indicative of potential fraud, whilst ongoing surveillance can reduce the incentives that lead to fraudulent behaviour. Likewise, the Fraud Diamond, which incorporates "capacity" into the Fraud Triangle, corresponds with the application of technology to evaluate and mitigate the competencies of prospective fraudsters. Integrating these theories can concentrate on how technology addresses the underlying causes of fraud, thereby improving the efficiency and cost-effectiveness of forensic accounting practices while improving both detection and prevention.

According to Odeyemi et al. (2024), the rising complexity of financial fraud may be exceedingly challenging for traditional forensic accounting approaches, calling for innovative technological applications. Traditional forensic accounting techniques may be insufficient for detecting complicated fraud patterns in an environment characterised by the daily generation of extensive data (Onowu & Oludi, 2024). Therefore, manual detection approaches are time-consuming, expensive, inaccurate, and impractical in the massive data age, leading to failure to find fraudulent activities (West & Bhattacharya, 2016). Because of these issues, there is a growing need for modern technology-based tools and techniques that help to make forensic accounting more accurate, rapid and efficient. The application of innovative technologies to this field has a significant impact; however, the application is vulnerable to substantial obstacles and issues. This study addresses the challenges of traditional forensic accounting techniques and reveals modern forensic accounting techniques and their impacts. This study seeks to identify advanced technological applications in forensic accounting and fraud detection while evaluating their impact on improving efficiency within this discipline. This study will examine the challenges associated with integrating technology in forensic accounting and propose practical solutions to address these issues.

This study seeks to ascertain the influence of technology on forensic accounting in Omani firms. The characteristic will engage forensic accountants in Omani firms with a minimum of thirty accountants. The duration to complete this study will be three months and two weeks, from October 6th to January 11th. It will concentrate on theories of technology's influence on this accounting field. This study is significant because it examines how effectively technological advancements change fraud detection and forensic accounting. Fraud techniques are becoming more complicated nowadays, whereas the traditional methods of investigating and detecting fraud meet challenges in keeping pace. Moreover, the study aims to deliver an in-depth understanding of how technology can improve the efficiency of forensic accounting. It is possible to mitigate reputational risks caused by fraudulent activities, enhance adherence to regulatory standards, and minimise financial losses from fraud by implementing more extraordinary detection techniques. Technology can improve financial reporting accuracy, accountability,

and transparency, which builds confidence in financial systems. Hence, the findings will seek to enhance detection methods and increase trust in financial systems, which will benefit regulators, organisations, and stakeholders.

# 2. LITERATURE REVIEW
## 2.1. Theoretical Framework
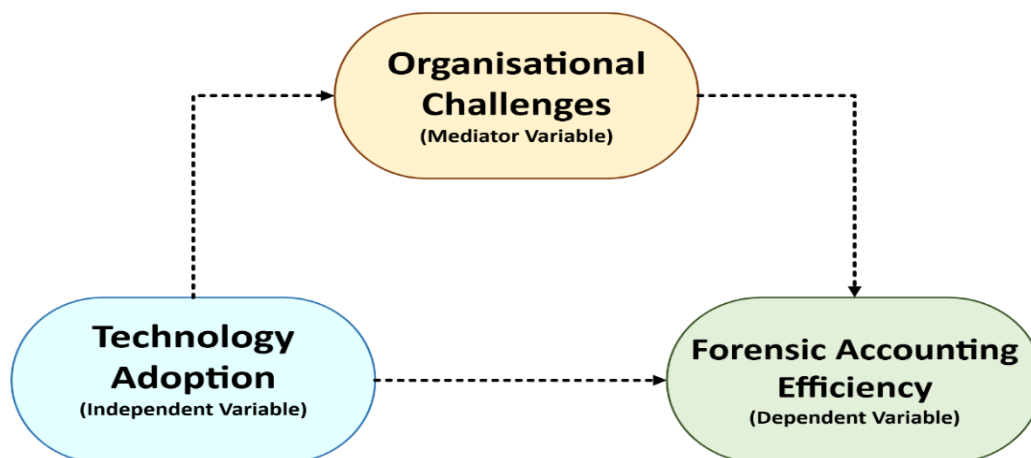


**Figure 1** *Theoretical Framework*

Based on the study framework implied in Figure 1, it is hypothesised that implementing technology as an independent variable will improve the effectiveness of forensic accounting, the dependent variable, by providing advanced applications that automate and optimise the detection and analysis procedures. However, the magnitude of such enhancement is mediated by organisational challenges, which cover an organisation's obstacles that may be faced, like skilled employees, infrastructure, and a supportive environment. These challenges affect how the technology can be successfully utilised and incorporated within forensic accounting's finest practices, in which overcoming organisational barriers is crucial to this adoption's success. Hence, even though the adoption of technology can boost the efficiency of forensic accounting immediately, the full impact of this technology will become apparent when an organisation can eliminate the challenges of implementing technological advancements. Therefore, organisational challenges hinder the deployment of new technology and substantially impact the overall efficacy and efficiency of forensic accounting investigations.

## 2.2. Forensic Accounting

Forensic accounting is a specialised field within the accounting profession that provides many services besides fraud investigation. According to Akkeren et al. (2013), It is a domain within the accounting profession that addresses financial

crime and its inherent complexities, necessitating a profound level of competence to analyse sophisticated financial transactions. Forensic accounting involves utilising specialised talents, including accounting, auditing techniques, finance, quantitative analysis, research, and investigative tactics. It also necessitates an understanding of specific legal domains. This expertise and these competencies empower forensic accountants to gather, analyse, and assess evidence subject matter and interpret and convey their conclusions (Crain et al., 2019). Fraud detection and prevention were recognised as components of accounting functions, with internal and external auditors tasked with identifying and mitigating fraud. Subsequently, it was observed that auditors are not accountable for fraud prevention and detection; their role is limited to verifying the adherence of the company's financial statements to applicable accounting standards and legislation governing financial reporting. Consequently, a new accounting field has emerged: "Forensic Accounting." The inception of Forensic Accounting was to identify fraudulent transactions occurring within commercial entities (Kaur, 2024).

### 2.2.1. Role of Forensic Accountant

Forensic accountants provide a crucial proactive risk mitigation function by serving as experts in statutory audits, devising and executing comprehensive procedures, advising audit committees, and supporting investment analyst research. Furthermore, when examining forensic accountants' duties, they are specialists in analysing what is behind the numerical data and addressing actual business scenarios (Wijerathna & Perera, 2020). Dalwadi (2023) stated that forensic accountants' primary roles are in detecting financial fraud; forensic accountants possess the expertise and insight to identify financial fraud, embezzlement, and various financial offences. They can examine dubious transactions, scrutinise financial records, and analyse financial data to detect anomalies or fraudulent acts. Also, forensic accountants may provide evidence for judicial processes, including criminal or civil cases. Their findings may be employed to substantiate legal claims or to convict persons or entities suspected of financial crimes (Alabdullah et al., 2013).

Additionally, to mitigate financial fraud, forensic accountants assist enterprises and organisations in preventing financial fraud by establishing robust internal controls, formulating anti-fraud policies, and performing risk assessments. Furthermore, avoiding financial losses, forensic accountants assist businesses in preventing financial losses caused by fraud or other financial offences. They can detect fraudulent actions promptly, allowing organisations to act swiftly and recapture lost revenue. Finally, to facilitate adherence to laws and regulations, forensic accountants assist in achieving compliance with financial regulations and legal rules. Forensic accountants can locate areas of non-compliance and offer recommendations for resolving such faults.

## 2.3. Financial Fraud

Financial fraud is a widespread and severe issue that adversely impacts individuals, organisations, and economies. Fraud is defined as a criminal act or sequence of illegal acts performed by nonphysical means and by secrecy or deceit to obtain money or property, prevent the payment or loss of money or property, or obtain trade or personal benefit (Free, 2015). According to the Global Fraud Study of the Association of Certified Fraud Examiners (ACFE) in 2016, fraud costs businesses an estimated 5% of their revenue annually, according to the median estimate of the Association (Association of Certified Fraud Examiners, 2016).

### 2.3.1.  The Fraud Theories

The Fraud Triangle Theory (FTT) and the Fraud Diamond Theory (FDT), proposed by criminologists Donald Cressey, Wolf, and Hermanson, respectively, are the two leading theories of fraud that have been proposed and frequently referenced in literature over the years.

### 2.3.2.  The Classic Fraud Triangle Theory

According to Eko (2022), the term 'Fraud Triangle' is attributed to Edwin Sutherland, who introduced it in his 1949 book, White Collar Crime. Thus, he becomes the principal contributor to the model. In 1953, Cressey formulated the idea to clarify the factors that drive individuals to commit fraud or criminal acts. The Fraud Triangle asserts that frauds encompass three elements: pressure, opportunity, and rationalisation. Opportunity is perceived as the prevailing gap that facilitates the commission of fraud. Moreover, the fertile soil is where the seed of fraud flourishes. An absence or poor internal control and governance structure primarily generates this opportunity. The Pressure factor necessitates that fraudsters feel compelled to engage in fraudulent activities and believe they cannot seek assistance or disclose their issues. Examples encompass pressure to fulfil or surpass analysts' earnings projections, cash flow difficulties, and constrictive loan covenants. The Rationalisation component refers to providing a justification that aligns with the fraudster's moral framework, or more precisely, an endeavour to mitigate cognitive dissonance among the individual (Gepp et al., 2023).

### 2.3.3.  The Fraud Diamond Theory

The Fraud Diamond Theory expands upon the Fraud Triangle Theory. The Fraud Diamond Theory by Wolfe & Hermanson first appeared in 2004 in the Certified Public Accountant (CPA) magazine and is seen as an enhancement of Cressey's (1953) Fraud Triangle Theory. The two theories are similar except for Wolfe and Hermanson's claims that the combination of pressure, opportunity, and rationalisation alone is inadequate for initiating fraud unless the potential perpetrator possesses the requisite intelligence, skills, and technical expertise to execute the intended fraud. Consequently, they incorporated the fourth factor

(Capacity) into Cressey's (1953) Fraud Triangle Theory to create their own Fraud Diamond Theory (Nwakeze et al., 2023). Several factors of "capability" encompassing position, cognitive capacity, self-assurance, resilience to stress and guilt, and the ability to manipulate and persuade others. Wolfe and Hermanson concluded that while opportunities, pressures, and rationalisations for fraud exist, the absence of the requisite capabilities in the fraudster prevents its occurrence. Figure 2 below shows the shift from the classic Fraud Triangle Theory to the Fraud Diamond Theory.
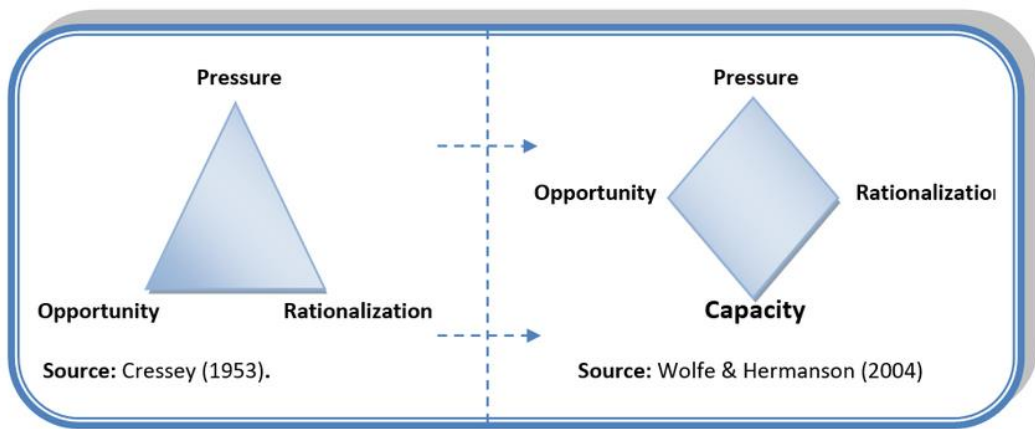


**Figure 2** *Fraud Triangle (FTT) and Fraud Diamond (FDT) Frameworks*

## 2.4. Technology Applications in Forensic Accounting

Specialised software and tools in forensic accounting use data analysis, fraud detection and prevention, financial statement analysis, and investigative accounting. Blockchain, data analytics, and artificial intelligence technology are increasingly vital in detecting and preventing financial crime (Hossain, 2023).

### 2.4.1. Blockchain Technology

Financial investigations have entered a new age of transparency, accuracy, and efficiency through blockchain technology's application to forensic accounting techniques. Blockchain's decentralised and immutable nature assures a tamper-proof ledger, ensuring that financial records cannot be altered retrospectively, strengthening the credibility of evidence in court processes. Forensic accountants can utilise blockchain to authenticate the validity of financial data, trace transactions, and improve the general transparency of financial records (Odeyemi et al., 2024). Blockchain technology's immutability, decentralisation, and cryptographic security allow forensic accountants to solve many of their main challenges. By leveraging blockchain's decentralised characteristics, forensic accountants can obtain real-time transactional data directly from the source, minimising dependence on intermediaries and mitigating the risk of data

manipulation. Moreover, many blockchain technology tools can be implemented to aid forensic accountants. One of them is the smart contract, a software application that conducts tasks on behalf of the user according to specified requirements (Zemánková, 2019). According to Brody et al. (2023), these computer codes autonomously run under specified conditions. The code can be saved and processed on a distributed ledger, which records any resultant changes. This category of smart contracts is characterised by an "internal model" framework. The code constitutes the complete agreement between the parties and replaces any other provisions expressed in plain language.

### 2.4.2. Artificial Intelligence and Machine Learning

The debate surrounding "artificial versus human intelligence" among scholars and professionals involves numerous contentious issues regarding the future of certain occupations, the necessary new skill sets and competencies, and the potential for effective collaboration between humans and machines (Mehta et al., 2021). Artificial intelligence relies on comprehending the essence of human intelligence by developing computer systems that can emulate human behaviour and supply users with the necessary information to facilitate prompt and informed decision-making. Machine learning applications in forensic accounting include decision trees, support vector machines, and clustering algorithms. These techniques train a model with pre-labelled data to predict new, unannotated data. Algorithms can be employed in forensic accounting to predict fraudulent transactions through real-time analysis and historical data examination. Decision trees and logistic regression are effective methods for predicting fraud using transaction data based on transaction information (Haddad et al., 2024). More recently, autoencoder networks have also been implemented in forensic accounting data analysis, which detects anomalies by applying fuzzy logic and autoencoder neural networks (ANN). For example, unusual accounting records, irregular combinations of general ledger accounts, and user accounts that multiple accounting departments use are examples of accounting anomalies. These local accounting anomalies are journal entries showing an unusual or rare combination of attribute values, while their attribute values occur frequently. This abnormality is far more challenging to identify, as fraudsters aim to conceal their actions by replicating a typical activity pattern. Consequently, such anomalies typically present a significant fraud risk related to procedures and activities that may not adhere to organisational rules (Schreyer et al., 2017).

### 2.4.3. Data Analytics and Big Data

Big data technologies are revolutionising corporate procedures and practices because traditional database management systems cannot manage large amounts of data. Akinbowale et al. (2023) divide three principal attributes typically employed to characterise "big data" as high volume (substantial size or quantity of data

acquired), high velocity (the rapidity of data collection), and high diversity (the different sources of the data collected). Big data technologies enable organisations to extract real-time intelligence from vast data. These enhanced techniques empower forensic auditors to do thorough analyses to extract significant insights from the data, hence facilitating evidence-based decision-making. They can manage varied and extensive data efficiently to deliver critical information and find trends and patterns for decision-making. Predictive analytics can predict future entries and provide forward-looking insight based on historical data. The ability to analyse all data sets instead of relying just on sampling techniques enhances auditors ' confidence in their conclusions (Mittal et al., 2021). Also, advanced analytics detect anomalies in the behaviour of customers and vendors, including payments that are repeated or unusual invoice patterns. Clustering analysis can facilitate the identification of information with common characteristics in data mining, while association rules can help establish the extant relationships among the datasets. The regression analysis can ascertain how much the data pattern changes when specific variables are altered. Therefore, implementing data mining techniques can improve data processing and increase the dependability of the obtained information in pursuing fraud mitigation.

## 2.5. Role of Technology in Enhancing Forensic Accounting Efficiency

Forensic accounting is becoming increasingly critical in combating financial misconduct in the digital era. Digital forensic accounting, encompassing collecting and analysing data from electronic sources, is essential for identifying crimes like phishing and money laundering. Digital forensics has the potential to investigate and analyse digital data, including electronic transactions and email interactions, to detect fraudulent acts much faster and more efficiently through the use of data analysis techniques (Onamusi et al., 2024). According to Boylan and Hull (2022), an accounting information system (AIS) can monitor the individuals responsible for generating journal entries, the dates on which they were completed, and the accounts that were changed. Also, the fact that blockchains are challenging to modify is generally regarded as an advantage, enabling auditors and management to prevent criminal activity. Moreover, data mining aids in scanning transaction listings, finding gaps in cheque runs, payroll payments to the same payee during the inquiry period, finding duplicated invoice or payment voucher numbers, and matching returns. It also compares new invoice prices with archival inventory costs and filters transactions to find new suppliers (Eko, 2022). These advances facilitate the administration of extensive information and improve the identification of nuanced fraud trends. The detection of hidden fraud has been enhanced by sophisticated anomaly detection and pattern recognition algorithms. In contrast, data mining and visualisation tools have improved the analysis of complicated financial transactions, resulting in further refined forensic accounting practices. Data analytics has substantially improved the efficacy and accuracy of forensic investigations by reducing investigation timeframes and enhancing the accuracy of

detecting fraudulent transactions. Advanced analytical approaches have improved data processing and decision-making, leading to more efficient investigations (Verma & Singh, 2024). This technology-based software, especially AI, is essential for forensic accountants, as it simulates the human intellect. It can also provide the required information and power at a rate that excels the speed and accuracy of human beings (Saluja et al., 2024).

## 2.6. Barriers to Integrating Technology in Forensic Accounting

Adopting emerging technology trends in forensic accounting may present significant challenges for businesses, such as the necessity of major investments in skilled personnel and technology infrastructures. These technologies need specific knowledge and skills that organisations or accounting professionals may not have (Al Abbadi et al., 2021). Additionally, companies may encounter barriers in implementation costs and system integration to use these technologies successfully. Businesses may struggle to integrate new technologies with the workflow of the existing system, which is one of the main challenges. In addition, employees or management may resist embracing new technologies due to concerns about job displacement or lack of familiarity with the new technology. According to Oladejo and Jack (2020), the challenges in data security risks can be shown in blockchain technology, where it may leak data, and hackers can penetrate blockchain technology's cryptography to perform fraud and other attacks, compromising its source documents and reliability. Moving to the legal aspect's challenges that may raise concerns and affect the application of techniques, Chinweike (2024) explains different legal challenges such as:

In the courts, the admissibility of digital evidence is governed by several rules and criteria like reliability, authenticity, and relevance. Digital evidence is regularly reviewed by courts, with authentication frequently requesting expert testimony to verify forensic processes, causing difficulties in guaranteeing the acceptance of this evidence. Additionally, as technology advances, digital forensics accounting faces new legal challenges. Blockchain and end-to-end encryption complicate traditional forensic methods. When laws do not keep up with technology, grey areas arise that impede investigations and court cases. Addressing these changing issues requires ongoing research and revised legislation. Moreover, since different nations have varied laws surrounding the collecting, sharing, and admissibility of evidence, cases that include investigations across international borders can be complicated. Despite this, international legal cooperation and agreements are frequently required, which can be time-consuming and complicated. Furthermore, digital evidence integrity depends on the chain of protection. From evidence gathering to court presentation, this process should be meticulously documented. Chain gaps can put suspicion on the evidence's authenticity and exclude it. Documenting and following procedures are essential to meeting admissible evidence criteria (Chinweike, 2024).

## 2.7. HYPOTHESES:

**H1$_1$:** *Technology adoption positively influences forensic accounting efficiency.*
**H1$_0$:** *Technology adoption negatively influences forensic accounting efficiency.*
**H2$_1$:** *Organisational challenges mediate the relationship between technology adoption and forensic accounting efficiency.*
**H2$_0$:** *Organisational challenges do not mediate the relationship between technology adoption and forensic accounting efficiency.*

# 3. METHODOLOGY:

## 3.1. Research Design

This research utilises descriptive design. The descriptive design offers a detailed overview of statistical data to reveal population characteristics or patterns related to this research. Also, it describes the different technology applications applied in this field and how it has enhanced its processes nowadays. The research design explains technology's integration challenges and solutions through recent literature reviews and forensic accountants' perspectives. Additionally, the research uses a mixed-method approach, where qualitative data is gathered through non-numerical data through open-ended questionnaire questions that focus on understanding experiences and perspectives. The quantitative method, such as the numerical data from the questionnaire, gathers actionable insights through statistical conclusions. Both statistical analysis and hypothesis testing are included in the data analysis process, and the results are shown as numbers and statistics.

## 3.2. Population of the Study and Sample Size

Professionals and organisations engaged in fraud detection and forensic accounting within Omani organisations encompass the population of this investigation. The research distributed a questionnaire to specific respondents to gain insights into the recent technology in forensic accounting. Overall, the population size of this research includes forensic accountants who are specialised in financial fraud detection, internal and external auditors who are engaged in investigating forensic practices or audits using fraud detection technologies, managers and people who make decisions in Omani companies; these are the people in charge of forensic accounting units or fraud detection teams. Hence, the sample size of this research will be 30 respondents. The population scope targets respondents from government and private sector entities as well as Omani small and medium enterprises (SMEs).

## 3.3. Sampling Technique

This research uses a non-probability sampling approach, wherein the researcher picks the sample based on subjective judgment rather than random selection. This strategy excludes some population members from participating in the research

(BYJU'S, 2024). Specifically, snowball sampling or a chain-referral sampling technique has been applied, which is used when samples with the desired characteristics are inaccessible (Naderifar et al., 2017).

### 3.4. Research Instruments and Validity and Reliability Testing

According to Afolayan and Oniyinde (2019), questionnaires are less expensive than interviews and can occasionally be mailed in without requiring skilled interviewers. It is simpler to use and can engage a larger audience. It enhances the reliability of data due to anonymity. Ultimately, it ensures that all participants are provided with identical questions, thus eliminating interviewer bias. The questionnaire consists of two parts: the demographic and the research objectives. Five demographic enquiries were included concerning the respondents' age, gender, education level, years of professional experience, and forensic accounting or fraud examination certifications obtained. The second part consists of fifteen questions related to the research objectives, which collects data using open-ended and closed-ended questions, including one dichotomous question (yes/no), two Multiple Choice Questions (MCQs), one rating scale, seven Likert scale responses (ranging from strongly agree to disagree and from very effective to very ineffective strongly) and two open-ended questions.

## 4. DATA ANALYSIS AND RESULTS

### 4.1. Descriptive Analysis

**Table 1** *Descriptive Analysis of Demographics Data*

| Measures | Gender | Age | Academic Qualification | Work Experience |
|---|---|---|---|---|
| Mean | 1.5667 | 3.2 | 1.9333 | 2.6333 |
| Standard Error | 0.0920 | 0.2166 | 0.0951 | 0.1477 |
| Median | 2 | 3 | 2 | 3 |
| Mode | 2 | 3 | 2 | 3 |
| Standard Deviation | 0.5040 | 1.1861 | 0.5208 | 0.8087 |
| Sample Variance | 0.2540 | 1.4069 | 0.2713 | 0.6540 |
| Kurtosis | -2.0621 | -0.8356 | 1.0890 | -0.3431 |
| Skewness | -0.2834 | -0.0159 | -0.1092 | -0.0459 |
| Range | 1 | 4 | 2 | 3 |
| Minimum | 1 | 1 | 1 | 1 |
| Maximum | 2 | 5 | 3 | 4 |

| Sum | 47 | 96 | 58 | 79 |
|---|---|---|---|---|
| Count | 30 | 30 | 30 | 30 |

- **Genders**

The mean gender value of 1.57 suggests a minor female (2) dominance among participants. The median and mode values 2 indicated that females comprised the majority. According to UN Women (2019), investments in women's economic empowerment establish a direct path to gender equality, poverty eradication, and inclusive economic development. Women significantly boost economies, whether working as employees or entrepreneurs in enterprises. With a standard deviation of 0.50, the gender representation is comparatively balanced and indicates moderate variability. With a sample variance of 0.25 for gender, the data shows minimal variation. This minor variation demonstrates that the replies are relatively consistent, with a slight inclination towards females. This corresponds with the standard deviation 0.50, further validating an equitable distribution across males and females. The gender range is 1, the difference between maximum females (2) and minimum males (1).

- **Ages**

A mean age value of 3.2 indicates that the average respondent belongs to the 35-39 age group (3). The median score of 3 implies a symmetrical distribution within this group. This signifies a central tendency within this age range. The mode of 3 further substantiates that the age group of 35-39 years is the most prevalent in the sample. A standard deviation of 1.19 indicates considerable variability, suggesting a broad age range among participants. A substantial amount of variation can be seen in the age categories of the respondents, as noted in the sample variance for age, which is 1.41. This shows that responders are scattered across age groups, but (35-39) is the main concentration. The age **range** is 4, encompassing the youngest group (1= 25-29) to the oldest group (5= 45 and above). This broad spectrum indicates a varied age demographic among the respondents, encompassing beginners to expert workers.

- **Academic Qualification**

With a mean qualification of roughly 1.93, it falls between a bachelor's degree (1) and a master's degree (2), with a small amount of bias towards the master. The median and mode are 2 (Master's degree), indicating a significant prevalence of this category. The standard deviation is 0.52, indicating negligible variance in qualifications. The participants' educational qualifications are homogeneous, as evidenced by the low variance 0.271. The range is 2, encompassing a minimum of 1 (Bachelor's degree) to a maximum of 3 (PhD degree). This small range shows that most respondents are between three educational levels.

- **Work Experience**

The mean job experience is roughly 2.63, ranging from 6-10 years (2) and 11-15 years (3). As indicated by the median and mode of 3, most responders have between 11 and 15 years of experience. A standard deviation of 0.81 signifies moderate variability in the job experience. The work experience sample variance is 0.65, indicating significant respondent variability. This encompasses a variety of people with different years of experience, ranging from early-career professionals 1-5 years to individuals with considerable expertise over 15 years. The range 3 extends from 1 (1-5 years) to 4 (over 15 years), representing a variety of participants across various experience levels.

## 4.2. Correlation and Regression Analyses

**Table 2** *Correlation Table*

|  | *Effectiveness of Data Mining* | *Reduction in Fraud Detection Time* |
|---|---|---|
| **Effectiveness of Data Mining** | 1 |  |
| **Reduction in Fraud Detection Time** | 0.4884 | 1 |
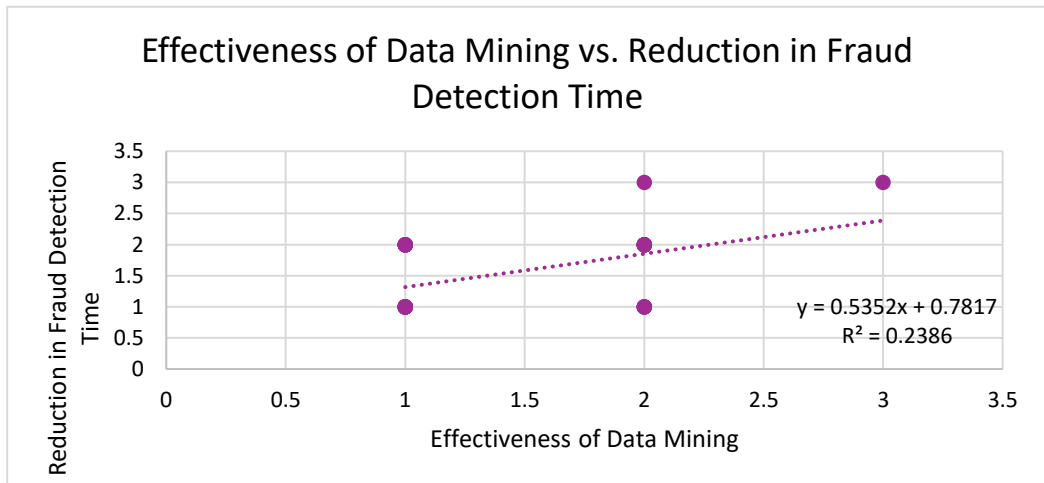


**Figure 3** *Effectiveness of Data Mining vs. Reduction in Fraud Detection Time*

As shown in Figure 3 with a correlation coefficient of 0.488, the correlation analysis demonstrates a moderately positive relationship between the efficiency level of data mining and the reduction in the time required to detect fraudulent activity. The results support the hypothesis that a moderately strong correlation exists between the increased efficacy of using data mining (One of the technology applications) and significant reductions in fraud detection time (Efficiency of

forensic accounting). The trendline indicates that enhancements in data mining efficacy correlate with decreased fraud detection time. At the same time, the explained variance implies that this relationship is very weak. Although data mining is crucial for improving fraud detection efficacy, other elements like AI or blockchain may also considerably affect results. Moreover, external factors such as training, cost, and management engagement may be facilitators or obstacles to efficiently utilising data mining. An in-depth examination of these aspects and focused actions may yield a comprehensive understanding and enhance the efficacy of technology in fraud detection.

**Table 3** *Regression Analysis 1*

| Regression Statistics | |
| --- | --- |
| Multiple R | 0.4884 |
| R Square | 0.2386 |
| Adjusted R Square | 0.2114 |
| Standard Error | 0.5560 |
| Observations | 30 |

ANOVA

| | df | SS | MS | F | Significance F |
| --- | --- | --- | --- | --- | --- |
| Regression | 1 | 2.7117 | 2.7117 | 8.7729 | 0.00617 |
| Residual | 28 | 8.6549 | 0.3091 | | |
| Total | 29 | 11.3667 | | | |

Forensic Accounting Efficiency

| | Coefficients | Standard Error | t Stat | P-value | Lower 95% | Upper 95% | Lower 95.0% | Upper 95.0% |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Intercept | 0.7817 | 0.2838 | 2.7544 | 0.01022 | 0.2004 | 1.3630 | 0.2004 | 1.3630 |
| Technology Adoption | 0.5352 | 0.1807 | 2.9619 | 0.00617 | 0.1651 | 0.9054 | 0.1651 | 0.9054 |

Table 3 shows the regression analysis by analysing the relationship between technology adoption as an independent variable and forensic accounting efficiency as a dependent variable, demonstrating a positive moderate correlation between them by Multiple R 0.488. The R Square of 0.239 suggests that the technology adoption score accounts for about 23.9% of the variance in forensic accounting efficiency. The model's statistical significance at the 1% level is confirmed by the F-statistic of 8.773 with p = 0.00617, which suggests that technology adoption accurately predicts forensic accounting efficiency. For technology adoption, the slope coefficient is 0.5352, which is statistically significant (p = 0.006). In other

words, the forensic accounting efficiency increases by an average of 0.5352 units for every unit gain in forensic accounting efficiency. An F-statistic has a p-value of 0.00617, which means that the model is statistically significant, and the independent variable explains a meaningful amount of the variation in forensic accounting efficiency. Thus, the null hypothesis is resected, and ($H1_1$) is accepted, ensuring that technology adoption positively influences forensic accounting efficiency. This makes the case that technology adoption is a factor that can significantly explain the changes in forensic accounting efficiency.

**Table 4** *Regression Analysis 2*

| Regression Statistics | |
|---|---|
| Multiple R | 0.0693 |
| R Square | 0.0048 |
| Adjusted R Square | -0.0307 |
| Standard Error | 0.8843 |
| Observations | 30 |

ANOVA

| | df | SS | MS | F | Significance F |
|---|---|---|---|---|---|
| Regression | 1 | 0.1056 | 0.1056 | 0.1351 | 0.7160 |
| Residual | 28 | 21.8944 | 0.7819 | | |
| Total | 29 | 22 | | | |

| | Organisational Challenges | | | | | | |
|---|---|---|---|---|---|---|---|
| | Coefficients | Standard Error | t Stat | P-value | Lower 95% | Upper 95% | Lower 95.0% | Upper 95.0% |
| Intercept | 2.1549 | 0.4514 | 4.7741 | 0.0001 | 1.2303 | 3.0795 | 1.2303 | 3.0795 |
| Technology Adoption | -0.1056 | 0.2874 | -0.3675 | 0.7160 | -0.6943 | 0.4831 | -0.6943 | 0.4831 |

Table 4 shows the regression of technology adoption and the organisational challenges. A Multiple R of 0.069 signifies a negligible positive correlation between both variables. R Square (0.0048) indicates that 0.48% of the variance in organisational challenges is elucidated by technology adoption. Technology adoption suggests no significant explanatory power for anticipating organisational challenges. Significance F represents the p-value for the complete model. A p-value of 0.716 signifies that the regression model does not have statistical significance, indicating that technology adoption fails to predict organisational challenges. The regression line's slope demonstrates that for each 1-unit rise in technology

adoption, the organisational challenges diminish by 0.11 units. Hence, it accepts the null hypothesis (Organisational challenges do not mediate the relationship between technology adoption and forensic accounting efficiency ($H2_0$)) and rejects the alternative hypothesis.

**Table 5***: Regression Analysis 3*

| *Regression Statistics* | |
|---|---|
| Multiple R | 0.3794 |
| R Square | 0.1440 |
| Adjusted R Square | 0.1134 |
| Standard Error | 0.5895 |
| Observations | 30 |

ANOVA

| | df | SS | MS | F | *Significance F* |
|---|---|---|---|---|---|
| Regression | 1 | 1.6364 | 1.6364 | 4.7088 | 0.0386 |
| Residual | 28 | 9.7303 | 0.3475 | | |
| Total | 29 | 11.3667 | | | |

| Forensic Accounting Efficiency | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | *Coefficients* | *Standard Error* | *t Stat* | *P-value* | *Lower 95%* | *Upper 95%* | *Lower 95.0%* | *Upper 95.0%* |
| Intercept | 2.1121 | 0.2734 | 7.7244 | 0.0000 | 1.5520 | 2.6722 | 1.5520 | 2.6722 |
| Organisational Challenges | -0.2727 | 0.1257 | -2.1700 | 0.0386 | -0.5302 | -0.0153 | -0.5302 | -0.0153 |

The Multiple R of 0.3794 indicates a moderate linear correlation between organisational challenges and the efficiency of forensic accounting. R Square (0.14) signifies that about 14.4% of the variance in forensic accounting efficiency is attributable to organisational issues. The regression is statistically significant at just below 5%, as indicated by the F-Statistic of 4.7088 and a significance F of 0.0386. This suggests that organisational challenges have significantly impacted forensic accounting efficiency. The intercept of 2.11, accompanied by a highly significant p-value, indicates that in the absence of organisational challenges, the baseline efficiency of forensic accounting is 2.11. The organisational challenges negatively impact the efficiency of forensic accounting, with a p-value of 0.0386 (moderately significant) and a coefficient of -0.27. For every unit rise in

organisational challenges, the efficiency of forensic accounting diminishes by 0.27 units.

**Table 6**: *Regression Analysis 4*

| Regression Statistics | |
|---|---|
| Multiple R | 0.5988 |
| R Square | 0.3586 |
| Adjusted R Square | 0.3111 |
| Standard Error | 0.5196 |
| Observations | 30 |

ANOVA

| | df | SS | MS | F | Significance F |
|---|---|---|---|---|---|
| Regression | 2 | 4.0757 | 2.0379 | 7.5467 | 0.0025 |
| Residual | 27 | 7.2909 | 0.2700 | | |
| Total | 29 | 11.3667 | | | |

Forensic Accounting Efficiency

| | Coefficients | Standard Error | t Stat | P-value | Lower 95% | Upper 95% | Lower 95.0% | Upper 95.0% |
|---|---|---|---|---|---|---|---|---|
| Intercept | 1.3196 | 0.3573 | 3.6935 | 0.0010 | 0.5865 | 2.0526 | 0.5865 | 2.0526 |
| Technology Adoption | 0.5088 | 0.1693 | 3.0056 | 0.0057 | 0.1615 | 0.8562 | 0.1615 | 0.8562 |
| Organisational Challenges | -0.2496 | 0.1111 | -2.2475 | 0.0330 | -0.4775 | -0.0217 | -0.4775 | -0.0217 |

Table 6 shows the relationship between forensic accounting efficiency (dependent variable) and technology adoption with organisational challenges (independent variables). Multiple R (0.599) represents the correlation coefficient indicating the strength and direction of the association among the predicted variables (technology adoption and organisational challenges) and the dependent variable, indicating a moderate positive correlation among variables. Technology adoption and organisational challenges combined include 35.9% of the variance in forensic accounting efficiency, as the R Square indicates (0.359). The coefficient of

technology adoption in forensic accounting efficiency increases by 0.509 units for each unit, with organisational challenges held constant. The P-value of (0.0057) indicates a statistically significant relationship between technology adoption and forensic accounting efficiency. A higher perceived technology adoption is linked to a significantly higher perceived forensic accounting efficiency. The coefficient shows that with each 1-unit increment in organisational challenges, forensic accounting efficiency diminishes by 0.250 units. P-value (0.03298) indicates a statistically significant correlation between the two variables since $P < 0.05$. The regression analysis is statistically significant, indicating that technology adoption and organisational challenges are influential indicators of forensic accounting efficiency.

## 4.3. ANOVA Analysis

**Table 7:** *ANOVA Single Factor Analysis*

| Groups | Count | Sum | Average | Variance | | |
|--------|-------|-----|---------|----------|---|---|
| 1-5 Years | 2 | 4 | 2 | 2 | | |
| 6-10 Years | 11 | 19 | 1.7273 | 1.4182 | | |
| 11-15 Years | 13 | 30 | 2.3077 | 1.5641 | | |
| Above 15 Years | 4 | 6 | 1.5 | 0.3333 | | |
| ANOVA | | | | | | |
| Source of Variation | SS | df | MS | F | P-value | F crit |
| Between Groups | 3.0156 | 3 | 1.0052 | 0.7270 | 0.5451 | 2.9752 |
| Within Groups | 35.9511 | 26 | 1.3827 | | | |
| Total | 38.9667 | 29 | | | | |

Table 7 Shows an ANOVA analysis that compares the average of two groups: the years of experience in the fraud detection field and the level of agreement on the statement about AI improving fraud detection accuracy over the years. The group with (11-15 Years) of experience, 2.31, exhibited higher averages than others, followed by (1-5 Years) with an average of 2, 1.73 for group 6-10 Years, and 1.5 for the group above 15 Years of experience. The ANOVA table shows that the F-statistic is 0.73 and the p-value is 0.55, higher than the significance level (0.05). No statistically significant relationship exists between working experience (the grouping variable) and responses showing agreement that AI improves fraud prevention (the dependent variable). In other words, the job experience of respondents does not significantly affect their agreement on AI-enhancing fraud detection accuracy.

# 5. CONCLUSION

This research has studied the impact of technology on forensic accounting and fraud detection from Omani companies' perspectives. Through regression analyses, the first hypotheses of this research have been accepted and concluded that ($H1_1$) technology positively influences forensic accounting efficiency and ($H2_1$) rejected, showing that organisational challenges do not mediate the relationship between technology adoption and forensic accounting efficiency. Undoubtedly, forensic accounting efficiency has a direct relationship between technology adoption and organisational challenges separately. However, organisational challenges do not correlate with technology adoption, which shows that other challenges may affect this adoption. These findings shed deeper insight into the significance of technology in forensic accounting, enhancing fraud detection techniques and increasing trust in financial systems, benefiting regulators, organisations, and stakeholders.

These are the suggested recommendations for the companies: Encourage businesses to augment investments in artificial intelligence and machine learning technology. As evidenced by the research findings, these techniques have considerable potential in enhancing the rapidity and accuracy of fraud detection systems. Also, auditors must receive continuous training in digital fraud detection techniques to guarantee they can utilise sophisticated tools and keep up with technological advancements. Additionally, as forensic accounting increasingly depends on digital technology, enhancing and integrating comprehensive cybersecurity measures is crucial for protecting sensitive data and maintaining confidence within financial reporting systems.

## 5.1. Limitations

One of the main limitations encountered in this study was the scarcity of relevant journal articles on this specialised topic, which requires looking for specific articles related to this topic. This research discusses the new technologies used and applied nowadays, which are still developing regularly, and researchers are trying to catch the advancements of these technologies. Hence, most of the articles found were recently published a few months ago, and choosing journal articles over the last five years would enhance the accuracy of the data gathered. Finally, the audience of this study has specific characteristics, such as obtaining a certified fraud examiner (CFE), certified forensic accountant (CrFA), or other certificates focused on fraud detection. Forensic accountants or auditors specialising in fraud detection investigations in Oman are not easily reachable or accessible.

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# Employee Personality Traits and their Prospected Behavior to Adopt Organizational Cynicism: A Mediated Moderated Model

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## ABSTRACT

This study examined the personality qualities of employees and how they responded to organizational cynicism in Pakistan's banking industry by using organizational commitment as a mediating factor. The research construct is supported by the HEXACO model. The study used quantitative survey method, and data from bank employees in Islamabad, Rawalpindi, and Mianwali were obtained. The study's sample included 493 bank employees from various branches located in these cities. Using SPSS-21 and SmartPLS-4, the analysis includes reliability testing, confirmatory factor analysis, and structural equation modeling. The results of the analysis demonstrated a strong positive correlation between extraversion, conscientiousness, agreeableness, openness to new experiences, honesty-humility, and organizational commitment. Furthermore, the results revealed that, through the mediating role of organizational commitment, the personality traits of conscientiousness, extraversion, honesty-humility, and openness to new experiences have a negative connection with organizational cynicism. The results also showed a negative relationship between organizational commitment and organizational cynicism in relation to occupational stress. The results demonstrate the significance of HEXACO personality traits in explaining employees' commitment levels and how they respond to cynicism in the workplace. Findings contribute to literature to understand the interplay between personality, commitment, and cynicism. These results provide practical guidance to HR professionals and policymakers by informing recruitment practices and commitment-building activities to decrease cynicism at work and improve organizational harmony.

**Keywords:** HEXACO Personality Traits, Organizational Commitment, Organizational Cynicism, Occupational Stress.

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# 1. INTRODUCTION

Organizations endeavor to ensure their longevity by adapting to new developments and changes. Therefore, it is imperative for firms to meticulously build their organizational structure to achieve their primary objectives and aspirations effectively. Hence, it is imperative to recognize that organizations inherently rely on employees, who are essential to these entities. Consequently, employees should be regarded as a focal point of concern within the organizational context. Businesses must concentrate on improving several facets of employees' work environment, job performance, and happiness to improve organizational performance and achieve a sustained competitive edge. Agreeing to (Quick et al., 2001), employees possess certain job expectations, and their ability to maintain good performance and exhibit positive attitudes towards the organization is contingent upon their level of job satisfaction. According to (Qian & Daniels, 2008), the emergence of disappointment among employees is associated with developing negative attitudes. Consequently, as noted (Kirjonen & Hänninen, 1984), employees tend to exhibit a desire to disassociate themselves from the firm promptly. Organizational behavior has witnessed an increasing focus on aspects such as job satisfaction, employee interactions, job transition, and organizational commitment. Newly, there is a notable interest in the concept of cynicism (Bommer et al., 2005). Behavior cynicism refers to a pessimistic attitude displayed by employees, which prompts them to share unfavorable information about organizations with those external to the organization. For example, the authors (Dean et al., 1998) express discontent or critique their respective organizations. Özler and Atalay (2011) argue that companies generally face significant criticisms, employ sarcastic humor, and are subject to pessimistic forecasts. Prior investigations determined a correlation between organizational cynicism and individuals' experiences within corporations (Wanous et al., 1994; Nafei, 2013; Andersson and Bateman, 1997; Naus et al., 2007; Kutanis and Çetinel, 2009; Johnson and O'Leary-Kelly, 2003; Aydın Tükeltürk et al., 2013; Özler and Atalay 2011; Kasalak and Aksu, 2014). It is thought that organizational cynicism is related to personality in addition to organizational characteristics and experiences. According to Eren (1984), individuals exhibit varying emotions, attitudes, and behaviors across diverse domains of human existence. These distinctions are mostly attributed to variations in personality. If employees perceive that the emotional demands of their employment exceed their capacity to manage, this can deplete their emotional resources. This situation may be harmful to the organization by instilling negativity, feelings of disappointment, and negative feelings in employees (cynicism), which further affects efficiency (Abro et al., 2023), and performance on the job (Chen et al., 2023) and counterproductive work behaviors (Abdullah et al., 2021). HEXACO was used in place of the standard Big

Five model since it comprised the Honesty-Humility factor, which played a crucial role in its use for employee integrity, ethical conduct, and organizational cynicism.

The pillar of Pakistan's economy, the financial industry, has consistently played a crucial role in preventing economic catastrophes (Ahmad et al., 2022). The banking profession is considered arduous and commonly identified with heavy responsibilities, numerous targets, extensive client interactions, time constraints, inconsistent difficulties, too much paperwork, and qualitative burden. (Tiron-Tudor & Faragalla, 2022). However, the banking sector contributes the most to asset composition, with 72.7% of total assets in 2007 and a significant share in the same year's gross domestic product (GDP) (SBP, 2010). Pakistan is dominated by commercial banks (SBP, 2012). The banking sector is an essential segment of the financial area in any economy. Many empirical investigations and conduct in many countries have depicted the negative consequences of work pressure stress on their workers' health, society, and organizational performance (Aboramadan, Turkmenoglu, et al., 2020; Giorgi et al., 2019). Stress constitutes one of the most pressing concerns in Pakistan's banking industry and must be addressed for workers to deliver great work comfortably (Ehsan & Ali, 2019). Stress damages employees' cognitive and emotional behavior, leading employees to negative behavior toward the organization (Aboramadan, Turkmenoglu, et al., 2020). Due to the emergence of the new financial industry, state-owned banks face strict encounters with other banks and workers interacting with extreme pressure levels to meet their work demands (Khalid et al., 2020). The banking sector is an essential segment of the financial area in any economy. Many empirical investigations and conduct in many countries have depicted the negative consequences of work pressure stress on their workers' health, society, and organizational performance (Astrauskaite et al., 2015; Giorgi et al., 2019). Stress constitutes one of the most pressing concerns in Pakistan's banking industry and must be addressed for workers to deliver great work comfortably (Ehsan & Ali, 2019). The prevalence of organizational cynicism among employees has emerged as a prominent phenomenon inside the workplace (Chiaburu et al., 2013). An attitude of frustration, despair, and pessimism is cynicism. Which results in a negative influence on the organization's overall operation and reputation. Personality qualities play a vital role in establishing organizational cynicism (Soomro et al.,2022). Despite the considerable discourse around organizational cynicism, prior academic research remains limited in its ability to ascertain the characteristics that enhance the connection between personality traits and organizational cynicism, particularly within the banking industry in Pakistan. Recent research demonstrates that organizational cynicism undermines the employees' well-being and performance at work, particularly in small and medium-sized service enterprises (del Pilar Pulido-Ramírez et al., 2025). To mitigate these adverse effects, there is a need to investigate the underlying factors contributing to organizational cynicism. This study fills the void by implementing the HEXACO personality model to

examine the complex relationship between employees' personality traits, their level of commitment to the organization, and the subsequent development of organizational cynicism. This multi-faceted issue requires a comprehensive investigation to uncover the intricate factors within this sector. This investigation aims to provide a thorough understanding of these connections, shedding light on the factors influencing employee behavior towards cynicism within Pakistani banking institutions. Ultimately, it seeks to offer practical insights for cultivating a more positive and productive organizational culture. The importance of the study lies in its potential to provide constructive comprehensions into employee behavior within the banking sector. Research on the interplay between HEXACO personality traits, commitment, and cynicism among bank employees holds several important implications. By investigating the relationships between HEXACO personality qualities, organizational commitment, and organizational cynicism within banking industry, this research will contribute to a deeper understanding of how individual characteristics impact employee behaviors. This can help banks tailor their management and human resources strategies to create a more conducive and supportive work environment. Understanding the role of personality in influencing organizational commitment and cynicism can assist banks in identifying factors that influence employee engagement and retention. Banks can use this knowledge to design targeted programs to increase job satisfaction and reduce cynicism, leading to a more committed and motivated workforce. Though organizational cynicism and personality studies have been gaining increased interest, little empirical research is available to investigate such dynamics in Pakistani banking based on the HEXACO model. This research fills such a void by suggesting a mediated-moderated model linking personality to cynicism via organizational commitment with occupational stress moderating such relationships. The research provides theoretical contributions and practical recommendations for employee attitude management. Therefore, the current research makes an addition with a localized stakeholder decision-making model in HR and leadership. This research is structured in the following way. Section 02 will explain the literature review about the variables of the study. Section 03 will explain the methodology, data composition, and analysis tools. Section 4 will explain the specification analysis, and last Section 05 will give a conclusion, implications, and policy recommendations.

## 2. LITERATURE REVIEW

Organizational cynicism is "a both general and particular mentality that expresses disappointment, desperation, and dissatisfaction as well as contempt for and mistrust of an individual, group, philosophy, social convention, or institution."" (Andersson, 1996). "One's negative attitude towards organization" (Abraham,

2000). "Employee's negative attitude towards the organization, its practices, processes, and management" (Wilkerson et al., 2008). "An attitude composed of cognitive (faith), affective (emotion) and behavioral (behavior) tendencies" (Kalağan & Güzeller, 2010). The literature study of (Dean Jr et al., 1998) identified three dimensions of organizational cynicism: cognitive cynicism, affective cynicism, and behavioral cynicism. "Cognitive cynicism" refers to the belief that the organization is dishonest and that its methods lack fairness, honesty, and truthfulness. (Dean Jr et al., 1998). Employee cynicism of their companies is called the cognitive component (Urbany, 2005). Employees may compromise their value judgments, including sincerity, frankness, honesty, and truth, and act dishonestly and immorally in their best interests (Kalağan, 2009). The "effective cynicism" component includes negative feelings directed at the structure and intensely personal feelings like disrespect, rage, distress, and shame (O'Leary, 2003). (Dean Jr et al., 1998) People with cynical views towards their organizations disregard organizational principles and regulations because they do not take these individuals seriously; as a result, they engage in a great deal of misconduct. Cynical people also struggle to believe in others and prioritize their interests over those of others. Strong emotional responses such as disdain, wrath, sorrow, and shame are part of the effective component of organizational cynicism. Disrespect, failure to see the worth of others, wrath, rage, hatred of others, hubris, moral corruption, disappointment, and unreliability all exist here. "Behavioral cynicism" refers to Staff who behave cynically and are unenthusiastic about future organization-related events, engage in cynical humor, disdain their organizations, and act brutally and innocuously while moaning about their organizations exhibit cynical behavior and attitudes (Dean Jr et al., 1998). Cynical behavior can also be shown in groups through nonverbal cues. Symbolic gestures, sarcastic grins, and mocking laughter can be examples of negative behavior (Brandes & Das, 2006). Cynical employees are characterized by several negative traits, including a gloomy outlook on the company's future, a sarcastic sense of humor, a disdain for the organization, and a tendency to voice severe criticism. According to research, organizational cynicism has impacts on personnel leading to in low efficiency, unwillingness in exhibiting organizational citizenship, unethical conduct, inspiring decrease, interpersonal disputes, absenteeism, an increase in employment termination, a decline in commitment to the organization, and dissatisfaction with work, all of which may negatively impact organizational efficiency (Cinar, Karciıglu, & Aslan, 2014; Kaygin et al., 2017; Shahzad & Mahmood, 2012). An investigation proved that organizational cynicism affects employee performance (Dimbga et al., 2022). Organizational cynicism is a situation where many workers distrust the company. Another meaning of organizational cynicism is the belief that an organization lacks moral character and consistently violates values like sincerity and honesty, which harm organizational performance, Because of Pakistan's collectivist society, cynical employees do not demonstrate commitment to labor organizations (Bashir & Ramay, 2008). Researchers Abugre (2017) found that unfavorable connections in

workplaces that actively include individuals' intents to quit the firm were predicted and moderated by organizational cynicism (OC). According to research conducted in Pakistan by Arslan and Roudaki (2019), organizational cynicism (OC) has a negative and substantial influence on employee performance (EP), while employee engagement moderates the relationship among OC and EP. Results from a study conducted in Pakistan by (Abdullah et al. 2021) show that when workers' psychological capital is low, they only exhibit unproductive job behaviors associated with organizational cynicism (OC).

Literature posits that personality is an essential part of life that influences how an individual thinks, feels, and behaves (Costa & McCrae, 1992). According to (McCrae & Costa, 1992), the big-five personality model is the most frequently used and standard model of personality in literature. It includes Openness, Extraversion, Agreeableness, Conscientiousness, and Emotionality/Neuroticism domains (Goldberg, 1990). However, it has recently been argued that a six-factor structure is preferable to a five-factor one for Personality (Ashton & Lee, 2007). In contrast, the last decade has witnessed the emergence and rising prominence of a newer six-factor structure known as the HEXACO model (Lee & Ashton, 2004). The HEXACO model of personality was first introduced by Ashton and Lee in 2001 as an alternative to the widely used Big-Five model of Personality (Ashton & Lee, 2001). The HEXACO model's primary goal was to incorporate a sixth trait of Personality, Honesty-Humility, that defines a tendency to be fair and genuine in relations with others which was not explicitly represented in the Big Five model.
The HEXACO personality framework is widely used in personality psychology (Thielmann et al., 2022). It contains six factors that measure traits along the dimensions of "Honesty-Humility, Emotionality, Extraversion, Agreeableness, Conscientiousness, and Openness to Experience"(Ashton & Lee, 2007). The HEXACO model of personality was developed to supersede some of the limitations of the Five-Factor Model (FFM) and offer a more complex model for exploring personality traits. It came out of large lexical studies of self and observer ratings of personality-descriptive terms in several languages, thus with greater cross-cultural validity and theoretical scope (Sharifibastan et al., 2025). In the HEXACO model, The Honesty-Humility (H) factor is distinctive and measures characteristics such as fairness, sincerity, modesty, and greediness avoidance. Emotionality (E) refers to emotional sensitivity and the tendency to experience anxiety and vulnerability. Extraversion (X) measures social behavior and the tendency to seek stimulation and activity. Agreeableness (A) refers to traits such as kindness, trust, and forgiveness. Conscientiousness (C) measures self-discipline, organization, and responsibility. Finally, Openness to Experience (O) refers to curiosity, creativity, and appreciation for art and beauty (Ashton & Lee, 2007). Researchers have used the HEXACO model to investigate leadership, decision-making, and job satisfaction. Another study uncovered that (Rothman & Coetzer,

2002). Previous Studies have explored the relationship among HEXACO personality traits and job performance, leadership, and managerial decision-making styles. The results of (Soomro et al.,2022) suggest that agreeableness, extraversion, emotional stability, conscientiousness, and openness contribute significantly positively to cognitive, affective, and behavioral cynicism dimensions. But these cynicism dimensions are not able to predict employee performance significantly, summing up that cynical attitude and objective work performance have a weak or non-significant relationship. (Van Eeden et al., 2008) Found that individuals with high Agreeableness and Conscientiousness displayed transformational leadership styles more likely, while individuals with high Neuroticism displayed transactional leadership styles. A recent study found that individuals with high agreeableness trait are negatively significantly related to cynicism (Blötner, 2025). Another study found that (Murad & Khan, 2022) while individuals high in Conscientiousness preferred analytical decision-making styles. Additionally, investigations have researched the realtionship among HEXACO personality traits and job satisfaction (Saltukoğlu et al.) and the role of Honesty-Humility in ethical decision-making in the workplace (Allgaier et al., 2020). A recent study Wunk(2025) found that Honesty-Humility personality trait is negatively related to organizational cynicism. Organizational commitment has been defined as "an affection or attitude of the individuals improve towards the objective of the specific firm "(Bashir & Ramay, 2008).

Organizational commitment refers to the aspiration for the workers to be in the right place in the firm and ignite them to add more arduous work for corporate profit (Noor et al., 2020). According to the literature study (Mathieu & Zajac, 1990), re-conceding the organization's commitment is the opposite of retaining and is an excellent anticipator of the actual turnover behavior. The vital and prominent representatives of the service firms are the frontline employees. Such commitment can implement a social exchange connection connecting employees and the firm as it depicts the strong relationship and obligations of the person in the organization (Cropanzano et al., 2003). Effective interaction has a positive attitude with the customers because they have self-confidence and are well-committed (Woodside et al. 1989). According to (Nägele & Neuenschwander, 2014), Organizational commitment is characterized by improved effort and motivation, better job satisfaction, lower absenteeism, and a more protective message. As a result, organizational dedication may contribute to the corporation's healthy and steady development. Organizational commitment benefits the company by lowering absenteeism and turnover rates and increasing production (Jernigan et al., 2002). According to (Joiner & Bakalis, 2006), a deeply committed employee adds to the company's success. Organizational commitment is a broader thought and different from the satisfaction of the career. It depicts an employee's emotional attachment to the whole direction and is not confined to an actual business (Garland et al., 2009). Analogously, the organization's commitment designates to the level where evidence

of the employee's distinctiveness is linked to the organization (Mowday et al., 2013). Recent research proposes that personality traits operationalized by the HEXACO model can have both direct and indirect influences on individual behavior through a mediating mechanism of commitment (Karim et al., 2024). This provides more insight into how fundamental personality elements might influence positive versus negative attitudes at work, e.g., decreased cynicism and increased engagement.

## 3. METHODOLOGY

The current research relies on factual and quantitative methods to approach the employee's behavior with the influence of organizational cynicism, having an intervening role of organizational commitment and the moderating effect of occupational stress. For such an objective, primary data is gathered via a survey questionnaire from the bank employees. The surveys of self-managed may confirm the whole confidentially, and it is hard to find the survey back to respondents (Bjarnason, 1995). Confidentiality is sure in the author's virtuous right of principle. However, confidentiality is a meaningful feature of the author's design. Confidence in the questionnaire is crucial in preset research to ensure the candidate's response. The questionnaire survey is dispensed to commercial banks located in Rawalpindi, Islamabad, and Mianwali. The present research relies on descriptive research design, and primary data is gathered via Survey questionnaires from banking sector workers. For this reason, printed and Google forms (online questionnaires) are dispensed among the targeted respondents. The survey questionnaire is an appropriate way to engage the present study's primary data. Further, it is utilized to examine the hypothesized relations. Such a mechanism is like an interview type (Malhotra et al., 1996). Therefore, the questionnaire is a sensitive, organized matter to collect the respondents' data. According to the study (Churchill & Iacobucci, 2006), step one includes an extensive work review related to the literature or sufficient interpretation of the past studies, which are implemented in the current research. This stage ensures that all data collection through research instrument responses medium to fulfill the research targets.

Different tools are applied systematically, such as respondents' profile descriptive analysis, research variables descriptive Analysis, correlation analysis, structural equation model, and standard variance method. Statistical software (Smart PLS 4) and statistical package for social sciences (SPSS 21) have been used to analyze data. SmartPLS-4 was utilized due to its capacity for handling complex models with latent constructs and Partial Least Squares SEM, while SPSS-21 was utilized for reliability tests and basic analysis. The sample size of n=493 is well beyond Hair et al.'s (2019) minimum requirements specified for SEM and possesses sound statistical power. This methodological approach is consistent with

earlier validated procedures employed in organizational behavior studies (e.g., Bagozzi & Yi, 1988; Hair et al., 2006) to enhance the reliability and validity of the approaches used.

# 4. Analysis and Results

The data was collected by distributing the questionnaire among the employees (to both genders) of the different banks in Rawalpindi, Islamabad, and Mianwali including main and subbranches from on the certainty that almost all the branches pinpoint in such cities that can better speak for them. It concentrated on all categories of employees in the banking sector.

**Table 1** *Demographics Descriptive Statistics*

|  |  | Respondent Gender | Respondent Age | Respondent Education | Respondent Experience |
|---|---|---|---|---|---|
| N | Valid | 493 | 493 | 493 | 493 |
|  | Missing | 0 | 0 | 0 | 0 |
| Mean |  | 1.2632 | 2.9757 | 1.9879 | 1.7874 |
| Std. Deviation |  | .44079 | .77970 | .68884 | .54917 |
| Skewness |  | 1.079 | -.164 | .651 | .523 |
| Std. Error of Skewness |  | .110 | .110 | .110 | .110 |
| Kurtosis |  | -.839 | .355 | 1.020 | 2.893 |
| Std. Error of Kurtosis |  | .219 | .219 | .219 | .219 |
| Minimum |  | 1.00 | 1.00 | 1.00 | 1.00 |
| Maximum |  | 2.00 | 5.00 | 4.00 | 4.00 |

For respondent age, the mean age is approximately 2.98, which suggests that, on average, the respondents are around 29 years old. The standard deviation of 0.78 indicates a relatively wide age range. The skewness value of -0.164 indicates a slight negative skew, implying that the distribution may have a slightly longer tail on the older age side. This descriptive statistics table provides valuable insights into the demographic characteristics of the respondents, indicating that the sample is slightly skewed towards males, includes a range of ages with a slight bias towards younger respondents.

## 4.1 Correlations Analysis

The correlation table presents the interrelationships between the variables in the study, providing valuable insights into their relationships.

**Table 2** *Correlation Analysis*

|      | HH | EMO | EXT | AGR | CON | OPE | OCOM | OCY |
|------|------|------|------|------|------|------|------|------|
| HH   | 1 | | | | | | | |
| EMO  | 0.043* | 1 | | | | | | |
| EXT  | .548** | .410** | 1 | | | | | |
| AGR  | -0.044* | -0.081* | -0.086* | 1 | | | | |
| CON  | .571** | .219** | .708** | -0.018* | 1 | | | |
| OPE  | -.093* | -0.061* | -0.03* | -0.072* | -0.009* | 1 | | |
| OCOM | .799** | 0.08 | .716** | 0.001* | .744** | -0.021* | 1 | |
| OCY  | 0.088 | -0.059 | -.159** | -.157** | -.121** | .157** | -.157** | 1 |

*,**. Correlation is significant at the 0.01, & 0.05 level (2-tailed).

The correlation Analysis has been performed to examine the relationship among all variables. The Correlation results among variables found positive i.e., EMO r = .043, EXT r = .548, $p < 0.01$, AGR r = -.044, CON r = .571, $p < 0.01$, OPEN r = -.093, $p < 0.01$. The other variable i.e., OCOM r = .799, $p > 0.01$. similarly, variable i.e., OCY = .088, $p < 0.01$ and the last variable i.e., OS r = .213, $p < 0.01$.

## 4.2 Reliability Statistics

In psychometrics, the measurement of a variable consistency is called reliability. A measurement that provides the same output in different circumstances is called a reliable measure (Carlson et al., 2018). Cronbach's Alpha has been calculated to anticipate the measure's internal consistency. Cronbach's Alpha is the item's average intercorrelated function and the measured variables numbers in a scale used for grand scales. The more a grand summated rating has, the Cronbach alpha value is kept by keeping everything constant. Having the number of items for measuring variables (construct) to measure the scale reliability for the study ameliorates the preciseness or reliability of the study instruments (Hinkin, 1998).

The following table shows the reliability or questionnaire's internal consistency of the study factors. According to the study of George and Mallery (2003) an acceptable range of Cronbach's Alpha which is less than the .5 value is not acceptable. Moreover, a value of .5 is categorized as weak, while a value of .9 is considered excellent reliability (George & Mallery, 2003). Therefore, the Cronbach Alpha value ranges between 0.5 to .9 for reliability. Table 3 shows the Cronbach's Alpha of the study variables. The table indicates that the Cronbach alpha value of all variables is in the acceptable range. These results show that these instruments have internal consistency and are considered good data collection instruments. The item numbers are also presented in the last column of the table 3.

**Table 3** *Cronbach Alpha*

| Sr. No | Variable | Cronbach's Alpha | No. of items |
|--------|----------|------------------|--------------|
| 1 | Honesty-Humility | 0.880 | 10 |
| 2 | Emotionality | 0.906 | 10 |
| 3 | Extraversion | 0.796 | 10 |
| 4 | Agreeableness | 0.874 | 10 |
| 5 | Conscientiousness | 0.806 | 10 |
| 6 | Openness to experience | 0.889 | 10 |
| 7 | Organizational cynicism | 0.988 | 15 |
| 8 | Organizational commitment | 0.967 | 6 |
| 9 | Occupational stress | 0.882 | 15 |

## 4.3 KMO and Bartlett's Test

Kaiser-Meyer-Olkin and Bartlett's Test was performed by IBM SPSS 21 software. Table 4 shows the results of KMO and Bartlett's test. The KMO value of 0.918 is quite high, close to 1. This suggests that the variables in your dataset are highly correlated, indicating that factor analysis is likely to be appropriate and could yield meaningful results. Bartlett's test statistic of approximately 40598.042 with 3240 degrees of freedom (df) yields a p-value of 0.000. Since the p-value is very small (much less than 0.05), can reject the null hypothesis. This implies that the correlation matrix is not an identity matrix, and there are significant relationships among the variables in the dataset, making it suitable for factor analysis.

**Table 4** *KMO and Bartlett's Test*

| *KMO and Bartlett's Test* | |
|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | 0.918 |

| Bartlett's Test of Sphericity | Approx. Chi-Square | 40598.04 |
| | df | 3240 |
| | Sig. | 0 |

Based on the provided KMO value and Bartlett's test results, data seems to be well-suited for factor analysis. The high KMO value indicates that the variables are correlated, and the small p-value from Bartlett's test suggests that the variables have significant relationships, supporting the use of factor analysis techniques.

## 4.4 Confirmatory Factor Analysis of the validity of the variable

The first phase of the measurement model was common factor analysis. To verify all the observed variables measurement model consists of two processes. Factor analysis examines critical types or relationships for extensive accumulation of factors to define whether information can be condensed or precise in a modest set of mechanisms (Hair et al., 2006). There are two different sorts of factor analysis such as exploratory factor analysis and confirmatory factor analysis. Between both factor analyses, confirmatory factor analysis has been applied to this study. In the five-point Likert questionnaire, confirmation factor analysis (CFA) is applied on each scale, i.e., HEXACO, organization commitment, organizational cynicism, and occupational stress. The study of Oehley (2007) argues that CFA allows the researchers to state a measurement model to evaluate the perceiving indictors' coherence and approach the underlying theoretical variables they are theoretical to disclose. Therefore, the best fit from the sample in the present study was investigated between the model measurement and data composition. Model fit was examined by analyzing the sequence of goodness of fit. The present study contains latent variables such as honesty-humility, emotionality, extraversion, agreeableness, conscientiousness, openness to experience, organizational cynicism, organizational commitment, and occupational stress. These unobserved variables were estimated through their measured variables. The following part of the study consists of the explanation data analysis of these unobserved variables.

**Table 5** *Calculation of Measurement Model of overall CFA*

| *Parameters with the Acceptable & Calculated Measures* | | | | |
|---|---|---|---|---|
| *Goodness of Fit* | *Acceptable Level* | *Calculated Measures* | *Status* | *Remarks* |
| RMR | < 0.05 shows good fit, but acceptable when < 0.08 | 0.063 | Acceptable | Accepted |

| | | | |
|---|---|---|---|
| GFI | < 1.000 | 0.642 | Acceptable |
| CFI | > 0.900 | 0.905 | Acceptable |
| RMSEA | Best fit when = 0.05, acceptable < 0.08 | 0.064 | Acceptable |
| Degrees of freedom | Should be positive | 3941 | Acceptable |
| Chi-square | - | 11861.872 | Acceptable |

The table presented outlines the goodness of fit measures for a Confirmatory Factor Analysis (CFA) model, assessing the model's adequacy in explaining the observed data. Several fit indices are considered to evaluate the model's performance. Root Mean Square Residual (RMR) is 0.063, which falls within the acceptable range as it is less than 0.08. RMR measures the discrepancies between the observed and model-implied covariances, and a lower value indicates a better fit. The Goodness of Fit Index (GFI) is 0.642, which is considered acceptable. GFI measures the proportion of the total variance accounted for by the model, and values below 1.000 are acceptable. The Comparative Fit Index (CFI) is 0.905, surpassing the acceptable threshold of 0.900. CFI assesses how well the proposed model fits compared to a null model, with higher values indicating a better fit. The Root Mean Square Error of Approximation (RMSEA) is 0.064, which is acceptable, especially since it falls within the range of 0.05 to 0.08, considered acceptable in academic literature. RMSEA assesses the model's goodness of fit in relation to the degrees of freedom. Furthermore, the degrees of freedom for this model are 3941, which is positive, indicating that the model has sufficient degrees of freedom to fit the data.

**Table 6** *Model fit Results*

| | Validity | | | |
|---|---|---|---|---|
| Convergent Validity | | | Discriminant Validity | |
| Variable | AVE > 0.50 | CR > 0.70 | Variables | AVE > Shared Variance |
| Honesty-Humility | 0.511 | 0.820 | HH & OCOM | 0.866 > 0.341 |
| Emotionality | 0.494 | 0.876 | EMO & OCOM | 0.090 > 0.325 |
| Extraversion | 0.685 | 0.705 | EXT & OCOM | 0.823 > 0.389 |
| Agreeableness | 0.49 | 0.853 | AGR & | 0.555 > |

| | | | | |
|---|---|---|---|---|
| | 3 | | OCOM | 0.311 |
| Conscientiousness | 0.540 | 0.706 | CON & OCOM | 0.841 > 0.296 |
| Openness to experience | 0.655 | 0.881 | OPEN & OCOM | 0.592 > 0.360 |
| Organizational cynicism | 0.647 | 0.987 | OCOM & OCY | 0.555 > 0.311 |
| Organizational commitment | 0.529 | 0.961 | OS & OCOM | 0.492 > 0.360 |
| Occupational stress | 0.644 | 0.860 | OS & OCY | 0.620 > 0.389 |

Lastly, the Chi-square statistic is 11861.872, which is acceptable in this context. The Chi-square test assesses the difference between the model-implied and observed covariance matrices, and a non-significant Chi-square indicates a good fit, though its absolute value alone may not be a strong indicator of model fit. The CFA model appears to have an acceptable goodness of fit based on these fit indices. While some indices are slightly above the ideal cutoffs, they generally fall within the range of acceptability, suggesting that the model adequately explains the observed data. Researchers may further scrutinize the model and consider potential modifications to improve fit, if necessary, but these results provide reasonable confidence in the model's appropriateness for the given data.

## 4.5 Structural Model

Following the measurement model for testing the hypothesized relationships among independent and dependent constructs to estimate the structural model. The specification of the model is indicated in the following figure. The model consists of a mean score of nine unobserved factors. Based on the presented model, HEXACO personality traits including honesty-humility (H-H), emotionality (EMO), extraversion (EXT), agreeableness (AGR), conscientiousness (CON) and openness to experience (OPEN) has been considered exogenous variable (Independent variable), organization commitment (OCOM) having mediation role, organizational cynicism (OCY) was an endogenous variable (dependent variable). In the conducted study, the focus was on investigating the impact of HEXACO personality traits as exogenous variables. The HEXACO model comprises six dimensions, namely Honesty-Humility, Emotionality, Extraversion, Agreeableness, Conscientiousness, and Openness to Experience. The set of variables included a total of 60 items, distributed evenly with 10 items representing each dimension. However, during the data analysis phase, it was deemed necessary to refine the measurement instrument. These adjustments were made to ensure the reliability and validity of the measurement instrument, thereby enhancing the overall quality

of the study's findings. In the structural model under investigation, the endogenous variable was organizational cynicism, which was measured using fifteen items. Another variable within the structural model was organizational commitment, consisting of six items. The satisfactory results from structural model estimation for model fit in the following figure and all indices' values indicate admissible fitness such as GFI= 0.916, RMR=0.048, CFI=0.925, and RMSEA= 0.072.
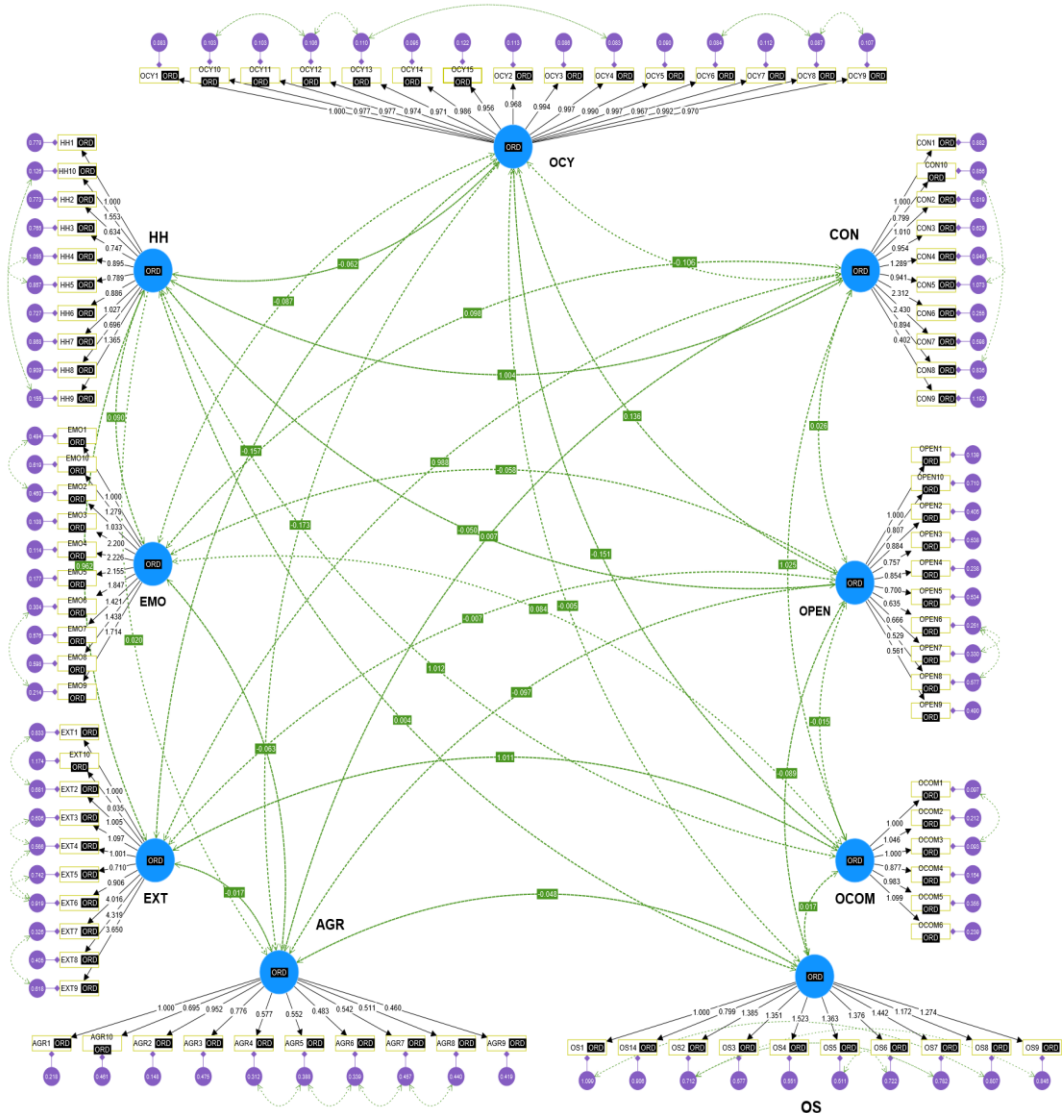


**Figure 1** *Structural Equation Model (SEM) showing latent constructs with their indicators and interrelationships*
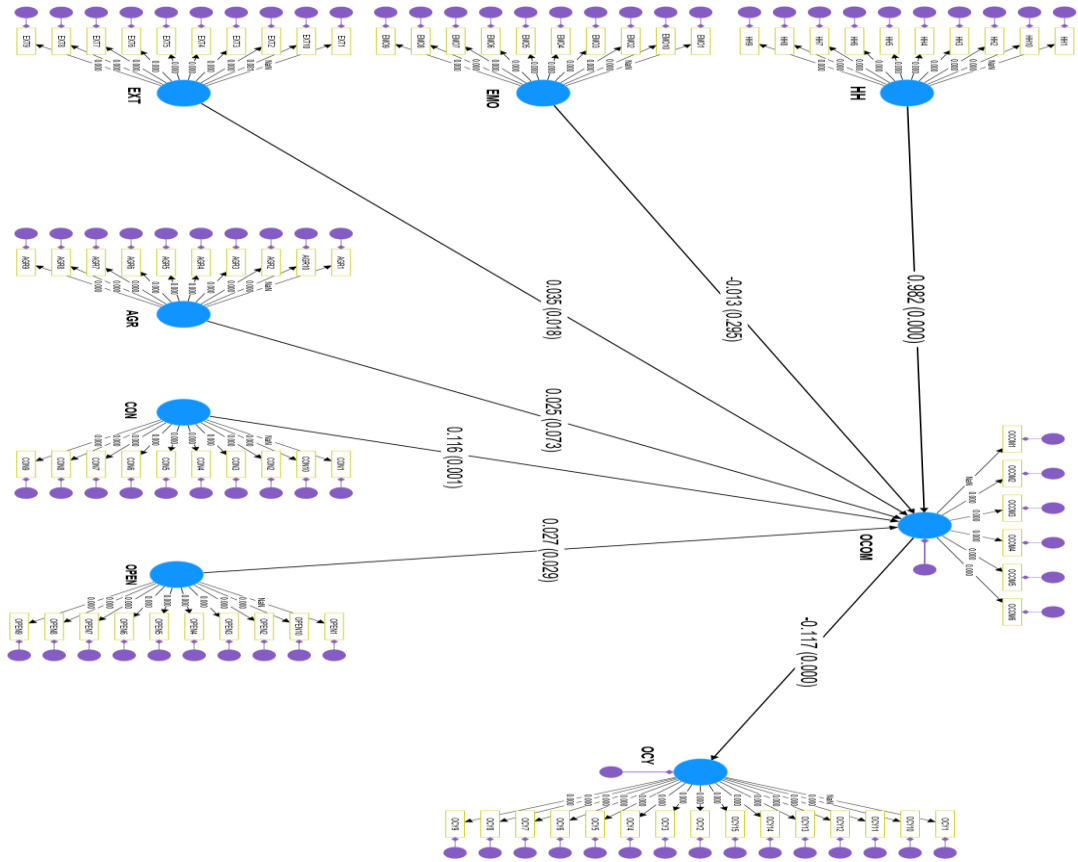
**Figure 2** *Path diagram for structural model*

## 4.6 Direct Effects

Smart PLS 4 is used to investigate the relationship between the latent variables of the study, Table 4.20 summarizes the findings including direct effects of variables, path coefficients, T statistics, and P values of the relationships. There is a strong positive relationship between Honesty-Humility (HH) and Organizational Commitment (OCOM), as shown by the path coefficient of 0.983. The T statistics for this path is 123.369, and the p-value is 0.00, indicating strongly positive statistical significance. Similarly, Emotionality (EMO) has an insignificant impact on Organizational Commitment, as evidenced by the path coefficient of -0.013. The T statistics for this path is 1.048, and the p-value is 0.295, which denotes a statistically insignificant relationship. It has been observed that there is a positive relationship between Extraversion (EXT) and Organizational Commitment (OCOM). The path coefficient between EXT and OCOM is 0.035. The T statistics for this path is 2.377, and the p-value is 0.018, which indicates a statistically small but positive significant outcome. Additionally, there is a positive relationship

between Agreeableness and Organizational Commitment. The path coefficient between AGR and OCOM is 0.024. The T statistics for this path is 1.796, and the p-value is 0.073, which suggests a relatively weak positive but statistically significant outcome. Additionally, there is a strong positive relationship between Conscientiousness (CON) and Organizational Commitment (OCOM), as shown by the path coefficient of 0.114. The T statistics for this path is 3.281, and the p-value is 0.001, indicating moderate positive statistical significance. Similarly, Openness to Experience (OPEN) has a significant positive impact on Organizational Commitment (OCOM), as evidenced by the path coefficient of 0.028. The T statistics for this path is 2.186, and the p-value is 0.029, which also denotes small positive but statistical significance. Through SEM, it has been observed that there is a negative and significant relationship between Organizational commitment (OCOM) and Organizational Cynicism (OCY), as shown by the path coefficient value of -0.114. The T statistics for this path is 3.621, and the p-value is 0.000, which denotes negative statistical significance.

**Table 7** *Calculation of Structural Model*

| Type of effect | Effect | Path Coefficient | T value | P value | Remarks |
|---|---|---|---|---|---|
| Direct effect | HH -> OCOM | 0.982 | 2.369 | 0.000 | Accepted |
| Direct effect | EMO -> OCOM | -0.013 | 1.048 | 0.295 | Rejected |
| Direct effect | EXT -> OCOM | 0.035 | 2.377 | 0.018 | Accepted |
| Direct effect | AGR -> OCOM | 0.025 | 1.796 | 0.073 | Accepted |
| Direct effect | CON -> OCOM | 0.116 | 3.281 | 0.001 | Accepted |
| Direct effect | OPEN -> OCOM | 0.027 | 2.186 | 0.029 | Accepted |
| Direct effect | OCOM -> OCY | -0.117 | 3.621 | 0.029 | Accepted |

## 4.7 Indirect Effects (Mediation)

The study investigated the mediating effects between the variables of the study by structural equational modelling (SEM) using statistical software smart PLS 4. Results of the investigation between the variables honesty-humility (HH), emotionality (EMO), extraversion (EXT), agreeableness (AGR), conscientiousness (CON), openness to experience (OPEN), organizational commitment (OCOM), and organizational cynicism (OCY) are abridged in the table.

**Table 8** *Calculation of Structural Model*

| Type of effect | Effect | Path Coefficient | T value | P value | Remarks |
|---|---|---|---|---|---|
| Indirect effect | HH -> OCOM -> OCY | -0.145 | 3.344 | 0.001 | Accepted |

| | | | | | | |
|---|---|---|---|---|---|---|
| Indirect effect | EMO -> OCOM -> OCY | | 0.003 | 1.024 | 0.306 | Rejected |
| Indirect effect | EXT -> OCOM -> OCY | | -0.006 | 1.848 | 0.065 | Accepted |
| Indirect effect | AGR -> OCOM -> OCY | | -0.003 | 1.497 | 0.135 | Rejected |
| Indirect effect | CON -> OCOM -> OCY | | -0.017 | 2.342 | 0.002 | Accepted |
| Indirect effect | OPEN -> OCOM -> OCY | | -0.003 | 1.843 | 0.066 | Accepted |

The first case examines the indirect effect of the variable honesty-humility (HH) on the dependent variable organizational cynicism (OCY) through the mediator organizational commitment (OCOM). The path coefficient of -0.145 indicates a negative indirect relationship between "HH" and "OCY" through "OCOM." The t-value of 3.344 suggests that this relationship is statistically significant. The low p-value of 0.001 further supports the significance of the relationship, indicating that the effect is not likely due to chance. Therefore, the result is accepted, and it suggests that "HH" has a statistically significant indirect effect on "OCY" through the mediator "OCOM." The second case examines the indirect effect of the variable emotionality (EMO) on the dependent variable organizational cynicism (OCY) through the mediator organizational commitment (OCOM). The path coefficient of 0.003 indicates a very small positive indirect relationship between "EMO" and "OCY" through "OCOM." The t-value of 1.024 is relatively low, and the p-value of 0.306 is greater than the typical significance level of 0.05. These values suggest that the relationship between "EMO" and "OCY" through "OCOM" is not statistically significant. Therefore, the result is rejected, and it implies that "EMO" does not have a statistically significant indirect effect on "OCY" through the mediator "OCOM." The third case examines the indirect effect of the variable extraversion (EXT) on the dependent variable organizational cynicism (OCY) through the mediator organizational commitment (OCOM). The path coefficient of -0.006 indicates a small negative indirect relationship between "EXT" and "OCY" through "OCOM." The t-value of 1.848 is relatively higher than in the second case, but the p-value of 0.065 is slightly above the typical significance level. While the p-value is somewhat borderline, it is still below 0.1, which may be considered as marginally significant. Therefore, the result is tentatively accepted, suggesting that "EXT" may have a weakly significant indirect effect on "OCY" through the mediator "OCOM." The fourth case examines the indirect effect of the variable agreeableness (AGR) on the dependent variable organizational cynicism (OCY) through the mediator organizational commitment (OCOM). The path coefficient of -0.003 indicates a very small negative indirect relationship between "AGR" and

"OCY" through "OCOM." The T-value of 1.497 is moderate, but the p-value of 0.135 is above the typical significance level of 0.05. These values suggest that the relationship between "AGR" and "OCY" through "OCOM" is not statistically significant. Therefore, the result is rejected, indicating that "AGR" does not have a statistically significant indirect effect on "OCY" through the mediator "OCOM." The fifth case examines the indirect effect of the variable conscientiousness (CON) on the dependent variable organizational cynicism (OCY) through the mediator organizational commitment (OCOM). The path coefficient of -0.017 indicates a moderate negative indirect relationship between "CON" and "OCY" through "OCOM." The t-value of 2.342 is relatively high, and the p-value of 0.020 is below the typical significance level of 0.05. These values suggest that the relationship between "CON" and "OCY" through "OCOM" is statistically significant. Therefore, the result is accepted, indicating that "CON" has a statistically significant indirect effect on "OCY" through the mediator "OCOM." The sixth case examines the indirect effect of the variable openness on the dependent variable organizational cynicism (OCY) through the mediator organizational commitment (OCOM). The path coefficient of -0.003 indicates a very small negative indirect relationship between "OPEN" and "OCY" through "OCOM." The T-value of 1.843 is moderate, and the p-value of 0.066 is slightly above the typical significance level. While the p-value is somewhat borderline, it is still below 0.1, which may be considered as marginally significant. Therefore, the result is tentatively accepted, suggesting that "OPEN" may have a weakly significant indirect effect on "OCY" through the mediator "OCOM."

## 4.8 Moderation Results

The moderating effect of occupational stress was analyzed between the relationship of organizational commitment and organizational cynicism using Hayes process. Model number one was used to examine the effect of occupational stress on the relationship between commitment and cynicism. Table 9 contains the results of moderation analysis.

**Table 9** *Summary of Moderation Analysis*

| Interaction effects | Coefficient | t value | p value | LLCI | ULCI |
|---|---|---|---|---|---|
| OS  OCOM | -0.048 | 2.588 | 0.01 | -.0113 | .0210 |

The results of the moderation analysis disclose a significant and meaningful interaction effect in the context of the relationship between organizational commitment (OCOM) and organizational cynicism (OCY), with occupational stress (OS) serving as the moderator. The interaction term "OS_OCOM" has a

coefficient of -0.048, indicating that occupational stress influences the relationship between organizational commitment and organizational cynicism. The statistically significant p-value of 0.01 emphasizes the importance of this moderating effect, indicating that it is unlikely to be due to random chance. In addition, the moderately large t-value of 2.588 indicates that this interaction has a significant practical impact, indicating that the relationship between commitment and cynicism may be attenuated or different when occupational stress is present compared to when it is absent. These findings highlight the significance of considering the role of occupational stress in shaping employee attitudes within organizations, particularly in determining whether commitment can mitigate cynicism under varying levels of stress.

# 5. Detailed Discussion

The study revealed a strong and statistically significant positive relationship between honesty-humility and organizational commitment in the banking industry. This finding is particularly relevant in the financial sector, where trust and integrity are foundational. Employees with higher levels of honesty and humility are likely to align with the ethical values upheld by banks. Employees high on emotionality are noticed to be sincere and fair. Their commitment to the organization is not only evident in their dedication to their work but also in their commitment to upholding the institution's reputation and trustworthiness. The second hypothesis delved into the mediating role of organizational commitment (OCOM) on the relationship between honesty humility (HH) and organizational cynicism (OCY). Surprisingly, even after controlling organizational commitment, there was a statistically significant negative relationship between HH and OCY. This implies that individuals with high levels of honesty and humility not only exhibit stronger commitment to their banking organizations but also tend to be less cynical. The implications of this finding are significant for the banking sector, as reduced cynicism can lead to a more cooperative and harmonious work environment. Turning to the third hypothesis, which explored the relationship between emotionality (EMO) and organizational commitment (OCOM), the results indicated a weak and statistically non-significant negative relationship. This can be due to the high-pressure world of banking, where emotional stability is often valued, this result may suggest that emotional disposition does not significantly affect organizational commitment among employees. This may be due to the high level of fear, anxious feelings, and sentimentality of the employees. Banking institutions may need to focus on other factors to enhance commitment in their workforce. The mediation hypothesis involving emotionality (EMO), organizational commitment (OCOM), and organizational cynicism (OCY) did not yield strong support. The initial link between EMO and OCOM was weak and statistically non-significant. Consequently, it is challenging to establish that

organizational commitment significantly mediates the relationship between emotionality and organizational cynicism within the banking sector, at least based on this study's analysis. The fifth hypothesis explored the relationship between extraversion (EXT) and organizational commitment (OCOM), revealing a positive and statistically significant relationship. This suggests that individuals with higher levels of extraversion tend to exhibit stronger organizational commitment in banking institutions. Employees with this personality trait are sociable, bold and are high on liveliness. In the banking sector, where teamwork and client interactions are vital, extraverted employees may engage more readily with colleagues and clients, contributing to enhanced commitment levels. These findings are supported by the studies (Farrukh et al., 2017) and results of the analysis align with the conclusion drawn by Farrukh et al. (2016). Employees that exhibit extroverted traits tend to establish a mutually beneficial relationship with their employer, perceiving it as a psychological contract wherein they contribute to fostering a socially conducive environment (Herath & Shamila, 2018). As previously mentioned, individuals with high levels of extroversion exhibit characteristics such as sociability, assertiveness, verbosity, and gregariousness (Takase et al., 2018). Results of the current study are also aligned with (Benard Korankye 2021), and it is evident that personality trait extraversion has a positive and significant relationship with organizational commitment. The analysis of the mediation hypothesis involving extraversion (EXT), organizational commitment (OCOM), and organizational cynicism (OCY) indicated a marginally significant negative relationship. This suggests that highly extraverted banking employees, when committed to their organization, may exhibit slightly lower levels of organizational cynicism. This result aligns with the notion that extraverted individuals tend to focus on the positive aspects of their organizations and are more likely to engage with colleagues and clients constructively. These findings conclude that personality trait extraversion negatively impacts organizational cynicism with the mediation of organizational commitment. Findings of the study are different from recent study (Soomro et al.,2022) findings where direct effect of extraversion on organizational cynicism was positively significant. While results are aligned with the previous investigation (Acaray and Yildirim,2017). Employees high on agreeableness are flexible, gentle, and have a high level of forgiveness and patience. The seventh hypothesis examined the relationship between agreeableness (AGR) and organizational commitment (OCOM), indicating a positive relationship, though not highly statistically significant. This suggests that agreeable individuals in the banking sector may exhibit slightly higher levels of organizational commitment. While the statistical significance is not strong, agreeable, characterized by cooperativeness and interpersonal warmth, it may contribute to a more harmonious work environment. These findings align with the study (Farrukh et al., 2017). Findings of the current study are also supported by the previous study (Benard Korankye 2021). The mediation hypothesis involving agreeableness (AGR), organizational commitment (OCOM), and organizational cynicism (OCY)

did not provide strong support. The influence of agreeableness and organizational commitment on organizational cynicism was weak and not statistically significant. This implies that agreeableness and organizational commitment may not significantly impact the levels of organizational cynicism observed among banking employees in this specific analysis. A previous study (Soomro et al., 2022) found a positive direct relationship between emotionality and cynicism. The ninth hypothesis investigated the relationship between conscientiousness (CON) and organizational commitment (OCOM). The results indicated a robust and statistically significant positive relationship. Employees with higher levels of conscientiousness, characterized by responsibility and diligence, tend to demonstrate stronger organizational commitment in the banking sector. Conscientious employees are seen as reliable, dependable, and dedicated, qualities highly valued in the financial industry. Individuals that possess a high level of conscientiousness are commonly described as being dependable, meticulous, organized, hard-working, diligent and perfectionist. These findings are aligned with previously suggested arguments of (Chiaburu et al.,2011), and (Takase et al., 2018). And the results were contrary to the findings of Ziapour et al., (2017) and (Korankye et al., 2021). The mediation hypothesis involving conscientiousness (CON), organizational commitment (OCOM), and organizational cynicism (OCY) revealed a statistically significant negative relationship. This suggests that highly conscientious banking employees, when committed to their organization, are less inclined to engage in organizational cynicism. This finding underscores the importance of conscientiousness in mitigating cynicism, as committed individuals are more likely to view their organization's decisions and actions in a positive light. These findings conclude that personality trait conscientiousness negatively impacts organizational cynicism with the mediation of organizational commitment. Findings of the study are different from recent study (Soomro et al.,2022) findings where direct effect of conscientiousness on organizational cynicism was positively significant. While results are aligned with the previous investigation (Acaray and Yildirim,2017). The eleventh hypothesis examined the relationship between openness to experience (OPEN) and organizational commitment (OCOM), indicating a positive and statistically significant relationship. Employees who are open to new challenges and experiences tend to exhibit stronger organizational commitment in the banking sector. Their willingness to adapt to change, embrace innovative ideas, and invest in their roles contributes to their commitment to the organization's mission. These findings Contradicts the arguments of (Choi et al., (2017) and are aligned with findings of (Fernández-Mesa et al., 2018) (Benard Korankye 2021). The mediation hypothesis involving openness to experience (OPEN), organizational commitment (OCOM), and organizational cynicism (OCY) revealed a marginally significant negative relationship. Highly open individuals, when committed to their organization, displayed slightly lower levels of organizational cynicism. While this relationship was marginally significant, it

suggests that openness may play a role in reducing cynicism when paired with commitment, even though the initial relationship between openness and commitment was not strongly significant. To the surprise of the authors, emotionality had no significant impact on cynicism or commitment. This contradicts previous findings (e.g., Soomro et al., 2022) and indicates that in stressful bank cultures, structural or cultural features might overshadow emotional ones. These findings conclude that personality trait openness to experience negatively impacts organizational cynicism with the mediation of organizational commitment. Findings of the study are different from recent study (Soomro et al.,2022) findings where direct effect of openness to experience on organizational cynicism was positively significant. While results are aligned with the previous investigation (Acaray and Yildirim,2017). The thirteenth hypothesis explored the direct relationship between organizational commitment (OCOM) and organizational cynicism (OCY), revealing a statistically significant negative relationship. Employees with higher levels of organizational commitment tend to exhibit lower levels of organizational cynicism. This implies that fostering strong commitment within the banking workforce can lead to a more positive perception of the organization and a reduced inclination to view organizational decisions through a cynical lens. These detailed findings offer nuanced insights into the dynamics of personality traits, organizational commitment, and cynicism within the banking sector. While not all relationships were equally strong or significant, the study underscores the importance of personality traits in shaping commitment and cynicism among employees in the financial industry. Banking institutions may use these insights to tailor their HR practices and strategies to create a more committed and positive work environment. The commitment of employees is a strong construct within the field of organizational behavior that has been found to have a considerable impact on reducing organizational cynicism (OC) (Yetim and Ceylan, 2011; Mushraf et al., 2015). Organizations that proactively undertake activities to encourage and offer incentives to their employees are less likely to experience organizational cynicism (OC) (Eskildsen and Dahlgaard, 2000). A job-related attitude is a significant factor that reflects an employee's behavior and individual characteristics, which in turn indicates their level of commitment inside a company (Kumar and Bakhshi, 2010; Spagnoli and Caetano, 2012; Syed et al., 2015). The study examines the moderating role of occupational stress in the relationship between organizational commitment and organizational cynicism. The findings suggest that when levels of occupational stress increase, the strength of the relationship between organizational commitment and organizational cynicism diminishes. Put simply, individuals who encounter elevated levels of stress in their professional environment may not demonstrate the same level of skepticism towards the company, despite having lower levels of commitment. On the contrary, in situations where occupational stress is reduced, there is a heightened correlation between organizational commitment and organizational cynicism. This finding

implies that in work contexts with lower levels of stress, there is a stronger relationship between the level of commitment and the level of cynicism.

# 6. CONCLUSION

According to (Soomro et al., 2022), it is worthwhile to investigate the employee behavior towards organizational cynicism through organizational commitment. As the result of this, the study was designed to determine the relationship of employee personality traits with organizational commitment and their behavior towards organizational cynicism exhibited by bank employees in Pakistan. The results of this study offer empirical evidence for the hypotheses that a positive significant relationship exists between honesty-humility, extraversion, agreeableness, conscientiousness, and openness to experience personality qualities and organizational commitment. While the relationship between personality trait emotionality and organizational commitment was negatively insignificant. Findings of the mediating relationships between personality traits, organizational commitment and organizational cynicism offer evidence that personality traits honesty-humility, extraversion, conscientiousness have a negative significant relationship towards organizational cynicism, while emotionality and agreeableness showed an insignificant relationship with organizational cynicism in this study. Additionally, the moderating role of occupational stress was found to be negatively significant between organizational commitment and organizational cynicism. These findings contribute significant new information to the existing body of literature on the subject and hint that additional investigation is required to definitively determine the links in question. Based on this research, we propose that HR practitioners take into consideration the results of this study when employing personnel. In addition, HR practitioners need to find ways to encourage current employees by implementing various reward and training programs to make those employees more devoted to their firms, which will ultimately result in higher levels of productivity. Future research may use this model for other pressure-sensitive industries like health care, education, or computing to investigate sector-specific differences in the relative importance of personality dimensions in the prediction of cynicism and commitment. Moreover, the model developed here is extendable to grasp employee attitudes in organizations involved in climate change, sustainability, and natural resource management fields where integrity and commitment are at the core.

# 7. IMPLICATIONS

The implications of this study extend far beyond the realm of academic research, offering tangible benefits for banks and organizations at large. In today's fiercely

competitive business landscape, the importance of understanding and harnessing the dynamics of employee personality traits cannot be overstated. The findings shed light on the critical role of honesty-humility, emotionality, extraversion, agreeableness, conscientiousness, and openness to experience in shaping employee attitudes and behaviors. For the banking industry executives and HR policymakers, this study highlights the need for screening personality traits critical to selection and for the design of targeted engagement initiatives. Organizational cynicism can be buffered by interventions like stress management training, ethics, and commitment incentives. This insight provides a strategic advantage for banks in their recruitment and selection processes, allowing them to identify and attract individuals who possess these desirable traits. By recognizing the link between these personality attributes and organizational commitment, banks can focus on creating an environment that nurtures and sustains commitment among their employees. This is not merely a theoretical exercise but a practical strategy for enhancing employee engagement, reducing turnover, and ultimately, improving the organization's bottom line. Furthermore, the mediating role of organizational commitment in the relationship between personality traits and organizational cynicism underscores the significance of commitment as a protective factor. Banks can leverage this knowledge by implementing targeted interventions to bolster commitment levels. This might involve leadership development programs, effective communication strategies, and initiatives aimed at building a sense of belonging and purpose among employees. By doing so, banks can effectively mitigate the emergence of cynicism within their workforce, which, left unchecked, can erode trust, hinder collaboration, and impede overall performance. Importantly, the study's revelation that occupational stress can moderate the relationship between organizational commitment and cynicism highlights the urgency for organizations, including banks, to address and manage workplace stressors. Implementing stress reduction initiatives, offering stress management resources, and fostering a supportive work environment can go a long way in safeguarding employee commitment and well-being. Banks that prioritize the well-being of their employees by managing stressors effectively not only contribute to a healthier work environment but also enhance their ability to retain and motivate their workforce, yielding long-term benefits in terms of productivity and customer satisfaction. The theoretical implications of this study are manifold and offer valuable contributions to the broader understanding of organizational behavior, particularly in the context of employee personality traits, organizational commitment, cynicism, and stress within the banking sector.

# 8. LIMITATIONS

While this study contributes valuable insights into the field of organizational behavior and the banking sector, it is essential to acknowledge its limitations. These limitations may provide context for interpreting the findings and guide future research efforts. One notable limitation is the potential for sampling bias. The study focused exclusively on bank employees, which may limit the generalizability of the findings to other industries or organizational contexts. It is important to recognize that the banking sector may have unique characteristics, culture, and stressors that could affect the observed relationships differently than in other industries. The research design employed in this study was cross-sectional, which means that data was collected at a single point in time. This design limits our ability to draw causal conclusions about the relationships examined. Longitudinal or experimental designs could provide more robust evidence of causality and help establish the temporal sequencing of the variables under investigation. The study relied on self-report measures for collecting data on personality traits, organizational commitment, cynicism, and stress. Self-report measures are susceptible to response bias and social desirability bias, which may affect the accuracy of the reported relationships. Future research could benefit from incorporating objective or behavioral measures to complement self-reports.

# 9. FUTURE RESEARCH DIRECTION

Building on the insights and limitations of the current study, several promising directions for future research emerge in the domain of organizational behavior, particularly concerning employee personality traits, organizational commitment, cynicism, and stress within the banking sector. Conducting longitudinal research designs can help establish causal relationships and offer a more nuanced understanding of how personality traits evolve over time, their impact on organizational commitment and cynicism, and how stressors influence these trajectories. Long-term studies can capture dynamic changes and shed light on the temporal aspects of these relationships. Extending the investigation into different cultural contexts is essential for understanding how cultural factors influence the expression of personality traits, commitment, cynicism, and responses to stress. Comparative cross-cultural studies can reveal cultural nuances and universalities in these dynamics. Combining self-report measures with objective or behavioral assessments can help mitigate common method variance and provide a more comprehensive understanding of the relationships under examination. Utilizing diverse data sources can enhance the validity and reliability of findings.

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# Relationship of Motivational and Social Factors with Entrepreneurial Intentions

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# ABSTRACT

Global interest is increasingly moving away from traditional business models and gravitating toward entrepreneurship as a means of gaining a competitive edge. Individuals with creative and innovative mindsets launch new ventures by tapping into emerging or underutilized resources, generating returns in the form of wealth, recognition, and reputation, and are ultimately recognized as "entrepreneurs." The process they engage in is known as "entrepreneurship." This concept is crucial for driving economic growth and reducing unemployment by uncovering new opportunities and creating jobs. Therefore, it becomes essential to examine the factors that either support or hinder an individual's journey into entrepreneurship. Based on existing literature, it is evident that certain key elements particularly motivational and social influencesscan either inspire or deter someone from becoming an entrepreneur. This study aims to explore how these motivational and social factors impact entrepreneurial intentions within the context of Pakistan.

**Keywords:** Entrepreneurship, Entrepreneurial Intentions, Motivational Factors and Social Factors.

# 1. INTRODUCTION

Thirst of the supremacy is a so-called dilemma of humans (Maslow, 1943). Empires, countries, organization and Industries always have been tried to get power over other empires, countries, organizations, and industries. In the 19th century, a state starts a civil or military war with other states to take control over them. But with the passage of time things got more simplified and nowadays civil or military wars has been shifted to economic wars among countries. As entrepreneurship is the emerging phenomenon in the business world which could be explained as the process of starting a new venture by exploring new resources or by using existing resources in a synergic way which enable the business to capture maximum market share and accomplish maximum profit with a minimum output (Drucker, 2024).

Entrepreneurship prompts both academic researchers and policymakers from last few decades as there is need to grow entrepreneurs who accelerate economy not by innovating the technology but they could reduce unemployment by exploring and creating opportunities for other people (Reynolds, 1987; Zahra, 2023). Since the cultivation of entrepreneurial activities is important for the galvanization of the economy, we could try to understand how to revive the economy through entrepreneurship (Baumol, 1968). Generally, entrepreneurship has the potential to plays a significant role in the galvanization of the economic activity of any country, as well as, the areas which have a greater increase in entrepreneurial initiatives index have a probability to show a greater fall in unemployment (Audretsch, 2002). However, the entrepreneurial resource is scarce (Linan, Rodriguez-Cohard & Rueda-Cantuche, 2011).

Respectively, less than 10% of the OECD adult population was starting a new venture (Nolan 2003). In developing countries like Pakistan, people have less favourable attitudes toward entrepreneurship. So it is crucial to promote and encourage the phenomenon of entrepreneurship to electrify economic development and tackle the problem of unemployment by exploring new opportunities and creating new modes of employment (Mitra, 2008). In this study, the relationship of motivational factors which is supported by the psychological entrepreneurship theory, the association of the social factors with the entrepreneurial intentions as favoured by the sociological entrepreneurship theory is under analysis.

## 1.1. Problem Statement

Despite the increasing global attention to entrepreneurship as an answer to economic problems like unemployment and stagnation, developing nations like Pakistan also still regularly record very low levels of entrepreneurial activity. While motivational (e.g., need for achievement) and social influences (e.g., perceived social norms) are assumed to be important antecedents of individuals' intentions to become an entrepreneur, very few studies investigate these influences collaboratively as constraining or enabling within the cultural and socio-economic context of Pakistan. Most studies have either examined psychological determinants or demographic determinants--not both together. This lack of understanding in regard to the influences that individuals' perceptions of motivational and social factors have on their intentions to become an entrepreneur has made it difficult for policymakers and educators to develop effective programs to promote entrepreneurship. It is imperative to study the extent in which motivational and social factors impact shaping individuals' entrepreneurial intentions in Pakistan.

## 1.2. Scope and objectives

As there is a need to promote entrepreneurship, some factors are existing which hinders entrepreneurial intentions. Therefore, it is important to clarify such elements which play an influential role in shaping the individual's decision to start a new venture (Linan, Rodriguez-Cohard & Rueda-Cantuche, 2011). There is a lack of concord among researchers which determine the decisions of an individual to start a new business or venture (Baron, 2004; Krueger, 2003) so there is a need to elucidate such factors which encourage or discourage individual's decision about entrepreneurial intentions (Linan, Rodriguez-Cohard & Rueda-Cantuche, 2011).

## 1.3. Research question

To what extent motivational and social factors play a significant role while individuals make decisions to start their new venture?

## 1.4. Theoretical framework

This study is a little contribution to the **"Theory of planned behaviour".** The theory explained it as the behaviour of an individual is driven by the behavioural intentions whereas behaviour intentions of an individual are surrounded by an individual's attitude toward behaviour, subjective norms, and perceived behavioural control (Ajzen, 1991). In contrast to it, "**Behavioral decision theory"** which tries to grasp and elucidate the patterns of human decision making, arguing that tendencies of individual's true decision making are governed by either underweighting or overweighting the probabilities, individual satisfaction and choice of decision.

This research is based on two main theoretical foundations, which provide explanations for entrepreneurial intentions. The first is the Theory of Planned Behavior (Ajzen, 1991), which states that a person's behavior is based on his/her intention to conduct that specific behavior, which is based on his/her attitude, subjective norms, and perceived behavior control. This theory will help us explain how entrepreneurial intention is derived through motivational and social factors. The second, Behavioral Decision Theory, provides some insight into the decision-making process of individuals when engaging in decision-making under uncertainty, considering perceived risks, perceived rewards, and emotions. There are motivational factors (risk-taking, self-efficacy, and goal-setting) in this research that fall into the criteria of Behavioral Decision Theory, and there are social factors (referent peer group and social acceptance) that would fall more closely to the subjective norms of TPB. Together, these two theories help to provide a basis for generating our hypotheses on motivational and social influences and entrepreneurial intentions.

## 2. LITERATURE REVIEW AND HYPOTHESES

Entrepreneurial Intentions have been influenced by different factors, the author argued that specific personality traits exist such as the need for achievement has associated with entrepreneurial intentions (McClelland, 1961). Others work to highlight the role of demographic variables such as age, race, gender, religion, income etc. (Robinson, Stimpson, Huefner, & Hunt 1991). The individual's decision to start a new venture (Reynolds, Storey & Westhead 1994). These two streams elucidate the association of entrepreneurial intentions with the personality traits, on the other hand, many authors criticized these approaches in their studies such as (Ajzen 1991; Gartner 1989) and study of (Santos & Liñán, 2007; Shapero & Sokol 1982; Veciana, Aponte & Urbano, 2005). There is no concord between researchers on what the actual influential factors consortium with entrepreneurial intentions, so as the beauty of research. Motivation is the driver of the behaviour of an individual when the goal is to compete, persist and to circumvent the failure (Carsrud & Brännback 2011).

According to Ryan & Deci (2000), state that motivation entails direction, energy, determination of activation and specific intention which indicates that human behaviour is driven by the goals and motives, as well as, indeed there is a link between motivation, behaviour, and intentions of an individual.

As motivational factors for the entrepreneurs such as risk-taking, self-efficacy, the setting of goal and passion are also vital for the individuals to make decisions as nascent entrepreneurs in high-security risk and underdeveloped areas (Shane, 2003; Eckhardt & Shane, 2003). Keen motivations are the opportunities to take risks, finance allocation, independence and security of resources such as employment control and stability of land and capital etc. (Turnbull, William, Paddison & Fahad, 2001). Similarly, entrepreneurial motivation important for nascent entrepreneurs (Shane, 2003). Although the emerging literature on entrepreneurship suppresses that individual's intention play a significant role in someone's decision to start a new firm (Liñán & Chen, 2009). In addition to, this psychological control of an individual on emotions leads him or her to higher expectancies of success (Stumpf, Brief & Hartman, 1987) and more precisely the focus of the psychological theory of entrepreneurship is on individual's traits such as need of achievement, locus of control, personal motivation, risk-taking ability and innovativeness and other characteristics that have been associated with the entrepreneurial intentions and have empirical support (Simpeh, 2011).

Similarly, motivational factors play a significant role in entrepreneurial intentions of an individual besides the decision of an individual to start a new venture is positively related with its motivation meanwhile they could lead the nascent venture toward success so there is a need to identify the relationship of

motivational factors that govern individual decision to start new venture (Ismail, Shamsuddin & Chaudhary 2012). So following hypothesis is posited

**H1:** *Entrepreneurial intentionsl are positively affected by motivational factors.*

The sociological entrepreneurship theory buttresses the literature of entrepreneurship by explaining the role of societal factors as the drivers in the success and failure of an entrepreneur. Landstrom (1998), argues that the social theory of entrepreneurship emphasizes the importance of social factors in someone's decision toward entrepreneurial initiatives. Reynolds (1991), enrich the literature by identifying four societal contexts that directly or indirectly related to the individual's entrepreneurial intentions. First, somehow individuals have concerns with the other people in the society and they cannot abandon themselves from the societal context while they make decisions to start new ventures even though to some extent their decisions influenced by some societal factors. Second, somehow it is possible that individual got influenced by the good or bad experience of the other people to whom they are closely or partially related at the time to make a decision or take actions about entrepreneurial initiatives. The third is ethnic identity defined as one's perception, feeling, thinking and behaviour because the ethnic group to whom he or she is belonging (Trimble & Dickson, 2005).

So to some extent, the decision of individuals governed by their society. Fourth is the population ecology that political system, the system of legislation, business trends and market's nature could influence the individuals' decision to start a new business and somehow play mediating role in the success of a new business. Moreover, entrepreneurial intentions are driven by social factors, as well as, a high need for achievement is directly related to entrepreneurship is postulate on assumptions like existence of social environment, freedom of occupational decision and admirable chances of success where success and failure depend on individual's effort (McClelland & Winter 1969) In contrast, the impact of demographic variables such as family, religion, region, income etc. on entrepreneurial intentions is negligible (Reynolds & Storey 1994). So in the light of these arguments, we conclude that

**H2:** *Entrepreneurial Intentions are positively affected by social factors.*

# 3. METHODOLOGY
## 3.1. Instruments

An instrument based on 17 items was designed for data collection, 5 points Likert scale (from strongly disagree to strongly agree) based on 5 items to measure entrepreneurial intentions have been adapted from the study of (Linan & Chen, 2009; Krueger, Relly & Carsrud, 2000). Some question jargons moulded by the

author for the convenience of a sample, and to measure the motivational factors affecting the entrepreneurial intentions among nascent entrepreneurs. We have used 5 point Likert scale from strongly disagree to strongly agree based on 9 items referred by (Vijaya & Kamalanabhan, 1998), as well as, we have chosen 5 points Likert scale from strongly disagree to strongly agree based 3 items for measuring the impact of social factors on the entrepreneurial intentions of an individual which is referred by (Vijaya & Kamalanabhan, 1998) and coefficient alpha for each scale is **0.69, 0.83, 0.76**.

Respectively, which indicates the internal consistency of the items to measure each variable as reliability refers to the capacity of the measurement to yield stable results (Sarantakos, 2005). Similarly, the reliability and validity of the instruments could be assumed by inspecting the journal in which they were published and the similarity between nascent and prior assumptions for them are being used (Linan, 2009). Internal consistency of each variable is being measured by using a statistical approach (Cronbach's coefficient alpha) which is the best predictor of the internal consistency of the variables (Litwin, 1995).

### 3.2. Sample and Data Collection:

A convenient sample of 200 nascent and future entrepreneurs has been selected belonging to 3 major regions of Pakistan (Lahore, Islamabad, and Faisalabad). The total of 200 questionnaires was distributed and we received a response of 163 respondents, from which 24 respondents show a fragmentary response. We have 139 consummate responses for statistical analysis, data is analyzed on SPSS by using regression analysis which is one of the statistical approaches to identify the relationship between dependent and independent variables.

Data was collected from a convenience sampling method for 200 nascent and future entrepreneurs in Lahore, Islamabad, and Faisalabad. This was a good method to collect data, but it limits the extent to which you can generalise the data to the population of entrepreneurs in Pakistan. Therefore, researchers must use caution when extrapolating and applying the findings beyond the sample studied.

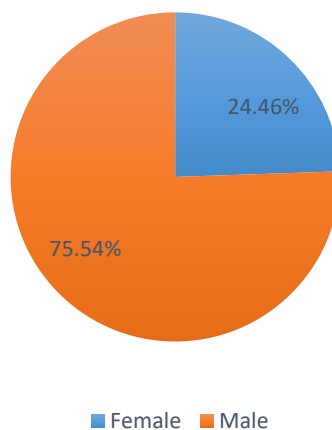## 4. FINDINGS AND RESULTS
### 4.1. Descriptive statistics

Table 1 highlights the descriptive statistics such as mean, median, and mode as well as standard deviation, range (minimum, maximum) of the all dependent, independent and control variables.

**Table 1** *Descriptive Analysis of all Dependent, Independent and Control Variables*

| Variables statistics | G | AGE | Education Level | Income | Entrepreneurial Intentions | Motivational Factors | Social Factors |
|---|---|---|---|---|---|---|---|
| Valid | 139 | 139 | 139 | 139 | 139 | 139 | 139 |
| Missing | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mean | .76 | 2.10 | 3.27 | 2.7050 | 4.2777 | 4.1087 | 3.6115 |
| Median | 1.00 | 2.00 | 3.00 | 2.0000 | 4.2000 | 4.1111 | 3.6667 |
| Mode | 1 | 2 | 3 | 1.00 | 4.00 | 4.00 | 3.00 |
| Std. Deviation | .431 | .581 | .546 | 2.36659 | .49608 | .53446 | .82785 |
| Range | 1 | 4 | 3 | 8.00 | 2.00 | 3.44 | 3.33 |
| Minimum | 0 | 1 | 2 | 1.00 | 3.00 | 1.56 | 1.67 |
| Maximum | 1 | 5 | 5 | 9.00 | 5.00 | 5.00 | 5.00 |

Figure1 shows that 75.54 % of our sample is consist of males and 24.45% of females. Figure 2 shows that the age groups reflect that majority of our sample is lies between the ages of 21-30 whereas 13.67% of the respondents' ages are from 31 to 40 years and 0.72% people lies between the ages of 41-50 years and rest of them are more than 50 years. Figure 3 shows the four distinctive education levels as 67.63% of our respondents had a bachelor degree or enrolled in bachelor degree and 27.34% of the respondents complete their master degree or enrolled in master programs whereas 3.59% of the total respondents are coping with their high school degree and rest of them have different obligations. Moreover, the majority of our respondents have low income (below than 150000) and 17% of the respondents have income between 15000 to 25000 and 12% have more than 25000 and less than 35000 whereas rest of the respondents' income is more than 35000.

## Gender



**Figure 1** Gender of participants.

## Age



0.72%  1.44%
8.63%
13.67%
75.54%

■ Less than 20  ■ 21-30  ■ 31-40  ■ 41-50  ■ More than 50
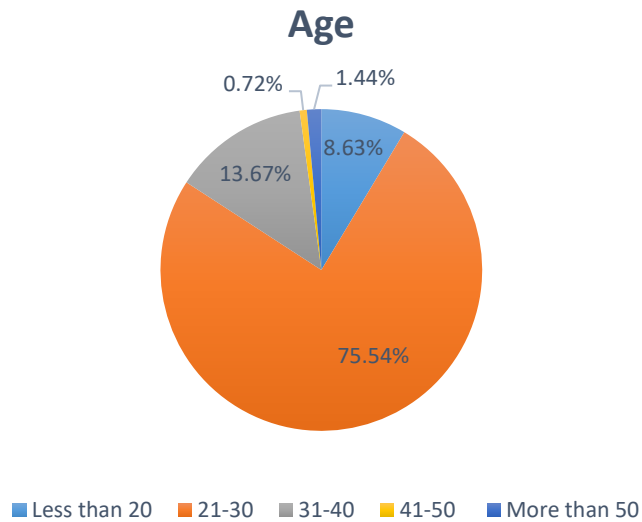
**Figure 2** Age of participants.

## Educational Background



1.44%  3.59%
27.34%
67.63%

■ High School  ■ Master  ■ Bachelor  ■ Others
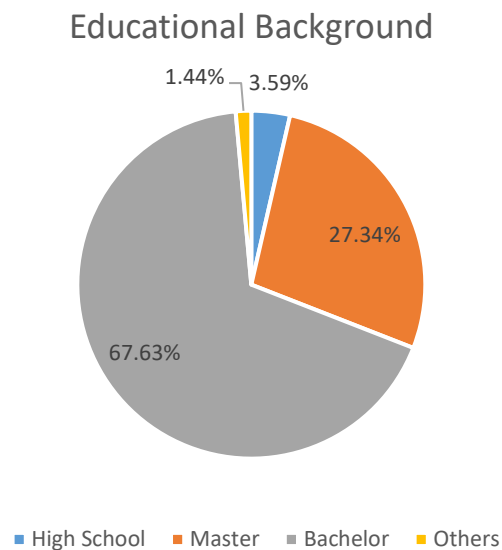
**Figure 3** Educational background of participants.

### 4.2. Data Analysis

For elucidating the relationship of variables, we used multiple regression analysis that is a statistical technique which is used to examine the relationship between a single dependent variable and single or multiple independent variable(s). The significance value of motivational factors (independent variable) is .000 which is less than the level of significance (0.05) which reflect the significance of its

relationship with the dependent variable, which shows that 1-unit increase in motivational factors leads to 0.434 units increase independent variable (entrepreneurial intentions). Table 2 shows the significant value of social factors (independent variable) is .575 which is greater than level of significance (0.05) which reflect insignificance of its relationship with dependent variable but social factor is positively correlated with dependent variable as its value is .252, the range of correlation lies between -1 to 1 whereas 1 denoting perfect correlation, 0 denoting no correlation and -1 designated as negative correlation. Besides, our control variables (gender, age, income, and education) show no significant relationship with the dependent variable and positively correlated with the dependent variable.

As the coefficient of determination ($R^2$) determine the overall prediction by the independent variable(s) value of $R^2$ lies between 0 to 1 whereas 1 indicates complete prediction and 0 indicate no prediction. Value of the significance explain the relationship among single dependent and other independent variables (s) where we consider Level of significance (0.05) and if the value of significance of an independent variable against single dependent variable less than the level of significance then we consider this independent variable as a significant independent variable and vice versa. Results of multiple regression analysis and value of the coefficient of determination ($R^2$) is .282 that means that 28% variation dependent variable is explained by independent and control variables whereas p-value .000 is less than 0.05 which reflect that overall model is strong and choice of dependent and independent variables

**Table 2** *Statistical Relationship between Different Variables*

| Variables | Beta | Significance |
|---|---|---|
| Entrepreneurial Intentions | 2.024 | .000 |
| Social Factors | .028 | .575 |
| Motivational Factors | .434** | .000 |
| Gender | .111 | .214 |
| Age | .007 | .930 |
| Income | .008 | .657 |
| Education Level | .077 | .282 |
| Model Summary R-square = 28.2% | F= 8.623 | Significance .000 |

## 5. Discussion

Results of regression analysis predict the association of motivational factors with the entrepreneurial intentions and if someone is positively motivated toward entrepreneurial initiatives than there are higher expectancies that he or she will take decisions to start a new venture or emerge as a nascent entrepreneur in near future. The previous argument also has support from existing literature as an entrepreneurial motivation of an individual leads him or her to take steps to start a new venture (Shane, 2003; Eckhardt & Shane, 2003). Similarly, an individual's motivation toward something galvanized him or her intentions to perform such activity in future (Carsrud & Brännback, 2011) and oppose the notion that entrepreneurial intentions of an individuals based on its age, income, gender, religion, and region etc. argued by (Robinson, Stimpson, Huefner, & Hunt, 1991).

Statistical results also elucidate that there is no significant relationship between social factors and entrepreneurial intentions of individuals which means that entrepreneurial intentions of an individual in Pakistan are not hinder or encourage by the social factors such as family, friends, and society although there is a partial correlation of social factors with the entrepreneurial intentions. These results are surprising because meanwhile, people of Pakistan cannot have leashed themselves from communism culture as most of the population of Asian countries like Pakistan, India and Bangladesh has clenched by communism culture (Franda, 1970) opposite to capitalism, communism is a culture in which an individual oblige to social norms and has less freedom to make decisions independently (Marx & Engels, 2002; Engels & Marx, 2004). Nascent entrepreneurs are a vital resource of a country they have abilities to change the world developing economies to developed economies. There are always some factors behind the success or failure of an entrepreneur in the accomplishment of his or her goal.

My tiny effort is to strengthen the literature on entrepreneurship by highlighting the association and effect of some of these factors such as motivational, social and economic factors on entrepreneurial intentions of an individual in Pakistan's context. After analysis statistical results predict the significant consortium between entrepreneurial intentions and motivation of an individual has a positive impact on the entrepreneurial intentions whereas the social and economic factors are not playing a significant role while individual take initiatives as an entrepreneur although they are partially correlated with the dependent variable. So we conclude that if an individual is motivated to start a new venture so there is a high probability that he or she will take initiatives as an entrepreneur in the future.

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# Untangling Demand-Following and Supply-Leading Postulate with the Lens of Granger Causality

## Mushtaq Hassan

## ABSTRACT

Researcher experimentally examined the interconnectedness among economic prosperity (EG) plus financial prosperity (FD) using the ARDL and Granger methodologies on annual data spanning 24 years, from 1988 to 2012. We measure economic prosperity (EG) by looking at real economic prosperity (GDP), and we measure financial prosperity (FD) by looking at two things: the progress of the financing system plus advancement of the stock market. The present study shows that the variables are cointegrated. A signal-directional causal link exists between financial prosperity (FD) and economic prosperity (EG), wherein LGDP granger causes finance lending growth and financial market capitalization and share trading volume granger cause LGDP. In certain instances, a supply-leading relationship is established, whereas in others, a demand-following relationship is demonstrated. Policymakers should formulate policies to enhance microfinance facilities, thereby fostering investment in small and medium firms. Pakistan's economy would grow faster if the financial sector improved and streamlined its microfinance processes, corporate governance, and risk management.

**Keywords**:  Financial Development, Economic Growth, Causality

## 1. INTRODUCTION

   A country's economic standing determines its progress. Each nation endeavors to identify the true factors that enhance the rate of economic growth. Depending on their economic standing, some countries are classified as industrial, while others are classified as subsistence economies. Developed and industrial economies are defined as those with steady and strong economic growth, whereas subsistence or developing economies are defined as those with erratic economic growth patterns. By lowering transaction costs and easing credit restrictions, a sophisticated financial system can boost domestic economic activity. Reduced economic activity and, as a result, slower

growth are the outcomes of a broken financial system. To clarify the fundamental forces propelling economic prosperity and its relationship with financial development, numerous empirical and theoretical investigations are conducted worldwide by a variety of academics. While some researchers claim that FD defines EG, others show that EG leads to FD. The EG's financial system was developed by Bagehot (1873) and Schumpeter (1911). While Shaw (1973) emphasized the role of financial liberalization in boosting savings and investment, the main focus of economics pioneers is on the relationship between investment efficiency and financial development (Goldsmith, 1969). Schumpeter (1911) posits that financial development (FD) is the primary source of economic growth (EG), although Robinson (1952) contests the notion that the monetary segment only reacts to the financial desires generated by the increase in the size of the economy. According to Patrick (1966), financial development (FD) results from rapid growth, which calls for more effective financial services. Granger (1969) backs up the claim that both are related. The development of monetary intermediaries can pronounce economic prosperity, according to proponents of supply-driving hypothesis (Pagano, 1993). According to Demetriades and Hussein (1996), financial prosperity (FD) and economic prosperity (EG) have a positive reciprocal relationship. Risk is inherent in all investment decisions, and stock markets act as risk diversifiers (Levine, 1991; Greenwood & Smith, 1997: Christopoulos & Tsionas, 2004; Rousseau and Wachtel, 2000). The questions of whether policymakers should focus on economic growth to attract FDI, prioritize economic prosperity to attract FDI, or address both at the same time remain unanswered. Accordingly, traders used the swapping volume merged index, liquidness, transaction volume, and other studies that used trade volume, liquidness, and market capitalization to evaluate the change in share trading marketplace (Agrawalla and Tuteja, 2007; Soumya and Jaydeep, 2008). Researchers agree that Egypt is a supply-leading economy thanks to developments in the fiscal segment. EG promotes the development of the financial industry, which is thought of as a demand-following economy.

## 1.1. Overview of Financial Intermediaries in Pakistan

In Pakistan, the financial sector is just as essential as any other area of development. Financial institutions facilitate a range of business transactions by acting as middlemen between investors and deposit end users. Transferring savings from households with surpluses to those with deficits is made possible by financial intermediaries. While deficit households relate to borrowing businesses and governmental entities, saver households are consumers. The primary role of the share marketplace and financing sector is that of economic intermediaries. By providing lenders and borrowers with timely information and enabling the apportionment of resources to the greatest fruitful opportunities, the banking sector improves social welfare and economic efficiency (Fase and Abma, 2003). The banking industry has a substantial market share of 88 percent, and the SBP which was put in place in 1948,

soon after the division, under quasi-government ownership (Pakistan Strategy Paper, n.d.). Six nationalized banks were established in 1974 to improve lending practices for industries. The Pakistan Banking Council was in complete control of these banks. Four state-owned banks remained in operation by 1997, but they were up against competition from 27 foreign and 21 domestic banks. Pakistan's financial industry is being actively improved by financial deregulation and a standardized banking sector. Four specialized banks and thirty-four private banks are active in Pakistan (Anwar et al., 2011). Five Islamic banks and 29 conventional banks make up these private banks (SBP, 2012). In order to pool capital, transfer wealth, and share risk, consumers and savers can exchange securities on the stock market (Mehr-un-Nisa and Nishat, 2011). By directing capital toward the most productive industries, the securities exchange, in a state of general equilibrium, is essential to any economy (Nishat and Saghir, 1991). According to Baumol (1965), stock markets in developed countries are closely linked to the overall economy. The causal link between changes in consumption and stock market prices is established by Mookerjee (1987). Both listed companies and total market capitalization, the Pakistani stock market has consistently performed poorly in terms of attracting domestic savings for investment (Nishat and Saghir, 1991). Demand and supply dynamics, which include technical aspects, market sentiments, and fundamental considerations, impact stock market prices (Mehr-un-Nisa and Nishat, 2011). In order to take advantage of its advantages, every developing country is actively working to ascertain the essential grounds of financial advancement. Despite a number of financial reforms carried out by the government between 1978 and 1990, Pakistan's economic history has fluctuated since the country's independence. Unfortunately, research in Pakistan is still insufficient to determine the cause of FD and EG, despite its importance. By employing the Granger Causality Approach while investigating the "Demand-Pushed" and "Supply-Pull" hypotheses in Pakistan, this learning hunt the gap.

## 1.2. Study Aims

Purpose is basically scrutinizing the nature of the connection and ascertain whether there is a supply-side, demand-side, or nonexistent relationship in Pakistan. The goal of the study is:

1. To ascertain how fiscal progress and economic advancement are related.

2. To identify whether there is a supply-leading, demand-following, or nonexistent causal connection between fiscal progress and economic advancement.

A concept overview is given in the study's first section, which then moves on to a discussion of the issue and the establishment of goals. A thorough review of literature is given in Section II. The research design is covered in Section III, along

with an explanation of the study variables and data sources. Tthe conclusion is given in Section IV.

## 2. LITERATURE REVIEW

Researchers have identified the degree of FD as a significant determinant of EG. According to the ongoing discussion among researchers, the literature currently in publication exhibits a number of theoretical shifts. As a result, four postulates about the FD and EG domains were proposed by researchers worldwide.

According to the first viewpoint, foreign direct investment is a useful tool for promoting economic expansion. According to Schumpeter (1911), an efficient financial system boosts the growth rate by redistributing resources from unproductive to productive sectors, thereby facilitating technological advancements. According to Rousseau and Sylla (2003), effective securities markets foster economic expansion.

Goldsmith (1969) and Shaw (1973) make substantial contributions to the literature on FD and EG. Shaw (1973) created liberalization framework and highlighted how important financial liberalization is for increasing domestic savings and boosting growth rates. EG and FDI are found to be related over the long term by Christopoulos and Tsionas (2004).

The second viewpoint is the growth-led finance theory, which is recognized as a demand-following hypothesis. According to Robinson (1952), a larger real sector will require better financial services, which will encourage the financial sector's growth and ultimately spur economic expansion. According to Odhiambo (2007), Tanzania exhibits a supply-leading response, while South Africa and Kenya exhibit a demand-following response between FD and EG. Menyah et al. (2014) support the study's conclusions that EG succeeds pecuniary enhancement.

The third viewpoint explains the reciprocal causal links among monetary expansion and fiscal advancement. The claim that foreign direct investment (FD) causes EG. Monetary development and fiscal depth are correlated equal directions (Deb & Mukherjee, 2008; Odhiambo, 2007).

Finally, fourth viewpoint asserts, no causal connection among variables. According to Lucas (1988), FD and EG have no mutual influence. He claims that economists place too much emphasis on how important financial factors are to economic expansion. The directional relationship between Zambia's economic growth and stock market development was examined by Sililo (2010). The results support the idea that economic growth and stock market development are independent of one another.

Regarding the exact connection among EG and FDI, scholars within Pakistan have differing opinions, which leaves the question open. While some studies support a demand-side approach, others support a supply-side approach, and they look at the

short- and long-term causality between these two forces (Husain and Mahmood, 2001; Kanwal and Nadeem, 2013; Iqbal et al., 2012; Anwar et al., 2011; Zaman et al., 2010).

## 2.1. Overview of Panel and Time Series Studies

From 1970 to 2010, Ductor and Grechyna (2015) assessed the connection among fiscal advancement (FD) and EG as well as impact over monetary progress (EG) in 101 developed and developing nations. According to panel estimation and cross-sectional regression using the FD-GMM approach, when private credit expands quickly without a corresponding rise in real sector production, the impression of financial progress on progress turns negative.

Menyah et al. (2014) used a panel analysis to look 21 African nations between 1965 and 2008. In South Africa, Sierra Leone, and Benin, experimental outcomes illustrate unidirectional connection among FD and EG, supporting the "supply-driving" theory. Only in Nigeria was inverse unidirectional causality from EG to FD found, supporting the "demand-following" theory. Additionally, they discovered a weak causal link between trade liberalization and FDI. It appears that concepts between trade-led growth and finance-led growth are incompatible.

Cavenaile and Sougne (2012) investigated the relationship between FD and EG and critically examined how banks and institutional investors contribute to EG stimulation. According to output, money is either made available for investment or allocated to the banking industry.

In the study of Dimitris & Efthymios (2004) studied FD and EG in ten emerging countries between 1970 and 2000. Although there was no indication of bi-directional causality between the variables. Moreover, there is no immediate correlation between output and financial deepening.

Arestis and Demetriades (1997) determine how fiscal expansion affects monetary progress in Germany and the United States. According to the Johansen cointegration analysis, banking development has an important impression on progress in Germany, while weak connection in US. Nevertheless, a directional relationship indicates that real GDP influences the growth of both the stock and banking markets.

Ahmed and Mmolainyane (2014) evaluated how financial integration affected Botswana's economic expansion between 1974 and 2009. The results disprove a direct and meaningful link between Botswana's economic expansion and financial integration.

In order to ascertain whether FD may improve EG, Jedidia et al. (2014) carried out an observational study in Tunisia between 1973 and 2008. The findings suggest that fiscal expansion is a catalyst for long-term monetary progress but susceptible to financial instability. In addition to arguing that bank intervention in stock markets is harmful to economic growth, this paper suggests a reciprocal.

Samargandi et al. (2014) divided the sectors into oil and non-oil for scrutinize conclusion of fiscal progress over monetary progress in Saudi Arabia.

Ndlovu (2013) used a multivariate Granger causality test to establish the connection among Zimbabwe's fiscal structure and monetary progress. The outcomes indicate that since economic development is a passive reaction to trade liberalization and related measures to boost economic growth, policy attention should be directed toward these measures. Promoting investments and removing obstacles for foreign investors are two examples of such tactics.

Ogunyiola (2013) conducted an empirical investigation into monetary progress (EG) & FDI within Cape Verde between 1980 and 2011. Results showed no correlation among FD and EG; there is a long-term one. According to the paper, there is a one-way causal connection between EG and domestic credit for the private sector.

The long-term impacts of FDI in Ghana were investigated by Adua et al. (2013). The findings show that the choice of proxy used has an impact on the growth effect of FD.

The causal connection among Malaysia's energy ingesting, monetary progress, comparative pricing, FDI, and fiscal progress was investigated by Tang and Tan (2014). In Malaysia, EG Granger and energy ingesting are mutually Granger-caused over the long and short terms.

According to Zhang et al. (2012), financial reforms are proceeding as planned since China joined the WTO, and the banking system presently promotes economic expansion.

The effect of FD on EG in Iran was shown by Ara et al. (2012). The study logically comes to the conclusion that both short- and long-term foreign direct investment has boosted the Iranian economy. Long-term real output is significantly and favorably impacted by capitalization and oil revenue. While capitalization has a short-term positive impact, oil revenue has a longterm negative influence on monetary progress.

The directional relationship between Zambia's economic progress and security market expansion was studied by Sililo (2010). It is determined that economic progress and share market development are unrelated.

Shahbaz (2008) uncover longterm correlation of Pakistan's economic progress and the development of the security market. Although he finds a long-term feedback affiliation between economic progress and stock market development, causality only works in the short term.

According to research by Bahadur and Neupane (2006), there is a causal relationship and long-term connection among Nepal's economic development and stock market integration.

Muhsin and Eric (2000) evaluated a relationship between monetary progress (EG) and FDI in Turkey between 1963 and 1995. There is a weak correlation between FD and EG, according to the data.

Primarily King & Levine's (1993b) analysis of IMF data, financial development, growth rates, capital accumulation, and economic efficiency are all positively correlated. They acknowledge the significance of arrangements that alter financial intermediation's effectiveness.

A study, Atje and Jovanovic (1989) found a robust encouraging association among securities expansion and economic progress.

## 2.2. Overview of Pakistan Based Researches

Ali et al (2014) studied Pakistan's monetary progress and FDI between 1972 to 2011. The long-term relationship between all proxies was validated by the cointegration test. The bidirectional causation that affects price increases and development, credits and development, and savings and growth further support the idea of supply driving. Additionally, a unidirectional cause and effect affiliation between monetary prosperity and FDI has been established.

The substantial dedication of Pakistani commercial banks to fixed deposits was examined by Kanwal and Nadeem (2013), who also looked into how macroeconomic reasons effected the productivity of publicly traded deposit association from 2001 to 2011. Results show that ROA, ROE, and EM have a positive connection with monetary policy rate. Additionally, study found that GDP has a negligible bad effect on ROE and EM and a negligible positive impact on ROA. Overall, it is found that macroeconomic factors barely affect commercial banks' profitability.

Iqbal et al. (2012) investigate how private sector loans and savings affect economic expansion. They used time series data from 1973 to 2007 to assess this effect in Pakistan. According to the study, private sector credit has a big inspiration on economic prosperity over long and short-terms.

Jalil and Ma's (2008) study looks at how banking sector reforms affected economic prosperity and FDI. The findings showed FD and EG significantly correlated while deposit liability ratio in China displayed a encouraging and important relationship.

An experimental study by Rahman and Salahuddin (2009) investigated a construction among monetary prosperity in Pakistan with fiscal market progress, with a particular emphasis on economic growth (EG). The conclusions demonstrate that both short- and long-term monetary progress and an efficient share marketplace are in correlation with each other.

To analyze a linking among FDI and economic prosperity in South Asian economies, Fase and Amba (2003) carried out an experimental analysis of nine

emerging economies, including Pakistan. The main finding is that fiscal expansion has a substantial impression on economic progress and consistent cause & effect connection among fiscal structure & monetary development.

Husain and Mahmood (2001) findings point to a sustained connection among stock prices and macroeconomic factors.

Connection and implications of the association between FD and EG have been the subject of disagreement in the literature. Numerous studies have produced contradictory findings in spite of these findings. To accomplish its goals, this work has developed four postulates based on the previously mentioned theoretical viewpoint.

## 2.3. Study Hypothesis

The examination of theoretical frameworks and the prevailing literature leads to the establishment of the subsequent study hypothesis:

$H_{0a}$ *There is no connection among development in finance and growth in the economy.*

$H_{1a}$ *Financial development correlates with growth in the economy.*

$H_{0b}$ *There exists no demand-following relationship between development in finance and growth in the economy.*

$H_{2b}$ *A demand-following connection exists between financial development and economic growth.*

$H_{0c}$ *No causal connection in which financial development influences economic growth.*

$H_{3c}$ *A connection exists between financial development and economic growth, characterized by a supply-leading dynamic.*

$H_{0d}$ *The evidence suggests that a causal relationship between financial development and economic growth does not exist.*

$H_{4d}$ *A cause-and-effect connection exists between financial development and economic growth.*

## 2.4. Theoretical Framework

Numerous panel and time series studies have empirically and theoretically investigated diverse characteristics of the affiliation among financial prosperity (FD) and economic prosperity (EG). The variable that researchers are most interested in determining its actual significance in EG is the component of FD (Levine, 1997). A

linguistic conflict in explaining the connection between FD and EG is revealed by the literature on the subject. Additionally, a number of scientists claim that the association is always positive. While some research suggests a difference in panel or time series analysis results, most scholars agree that causality is reciprocal. A contrasting perspectives on whether economic growth is supply-driven, demand-following, or whether there is a causal relationship are demonstrated by thorough research on Pakistan. The following model is used to accomplish the study's goals:
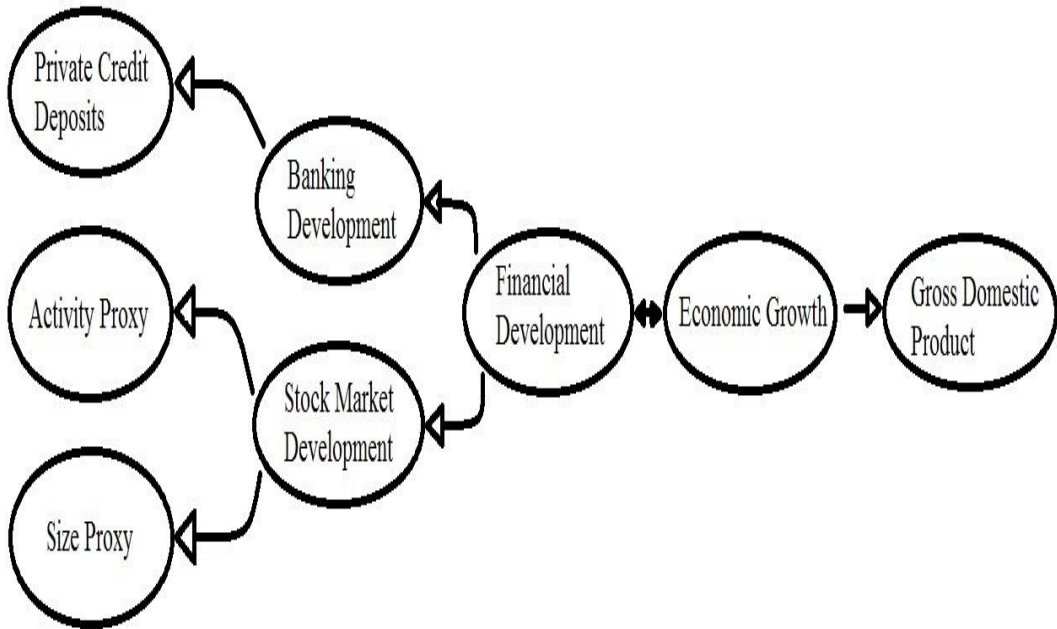


**Figure 1** *Study Framework*

The motive of this research is to analytically ascertain potential correlation and causative relationship between FD and EG. EG is seen as real GDP per person, while FD is measured by two things: development of deposit institute and progress in share market. The ratio of private credit deposits by banks to GDP will help banks grow, while the ratio of capitalization to real GDP and the ratio of stock volume to real GDP will help stock exchanges growth. WDI and Freedom House data bases will be used for data collection.

## 3. DATA AND METHODS

To evaluate FD and EG, numerous studies have been conducted worldwide. The development of the stock market and banking are the two main indicators used by researchers to evaluate financial development (FD) (Samargandi et al., 2014: Anwar et al., 2011). (Cavenaile and Sougne, 2012). Both indicators are assessed through various proxies, including credit provided by deposit and currency ratio, broad

currency ratio, exchanged value, issuance of bank instruments, convertible commitments, national lending, broad money, market value, liquidity in circulation, trading volume, and the proportion in private money in deposit.

Studies involving Pakistani researchers who evaluated financial development (FD) through the expansion of the stock market and banking were given special attention. These studies used indicators like currency in circulation, average market capitalization, price increments, credit to private sector deposits, foreign direct investment (FDI), domestic savings, real GDP, real interest rates, national savings, total exports, total imports, consumer price index, bank deposit liabilities, and broad money supply (Anwar et al., 2011; Ali et al., 2014; Kanwal and Nadeem, 2013; Zaman et al., 2010; Muhammad and Mahmood, 2001).

This research uses the following variables:

1. The real market capitalization ratio, also known as the Size Proxy, and the real value traded ratio, also known with the name of Activity Proxy, are the two methods that can be utilized to evaluate the expansion of the stock market.

2. Private credit deposits will be used as growth of banks.

3. The real market capitalization ratio, also known as the Size Proxy, and the real value traded ratio, also known as the Activity Proxy, are the two methods that can be utilized to evaluate the share marketplace.

4. To determine the rate of economic expansion, the logarithm of GDP is utilized.

We got all of our data from the Freedom House, UNDP, and WDI databases. We used E-Views 8.0 and Microfit 4.0 to look at the data. E-Views checks for stationarity and causality in data, while Microfit uses ARDL.

## 3.1. Estimation Procedure

A test invented in 1979 with the name of Augmented Dicky Fuller utmost common and extensively utilized trial for checking for stationarity. This means that the ADF statistic for individually inconstant is higher than the critical value for that variable. This evaluation comprises assessing next equation:

$$\rightarrow \quad \Delta y_t = (\phi - 1)y_{t-1} + \sum_{j=1}^{\kappa} \delta_j \Delta y_{t-j} + \varepsilon_t \P$$

Equation 1

$\varepsilon_t$ states WN $(0, \sigma_2)$.

The variable $\varepsilon t$ has a normal distribution with a mean of 0 and a variance of $\sigma^2$. The unit root test requires the assessment of the null hypothesis H0: $(\phi - 1) = 0$. The

series is non-stationary, in contrast to the alternative hypothesis H1: $|\phi| < 1$, assuming that $\varepsilon t$ is Gaussian snowy blast. This means finding the standard t-ratio of the estimate of $(\phi - 1)$ in relation to its standard error.

The extreme order of integration (dmax) is utilized to find out if the arrangement is stationary. A time series is deemed stationary when the mean and variance of the variables are stable, and the covariance remains uniform across successive time intervals. An integrated of order one variable, or I(1), is one that stays the same at the first difference. If a variable remains constant after being differenced n times, it is categorized as integrated of order n, represented as I(n).

Experts use Granger (1969) to look into the causal relationship between two variables. The Granger test is usually based on the idea that all variables are stationary, or if they aren't, they must have the same order of integration. In the Granger test, one variable is called x and the other is called y. The variable y signifies historical characteristics that substantially aid in forecasting the future value of another variable x. If prior estimates of x enhance the prediction of y, it is determined that x Granger-causes y.

$$y_t = \beta_0 + \sum_{k=1}^{M} \beta_k y_{t-k} + \sum_{l=1}^{N} \alpha_l x_{t-l} + u_t$$

Equation 2

$$x_t = \gamma_0 + \sum_{k=1}^{M} \delta_k y_{t-k} + \sum_{l=1}^{N} \gamma_l x_{t-l} + v_t$$

The subsequent level consisted of challenging for the existence of a long-term balance affiliation between the variables. This study employs the ARDL Bounds testing methodology to determine the enduring connection among foreign direct investment (FDI) and economic growth (EG) in Pakistan. Pesaran et al. (2001) said that it was used for cointegration. In the cointegration approach, all variables must be integrated in the similar rank. A long-term connection between the variables can't be made if the order of integration is different. The unit root test is still used to find the order of integration, even though it might not be very good at rejecting the null hypothesis of non-stationarity. Choosing the right lag length is the first step in getting the results of these tests. In studies with small samples, ARDL gives better results because it solves problems that come up when time series data isn't stationary (Majid, 2007, p. 168). It is applicable when the fundamental regression triggers are solely I(0) or entirely jointly interconnected I(1) (Pesaran and Shin, 1999). It is easy to find structural breaks in time series data with ARDL.

After establishing a long-term relationship through ARDL, the subsequent phase entails the development of the ECM, referred to as PSS, in alignment with Pesaran et al. (2001).

The interconnectedness of FD and EG in Pakistan was analyzed through the PSS F-test statistic. The F-statistic outcome is equated to important rate set by Pesaran et al. (2001). If the F-test statistic is above the upper limit of the critical value, null claim of the absence of a long-term association can be rejected, regardless of whether the variables are I(0) or I(1). If the F-test statistic is lower than the minimum threshold value, the null hypothesis is accepted. The F-test statistic sample is situated between these two thresholds, yielding inconclusive results. When the integration order of the variables is known and all of them are I(1), a decision is made based on the upper bound. When all variables are I(0), decisions are made based on lower bounds. See table 1.

**Table 1** A*ugmented Dickey Fuller Test*

| Variables | Level | | 1st difference | | Conclusion |
|---|---|---|---|---|---|
| | Without trend | With trend | Without trend | With trend | |
| Gross Domestic Product (GDP) | −3.460463** | −3.339077* | −5.797278*** | −5.664168*** | I(0) |
| Banking Development (BD) | −0.922339 | −0.946640 | −3.713599** | −3.826229** | I(1) |
| Marketing Capitalization (MC) | −2.815574* | −3.539343** | −6.566569*** | −6.526810*** | I(0) |
| Stock Volume Traded (SVT) | −1.509900 | −1.191609 | −4.426958*** | −4.492370*** | I(1) |
| Gross Capital Formation (GCF) | −1.281381 | −2.135853 | −4.598592*** | −4.517594*** | I(1) |
| Education (EDU) | −2.505104 | 1.096961 | −3.192530** | −3.915076** | I(1) |
| LGDP | −3.763574*** | −3.682927** | −6.418917*** | −6.288384*** | I(0) |

1%, 5% and 10% critical values for Augmented Dickey Fuller Test (ADF) at level are −3.72, −2.99 and −2.63 for without trend, while 1%, 5% and 10% critical values at with trend are −4.39, −3.61 and −3.24 respectively. 1%, 5% and 10% critical values for Augmented Dickey Fuller Test (ADF) at 1st difference without trend are −3.75, −2.99 and −2.64, while 1%, 5% and 10% critical values with trend are −4.41, −3.62 and −3.23, respectively.

*** $p < 0.01$, **$p < 0.05$, *$p < 0.1$

Table 1 shows that GDP, Marketing Capitalization (MC), and LGDP are stationary at the 1% level ($P < 0.01$) when looked at both levels—without trend and with trend and at the first difference again, without trend and with trend. The Stock Volume Traded (SVT) for Banking Development (BD) shows non-stationarity at significance levels of 1%, 5%, and 10%, both at the level and when trends are taken into account. When looked at through first differences and without a trend, Gross Capital Formation (GCF), Stock Volume Traded (SVT), and Education (Edu) all show stationarity at 1%, 5% and 10%.

## 3.2. Results of Model 1

Table 2 indicates that exceeded value of upper limit demonstrating that cointegration exists amongst the variables at the 1% significance level.

**Table 2** *F-Test*

| Lags | F-statistics | Critical values at 1% | | Result |
|------|------|------|------|------|
| 1 | 5.63 | 3.29 | 4.37 | Cointegrated |

K = variables are on the left hand side

Table 3 indicates the usage of AIC at lag 1. The outcome of this study is derived from the AIC at lag 1. We will estimate the ARDL model in the subsequent step.

**Table 3** Lag Length Section Criteria

Endogenous variables: EDU GCF LGDP POLRIGHT MC
Exogenous variables: C
Sample: 1988-2012
Included observations: 23

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|------|------|------|------|------|------|------|
| 0 | −223.4278 | NA | 291.2487 | 19.86329 | 20.11014 | 19.92537 |
| 1 | −113.2775 | 162.8310* | 0.188481* | 12.45891* | 13.93999* | 12.83140* |
| 2 | −92.53524 | 21.64405 | 0.392361 | 12.82915 | 15.54446 | 13.51204 |

* indicates lag order selected by the criterion

In table 4, serial correlation, functional form, normalcy, and heteroscedasticity are evaluated using a diagnostic test. A functional form value greater than 5% was found using Ramsey's Reset test, indicating that there are no specification errors in the model. The model is normally distributed since the variance stays constant over time and the normality indicates an acceptable requirement. Heteroscedasticity is not present.

**Table 4** *Estimation Results of ARDL Model.*
*Dependent Variable: LGDP*
*Schwarz Bayesian Criterion is selected and ARDL based on this Criterion is (1,0,0,1,1)*

| Variables | Coefficient | Std. Error | t-Statistic | Prob. |
|------|------|------|------|------|
| LGDP (−1) | 0.77192 | 0.10066 | 7.6688 | 0.000 |
| MC | 0.0010349 | 0.3800E-3 | 2.7232 | 0.015 |
| EDU | 0.0094858 | 0.0044903 | 2.1125 | 0.051 |
| POLRIGHT | 0.0027066 | 0.0045531 | 0.5944 | 0.561 |

| POLRIGHT (−1) | −0.012649 | 0.0051158 | −2.4726 | 0.025 |
|---|---|---|---|---|
| GCF | 0.0081629 | 0.0039445 | 2.0695 | 0.055 |
| GCF (−1) | −0.0084814 | 0.0028536 | −2.9722 | 0.009 |
| C | 5.4564 | 2.3748 | 2.2977 | 0.035 |
| R-Square | 0.99879 | Prob (F-statistic) | | 0.00 |
| Adjusted R-Square | 0.99827 | Durbin-Watson statistic | | 2.1584 |
| F-statistic | | 1892.8 | | |

**Diagnostic Test**

| Test Statistics | | LM Version | F Version |
|---|---|---|---|
| A: Serial Correlation | *CHSQ(1) | 0.27872 [0.598] * F (1,15) | 0.17624 [0.681]* |
| B: Functional Form | *CHSQ(1) | 4.0147 [0.045] * F (1,15) | 3.0133 [0.103]* |
| C: Normality | *CHSQ(2) | 1.4195 [0.492]* | NA* |
| D: Heteroscedasticity | *CHSQ(1) | 2.1461 [0.143] * F (1,22) | 2.1605 [0.156]* |

## 3.3. Stability Test

Researchers use to evaluate the model's reliability and constancy parameters. Since the existence of cointegration among variables does not ensure the stability of the calculated coefficients, a stability test is necessary to generate reliable data.

In ARDL, the error correction model is used, and stability is evaluated using CUSUM and CUSUMQ. For both the SUSUM and CUSUMQ tests, every coefficient is considered stable.
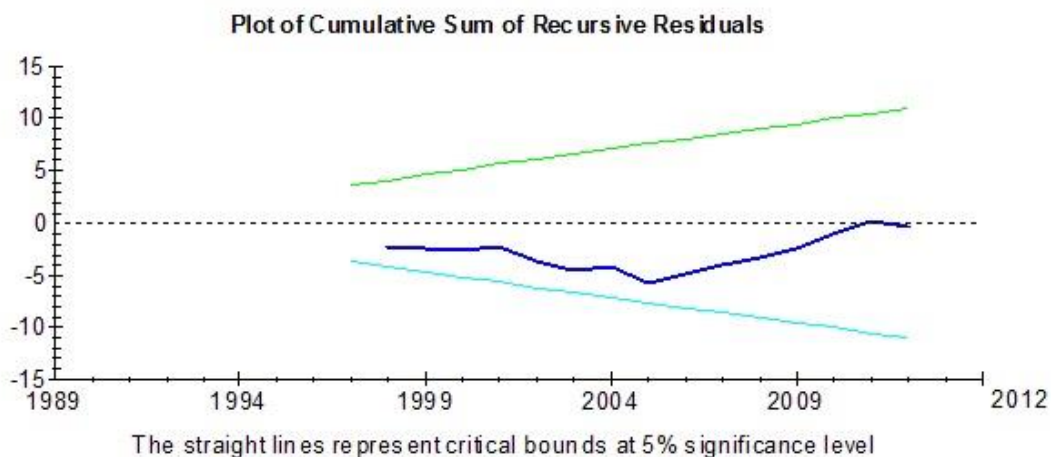


**Figure 2** *Plot of Cumulative Sum of Recursive Residuals*
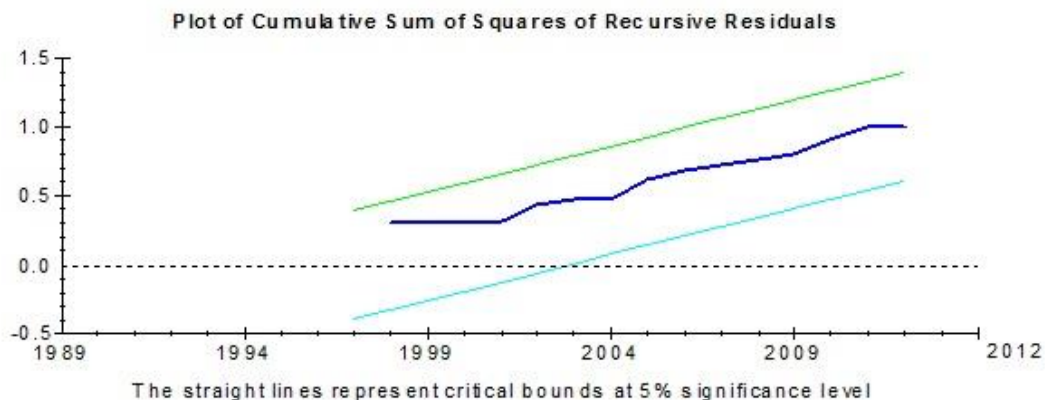
**Figure 3** *Plot of Cumulative Sum of Squares if Recursive Residuals*

The break points show how the CUSUM and CUSUMSQ work in which null hypothesis is accepted.

Long-term estimates in Model 1 using ARDL methodology are shown in Table 5. At the 10 percent, five percent, and one percent levels of significance, correspondingly, the table shows that MC, Edu, and PolRight have a significant impact on LGDP. Long-term GDP will change by 0.4% for every 1% change in marginal cost. There will be a 4.35% long-term negative impact on LGDP for every 1 index movement in Polright. Table 5 indicates that GCF has a negligible long-term impact on LGDP.

**Table 5** *Estimated Long Run Coefficients (ARDL Approach)*
*ARDL (1,0,0,1,1) selected based on Schwarz Bayesian Criterion. Dependent Variable is LGDP*

| Regressor | Coefficient | Standard Error | T-Ratio [Prob] |
|---|---|---|---|
| MC | 0.0045375 | 0.0025850 | 1.7553 [0.098] |
| EDU | 0.041589 | 0.0035741 | 11.6362 [0.000] |
| POLRIGHT | −0.043593 | 0.012343 | −3.5317 [0.003] |
| GCF | −0.0013965 | 0.013660 | −0.10223 [0.920] |
| C | 23.9229 | 0.35550 | 67.2933 [0.000] |

The Error Correction Model estimates for Model 1 are shown in Table 6. At the 10 percent, five percent, and one percent significance, in the short term, respectively, the variables MC, Edu, and GCF have a significant impact on the dependent variable LGDP, according to the results in Table 6. Instead, showing divergence, ECM's coefficient is adverse, suggesting convergence towards equilibrium. This shows the long-term rate of adjustment to equilibrium.

**Table 6** Error Correction Representation of Selected *ARDL Model*
*ARDL (1,0,0,1,1) selected based on Schwarz Bayesian Criterion. Dependent Variable is dLGDP*

| Regressor | Coefficient | Standard Error | T-Ratio [Prob] |
|---|---|---|---|
| dMC | 0.0010349 | 0.3800E-3 | 2.7232 [0.014] |
| dEDU | 0.0094858 | 0.0044903 | 2.1125 [0.049] |
| dPOLRIGHT | 0.0027066 | 0.0045531 | 0.59444 [0.560] |
| dGCF | 0.0081629 | 0.0039445 | 2.0695 [0.053] |
| dC | 5.4564 | 2.3748 | 2.2977 [0.034] |
| ecm(−1) | −0.22808 | 0.10066 | −2.2659 [0.036] |

| | | | |
|---|---|---|---|
| R-Squared | 0.66994 | S.E. of Regression | 0.012111 |
| R-Bar-Squared | 0.52554 | F-stat. F (5, 18) | 6.4951 [0.001] |
| Mean of Dependent Variable | 041395 | Residual Sum of Squares | 0.0023467 |
| S.D. of Dependent Variable | 0.017582 | Equation Log-likelihood | 76.7392 |
| Akaike Info. Criterion | 68.7392 | DW-statistic | 2.1584 |
| Schwarz Bayesian Criterion | 64.0270 | | |

## 3.4. Results of Model 2

Table 7 shows that the F-statistic is higher than the upper limit of the critical value. This proves that the variables are cointegrated at the 1% level of significance.

**Table 7** *F-Test*

| Lags | F-statistics | Critical values at 1% | | Result |
|---|---|---|---|---|
| 1 | 4.45 | 3.29 | 4.37 | Cointegrated |

K = variables are on the left hand side

Table 8 directs the AIC application at lag 1. This study's result is derived from the AIC at lag 1.

**Table 8** *Lag Length Selection Criteria*

Endogenous variables: EDU GCF BD LGDP POLRIGHT
Exogenous variables: C
Sample: 1988 2012
Included observations: 23

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | −195.3324 | NA | 25.30752 | 17.42021 | 17.66706 | 17.48229 |
| 1 | −78.12994 | 173.2559* | 0.008870 | 9.402603 | 10.88368* | 9.775091 |
| 2 | −45.90029 | 33.63094 | 0.006800* | 8.773938* | 11.48925 | 9.456832* |

* Indicates lag order selected by the criterion.

Table 9 showed that the significance value is greater than 0.05. Ramsey's Reset test shows that the functional form value is more than 5%, which shows that the model does not have a specification mistake. The normality signifies an acceptable

criterion, and the variance remains stable throughout the period. There is no heteroscedasticity. The table shows that the lag of the second period doesn't add much to the model.

**Table 9** *Estimation Results of ARDL Model*
*Dependent variable: LGDP*
*Akaike Information Selected Based on this Criterion is ARDL (2,0,2,1,2)*

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LGDP(−1) | 0.93747 | 0.30006 | 3.1243 | 0.010 |
| LGDP(−2) | −0.44354 | 0.33186 | −1.3365 | 0.208 |
| BD | −0.0013313 | 0.0025723 | −0.51753 | 0.615 |
| EDU | 0.010451 | 0.016490 | 0.63377 | 0.539 |
| EDU(−1) | −0.0097361 | 0.015237 | −0.63900 | 0.536 |
| EDU(−2) | 0.021146 | 0.012805 | 1.6514 | 0.127 |
| POLRIGHT | 0.010077 | 0.0061937 | 1.6269 | 0.132 |
| POLRIGHT(−1) | −0.021570 | 0.0066460 | −3.2455 | 0.008 |
| GCF | 0.013955 | 0.0052189 | 2.6740 | 0.022 |
| GCF(−1) | −0.010891 | 0.0043163 | −2.5232 | 0.028 |
| GCF(−2) | 0.0081584 | 0.0047028 | 1.7348 | 0.111 |
| C | 11.8487 | 4.3017 | 2.7545 | 0.019 |

| | | | | |
|---|---|---|---|---|
| R-Square | 0.99869 | | Prob (F-statistic) | 0.00 |
| Adjusted R-Square | 0.99737 | | Durbin-Watson statistic | 2.3843 |
| F-statistic | | 759.9407 | | |

**Diagnostic Test**

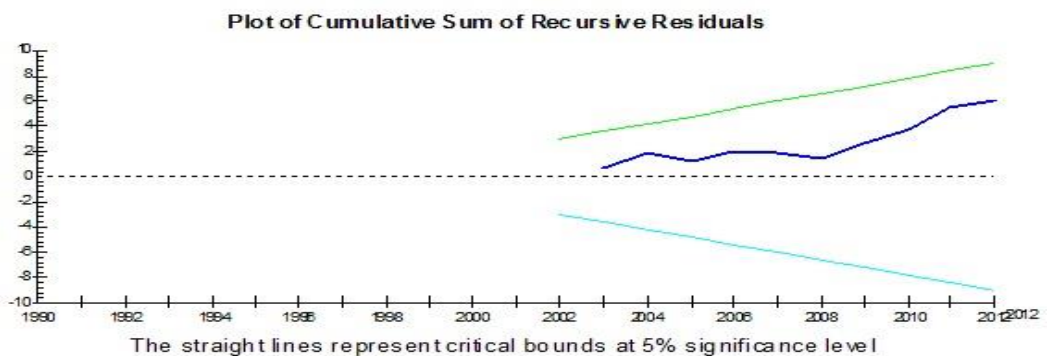| TEST STATISTICS | | * LM VERSION* | F VERSION* |
|---|---|---|---|
| A: Serial Correlation | *CHSQ(1) | 1.9506 [0.163] * F(1,10) | 0.92667 [0.358]* |
| B: Functional Form | *CHSQ (1) | 2.1608 [0.142] * F(1,10) | 1.0369 [0.333]* |
| C: Normality | *CHSQ (2) | 0.30468 [0.859]* | NA |
| D: Heteroscedasticity | *CHSQ (1) | 1.0874 [0.297] * F (1,21) | 1.0421 [0.319]* |

## 3.5. Stability Test



**Figure 4** *Plot of Cumulative Sum of Recursive Residuals*

## Plot of Cumulative Sum of Squares of Recursive Residuals



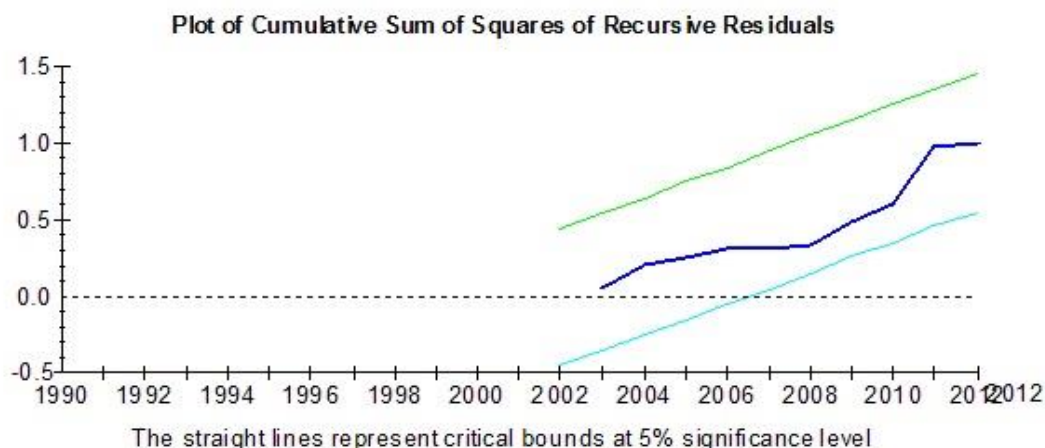The straight lines represent critical bounds at 5% significance level

**Figure 5** *Plot of Cumulative Sum Squares of Recursive Residuals*

The break points show how the CUSUM and CUSUMSQ work. The null hypothesis is supported. The plot shows how the variables stayed the same over the time period in question.

Table 10 shows the long-term predictions of Model 2 using the ARDL method. Table 10 shows that Edu, PolRight, and GCF all have a big effect on LGDP at the 1%, five percent, and ten percent, respectively. A one-point change in education will cause long-term LGDP to change by 4.3%. A 1-point change in Polright will have a long-term negative effect of 2.27% on LGDP. As shown in Table 10, BD has very little effect on LGDP over the long term.

**Table 10** *Estimated Long Run Coefficients (ARDL Approach)*
*ARDL (2,0,2,1,2) Selected Based on Akaike Information Criterion Dependent variable is LGDP*
*23 observations used for estimation from 1990 to 2012*

| Regressor | Coefficient | Standard Error | T-Ratio [Prob] |
|-----------|-------------|----------------|----------------|
| BD | −0.0026306 | 0.0049255 | −0.53408 [0.604] |
| EDU | 0.043196 | 0.0024382 | 17.7165 [0.000] |
| POLRIGHT | −0.022711 | 0.010967 | −2.0708 [0.063] |
| GCF | 0.022176 | 0.011251 | 1.9711 [0.074] |
| C | 23.4133 | 0.21545 | 108.6736 [0.000] |

Table 11 shows the Error Correction Model's estimates for Model 2. Table 11 shows that only GCF have major impact on LGDP in the short-term.

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**Table 11** *Error Correction Representative for the Selected ARDL Model. ARDL (2,0,2,1,2) Selected Based on Akaike Information Criterion.*
*Dependent Variable is dLGDP*

| Regressor | Coefficient | Standard Error | T-Ratio [Prob] |
|---|---|---|---|
| dLGDP1 | 0.44354 | 0.33186 | 1.3365 [0.203] |
| dBD | −0.0013313 | 0.0025723 | −0.51753 [0.613] |
| dEDU | 0.010451 | 0.016490 | 0.63377 [0.536] |
| dEDU1 | −0.021146 | 0.012805 | −1.6514 [0.121] |
| dPOLRIGHT | 0.010077 | 0.0061937 | 1.6269 [0.126] |
| dGCF | 0.013955 | 0.0052189 | 2.6740 [0.018] |
| dGCF1 | −0.0081584 | 0.0047028 | −1.7348 [0.105] |
| dC | 11.8487 | 4.3017 | 2.7545 [0.016] |
| ecm(−1) | −0.50607 | 0.18220 | −2.7776 [0.015] |
| R-Squared | 0.68175 | R-Bar-Squared | 0.36350 |
| S.E. of Regression | 0.014290 | F-stat. F (8, 14) | 2.9455 [0.037] |
| Mean of Dependent Variable | 0.041090 | S.D. of Dependent Variable | 0.017912 |
| Residual Sum of Squares | 0022464 | Equation Log-likelihood | 73.5546 |
| Akaike Info. Criterion | 61.5546 | Schwarz Bayesian Criterion | 54.7417 |
| DW-statistic | | 2.3843 | |

## 3.6 Results of Model 3

Table 12 shows that the F-statistic is higher than the upper limit of the critical value. This proves that the variables are cointegrated at the 1% level of significance.

**Table 12** *F-Test*

| Lags | F-statistics | Critical values at 1% | | Result |
|---|---|---|---|---|
| 1 | 6.78 | 3.29 | 4.37 | Cointegrated |

K = variables are on the left hand side

Table 13 directs the AIC application at lag 1. This study's result is derived from the AIC at lag 1.

**Table 13** *Lag Length Selection Criteria*

Endogenous variables: EDU GCF LGDP POLRIGHT SVT
Exogenous variables: C
Sample: 1988- 2012
Included observations: 23

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | −244.0987 | NA | 1757.497 | 21.66076 | 21.90760 | 21.72284 |
| 1 | −130.1950 | 168.3794* | 0.820639 | 13.93000 | 15.41108* | 14.30248 |
| 2 | −94.43375 | 37.31605 | 0.462788* | 12.99424* | 15.70955 | 13.67713* |

* Indicates lag order selected by the criterion

Table 14 shows the diagnostic test that was used to check for normality, functional form, serial correlation. The data shows a good level of normality, and the variance stays the same over time. Results are consistent with those shown in Tables 3 and 5, which show the other two models.

**Table 14:** *Estimation Results of ARDL Model*
*Dependent variable: LGDP*
*Akaike Information Selected Based on this Criterion is ARDL (1,1,2,1,2)*

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LGDP(−1) | 0.48954 | 0.13929 | 3.5146 | 0.005 |
| SVT | −0.1022E-3 | 0.1749E-3 | −0.58439 | 0.571 |
| SVT(−1) | 0.7303E-3 | 0.2162E-3 | 3.3780 | 0.006 |
| EDU | −0.016741 | 0.010208 | −1.6400 | 0.129 |
| EDU(−1) | 0.0032820 | 0.011036 | 0.29740 | 0.772 |
| EDU(−2) | 0.032016 | 0.0096300 | 3.3245 | 0.007 |
| POLRIGHT | 0.0066284 | 0.0050075 | 1.3237 | 0.212 |
| POLRIGHT(−1) | −0.021153 | 0.0050463 | −4.1918 | 0.002 |
| GCF | 0.0094747 | 0.0045014 | 2.1048 | 0.059 |
| GCF(−1) | −0.018527 | 0.0040332 | −4.5936 | 0.001 |
| GCF(−2) | 0.013916 | 0.0040098 | 3.4705 | 0.005 |
| C | 12.2148 | 3.2955 | 3.7065 | 0.003 |
| R-Square | 0.99927 | | Prob (F-statistic) | 0.00 |
| Adjusted R-Square | 0.99855 | | Durbin-Watson statistic | 2.4051 |
| F-statistic | | 1373.7 | | |

**Diagnostic Test**

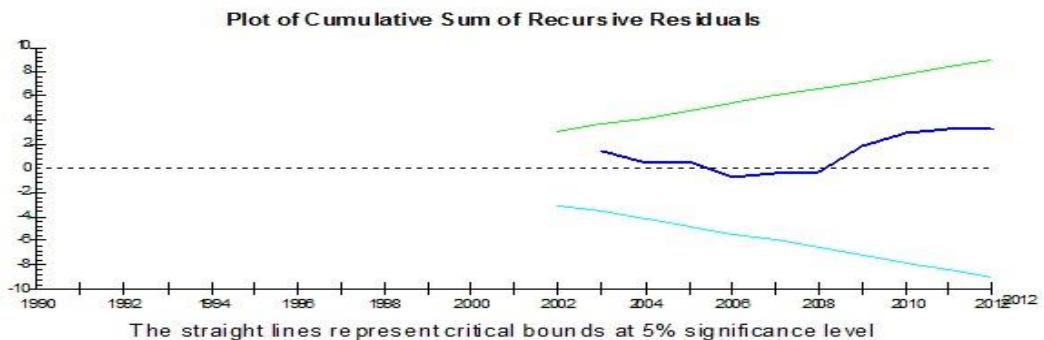| TEST STATISTICS* | | LM VERSION* | F VERSION* |
|---|---|---|---|
| A: Serial Correlation | *CHSQ(1) | 1.8324 [0.176] * F(1,10) | 0.86566 [0.374]* |
| B: Functional Form | *CHSQ(1) | 2.6148 [0.106] * F(110) | 1.2827 [0.284]* |
| C: Normality | *CHSQ(2) | 0.27540 [0.871]* | NA* |
| D: Heteroscedasticity | *CHSQ(1) | 0.36779 [0.544] * F(1,21) | 0.34127 [0.565]* |

## 3.7. Stability Test



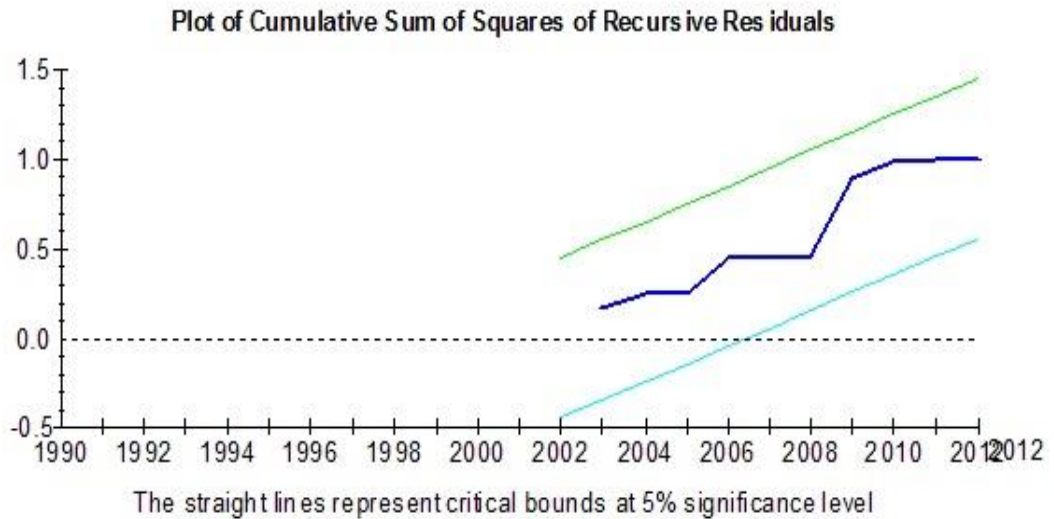**Figure 6** *Plot of Cumulative Sum of Recursive Residuals*

**Figure 7** *Plot of Cumulative Sum Squares of Recursive Residuals*

The graph shows that the variables stayed stable during the time of the observation. The relationship between CUSUM and CUSUMSQ and the breakpoints is shown by the graphs.

Table 15 shows the long-term predictions of Model 3 using the ARDL method. The table shows that SVT, Edu, and PolRight have a big effect on LGDP at five percet, and one percent implication level.

**Table 15** *Estimated Long Run Coefficients (ARDL Approach)*
*ARDL (1,1,2,1,2) Selected Based on Akaike Information Criterion Dependent variable is LGDP*

| Regressor | Coefficient | Standard Error | T-Ratio [Prob] |
|---|---|---|---|
| SVT | 0.0012303 | 0.5502E-3 | 2.2363 [0.047] |
| EDU | 0.036352 | 0.0025678 | 14.1568 [0.000] |
| POLRIGHT | −0.028454 | 0.0088322 | −3.2216 [0.008] |
| GCF | 0.0095283 | 0.0068009 | 1.4010 [0.189] |
| C | 23.9290 | 0.21719 | 110.1748 [0.000] |

The Error Correction Model estimates for Model 3 displayed in table 16 which showed the variables Edu1, GCF, and GCF1 have a big effect on the dependent variable LGDP.

**TABLE 16** *Error Correction Representation for the Selected ARDL Model*
*ARDL (1, 1, 2, 1, 2) selected based on Akaike Information Criterion*
*Dependent variable is dLGDP*

| Regressor | Coefficient | Standard Error | T-Ratio [Prob] |
|---|---|---|---|
| dSVT | −0.1022E-3 | 0.1749E-3 | −0.58439 [0.568] |
| dEDU | −0.016741 | 0.010208 | −1.6400 [0.122] |
| dEDU1 | −0.032016 | 0.0096300 | −3.3245 [0.005] |
| dPOLRIGHT | 0.0066284 | 0.0050075 | 1.3237 [0.205] |
| dGCF | 0.0094747 | 0.0045014 | 2.1048 [0.053] |
| dGCF1 | −0.013916 | 0.0040098 | −3.4705 [0.003] |
| dC | 12.2148 | 3.2955 | 3.7065 [0.002] |
| ecm(−1) | −0.51046 | 0.13929 | −3.6648 [0.002] |
| R-Squared | 0.82384 | R-Bar-Squared | 0.64767 |
| S.E. of Regression | 0.010632 | F-stat. F(7, 15) | 7.3488 [0.001] |
| Mean of Dependent Variable | 0.041090 | S.D. of Dependent Variable | 0.017912 |
| Residual Sum of Squares | 0.0012435 | Equation Log-likelihood | 80.3560 |
| Akaike Info. Criterion | 68.3560 | Schwarz Bayesian Criterion | 61.5430 |
| DW-statistic | | 2.4051 | |

### 3.8. Granger Causality Test

1. LGDP Granger causes monetary progress, whereas monetary progress doesn't Granger cause LGDP. Both are mutually independent. (Refer to Table 17)

2. Capitalization of the market Granger causes LGDP, whereas LGDP doesn't Granger cause Capitalization of the Market. Both are mutually independent. (Refer to Table 17)

3. Stock quantity executed Granger causes LGDP, whereas LGDP doesn't Granger cause stock volume traded. Both are mutually independent. (Refer to Table 17)

**TABLE 17** *Ganger Test for Causality*

| Null Hypothesis | Observations | F-Statistic | Prob. |
|---|---|---|---|
| LGDP does not Granger cause BD | 24 | 3.52686 | 0.0743 |
| BD does not Granger cause LGDP | | 0.04444 | 0.8351 |
| MC does not Granger cause LGDP | 22 | 2.50837 | 0.0983 |
| LGDP does not Granger cause MC | | 0.97686 | 0.4297 |
| SVT does not Granger cause LGDP | 21 | 2.82843 | 0.0727 |
| LGDP does not Granger cause SVT | | 0.62876 | 0.6512 |

## 4. CONCLUSION, DISCUSSION AND SUGGESTIONS

Using annual data from 1988 to 2012 obtained from the World Development Indicators (WDI), this study seeks to determine the nature of the relationship between

EG and FD in Pakistan, specifically whether it is supply-driven, demand-following, non-existent, or causal. The advancement of the securities exchange and the finance industry serves as the two metrics for assessing financial development. Private credit deposits are used to gauge the progress of banking, while activity and size indicators are utilized to gauge progress of the stock exchange. The GCT, model of ARDL, and ADF method analyzed data. When structural discontinuities are present, cointegration between variables is assessed consuming the ARDL bounds testing method. The following are the study's main findings:

1. Cointegration between the configurations surrounding fundamental breaks in the variables is revealed by the results.

2. The subordinate variables—banking development, market capitalization, and stock volume traded in relation to LGDP—have a unidirectional relationship.

3. The study claims a connection between FD and EG which is causal because results show a relationship between circumstances and outcomes.

4. Granger studies show that some variables have a supply-driven relationship, whereas others interact in a demand-following manner. While market capitalization and stock volume traded Granger cause log GDP, LGDP Granger causes banking development. In conclusion, the variables in this causal framework exhibit a unidirectional relationship that is defined by supply-driven dynamics and demand-following behavior.

The study found that financing occurs after growth (Muhsin and Eric, 2000; Regmi, 2012). Furthermore, studies showed that the cointegrating relationship shows that fiscal progress is influenced by monetary progress (Uddin et al., 2013; Ghosh et al., 2014; Abosedra et al., 2015). Furthermore, the study's conclusions are consistent with earlier investigations into Pakistan's economy. The cointegration test and the supply-driven hypothesis, which states that FDI and economic prosperity (EG) are positively correlated, were connected by Ali et al. (2014). Iqbal et al. (2012) provided empirical evidence indicating that the ratio of private sector loans significantly affects economic growth. Anwar et al. (2011) established a causal relationship among fiscal prosperity (FD) and economic prosperity (EG), indicating that FD positively and significantly influences EG. The demand-following theory was validated by Muhammad and Umer (2010). Fase & Abma (2003) found a causal link between financial structure and economic development and noted that financial development (FD) is a byproduct of economic growth (EG).

Every aspect from financial sector influences the Pakistani economy in a way that promotes growth. In order to speed up financial transactions in Pakistan, EG must be improved. By elevating the significance of saving, changes to financial intermediaries would encourage the investment process and increase investment. Research findings indicate that one significant reason contributive to monetary. On the same boat, EG was a key factor in supporting banking expansion. Since a strong

banking industry and a developed stock market are essential for intermediation for economic growth, the expansion of intermediaries can further the development of the financial market. Plan developers frequently argue verbally about whether to prioritize banking expansion or stock market performance.

By the end, expanding the study's aim by including a thorough correlation among other developing countries that have experienced different economic and development fluctuations is very alluring.

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# Promoting Innovation Performance in European Developing Nations: Role of Technology Transfer, Regulation Quality, Research and Development Expenditures, and Knowledge Spillovers

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## ABSTRACT

The European Union's single market has positioned it as a key player in global foreign direct investment (FDI). Nevertheless, the more developed economies of the original 15 EU member states have consistently drawn a larger portion of inbound FDI. This study explores the relationship between FDI, technology transfer, and innovation performance in 26 EU member states. It also considers the influence of human capital, R&D, and anti-corruption policies on FDI and innovation. Using panel data from 2011 to 2022 and fixed effect estimation (FEE) techniques, the research investigates how FDI-induced spillovers impact patent activities in both the advanced economies of the EU-15 and the transition economies of Central and Eastern European Countries (CEEC). The findings reveal that FDI generally boosts innovation performance in EU enterprises, with a more pronounced effect on the innovation activities of CEEC countries, reflecting their efforts to enhance their innovation capabilities. However, industry-level analysis indicates that EU-15 manufacturing sectors are more likely to benefit from FDI than their counterparts in the CEEC. The study offers valuable insights into the role of regulation quality, technology transfer, human capital, R&D investments, and FDI in driving innovation and economic growth in host countries.

**Keywords:** Technology Transfer; Foreign Direct Investment; Innovation; Human Capital; Regulation Quality

## 1. INTRODUCTION

Investment from foreign countries helps economies grow, allowing developing countries to learn about and adopt cutting-edge technologies from more wealthy

countries. Increased tax revenue results from a higher standard of living, which in turn increases the number of people able to work and contribute to society (Kim et al., 2023); and the number of people working and contributing to society. Spillover channels, such as the movement of technical labor and reverse engineering, are some ways in which this phenomenon influences the innovation process (Abbas & Khan, 2022). The transfer of technology fosters education and training in cutting-edge technologies, which advances human capital in the host country and paves the way for more incredible homegrown innovation (Chen et al., 2023).

Since FDI facilitates the transfer of technology from advanced to developing nations, some scholars, including Ahmad et al. (2020), consider it more significant than domestic investment. Consumers benefit more when goods are produced by companies based in more technologically sophisticated nations than those based in the host country (Najam et al., 2022). When MNCs enter a market, they increase domestic competition, which in turn encourages local businesses to become more competitive through increased efficiency in resource usage, enhanced customer service, and enhanced product quality (Wang et al., 2022). Knowledge, productivity, and export spillover occur in the host country (Tong et al., 2023) because foreign enterprises contribute sophisticated expertise and technological skills, eventually diffusing into the local economy (Yu et al., 2022).

The European Union (EU) has recently emerged as a key player in global FDI dynamics, strengthening its position as a major economic force (Tong et al., 2023). Historically, the bulk of incoming FDI has been directed toward the more developed economies of the EU's original 15 members, while newer members, particularly the Central and Eastern European Countries (CEEC), have attracted less attention. In an effort to enhance the innovation capabilities of domestic businesses and promote deeper economic integration between the CEEC and the EU, EU officials are implementing strategies to draw foreign investment to the CEEC region. However, it remains uncertain whether the impact of FDI on national innovation performance in the CEEC differs from or aligns with the effects seen in the EU-15.

Although there are several studies on FDI, economic growth, and intellectual property rights (IPR), most studies have only examined one country or region. Habib et al. (2019) analyzed the impact of human capital, IPR, and R&D spending on productivity growth in Brazil, Russia, India, and China (BRIC). Khadan (2018) looked into the impact of human capital on the region's creative output in the Caribbean. Using human capital as a moderating variable, Awan (2020) examined the effect of foreign direct investment and trade on knowledge spillover. Despite the increasing importance of CEEC to the global economy, the researchers could not find a reputable study that investigated FDI, technology transfer, and innovation performance in the context of CEEC and EU-15 and then compared the two regions.

To address this gap in knowledge, we utilize panel data from 2011 to 2022 to explore the relationship between foreign direct investment (FDI), technology transfer, and the innovation performance of the host country's manufacturing sector in both the CEEC and EU. The study analyzes firm patenting activities in the developed economies of the EU-15 and the transition economies of the CEEC to assess the impact of FDI-driven spillovers using the fixed effect estimation (FEE) method. Additionally, this research incorporates human capital, R\&D spending, and regulatory quality aimed at reducing corruption into the core framework of FDI and innovation. The CEEC region includes Bulgaria, Latvia, Poland, Croatia, Hungary, the Czech Republic, Slovakia, Romania, Slovenia, Lithuania, and Estonia, though Albania is excluded due to data limitations. The EU-15 comprises Belgium, Spain, Italy, Austria, Sweden, Denmark, Portugal, Greece, France, Ireland, and the Netherlands, with the United Kingdom, France, Germany, Ireland, the Netherlands, Finland, Luxembourg, and Sweden not being part of the original EU-15 group.

## 2. LITERATURE REVIEW

FDI plays an essential role in the host country's firm innovation performance, as foreign firms give local firms a chance to innovate via spillover and demonstration effect. Further, innovation is regarded as a powerful stimulator that aids micro-level firms to flourish and achieve success (Abbas, Bresciani, et al., 2025). The affiliation of multinational organizations significantly expands a firm's capability to innovate by aiding firms in overcoming impediments such as limitations of resources, funds, technology, and market information. Due to the availability of resources, organizations receiving FDI are more likely to appeal to and retain better-skilled and qualified employees through better compensation and reward packages than usual firms. Consequently, better financial conditions lead to organizational innovation.

FDI is considered an inexpensive technology transfer, particularly for developing nations, as they have limited funds and resources to acquire the latest technology (Zhou et al., 2023). As foreign firms enter the host country, local firms can learn new technologies via demonstration effect and try to hire workers of foreign firms to adopt these technologies. Furthermore, foreign entry into the host country leads to increased competition in the domestic market. The local firms either try to innovate or hire skilled labor to remain in the market. The demonstration effect occurs when local firms directly contact MNCs. Moreover, when local firms have limited knowledge about the cost and benefits of producing new products, they will try to imitate the technologies of MNCs (Wang et al., 2022).

Al-Kwifi et al. (2020) stated that MNCs' foreign subsidiaries increase competition in the domestic economy, and, in response, local firms stimulate their resources to compete with their rivals. This competitive pressure forces local firms to adopt new technologies and production techniques to retain their market identity (Abbas, 2025). Knowledge transfer is also a type of spillover through which domestic firms attain better organizational performance (Abbas, Dabic, et al., 2025; Fan et al., 2023) and innovation from FDI. Inward FDI can develop opportunities for local organizations to upgrade their technologies via learning (Ferreira et al., 2024). Networking is another type of spillover that is also important for the innovation performance of local firms (Zhao et al., 2022). Through networking (local and national), local firms can enhance their research and development levels and innovate. Moreover, firms within foreign linkages have more innovations than those with local associations. Local and foreign firms also collaborate through joint venture programs to achieve parallel goals. Hence, foreign-invested firms investing and operating in other industries lead to inter-industry spillover. These kinds of spillover may affect supplier-customer linkages, leading to increased innovation performance (Xiao et al., 2022).

The entry of foreign firms sparks competition in the host country's market, and these competitive effects provide incentives to local firms to use their existing resources more efficiently or to invest in R&D to innovate (Khan et al., 2022). There is a probability that competitive effects are not positive if domestic firms experience considerable loss because of ineffective technology. Generally, there are four productivity channels, namely labor mobility, demonstration effect, competition effect, and market access spillover, which primarily affect a country's innovation performance (Jiakui et al., 2023). Moreover, FDI's demonstration effect is imperative in overall organizational productivity (Mohebi & Komijani, 2018), especially in the quality of products/services and organizational framework. Proponents of knowledge transfer believe that foreign investment plays a key role in the diffusion of innovation activities in host firms. Firms with a higher innovation capacity improve their chances to access funds externally by utilizing professional networking (Kumari et al., 2022).

## 2.1. Relationship Between FDI and Innovation

FDI inflow into the host country enhances innovative activities via two channels: firstly, the transfer of accumulated knowledge through the transfer of technology or employees' mobility; secondly, after FDI, firms have more funds to spend on R&D; thus leading to enhanced innovation (Nyeadi & Adjasi, 2020). FDI (inward and outward) positively affects the creative competencies of firms. Zhang et al. (2022) researched South Asian countries from 2000 to 2011 and concluded that R&D is crucial in determining innovation. They also observed that FDI positively impacts the innovation activities of firms. Still, its intensity depends on

absorptive capacity and resources, aiding the firm's technological innovation. Loukil (2016) said that FDI channelizes modern technology from technologically advanced nations to developing ones; however, a corresponding asset is necessary for effectiveness.

While examining the relationship between FDI and firms' competition in developed countries, Murthy et al. (2017) stated that inward FDI leads to increased competition in the domestic market, decreasing the domestic firm's profitability. In reply, firms must produce more efficient and improved products that maintain their market position (Xie et al., 2022). The result varies from industry to industry, and it depends upon the ability and competency of domestic firms to respond to these foreign challenges (Pan et al., 2022). When foreign firms invest in host countries, local firms try to imitate their technologies. The spillover effect from these MNCs depends upon the complexity of their products and how well competitors can understand them. Therefore, when products are sold and manufactured by horizontal FDI, they are easy to imitate because of production and sale in the same country.

On the other hand, if the goods associated with vertical FDI are labor-intensive and require less technology, they may be more susceptible to imitation. Although numerous scholars have examined the relationship between foreign direct investment (FDI) and innovation from different perspectives, it remains uncertain whether FDI enhances the innovative performance of manufacturing firms in host nations. To do so, the following hypothesis is put forth:

**H₁**: *Direct investment from foreign countries has been shown to significantly and positively affect the innovativeness of host-country enterprises.*

## 2.2. High Technology Exports and Innovation.

Following the path-dependent character of internationalization, the learning view of the global operation of multinational firms has emerged. It demonstrates that the process is not instantaneous and that businesses continually learn from market experience, influencing future export decisions. Many companies export their products to adjacent markets as a first step toward globalization. After gaining more knowledge and experience, these firms become the persistent exporter of goods that enhance innovation (Nyeadi & Adjasi, 2020). Zaman *et al.* (2019) studied the relationship between international competition and domestic industry high-technology export. They said that it positively affects the innovative activities in the host countries because high-tech products require more sophisticated methods and techniques. Marjit and Ray (2017) stated that with advanced technology and exports, the performance of firms is boosted. Moreover, the

intensity of competition also rises with the existence of advanced technology, which ultimately leads to higher productivity growth.

Ekananda and Parlinggoman (2017) studied the role of FDI in high and non-high-tech exports covering 50 countries over two decades. They suggested that high-technology export organizations covering high-tech-intensive exports and non-high-tech export countries possess substantial productivity and innovation relative to local industries. Trlaković, Despotović, and Ristić (2018) investigated the relationship between technology-intensive exports and Western Balkan countries' productivity (WBC). The results state that the manufacturing sector possesses a significant effect on increasing productivity and suggest that to develop, more nations should invest in high technology-intensive industries to abstain from massive dependence on imports. Mohebi and Komijani (2018) analyzed the relationship between FDI and innovation in the US, China, and Japan. They found that foreign competition due to the entry of foreign firms increases the innovative capability of host country firms. Further, their results depict that both FDI positively and significantly affect product and process innovation. However, the relationship between high-tech exports and innovation is rarely reported in comprehensive manners. Particularly in the context of EU and CEEC regions. For this reason, following hypothesis is proposed;

**H2:** *There is a positive correlation between high-tech exports and domestic innovation efforts.*

## 2.3. Research and development and innovation

Nyeadi and Adjasi (2020) conducted a study examining how foreign direct investment (FDI) impacted indigenous firms' innovation and absorptive capacity. They argue that knowledge production with well-equipped human capital, such as scientists, engineers, researchers, and R&D spending, is where domestic innovation capability begins. They dug deeper into the idea that a country's innovation potential is strongly linked to its expenditure on research and development at home.

According to Zaman *et al.* (2019), foreign firms tend to innovate with a higher propensity and higher ratios of R&D compared to domestic firms in Turkey. He compared three types of R&D activities at national and foreign establishments. His findings highlighted the significant role of R&D in the growing activities of the Turkish manufacturing sector. In the presence of foreign firms in-country, domestic firms prioritize strengthening their creative capability to survive and compete with their foreign counterparts, and domestic firms focus on their R&D activities to construct and improve their innovation capability (Cunningham et al., 2016). Moreover, few studies have found that FDI and R&D activities can strengthen the host country's propensity to become more creative because they stimulate the R&D activities of host firms (Maradana et al., 2017). Since this phenomenon is rarely

studied from the EU and CEES regions' perspective, the following hypothesis is proposed:

**H3:** *Research and development activities are positively associated with innovation activities in host countries*

## 2.4. Human capital and innovation

In the context of economics, human capital refers to the sum of an individual's education and work-related experience. Knowledge, skills, and talents are all components of an individual's competence, allowing them to carry out a given activity (Habib, Abbas and Noman, 2019). When workers invest in themselves by expanding their knowledge and skill sets, they boost their human capital, paving the way for the commercialization of technological progress and economic expansion in the long run. According to Azam's (2019) study of human capital's impact on economic growth in the so-called "Commonwealth Independent States." The benefactor country needs highly skilled people to generate complex negotiations due to the likely increase in costs associated with technology transfer brought on by robust intellectual property protections, which boosts producer bargaining power in the marketplace.

Mohebi and Komijani (2018) argued that foreign firms force incumbent firms to make themselves more efficient and productive by investing in human or physical capital or paying more attention to increase their productivity. Foreign companies train their employees in their operational sites, and this labor becomes available for the domestic economy; this is another source of domestic economy improvement from foreign firms. Labor mobility from foreign to local firms can provide a bridge to catch up with technological gaps because these employees transfer their knowledge from MNCs to local firms.

Nyeadi and Adjasi (2020) argued that selecting skilled labor and firms is significant and essential for innovation performance. They found that multinational enterprises positively affect the incumbent firms' performance because the entry of foreign firms increases the productivity and innovation performance of local firms via the demonstration effect. Felin and Hesterly (2007) stated that the center of knowledge lies at an individual level. Still, we all accentuate the firm level as these technological innovations predominantly contribute to the firm level rather than individually. That's how organizations can benefit from human capital as a resource to spur innovation. Considering the pivotal role of intellectual in the economic growth, this research claims that human capital plays a critical role in the innovation level of the host country in EU and CEES. Thus, the following hypothesis is proposed:

**H4:** *Human capital is a significant positive predictor of the innovation level of the host country*

## 2.5. FDI-based knowledge spillovers and innovation

Some knowledge spillovers from foreign firms to local firms through multiple channels, demonstration effect, and labor turnover. When an MNC establishes its subsidiary in another country, the likelihood of knowledge spillover increases through labor mobility from foreign firms to local firms. Chen et al. (2023) argue that geographical frontiers may be necessary for knowledge spillovers and information flows from one firm to another. As distance increases, the cost of transferring knowledge will also rise. Geographical proximity is also essential for knowledge spillovers. According to Jaffe et al. (2020), a firm's R&D activities can benefit its neighboring firm via spillovers, which have a noticeable impact on other firms.

Spatial proximity is essential for technological and knowledge spillover. It means that if a firm's neighbor produces more patents from R&D activities, it will also positively impact the other firms' performance from spillovers. Fosfuri et al. (2021) examined the relationship between FDI and patent registration from US multinationals to Japan and suggested a positive association. They analyzed a model focusing on spillovers generated by foreign firms in host countries. After training their local workers, they indicated that MNCs use superior technologies in their foreign subsidiaries. Technological spillovers from FDI firms arise when local firms hire these trained workers.

A knowledge spillover from FDI occurs when foreign firms invest in host countries, and these firms have better technological and organizational skills than local firms. Görg and Greenaway (2024) found that the acquisition of foreign technology from FDI can lead to an increase in human capital acquisition. Multinational firms demand skilled labor to continue their production processes. They invest in training programs for their workers in the host country, and it's tough for them to hide their technologies. The mobility of labor and technical expertise from these multinational firms to domestic firms can generate productivity and knowledge spillover. Thus, this research claims the following hypothesis;

**H5:** *FDI-generated knowledge spillover among firms has a significant positive impact on the innovation performance of firms in the host country*

## 2.6. Institutions and innovation

Economies institutions encourage new business ventures through financing and protection and encourage innovation by reducing the barriers to new business development . Market stabilization institutions benefit different industries, such as finance, telecommunication, and transport. These institutions lower the macroeconomic volatility, corruption, and financial crisis. Further, it encourages capital investment and R&D activities (Chen & Funke, 2011). Political risk and governmental enforcement of law impact FDI flow from both the host country and firm perspective (Nyeadi & Adjasi, 2020).

Political stability and institutional quality also play a vital role in attracting foreign firms and investors. Busse and Hefeker (2017) explored different aspects of governmental law enforcement and political stability that impact the flow of foreign firms. Foreign direct investment (FDI) attraction was significantly affected by contract enforcement, government stability, and the absence of internal strife. Other related research provides evidence of the sovereign risk while attracting the FDI, offering governmental policymakers insights into formulating policies to combat that risk. The research by Chen and Funke (2021) suggested that foreign firms are more sensitive to institutional uncertainty risk while making investments. However, different researchers suggested that governmental incentive packages are the better option to attract more FDI flows.

It is well known that innovation is an essential determinant of economic performance. The structure of institutions in an economy influences it. The institutional structure affects the external and internal factors of a firm's innovation activities in an economy. For example, good regulatory quality and less economic corruption foster R&D activities. However, countries with poorer institutional quality and a higher level of corruption distract local firms from engaging in innovative activities. This study claims that high regulatory quality and well-functioning institutions favor the R&D activities that nurture creative activities. Thus, the following hypothesis is proposed;

*$H_6$: Regulation's quality and control of corruption positively impact domestic firms' innovation performance.*

# 3. DATA AND METHODOLOGY

## 3.1. Data

### 3.1.1. Data sources

This study investigates the impact of technology transfer and FDI on firms' innovation performance using panel data from 15 EU countries and 11 CEEC

countries from 2011 to 2022. The data used in this study are taken from different secondary sources like the World Development Indicator, World Governance Indicators (*WDI*, 2023), UNCTAD, and OECD statistics. Further, Regulatory Quality (RQ) data is taken from WGI. Similarly, FDI inflow (Percentage of GDP) variable data is taken from UNCTAD (see Table 1 for a detailed list of variables, their sources, and expected impact on innovation). The number of patent applications is the dependent variable in the analysis and is taken from OECD statistics. The authors also analyzed the effect of manufacturing industry FDI in these countries to assess the spillover effect of manufacturing sector FDI on innovation performance in CEEC and EU-15 countries. Data on GDP, per capita GDP, research in R&D, expenditures in R&D, GDP growth, and high technology exports are taken from WDI. Similarly, patent application and FDI data are taken from OECD statistics. FDI manufacturing industry inflow data is taken from OECD stats. The authors took the lag and logarithm of all variables. Taking the lag of FDI and other variables was to address the endogeneity problem.

### 3.1.2. Data and variables

Following Calderón-Martínez and García-Quevedo's (2013) study, the authors used patent application to measure innovation, i.e., dependent variable. Patent applications are defined as the number of patents for which the local firms seek protection in the respective countries, and it is a proxy of innovation and R&D output. It is calculated by new patents that are registered at EPO. These patents were registered against new technologies in nanotechnologies, Information and Communications Technology (ICT), and health sciences. Human capital is calculated by following Whalley and Zhao's (2013) criteria, which state that human capital is positively associated with innovation. The regulatory quality is incorporated by following Barasa et al. (2017) studies, which is the proxy for governance quality at the country level.

FDI is another independent variable (percentage of GDP). Many studies explain that FDI flows strengthen the host country's propensity to innovate by stimulating firm activities that foster innovation. The authors took this variable's lag since the previous year's FDI will generate a patent after some time. GDP per capita is another variable that shows a country's demand and overall economic performance. R&D expenditure is included following Cheung and Lin (2004) as the measure of input of R&D activities, which are spent to increase the knowledge base for creative work.

**Table 1** *Variables, expected relationship, and their sources*

| Variable name | Proxy | Source | Expected sign |
|---|---|---|---|
| R&D expenditure | R&D input | WDI | Positive |
| High-tech exports | R&D intensive products | WDI | Positive |
| Human Capital | Availability of Human capital | Penn World table | Positive |
| GDP per capita | Market demand | WDI | Positive |
| FDI inflow | Foreign investment | OECD | Positive |
| Regulatory Quality | Rules and regulations of a country | WGI | Positive |
| Control of corruption | Government control over corruption | WGI | Positive |

*Authors proposition

**Table 2** *Descriptive statistics*

| Variable name | Observations | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| *lnPatent* | 442 | 5.48395 | 2.388099 | -0.4054 | 10.1072 |
| *lnFDI* | 436 | 3.53374 | 0.785464 | .08942 | 5.77514 |
| *lnRQ* | 428 | 0.08726 | 0.515613 | -3.9007 | 0.73075 |
| *lnCControl* | 421 | -0.0203 | 0.870586 | -2.6593 | 1.0438 |
| *lnGDPgrowth* | 421 | 1.06034 | 0.934357 | -4.5905 | 2.50416 |
| *lnRnDexp* | 419 | 0.19789 | 0.620321 | -1.0115 | 1.41828 |
| *lnHightexp* | 436 | 22.1288 | 2.0369 | 7.4952 | 25.9348 |
| *lnGDPpc* | 442 | 9.74134 | 0.927676 | 6.96892 | 11.6265 |

*Authors calculations based on data obtained from WDI, WGI, UNCTAD, and OECD statistics.

# 4. EMPIRICAL ESTIMATION AND METHODOLOGY

Cheung and Lin (2004) inspired the methodology used in this study to estimate the effect of FDI on innovation in the CEEC region. The authors used panel data that provided more information and efficiency by combining cross-sectional and time-series data. Moreover, panel data is more consistent because it efficiently measures and detects outcomes compared to time series and cross-section data. The primary concern in analyzing the panel data is to choose the right and valid model. While analyzing the panel data, the ordinary least square method gives biased results or estimates because the unobserved error term correlated with the error term.

There are multiple measures for panel data analysis, such as the fixed effect model (FEM) and the random effect model (REM). In FEM, the intercept of the regression can differ across the individual. To decide whether the fixed effect model (FEM) or the Random effect model (REM) be used, the Hausman test was performed. The null hypothesis $H_0$: $E(\varepsilon i \,|Xit) = 0$ of Hausman test implies that REM yields efficient and consistent estimates if $H_0$ is true. However, under the alternative hypothesis $H_A$: $E(\varepsilon i \,|Xit) \neq 0$, the FEM model yields efficient and consistent estimates. In other words, $H_0$ of the Hausman test suggests that the coefficient difference is not systematic, while $H_A$ indicates that the difference in coefficients is systematic. In the current study, the Hausman test suggests that the difference in coefficient is systematic, so we followed FEM (See table 3). The dependent variable is $lnPatent_{it}$ in the equation 1 and 2, which is the new patent citation in the respective country that indicates the innovation. Further, on the right side of the equation, we have used six independent variables: FDI, regulatory quality, human capital, R&D expenditure, and GDP per capita. In equations (1) & (2), respectively, the script "$i$" denotes the country, and "$t$" denotes the period that is the year.

**Table 3** *Hausman specification test*

|  | (b) | (B) | (b-B) | sqrt(diag(V_b-V_B)) |
|---|---|---|---|---|
|  | RE | FE | Difference | S.E. |
| $lnFDI$ | 0.154806 | 0.225782 | -0.087976 | 0.0196906 |
| $lnRQ$ | -0.09843 | -0.09568 | 0.0342511 | 0.0269051 |
| $lnHC$ | 0.010941 | 0.018015 | -0.0070739 | 0.0097868 |
| $lnRnDexp$ | 0.638792 | 0.495779 | 0.1430133 | 0.0339111 |
| $lnHightexppm$ | 0.38997 | 0.356171 | 0.043799 | 0.0253327 |
| $lnGDPpc$ | 0.591405 | 0.541546 | 0.0498589 | 0.0268078 |

Notes: b = consistent under Ho and Ha; obtained from xtreg  B = inconsistent under Ha, efficient under Ho; obtained from xtreg $\chi^2$ (6) = (b-B)'[(V_b-V_B)^(-1)](b-B)=45217.43Prob>$\chi^2$ = 0.0000

*Authors calculations based on data obtained from WDI, WGI, UNCTAD, and OECD statistics.

**(Equation 1)**

$$lnPatent_{it} = \beta_0 + \beta_1 lnFDI_{it-1} + \beta_2 lnRQ_{it-1} + \beta_3 lnHC_{it-1} + \beta_4 lnRnDexp_{it-1} + \beta_5 lnHightexp_{it-1} + \beta_6 lnGDPpc_{it-1} + \epsilon_{it}$$

**(Equation 2)**

$$lnPatent_{it} = \beta_0 + \beta_1 lnFDI_{it-1} + \beta_2 lnRQ_{it-1} + \beta_3 lnHC_{it-1}$$
$$+ \beta_4 lnR\&D\ Exp_{it-1} + \beta_5 lnHightexp_{it-1} + \beta_6 lnGDPpc_{it-1}$$
$$+ \beta_7 lnFDI_{it-1} \times lnRnDexp_{it-1} \in_{it}$$

Where $lnFDI$ denotes FDI inflow (percentage of GDP) in country $i$ at time $t$, similarly $lnRQ$ is a regularity quality that measures the implementation of rules and regulations of a country by the government. $lnR\&D\ Exp$ are expenditures in R&D that measure the intensity of expenditures in research and development. Similarly, per capita GDP is denoted by $lnGDPpc$ those measures the market's demand. The variable $lnHC$ denotes Human capital, which plays a positive role in innovation because the countries that have a high level of human capital can generate more patents. The authors incorporated another independent variable, i.e., high technology exports $lnHightexp$; with the logic, if a country is exporting more technology-intensive products, it will generate more innovation in the form of new patents.

## 5. RESULTS AND DISCUSSION

The researchers ran a correlation test to make sure there wasn't any connection between the factors mentioned above. Table 4 of the correlation matrix demonstrates that the level of the correlation coefficient is under 0.5, meeting the threshold set by Abdullah (2006) of being under 0.85. Researchers consider the results without making any mistakes or adjustments by using the numbers in the correlation findings in Table 6 in the appendix.

**Table 4** *Correlation table*

|  | $lnFDI$ | $lnRQ$ | $lnHC$ | $lnRnDexp$ | $lnHightex$ | $lnGDPpc$ | $lnFDI$ |
|---|---|---|---|---|---|---|---|
| $lnFDI$ | 1 |  |  |  |  |  |  |
| $lnRQ$ | 0.2117 | 1 |  |  |  |  |  |
| $lnHC$ | 0.2381 | 0.027 | 1 |  |  |  |  |
| $lnRnDexp$ | 0.2971 | 0.057 | 0.1321 | 1 |  |  |  |
| $lnHightec$ | -0.017 | 0.041 | 0.3495 | 0.1882 | 1 |  |  |
| $lnGDPpc$ | 0.1224 | 0.054 | 0.4077 | 0.3721 | 0.2878 | 1 |  |
| $lnFDI$ | 0.25 | 0.399 | 0.2145 | 0.2412 | -0.241 | 0.1511 | 1 |

*Authors calculations based on data obtained from WDI, WGI, UNCTAD, and OECD statistics.

Aggregate level analysis in Table 5 shows both regions of EU-15 Countries and CEE countries, and these results provide the FE model for 15 EU countries and 10 CEE countries, respectively. The empirical results in Table 6 show the significant and positive impact of FDI on innovation in both regions, i.e., CEEC and EU-15

countries. As per the aggregate analysis in Table 5, it can be seen that the impact of FDI on innovation is greater as compared to the CEEC region because of the larger coefficient (**EU-15** β=0.421, p< 0.01; for **CEEC** β= 0.195, p< 0.01). It is seen that a 1% increase in FDI (percentage of GDP) is associated with a 0.421% increase in the likelihood of innovation, as a patent application is a proxy variable for innovation, and FDI brings new technology from foreign countries. Therefore, the first hypothesis (H1) is accepted, i.e., FDI has a significant and positive impact on the probability of innovation. This finding aligns with Menghinello et al. (2021 ), who found that FDI brings advanced technology to the host countries, enhancing competition and worker mobility and positively influencing innovation. Further academic debate on firm innovation has mainly considered the FDI and spatial clustering as a driver of innovation and economic growth (Habib et al., 2019)

**Table 5** *CEEC and EU 15 countries Aggregate level analysis*

| | EU 15 countries | | CEEC Countries | | EU 15+ CEEC | |
|---|---|---|---|---|---|---|
| | *Equation 1* | *Equation 2* | *Equation 1* | *Equation 2* | *Equation 1* | *Equation 2* |
| $lnFDI_{t-1}$ | 0.421*** | 0.476** | 0.195*** | 0.155** | 0.226*** | 0.253** |
| | (0.0603) | (0.105) | (0.165) | (0.173) | (0.103) | (0.112) |
| $lnRQ$ | 0.335*** | 0.260** | 0.151* | 0.163** | 0.1957* | 0.13 |
| | (0.0859) | (0.0854) | (0.193) | (0.169) | (0.0811) | (0.0872) |
| $lnHC$ | 0.0220** | 0.0170* | -0.109 | -0.111 | 0.018* | 0.0201* |
| | (0.0147) | (0.0138) | (0.062) | (0.063) | (0.0269) | (0.0254) |
| $lnR\&Dexp$ | 0.458*** | 0.423*** | 0.237** | 0.193** | 0.296** | 0.600** |
| | (0.142) | (0.524) | (0.246) | (1.988) | (0.191) | (0.725) |
| $lnHightexp$ | 0.444** | 0.369** | 0.0782 | 0.0944 | 0.346*** | 0.245** |
| | (0.194) | (0.146) | (0.151) | (0.160) | (0.11) | (0.105) |
| $lnGDPpc$ | 0.412*** | 0.400** | 0.353*** | 0.334*** | 0.442*** | 0.460*** |
| | (0.147) | (0.144) | (0.176) | (0.179) | (0.118) | (0.105) |
| $lnFDI \times lnR\&Dexp$ | | 0.449** | | 0.316** | | 0.207* |
| | | (0.209) | | (0.309) | | (0.192) |
| | | | | | | |
| _cons | 0.999 | 0.747 | 3.197** | 3.454** | -1.372 | -0.597 |
| | (1.904) | (1.695) | (1.622) | (1.471) | (1.225) | (1.066) |
| N | 221 | 221 | 142 | 142 | 363 | 363 |
| R-sq | 0.601 | 0.622 | 0.625 | 0.616 | 0.615 | 0.623 |
| adj. R-sq | 0.619 | 0.686 | 0.648 | 0.646 | 0.606 | 0.624 |

*Note: Standard error in parentheses: *p<10, **p<0.05, ***p<0.01*

*Authors calculations based on data obtained from WDI, WGI, UNCTAD, and OECD statistics.

The analysis of H2, i.e., high technology exports are positively associated with innovation activities in the host country, also displays a significant and positive impact on innovation in EU-15 countries. In contrast, it does not affect innovation in the CEEC region (***EU-15*** β=0.444, p< 0.01; for ***CEEC*** β=0.0782, p< 0.05). In the initial stage of internationalization, many firms export goods to nearby markets; after gaining more knowledge and experience, these firms become persistent exporters of goods that enhance innovation in host countries (Andersson & Lööf, 2009). Exporting to other countries encourages firms to remain more competitive, pushing them to innovate. Secondly, international exposure provides an opportunity to access new knowledge and information, which can directly affect innovation through exporting partners. Several studies have found that international competition between the high-tech industry and their exports forces local firms to innovate in this competitive environment. In this regard, our results are in line with past studies. However, the magnitude of high-tech exports on innovation in the CEEC region is weak because these countries do not produce high-tech products as the EU-15 region, and we see the coefficients in Table 6.

Further, we examined the impact of R&D on innovation. We found a positive association between them for both regions, leading to the acceptance of H3, i.e., R&D activities are positively associated with the innovation activities in the host country. The R&D expenditures coefficients have a higher impact on innovation in EU-15 countries and a lesser impact in the CEEC region in equation 1 (***EU-15*** β=0.458, p< 0.01; for ***CEEC*** β= 0.237, p< 0.01). R&D expenditures play a significant role in the innovation process, as proposed by Habib et al. (2019). In the presence of foreign firms in countries, domestic firms prioritize improving innovation capability to survive and compete with their foreign counterparts, and domestic firms focus on their R&D activities to construct and improve their innovative products and services (Cunningham et al., 2016). This finding also relates to the study of Kayalvizhi and Thenmozhi (2018), who examined the relationship between FDI and R&D activities and said that such a relation strengthens the host country's propensity to innovate because it stimulates firms' activities, fostering overall innovation. The present research findings postulate that the countries that invest more in R&D files for more patent generations influence overall innovation activities.

In our findings, human capital significantly positively impacts innovation in EU-15 countries; however, its impact in the CEEC region is insignificant. Therefore, H4, which states that human capital is positively associated with innovation, is accepted for the EU-15 region and rejected for the CEEC region. These findings comply with Felin and Hesterly's (2007) results, which state that human capital significantly increases innovation. Still, these findings contradict the study above if we incorporate the CEEC region. Further, several researchers argued that human capital

is a vital component that drives technological progress and innovation (Acemoglu et al., 2009). The report by WIPO (2015) pointed out human capital as an innovation process factor or human factor that leads to spur innovation.

In equations 1 and 2, regulatory quality has a significant and positive impact on innovation in both regions, and these have a more significant and positive impact on EU-15 countries and a lesser impact on CEE countries. Therefore, H6, which explains the relationship between regulation quality and innovation, is also accepted (see table 6 **EU-15** β=0.335, p< 0.05; for **CEEC** β= 0.151, p< 0.10). These findings align with Barasa et al.'s (2017) and Fuentelsaz et al.'s (2018) studies, which explain that regulatory quality and low corruption positively impact firms' innovativeness. Regulations are considered crucial determinants of the economic system's industrial activities that foster innovation in the economies (Christenson & Raynor, 2013). However, countries with weaker institutional and regulatory quality distract local firms from engaging in innovative activities. Therefore, high regulatory quality and well-functioning institutions favor R&D activities, which are innovative activities' nurturing factors (Elert et al., 2017).

Our results are consistent with the study of Barasa *et al.* (2017), which states that FDI has a positive and significant effect on stimulating technological innovations. It shows that a rapid increase in the FDI inflows in the economies leads to enhanced innovation, thus positively affecting economic growth. This study highlights the importance of regulations as this determinant enhances innovation level in European countries because better regulatory quality in the region enhances the confidence of foreign and local firms, and previous studies, such as Maicas and Montero (2018) and Fuentelsaz et al., (2018) also confirm these findings. However, weak institutional enforcement and regulations impede innovation because competitors and peers try to imitate the products the industry incumbents offer.

**Table 6** *CEEC plus EU-15 Manufacturing industry*

| | EU 15 countries | | CEEC Countries | | EU 15+ CEEC | |
|---|---|---|---|---|---|---|
| | *Equation 1* | *Equation 2* | *Equation 1* | *Equation 2* | *Equation 1* | *Equation 2* |
| *lnFDIManufactuing*$_{t-1}$ | 0.221*** | 0.276** | 0.114** | 0.146* | 0.0719* | 0.0277 |
| | (0.0603) | (0.105) | (0.0810) | (0.557) | (0.0284) | (0.0399) |
| *lnRQ* | 0.0235*** | 0.0260** | -0.290 | -0.287 | 0.0732* | 0.0763** |
| | (0.0859) | (0.0854) | (0.432) | (0.435) | (0.146)* | (0.145) |
| *lnHC* | 0.0120*** | 0.0170** | 0.091 | 0.095 | -0.0193 | 0.0186* |
| | (0.0147) | (0.0138) | (5.278) | (5.626) | (0.0245) | (0.0237) |
| *lnRnDexp* | 0.464** | 0.444** | 0.363 | 0.361 | 0.509* | 0.698 |
| | (0.162) | (0.169) | (0.192) | (0.183) | (0.211) | (0.378) |
| *lnHightexp* | 2.662*** | 2.737*** | 0.292 | 0.2244 | 0.496*** | 0.499*** |

|  | (0.744) | (0.743) | (0.151) | (0.160) | (0.169) | (0.168) |
|---|---|---|---|---|---|---|
| *lnGDPpc* | 0.477** | 0.479** | 0.353*** | 0.334*** | 0.802*** | 0.798*** |
|  | (0.176) | (0.176) | (0.176) | (0.179) | (0.197) | (0.195) |
| *lnFDI × lnRnDexp* |  | 0.149* |  | 0.419** |  | 0.449* |
|  |  | (0.319) |  | (0.309) |  | (0.309) |
|  |  |  |  |  |  |  |
| _cons | 0.899 | 0.647 | 2.197** | 2.454** | 1.372 | 0.577 |
|  | (1.604) | (1.595) | (1.622) | (1.471) | (1.125) | (1.056) |
| N | 187 | 187 | 131 | 131 | 318 | 318 |
| R-sq | 0.601 | 0.622 | 0.577 | 0.557 | 0.615 | 0.623 |
| adj. R-sq | 0.619 | 0.686 | 0.591 | 0.585 | 0.606 | 0.624 |

*Note: Standard error in parentheses: *p<10, **p<0.05 , ***p<0.01*

*Authors calculations based on data obtained from WDI, WGI, UNCTAD, and OECD statistics.

## 6. CONCLUSION, IMPLICATIONS, AND LIMITATIONS

This study utilizes a framework to assess the effect of overall FDI from the manufacturing sector, R&D spending, human capital, high-tech exports, and regulations on innovation in the CEE countries, comparing them with the EU-15 nations. Our findings suggest that FDI likely fosters innovation in both the CEEC and EU-15 regions. The econometric analysis also reveals the influence of other factors, such as regulatory quality, R&D spending, high-tech exports, and human capital, on innovation in both regions. A second econometric analysis at the manufacturing level indicates that FDI in the EU-15 region has a more significant impact on innovation compared to the CEEC region. This difference may be attributed to weaker institutions, limited government control, and a lower focus on attracting more FDI in the CEEC. The results further show that the quality of government enforcement of regulations encourages domestic firms to innovate, while stronger regulatory quality attracts more FDI, providing host countries with better access to new technologies from abroad.

In the EU-15 regions, R&D expenditures are the most crucial factor driving innovation activities. However, at the manufacturing level of FDI analysis, R&D spending has little impact on innovation in the CEEC region. High-tech exports significantly influence patent applications, as countries or regions exporting high-tech products are more likely to innovate, given that the high-tech sector is more R&D-intensive than others. Similarly, economic development, as measured by per capita GDP, positively impacts innovation activities, indicating that a high-quality market increases the likelihood of innovation.

Based on our results and empirical findings, this study has several important policy implications that FDI-related policies should be promoted and more FDI projects are facilitated. This attempt will lubricate the interaction process between domestic firms and foreign MNCs and, as a result, generate more inter-industry spillovers that ultimately impact domestic innovation capability. Considering the results of this research, it is recommended that governments of CEEC and EU 15 countries try to attract more FDI via lenient and effective policies to stimulate domestic innovation capability. Results suggest that R&D expenditures and researchers in R&D are important drivers of innovative activities; governments of these economies should invest more in R&D by allocating more resources to foster local innovation activities. Similarly, adequate rules and regulations (institutional framework) of host countries are also an important factor that encourages innovative activities. Therefore, promoting regulatory quality may increase the likelihood of innovation in host countries. Similarly, it was found that the manufacturing sector FDI plays an important role in innovation activities in the EU 15 region because it is more R&D intensive. Therefore, policymakers of these economies should design policies that favor intensive technological FDI that introduce more innovations.

This study has several limitations. One key limitation is that the authors did not empirically assess the impact of FDI on labor mobility, imitation, and the demonstration effect due to a lack of available data in the CEEC and EU-15 regions. Another limitation is that the number of new products and processes introduced is a more accurate measure of innovation performance, which could be used in future studies. The effect of FDI differs across industries and firms, so future research could expand the analysis to various sectors, such as the services industry. Additionally, future research could include firm-level analysis in both the CEEC and EU-15 regions. Researchers could also examine the demonstration effect using utility model patents and explore the crowding-out effect on invention patents. Lastly, the impact of external design patents in an economy could be analyzed to understand the spillover effect of FDI on minor innovations.

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