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Applied strategic analysis of learning and growth based on a balanced scorecard: Theoretical foundations

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Abstract

Learning and growth is one of the essential tools that companies ought to use in today's market economy in order to ensure their sustainable development in the long-term and, consequently, to achieve their maximum market value. This article is predominantly of theoretical nature and considers the possibility of using the applied strategic analysis technique that was developed by the author to analyze learning and growth in the course of a study of strategic aspects of learning and growth. The technique is based on the balanced scorecard system of the same name. Methodologically, the study is based on Kaplan and Norton's balanced scorecard concept and the author's concept of applied strategic analysis. It is shown that applied strategic analysis of learning and growth envisages comparative evaluation, diagnostics of deviations and predictions of the values of the balanced scorecard metrics of learning and growth in the dimension of strategic objectives. It includes analysis of the level of motivation in employees, the volume of authority delegation and whether their personal goals match company goals; analysis of the expansion capacity of information systems, and analysis of the quality of retraining and the creativity level of employees. The applied strategic analysis of learning and growth with comparative evaluation of the metrics of the level of motivation in employees, the volume of delegation to them and of the match between their personal and corporate goals, and concludes with a prediction of the values of factor measures of the quality of retraining and creativity development in employees.The author comes to a conclusion that applied strategic analysis of learning and growth is a new and sufficiently effective instrument for studying the strategic aspects of companies' performance that is associated with the training and development of their personnel. The instrument provides analytical support to strategic management as regards personnel training and development in today's conditions. Its results might be useful when working out managerial decisions for the company's short-term, medium-term and long-term plans in the area of learning and growth.

1. Introduction

Personnel training and development is an essential tool that ensures companies' sustainable development in the long-term and helps them achieve their maximum market value in today's economy. As a perspective of the balanced scorecard, personnel training and development, or learning and growth, determines the infrastructure that needs to be created for the long-term growth and improvement. The strategic objectives of this perspective are a factor of the implementation of the plans set for the first three perspectives of the balanced scorecard: those of internal processes, customer perspective, and financial.

Learning and growth, including career growth, rests on three pillars: people, IT systems, and organizational procedures. The first three perspectives of the balanced scorecard usually reveal a gap between the current capabilities of people, IT systems and organizational structure, and what is needed for a breakthrough. In order to bridge the gap, the company needs to invest in retraining of its staff, improvement of information systems and technology, and building a link between organizational structures and day-to-day operations (Kaplan & Norton, 1996).

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It is also critical to not only assess the degree of implementation of a strategic decision on learning and growth, but also to identify causes for deviations (if they occur) and predict the future trajectory of the situation. This makes it relevant and timely to design and improve the appropriate analytical toolkit.

In this regard, the author considers it worthwhile to look at his earlier developed solution for applied strategic analysis as an analytical support tool for strategic management of learning and growth.

2. Previous Research

Before giving an outline of the author's contribution to solving the problem considered in this article, the current state of the problem that has been reflected in the works by arguably the most notable and authoritative scholars and experts will be discussed in brief. Their views on the problem can be divided into two groups:

1) the ones that imply the use of the balanced scorecard (BSC) method;

2) the ones that do not involve the use of the balanced scorecard method.

It should be noted though that researches whose views belong to the first group (for example, R.S. Kaplan and D.P. Norton, M.G. Brown, H.K. Rampersad, H.R. Friedag and W. Schmidt, N.-G. Olve, J. Roy and V. Wetter, experts from Horvath & Partners) usually focus on the use of analysis in application the BSC as a whole, including the learning and growth perspective.

Summing up their views (Kaplan & Norton, 1996; Brown, 2007; Rampersad, 2003; Friedag & Schmidt, 2002; Olve, Roy & Wetter, 2000; Horvath & Partners, 2004), we came up with the following observations:

- the purpose of analysis that is based on the balanced scorecard method is to measure the success of the company's strategy and to ensure the alignment between the balanced scorecard and the evolving environment;
- such analysis detects deviations between the actual values of the BSC metrics and their target values, identifies the causes of such deviations and determines the degree of criticality of the deviations for the company's structural units;
- additionally, in the course of analysis it is possible to study so-called analytical (comprehensive) performance indicators, including staff utilization, that are calculated as weighted means on the basis of more specific BSC metrics and are graded on a 100-point scale;
- among the outcomes of balanced scorecard analysis is a plan of actions that need to be implemented to increase the company's productivity or keep it at its present level, and the continuous level of learning that helps the organization to know itself better.

Among the researchers belonging to the second group (those who do not use the balanced scorecard technique) there are many representatives of a scientific school of the economic analysis of company performance that emerged in the Soviet Union and further developed in a number of post-Soviet countries.

The most renowned representatives of the school are one of its founders, A.D. Sheremet (Sheremet, 2005), as well as V.I. Barilenko (Barilenko, 2016), G.V. Savitskaya (Savitskaya, 2013), S.A. Boronenkova and M.V. Melnik (Boronenkova & Melnik, 2016), N.P. Lyubushin (Lyubushin, 2006).

It is worth noting that the researchers mentioned above do not differ much in their conceptual interpretation of economic analysis of company performance. In the context of economic analysis of company performance, no consideration is given at all either to analysis of personnel learning and growth as a combination of processes of personnel retraining and creativity growth in employees that enable the company to reach its strategic goals; or the processes of expanding the capabilities of information systems to a level that would enable employees to get complete essential information about customers, internal business processes and financial implications of their decisions; or motivation and delegation and the alignment between their personal goals and those of the company. Usually these aspects are partially explored as part of the analysis of labor resources in an organization (availability of labor resources and efficiency of utilization). Analysis of the condition and utilization of information systems is usually performed as part of fixed assets analysis.

3. Methodology

The methodological framework of the study is built upon two concepts:

1) the balanced scorecard, or BSC;

2) applied strategic analysis, or ASA.

The balanced scorecard as an analytical instrument for strategic management was developed by American scholars R.S. Kaplan and D.P. Norton in the early 1990s (Kaplan & Norton, 1992). The concept was further elaborated by the original authors (Kaplan & Norton, 1993, 1996, 2001, 2005, 2006, 2008; Kaplan, Norton & Rugelsjoen, 2010) and a number of other economics scholars (Brown, 2007; Friedag & Schmidt, 2002; Horvath & Partners, 2004; Maisel, 1992; Niven, 2014; Olve, Roy & Wetter, 2000; Rampersad, 2003). It has also been successfully tested in practice. Today, the BSC is regarded as one of essential and sufficiently effective means of strategic management in a company.

In general terms, the balanced scorecard can be defined as a composite of parameters that describe a company's performance in today's market economy. The prime objective of the balanced scorecard is to transform corporate strategy into concrete tangible goals, metrics and, eventually, activities. BSC metrics are constructed on the basis of each company's mindset and strategic goals and are, therefore, company-specific. At the foundation of the balanced scorecard are causal relationships, factors of successful outcomes and links with financial metrics. The balanced scorecard covers four key interrelated areas: finances, customer relationships, internal processes, and learning and growth. They are viewed through the lens of key problems, strategic goals, indicators and key values, as well as strategic efforts.

The development of the concept of applied strategic analysis was prompted by the need to increase the efficiency of strategic management amid the challenges of the modern market economy through provision of enhanced information and analytical support. This implies further development of the theory, methodology and methods of analysis of the strategic aspects of corporate performance as a whole, going further to, at least, the level of financial analysis that is a fairly effective instrument for examining the financial aspects of a company's performance on the basis of financial indicators.

Considered as a sustaining function of strategic management, ASA implies a comprehensive study of the strategic aspects of a company's economic performance on the basis of the balanced scorecard metrics (Krylov, 2013, 2014).

The objective of applied strategic analysis is to build a system of analytical support for strategic decision making.

Being based on the BSC that is always company-specific, ASA cannot have a standardized methodology. Its methods, too, are always company-specific.

ASA uses deductive reasoning that starts with the examination of the most general BSC metrics and moves on to its more specific measurements. This principle determines the general sequence of applied strategic analysis in the four key areas: financial indicators, analysis of customer relationships, analysis of business processes indicators, and analysis of personnel learning and growth.

While incorporating more specific actions, each of the areas of applied strategic analysis – financial, customers, internal processes, and learning and growth – is interpreted from the perspective of the key ASA objectives – those of comparative evaluation, diagnostics and prediction. Applied strategic analysis, therefore, starts with a comparative evaluation of financial metrics and ends with a prediction of the values of learning and growth metrics.

The areas of ASA mentioned above can evolve into standalone fields: applied strategic financial analysis, applied strategic analysis of customer relationships, applied strategic analysis of internal processes, applied strategic analysis of learning and growth. At the same time, applied strategic analysis of internal processes will include strategic analysis of after-sales service, applied strategic operational analysis and applied strategic innovation analysis.

When looking into the depth of applied strategic analysis as a fairly complex economic category, the author of the present article considered the above listed fields of ASA in his previous works (Krylov, 2014, 2015, 2016, 2017, 2019), one exception being applied strategic analysis of learning and growth (ASALG), which is the subject of this article.

4. Results

4.1. The Concept and Essence of Applied Strategic Analysis of Learning and Growth

Applied strategic analysis of personnel learning and growth is a type of applied strategic analysis that is aimed at conducting a comprehensive study of the strategic aspects of a company's learning and growth activities on the basis of a balanced scorecard for learning and growth. It can also be viewed as a support function for strategic management of staff learning and growth.

The subject of ASALG are learning and growth metrics within the balanced scorecard and factors that determine them; the object of applied strategic analysis of learning and growth are the strategic aspects of the company's activities in the field of staff learning and growth.

Applied strategic analysis of learning and growth is conducted to build up analytical support for strategic decision-making in the field of staff learning and growth.

In order to reach the above goals, the key tasks of applied strategic analysis of learning and growth need to be performed. Similarly, to applied strategic analysis as a whole, these are comparative evaluation, diagnostics of BSC metric deviations, and prediction of BSC metric values. The essential tasks of applied strategic analysis of education and growth that are mentioned above are closely intertwined as every task unrolls from the preceding one: diagnostics of BSC indicator variances relies on the results of their comparative evaluation, whereas predictions of metric values are produced with the results of deviation diagnostics taken into account.

The comparative assessment of the values of learning and growth indicators implies that their actual values are compared against their target values, the absolute and relative (percentage) deviation and qualitative assessments of these deviations are obtained. The latter evaluation largely depends on their size (Table 1).

Table 1. An Example of Qualitative Assessment of Deviations of Actual Values of BSC Metrics for Learning and Growth from Their Target Values

Deviation of actual values of BSC metrics for learning and growth from target values, %	Qualitative assessment of deviation of actual BSC metrics for learning and growth from target values
Under 1	Insignificant
From 1 to 5	Significant
From 5 to 10	Substantial
From 10 to 20	Serious
20 and above	Very serious

Source: Designed by the author

The diagnostics of the deviations of BSC metric values for learning and growth is based on cause-and-effect relationships that pull together balanced scorecard metrics, including those for learning and growth, forming a balanced mix of general performance indicators and factors that determine them (performance factors).

In the course of the diagnostics of the deviations of learning and growth metrics within the BSC, performance factors are identified that have the biggest impact on general performance indicators of learning and growth, and their values are calculated using appropriate methods of factor analysis. The calculation results are used for drawing relevant results.

A factor model of BSC indicators for learning and growth includes performance indicators for learning and growth as the ultimate (most general indicators and one level of the factors that determine them – the factor indicators of education and growth within the BSC.

Predicting the values of BSC metrics for learning and growth aims to set and adjust (in case of objective circumstances) target values of BSC metrics for learning and growth and to draw specific tracks to reach the targets set, or to devise measures for eliminating the emerging deviations between the actual and target values of the BSC metrics for learning and growth in the future. Predictions are first produced for general (performance) metrics, and then the forecast values are used as the basis for predicting the values of factor indicators of learning and growth.

The aspects of ASALG as a type of applied strategic analysis include this strategic perspective, as well as tactical analysis, and operational analysis.

As part of the strategic aspect of the applied strategic analysis of learning and growth, the ultimate, or strategic values of the learning and growth metrics of the BSC are assessed, diagnosed and predicted for the timeframe of the strategy that is designed for staff learning and growth.

As part of the tactical aspect of ASALG, interim, or tactical values of the learning and growth metrics of the BSC are assessed, diagnosed, and predicted at the end of each year.

Within the framework of the operational aspect of the applied strategic analysis of education and growth, interim, or operational values of the education and growth metrics of the BSC are assessed, diagnosed, and predicted at the end of each month.

All aspects of the applied strategic analysis of learning and growth are interrelated and coordinated: the results of the analysis of the operational values of indicators of learning and growth influence their tactical values, while the results of the analysis of tactical values influence strategic values.

The methodological toolkit of ASALG consists of approaches and methods making it possible to solve the essential tasks of analysis and, therefore, to achieve its objectives. The main methodological tools of the applied strategic analysis of staff learning and growth as a type of applied strategic analysis are the method of absolute, relative and mean values, comparison, grouping, graphical and tabular methods, regression and correlation analysis, factor analysis, cluster analysis, and the expert judgement method.

4.2. Information Base of Applied Strategic Analysis of Learning and Growth

The information base of the applied strategic analysis of staff education and growth is the learning and growth perspective of the balance scorecard. It can be presented in a tabular form (Table 2).

Table 2. Learning and Growth Perspective of a Company's BSC

Key problem of learning and growth within BSC	Strategic goal of learning and growth	Learning and growth indicator	Target value	Strategic metric in learning and growth
What goals in learning and growth need to be set to ensure that the objectives of internal processes, as well financial and customer relations objectives are reached?				

Source: Compiled by the author

4.3. Components and Sequence Base of Applied Strategic Analysis of Learning and Growth

The applied strategic analysis of learning and growth as a type of applied strategic analysis uses the principles of deductive reasoning that imply an examination of general learning and growth indicators first, and then a study of more specific indicators.

The key components of the applied strategic analysis of learning and growth are:

1. Analysis of employee motivation, analysis of how much authority is delegated to employees and how their personal goals match those of the company.
2. Analysis of the degree of the capacity expansion of information systems.
3. Analysis of the quality of retraining and level of the creative development of employees.

The process of the applied strategic analysis of education and growth starts with the analysis of employee motivation, the analysis of the levels of motivation among employees, the amount of authority that is delegated to them and of how their personal goals match the corporate ones. After that, the expansion capacity of information systems is analyzed. Finally, analysis is performed of the quality of retraining and of the level of creativity in employees.

A more detailed presentation of the process of the applied analysis of education and growth is given in Table 3 from the perspective of the key tasks of its main components.

Table 3. Process of Applied Strategic Analysis of Learning and Growth

Key components of analysis (i)	**Essential tasks of analysis (j)**		
	Comparative assessment of values of metrics of learning and growth BSC (1)	**Diagnostics of deviations of values of metrics of learning and growth BSC (2)**	**Prediction of values of metrics of learning and growth BSC (3)**
Analysis of employee motivation, analysis of how much authority is delegated to employees and how their personal goals match those of the company (1)	Comparative assessment of values of motivation metrics, authority delegation metrics, and indicators of the match between employees' personal and corporate goals	Diagnostics of deviations of values of motivation metrics, authority delegation metrics, and indicators of the match between employees' personal and corporate goals	Forecasting of values of motivation metrics, authority delegation metrics, and indicators of the match between employees' personal and corporate goals
Analysis of the degree of the capacity expansion of information systems (2)	Comparative assessment of values of degrees of capacity expansion of information systems.	Diagnostics of deviations of values of degrees of capacity expansion of information systems	Prediction of values of indicators of capacity expansion of information systems
Analysis of the quality of retraining and level of creativity in employees (3)	Comparative assessment of values of metrics of quality of retraining and creativity in employees	Diagnostics of deviations of values of metrics of quality of retraining and creativity in employees	Forecasting of values of metrics of quality of retraining and creativity in employees.

Source: Compiled by the author

Table 3 shows that as the metrics of the learning and growth component of the BSC are divided into general performance metrics and factor metrics, the applied strategic analysis of education and growth starts with the comparative assessment of the values of general performance indicators describing the level of motivation in employees, the amount of authority that is delegated to them and the match between their personal goals and corporate ones. It ends with a forecast of the values of factor indicators of the quality of retraining and of the creativity level in employees.

Moreover, Table 3 can be considered as a matrix in which the points of intersection of the groups of the education and growth indicators within the BSC and the essential tasks of the applied strategic analysis of education and growth are defined as elements.

By labelling the matrix elements with s_{ij} (i = 1, 2, 3; j = 1, 2, 3), the following formula can mathematically describe the contents of the ASALG:

$$S = \sum_{i=1}^{3} \sum_{j=1}^{3} s_{ij} \qquad (1)$$

where *S* is the sum total of all the elements of analysis;

i indicates the main components of the analysis of learning and growth: 1 – analysis of motivation in employees, amount of delegated authority, and alignment between their personal and corporate goals, 2 is analysis of the degree of capacity expansion in information systems, 3 is analysis of the quality of retraining and level of creativity in employees;

j indicates the essential tasks of the analysis of learning and growth: 1 is comparative evaluation of the values of indicators of the BSC education and growth component; 2 is the diagnostics of the deviations of the values of indicators of the BSC education and growth component, 3 are predictions of the values of the BSC education and growth component.

Examples of the performance metrics and factors being analyzed for each of the key components of the applied strategic analysis of education and growth are summarized in Table 4.

Table 4. Examples of Measurements of Key Components of Applied Analysis of Education and Growth

Key components of analysis	Metrics being analyzed	
	Performance metrics	**Factors**
1. Analysis of employee motivation, analysis of how much authority is delegated to employees and how their personal goals match those of the company	Average number of approved and implemented improvement suggestions per employee. Steady and regular pace of defect reduction. Level of interaction between employees and between structural units of the organization.	Number of employees. Number of approved and implemented improvement suggestions. Number of defects. Percentage of employees whose personal goals and objectives are determined on the basis of the corporate BSC and are aligned with it.
2. Analysis of degree of capacity expansion of information systems	Speed of delivery of full and plausible information for assessing customers' position on the market and for understanding and predicting their needs. Speed of delivery of customer feedback on products.	Share of customer service employees who have interactive access to the required information. Percentage of essential data that is delivered in real time more via customer feedback channels.
3. Analysis of the quality of retraining and level of the creative development of employees	Percentage of key staff turnover. Share of highly skilled employees among all staff. Share of wage costs in sales revenue. Workforce productivity. Added value per worker. Net profit per worker.	Employee satisfaction level. Medium time spent on professional retraining and development per employee.

Source: Compiled by the author

5. Discussion

We shall compare the author's obtained results with the previous research findings outlined in the «Previous Research» section.

The above summary of other researchers' views that involve the application of the balanced score card method in the analysis of a company's performance shows that they lack a clear and structure concept of conducting BSC analysis as a whole as well as analysis within the framework of the BSC perspectives, including learning and growth. There are only rough guidelines as to the contents and the sequence of such analysis.

By contrast, the author suggests a concrete and structured conceptual approach conducting applied strategic analysis of personnel education and growth as a type of his earlier concept of applied strategic analysis (Krylov, 2013, 2014). It would enable a boost in the efficiency of strategic management in a company in the field of learning and growth. This article also covers the key methodological aspects of the applied strategic analysis of learning and growth and cites examples of performance and factor indicators of the learning and growth perspective of the BSC that can be analyzed.

The author considers it inexpedient to construct so-called analytical indicators on the basis of the BSC indicators because the method of calculating them as a weighted average is rather subjective, which reduces rather than improves the accuracy of the analysis results.

As for the types of analysis of learning and growth that use the balanced score card method, the author considers them to be too limited and of little information value for the purposes of efficient strategic management of education and growth.

The author's vision of the problem being considered in this article is, therefore, more meaningful, concrete, descriptive and elaborate than the concepts in the studies referenced to above.

6. Conclusions

Having presented a concept of the applied strategic analysis of learning and growth, the author considers it relevant to set out the following conclusions:

- applied strategic analysis of learning and growth, which is a type of applied strategic analysis, is a new and fairly effective instrument for exploring strategic aspects of a company's activity that is associated with personnel education and growth as it forms an analytical support framework for strategic management in learning and growth;
- the balanced scorecard concept and the concept of applied strategic analysis form the methodological basis of the applied strategic analysis of learning and growth;
- applied strategic analysis of learning and growth entails comparative evaluation, diagnostics of deviations and prediction of the values of metrics of the learning and growth perspective of a company's BSC in terms of their strategic targets;
- applied strategic analysis of learning and growth incorporates analysis of the employee motivation level, the volume of delegation, analysis of the expansion capacity of information systems, and analysis of the quality of retraining and the level of creativity in employees;
- applied strategic analysis of learning and growth starts with the comparative evaluation of the values of performance metrics describing the level of motivation in workers; the volume of authority delegated to them, and the correspondence between their personal and company goals. It finishes with predictions of the values of factor indicators of the quality of retraining and of the level of creativity in employees;
- the results of applies strategic analysis of education and growth can be used when working out managerial decisions of long-term, mid-term and short-term nature in the field of personnel education and growth.

7. Further Research

The conceptual framework of the applied strategic analysis of learning and growth that has been considered in this article as a new tool for comprehensive research into the strategic aspects of learning and growth on the basis of the learning and growth perspective of the BSC defines general contours of such analysis as a new trend in research and practice while providing a theoretical base for its further development, especially from the point of view of its practical application.

Among the priority areas of further research in the field of the applied strategic analysis of learning and growth there could be:

- elaboration and clarification of the analysis methodology regarding specific stages and strategic objectives of learning and growth;
- development of analysis methodologies tailored to specific companies in various industries;
- expanding the applied strategic analysis of learning and growth onto indicators of current education and growth activities as they are derived from indications of the education and growth component of the BSC;
- development of mathematical models and software that would facilitate the use of applied strategic analysis in practice when managing learning and growth processes.

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Labor income gap in Ecuador due to discrimination, pre and post pandemic: Correction of error due to selection bias

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Abstract

The objective of this research is to analyze the labor gap in Ecuador, correcting the session period by sample selection to show if the differences in labor income are due to observable or discriminatory situations, and if they changed after the pandemic. To achieve this objective, the annual employment databases for the years 2018, 2019 and 202 were analyzed, and a model described by Jones (2007) and Adkins and Hill (2011) was initiated, who conclude in the application of the model of Heckman and the failure of the Oaxaca-Blinder method was estimated to correct errors and show possible discrimination in labor income. The results obtained show that it is more difficult for women, young people and ethnic minorities to find work, and when they are in employment their income is lower, even the labor gap between men and women increases after the pandemic. Income gaps are explained by discriminatory factors and observable factors in the case of women and ethnic minorities; while for young people it is due to observable factors.

1. Introduction

The search for equal pay has been going on for more than 103 years when Convention No. 100 on Equal Remuneration was defined in 1919, since its constitution already determined the fundamental principle "equal pay for work of equal value". As stated by the International Labour Organization (ILO, 2019):

"*This principle implies a questioning of wage discrimination, and in particular, gender roles and the sexual division of labor, from which the jobs of women and men are evaluated, resulting in some skills and competences being more valued than others (SNMT, 2010: 30). Thus, the Convention not only assumes that if two people perform the same work they are entitled to receive the same income; It also states that different jobs can have the same value. The establishment of the value of each job requires the evaluation of the capabilities expected of the worker, the efforts that are expected of the worker.*"

And although great progress has been made in the recognition of equal rights between men and women, significant signs of the wage gap still appear, even though Article 23 of the Universal Declaration of Human Rights (1948) states that:

> "*1. Everyone has the right to work, to free choice of work, fair and favourable conditions of work and protection against unemployment.*
>
> *2. Everyone has the right, without any discrimination, to equal pay for equal work.*

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> *3. Every working person has the right to just and favourable remuneration which will ensure him and his family an existence in conformity with human dignity and which shall be supplemented, if necessary, by any other means of social protection.*
>
> *4. Everyone has the right to form trade unions and to join trade unions for the defence of his interests*".

In addition, Article 7 of the International Covenant on Economic, Social and Cultural Rights (1966) states that:

> "*The States Parties to the present Covenant recognize the right of everyone to the enjoyment of just and favourable conditions of work which ensure in particular: (a) Remuneration which provides at least all workers: (i) Equitable and equal pay for work of equal value, without distinction of any kind; in particular, women should be guaranteed working conditions not inferior to those of men, with equal pay for equal work; (ii) Decent living conditions for themselves and their families in accordance with the provisions of the present Covenant; (b) Safety and health at work; (c) Equal opportunity for all to be promoted, within their work, to the appropriate higher level, without consideration other than the factors of length of service and capacity; d) Rest, enjoyment of leisure time, reasonable limitation of working hours and periodic holidays with pay, as well as remuneration for public holidays*"

The Political Constitution of Ecuador (2008) states that remuneration must be fair, that young people have the right to be active subjects in production, there is a right to work in communities, peoples and nationalities, and shall guarantee women equality in access to employment, to training and promotion to work and professional, to equitable remuneration, and all forms of discrimination are prohibited, as indicated in the following articles:

> "*Article 328.- The remuneration shall be fair, with a living wage that covers at least the basic needs of the worker, as well as those of his family; It shall be unattachable, except for the payment of maintenance pensions. Article 329.- Young men and women shall have the right to be active subjects in production, as well as in the work of self-employment. For the realization of the right to work of communities, peoples and nationalities, the State shall adopt specific measures to eliminate discrimination affecting them, recognize and support their forms of work organization, and guarantee access to employment under equal conditions. The selection, hiring and promotion processes will be based on requirements of skills, abilities, training, merits and abilities. The use of discriminatory criteria and instruments that affect the privacy, dignity and integrity of persons is prohibited. Article 331.- The State shall guarantee women equal access to employment, to training and promotion to employment and professional, to equitable remuneration, and to the initiative of self-employment. All necessary measures will be taken to eliminate inequalities. Any form of discrimination, harassment or act of violence of any kind, whether direct or indirect, affecting women in the work*".

However, the wage gap between men and women, in the case of Ecuador, widened further in the two years prior to the pandemic (2018-2019) as the following graph shows. The impact of the pandemic on the wage gap is more noticeable in young people, with an increase of 7 percentage points. Finally, in the case of ethnic minorities, the gap is greater compared to the other analysis groups, however, in the post-pandemic period, it did not show notable growth.

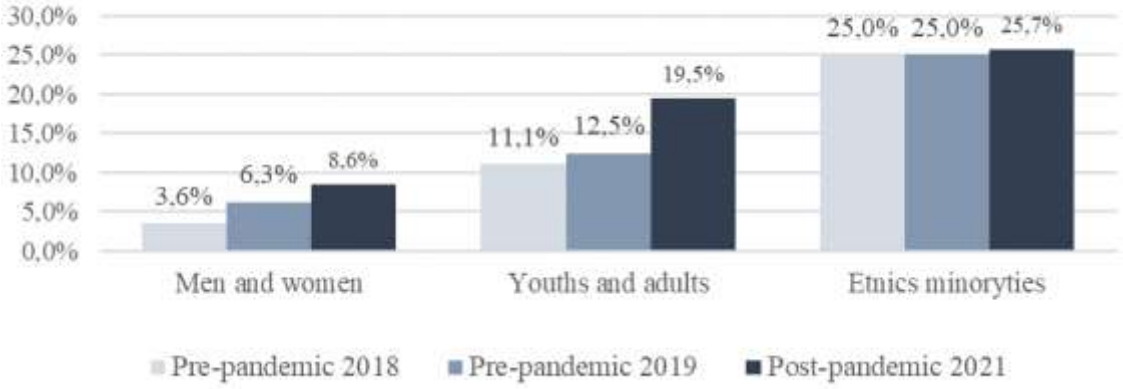


Figure 1. Wage gap in Ecuador, pre and post pandemic, 2018-2021 (percentage)

Notes: For young people, people between the ages of 18 and 24 are considered; ethnic minorities include indigenous, Afro-Ecuadorian, black, mulatto and montubio; Therefore, the analysis is regarding mestizos and whites. Expansion factors are used.

Source: National Institute of Statistics and Censuses -INEC-, National Survey of Employment, Unemployment and Underemployment -ENEMDU- quarterly series 2018-2019-2021. **Elaboration**: Authors.

Therefore, to determine the conditions of labor inequality, the existing gap in labor income between men and women, young people and ethnic self-identification, the present work shows whether the differences in labor income are due to observable or discriminatory situations, and if they changed after the pandemic. The methodology applied uses econometric models for the correction of sample selection bias, this problem is due to the fact that in the conventional income analysis people with employment are considered and the characteristics of those who are not working are omitted. There is a large amount of research in the field of gap analysis, which has not considered the bias described, resulting in the possibility of errors, especially in inference. In addition, the present research includes analyses of two other groups generally violated: young people and ethnic minorities; contributing to the explanation of wage differentials in these groups.

The structure of the research begins with an introduction where the beginnings of the understanding of labor inequalities between men and women from international regulations are briefly reviewed, and then briefly review Ecuadorian regulations. The second section addresses the evidence, from the methodological construction carried out in Ecuador by the National Institute of Statistics and Censuses (INEC) under the guidance of the International Labor Organization (ILO), as well as the studies carried out in this regard both in Ecuador and in the region. The third section reviews the methodology, for which a two-stage Heckman model described by Jones (2007) and Adkins and Hill (2011) was developed, and the decomposition of the Oaxaca-Blinder method was estimated to correct selection errors and evidence possible discrimination in labor income. The fourth section analyzes the results obtained, which determines that the employment gap between men and women increases after the pandemic, and income gaps are explained by discriminatory factors and observable factors in the case of women and ethnic minorities; while for young people it is due to observable factors. The research paper ends with the conclusions.

2. Literature Review and Evidence

2.1. Literature Review

In the determination of wage gaps between men and women, two methodological visions have been manifested. The first has to do with the theory of human capital, which explains the differences in human capital (seen as educational level achieved) that determines the difference between the salaries of men and women, therefore, it is pointed out that women receive lower salaries because they accumulate less human capital than men. But it must be considered that at present women have been acquiring greater human capital, and despite this, the

differences in income remain, as is the case of immigrant women in the United States where they have greater human capital than male immigrants (Anker, 1997).

The second, which considers other unobservable factors such as discrimination, which has not only led to women having less human capital, but access to work is restricted by this gender condition, as well as access to training and quality at work. Therefore, the literature begins to distinguish the difference in income between men and women due to "individual characteristics and endowment of human capital, from that unexplained and mostly related to gender prejudice and / or discrimination" (Atal et al., 2009), aspects that are considered in the model of Oaxaca (1973) and Blinder (1973), in which from Minas Cerian salary equations, divide two groups to differentiate wage income, a first group to explain group differences and productive characteristics such as experience or level of education, and a second group considered an unexplained residual component, to understand existing discrimination (Jann, 2008).

To this methodology of Oaxaca-Blinder decomposition, we can add the so-called "dimension curse" carried out by Ñopo (2010, 2012) to correct specific limitations: "First, because the pairing is constructed with discrete variables, the probability of finding a person with the same characteristics and endowments for each man or woman decreases as the number of variables included increases, which reduces the common support if the analysis is performed with a significant number of observable characteristics" (Enamorado et al., 2009), which has led to new evidence showing that attitudes and preferences towards work are not necessarily similar between men and women (Chioda, 2011). Speaking of discrimination and not only of differences in human capital, Becker (1971) points out that "discrimination against a particular group may depend on the social and physical distance between socioeconomic status, demographic characteristic, geographical location or personality" (p.137).

Meanwhile, the income gap between men and women can be considered as a condition of less work experience or because there are fewer working hours in women, but in reality this does not happen, moreover, when these two factors are not considered in models, the wage gap persists despite the fact that the greater experience or educational level was greater in women than in men. (Fortin, Bell & Böhm, 2017; Fields et al, 1998; Ñopo, 2012).

Occupational and economic sector segregation is also another form of wage discrimination (Hegewisch, 2010; European Commission, 2015), both because occupations considered "male" and covered by greater participation of women are considered less prestigious or of lesser value (Goldin, 2013¸ Pan, 2015), and because characteristics that can be classified as "feminine" are undervalued (ILO, 2019). In addition, in developing countries, administrative work, trade or services carried out by women are low paid (ILO, 2019).

With this broadening in the understanding of wage gaps between men and women, the gender and ethnicity approach begins to be incorporated, as Gallardo & Ñopo (2009), Ñopo (2012), and García-Aracil & Winter (2006) did. All these authors find that the characteristics of human capital allow to better explain the existing gaps between ethnicities, and to a lesser extent the gender gap.

Larger studies such as those carried out by Anglade, Useche and Deere (2017) show the gender gap in the wealth dimension, finding that "the gap in favor of men in the lowest quantiles is explained by differences in the returns of characteristics, while in the middle and upper part of the distribution it is mainly explained because men have better characteristics than women" (Benítez & Espinoza, 2018: 3).

Psacharopoulos and Zafiris (1992) with a study carried out in the 80s of the last century, for 15 countries in Latin America and the Caribbean in the late 80's find that:

> "*Women earned labor income that represents 65% of what a man receives, explained by differences in the level of education and human capital, which represented only a third of the total difference, leaving a large portion (about 43%) of the difference unexplained and possibly associated with discrimination*."

While Ñopo and Hoyos (2010) show that "the income gap narrowed from 16% to 9% between 1992 and 2007, however, the unexplained gap represented 34% in 1992 and 30% in 2007", which determines that the reduction

in the gap in recent years is due to greater investment in education, which led to an increase in women's educational level, allowing them to penetrate more into the labor market (Chioda, 2011; Gasparini and Marchionni, 2015).

Finally, the International Labor Organization (ILO, 2019) in a study for 17 countries, using the nonparametric decomposition of Ñopo, finds that the gap is greater in self-employed workers and more accentuated in low-income workers, while in the period 2012-2017, the unexplained income gap is reduced between 2 and 3 percent..

2.2. Evidence

The National Institute of Statistics and Censuses of Ecuador (INEC, 2012: 1) defines the labor income gap between men and women as the "Existing percentage difference between the hourly labor wage between men and women, expressed as a percentage of the male salary. It also corresponds to the exact rate of percentage change between the wages of men and women." In the same way, the calculation formula is defined as:

$$BYL(h-m) = \frac{(YLh - YLm)}{YLh} * 100$$

Where:

$BYL(h-m)$ = Gap in labor income between men and women

YLh = Hourly earnings men

YLm = Hourly earnings women

For the calculation of the indicator, INEC considers hourly labor income, for which the monthly labor income is divided for the monthly hours worked, since people are consulted about the hours they work in the week.

In the same vein, INEC (2012: 1) defines labor income as:

> *"any remuneration for productive activities in the form of payments in money, in kind or in services. For self-employed workers, net monetary income (both from the main and secondary activity) is considered, that is, discounting the expenses for the operation of the business. For salaried workers, monetary income includes disposable income, the amount on account of direct taxes and social security contributions."*

While, for Eurostat (2020), the wage gap between men and women, in its unadjusted form, is defined as "the difference between the gross hourly earnings of male and female employees, expressed as a percentage of the average gross hourly earnings of salaried workers".

For the International Labour Organization (ILO, 2019: 17) the wage gap between men and women is:

> *"which considers the difference between the average monthly income per work of women and that of men. In this regard, the ILO notes that wage inequality is often understood as the gap resulting from the difference between the average earnings of women and men as a percentage of men's income, if women's average monthly earnings account for 70 per cent of men's average monthly earnings, The gender pay gap is 30 percentage points".*

Also, the ILO (2019) considers that the data on the income gap between men and women considers income by salary, excluding self-employed people, which generates restrictions:

> *"Such indicators have so far proved useful for estimating in general terms the wage disadvantage faced by women. However, they do not allow us to know the wage inequality in different contexts or measure its impact on different groups of women and limit the possibility of designing effective public policies that protect those who need it most."* (p. 17).

In this regard, on the gender pay gap, when the ILO (2019) analyzes four countries (Mexico, Costa Rica, Peru and Uruguay) it finds something very important, which is considered in this study:

> *"Gaps in monthly wages are not the best indicator for estimating wage discrimination based on gender, since differences in monthly earnings by women and men are partly due to the fact that women on average work fewer hours than men work fewer hours on average. It is, considering the two reference years, about 15% less per week in Mexico, 17% in Costa Rica, 10% in Peru and 20% in Uruguay. Except in the latter country, these differences have increased slightly between 2010 and 2016"* (p. 36).

Studies on wage discrimination in Ecuador refer to the traditional methodology of the Mincer model (1978) that collects the gaps in access to education (human capital), and others delve into modeling that shows if wage differences are due to discriminatory factors, which in the present study is used, such as the well-known Oaxaca-Blinder decomposition.

In the study by Benítez and Espinoza (2018), wage discrimination between men and women in Ecuador is analyzed by branch of activity and company size, differentiating wage bias, and they point out:

> *"To differentiate the proportion of wage bias attributable to the characteristics of workers from that attributable to discrimination, the Oaxaca-Blinder decomposition is used. It is found that there is wage discrimination by gender in almost all branches of activity, but with different levels in each of them."* (p. 1).

Regarding the criticisms that exist about the application of the Oaxaca-Blinder decomposition model, Benitez and Espinoza (2018) explain the existence of several methodologies that use parametric and non-parametric methods, such as the quantile regression of the Oaxaca-Blinder model, by pointing out the following:

> *"Despite the criticisms made of the latter, mainly related to the existence of omitted variables and the fact that it does not measure gaps in access to human capital (such as education), the Oaxaca-Blinder decomposition is still widely used due to the ease with which wage differences can be expressed in components that account for the difference in characteristics (human capital). on the one hand; and from one unexplained part attributable to discrimination, on the other"* (p. 6).

Concluding these authors, Benítez and Espinoza (2018) with the following: "the data of administrative records about formal employment in Ecuador shows evidence that there is discrimination against women, despite the fact that there is no wage gap in this regard", which shows the benefit of using the Oaxaca-Blinder method to understand labor discrimination, as used in this investigation.

In another study for Ecuador, García (2022) analyzes the evolution of the wage gap and its relationship with the supply of skills related to higher education motivated by changes in income distribution, and points out that the explanation for the decrease in income inequality is due to "the unprecedented increase in a more educated workforce" (p. 11), That is to say, it is human capital that reduced the gaps and wage inequality, embracing the Mincerian model, the results show that:

> *"The improvement in the educational composition of the Ecuadorian labor market is evident. An interesting fact is that the positive scale used for women tells us that the participation of women with tertiary education exceeds the participation of those without this education, while, for men, although the participation of the former with respect to the latter has increased, the male labor force is still intensive in workers without higher education. Another important feature is that the improvement in educational composition grows rapidly only after 2015 for both men and women. Perhaps this is the reflection of the higher education reforms of 2008, whose main axis was free access to higher education, and the increase in investment in this type of education during the period of economic growth 2009-2014 that materializes only after 2015. It could also be due to the displacement of less productive, in this case less educated, workers out of the labor*

> *market during the period of economic contraction, something that is reaffirmed with the significant increase in the indicator in the 2020 pandemic year"* (pp. 12-13).

Puebla (2018) in a study for Ecuador, on wage gaps by gender with a focus on occupation and company size, uses the selection bias methodology, that is, it applies the Oaxaca-Blinder decomposition model to perform a decomposition of the gender wage gap to explain how much is due to gender differences. As noted in the study, three specifications were used.:

> "*i) Model 1: age (level and square), education and marital status; (ii) Model 2: model 1 and type of occupation; (iii) Model 3: model 2, size of enterprise and economic sector. However, the results shown refer mainly to Model 3, although in the case of decompositions a robustness test is carried out considering also the other models*" (p. 86).

In addition, this author, when analyzing the dimensions by company size and type of occupation, finds the following results:

> "*Women have a significant share in the top income quintiles, which occurs regardless of the size of the company in which they work ... The widest average wage gaps between men and women are among those who: have higher education, are over 45, are married, and who work in White Collar occupations ... Gaps typically show nonlinear patterns along the distribution, calling into question the scope of the average wage gap analysis.... Finally, when performing the analysis of wage decomposition, it was found that, in general, men have higher returns than women when compared to pairs of equal characteristics. Therefore, this becomes evidence that women face significant wage discrimination, despite the fact that in a global sense they have better characteristics than men, mainly in terms of educational level.*" (pp.104-105).

At the regional level, we have studies to determine wage inequality such as the study of the Inter-American Development Bank (IDB, 2020) when analyzing the labor income gap by gender in Bolivia uses the decomposition of the Oaxaca-Blinder model and the Ñopo model, and finds the following results.:

> "*The Blinder-Oaxaca Decomposition shows us a reduction from 32% of the income gap in 1993 to 7% in 2018 and the Ñopo Decomposition shows us a reduction in the gap from 43% to 7% in the same period. This reduction is explained by the reduction of both components, the first explainable by the reduction of differences in observable characteristics, especially that related to improvements in women's education and the impact of family characteristics.. The second component that explains the reduction of the gap is due to the reduction of the unexplained component, assumed as discrimination ... Considering formality, we find an absence of gap not explained by gender in the formal sector, while in the informal sector it is almost 7% of the average income ... These results have important implications for the possibility of implementing public policies. It is necessary to continue with the reduction of the income gap, for that it is necessary to promote equal access of women to sectors and occupations that generate higher remuneration. This can be achieved through the training and labor insertion of women in non-traditional occupations and sectors, which allows them to improve their labor productivity and consequently their labor income.*" (p. 18).

Arpi and Arpi (2018) in a study for Peru on labor income inequality between ethnic groups, use the decomposition of the Oaxaca-Blinder model to measure differences in educational level and experience between different ethnic groups, finding the following results:

> "*The explanatory scope by observable characteristics, mainly, difference in educational level, increased from 54% in 2006 to 77% in 2016; Meanwhile, the influence of unobservable characteristics (discrimination) on access to the Peruvian labor market decreased from 46% to 23% between the years of analysis. It is concluded that the inequality of labor income of ethnic groups, between 2006 and 2016, remains unchanged, and there is also a tendency for indigenous Peruvians to decrease over time*." (p1.).

A study by Colacce (2018) for 4 Latin American countries estimates how the elimination of gender differences in labor income can affect poverty and inequality in Bolivia, Brazil, Peru and Uruguay using Rubin's (1957) multiple imputation technique of missing data, and finds the following results:

> "*Brazil and Uruguay have similar participation gaps, but in which income gaps are smaller, and in Bolivia and Peru, the income gap is very large, maintaining high levels in the participation gap. Additionally, the differentials between men and women in the variables of interest along the income distribution are different between the two pairs of countries analyzed (p.8). While the effects of eliminating gender differences in the labor market on poverty are unequivocal and always positive, the effects on labor income and household income inequality cannot be widespread, they will depend on the country and the scenario. This is because, depending on the starting situation, changes are generated in different parts of the income distribution, reflecting how gender inequalities are concentrated in the labor market of each country.* (p. 1)".

Caicedo (2009) in a study of wage inequality in the United States for Mexican, Cuban and Central American immigrants, uses the method of decomposition of wage gaps developed by Oaxaca - Blinder, to establish how much of the gap is due to differences in human capital among workers, and how much to the differential treatment exercised by the market on some workers, and find the following results:

> "*There are great differences in human capital among workers, but also, the unequal treatment of the market exercised mainly towards some groups of Latin American workers (p.1). Stereotypes around different nationalities and sex operate strongly in societies as rich and developed as the United States, where there have supposedly been efforts to eliminate unequal treatment among workers. The symbolic constructions around sex and nationality, are especially affecting women, this means that, in most cases, although on average they have a set of productive characteristics superior to those of men, they are in a worse situation than they do in the market.* (p.17)".

3. Methodology

The methodology applied is based on the possible existence of error due to sample selection bias, since, when analyzing the income of the respondents, the characteristics of those who do not participate in the labor market are omitted. To identify the existence of this error, and the steps to follow, the process described by Jones (2007) and Adkins and Hill (2011) was used as a reference, who conclude in the application of Heckman's model to solve it. The estimates of Heckman's model allow to obtain reliable sign, magnitude and inference results. Subsequently, the Oaxaca-Blinder method was carried out, to show if the differences in income are due to discriminatory situations.

Based on the sample selection problem, according to Adkins and Hill (2011) the model to be estimated is made up of two equations. On the one hand, the regressors that determine if a variable has values greater than or equal to zero, or if it has lost values, that is, if the variable can be observed or not, this is described in equation number 1. It should be noted that the population analyzed is made up of $1, \dots, N$ people, $whereas, the\ population\ actually\ observed, without\ lost\ values, is\ made\ up\ of\ 1, \dots, n$ people; and, besides, n < N.

$$w_i = \alpha_0 + \beta x_i + \varepsilon_i\,, \qquad i = 1, \dots, N, \qquad w_i = \begin{cases} 1 & w_i \geq 0 \\ 0 & other\ cases \end{cases} (Equation\ 1)$$

On the other hand, the linear equation whose regressors are the objective of the research is estimated, in this case they contain the determinants of labor income, in general terms it is expressed in the equation 2.

$$y_j = \theta_0 + \delta z_j + \mu_j\,, \quad j = 1, \dots, n\ (Equation\ 2)$$

For Adkins and Hill (2011) there is a sample selection problem when the equation of w_i is equal to 1, that is, the variable is observed, and the errors between ε_i and μ_i are related, this is expressed by equation 3.

$$E[y_j/w_j = 1] = \theta_0 + \delta z_j + \delta_\lambda \theta_j \ , j = 1, \dots, n \ \ (Equation\ 3)$$

In the development of this model, it is important to analyze θ_j, which is called "Inverse Mills Ratio" and results from dividing the density functions of both the standard and cumulative random variable. If incorporating the "Inverse Mills Ratio" into equation 2 turns out to be significant, the inference of the model is not efficient, because there is a problem in the selection bias. This is solved from Heckman's model where standard errors are corrected, in general terms it is expressed in equation 4, where the "Inverse Mills Ratio" is estimated. $\bar{\lambda}_i$.

$$y_i = \theta_0 + \delta z_i + \delta_\lambda \bar{\lambda}_i + \mu_i \ (Equation\ 4)$$

In the case of identifying that the regressors are significant, it is pertinent to distinguish if there are differences due to discrimination, for the case of the present study discrimination by sex, age or ethnic self-identification of the people. The procedure described by Neuman and Oaxaca (2004), starts from Equation 4, and compares two groups (either men and women; young and non-young; etc.), which are identified with subscripts 1 and 2 in the following equations.

$$\bar{y}_1 - \bar{y}_2 = \bar{Z}'_2(\hat{\delta}_1 - \hat{\delta}_2) + (\bar{Z}_1 - \bar{Z}_2)'\hat{\delta}_2 + (\hat{\delta}_{\lambda 1}\hat{\lambda}_1 - \hat{\delta}_{\lambda 2}\hat{\lambda}_2) \ (Equation\ 5)$$

Within the framework of the approach described, the models being analysed are described in equations 6 and 7. The first model analyzes the determinants of the natural logarithm of people's labor income; Unlike the Mincerian models that consider experience measured in years, or age as a proxy for experience, the present model by incorporating dummies to identify young people implicitly includes experience. While the second model analyzes the probability of people participating in the labor market. The estimation of the second model responds to Heckman's two-stage methodology and the estimators allow us to understand what factors affect the employability of people.

Model of labor income:

$$y = \theta_0 + \delta_1 mujer + \delta_2 etnia + \delta_3 jefe + \delta_4 titulo + \delta_5 edad\_18\_24 + \delta_6 edad\_25\_30 + \delta_7 afiliacion + \delta_8 estab + \delta_9 sector + \delta_{10} grupo + \delta_{11} horas + \delta_\lambda IMR + \mu \ (Equation\ 6)$$

Where:

$y =$	Natural logarithm of labor income.
$\theta_0 =$	Coefficient representing a constant magnitude for the model.
$\delta_j, j = 1, \dots, 11$	Coefficients of each of the model-dependent variables
$mujer =$	Dummy, women=1.
$etnia =$	Dummy, ethnicity other than mestizo, white, or other =1.
jefe =	Dummy, Head of household =1.
titulo =	Dummy, whether the person has a third or fourth level degree =1.
$edad\_18\_24 =$	Dummy, if the person is between 18 and 24 years old =1.
$edad\_25\_30 =$	Dummy, if the person is between 25 and 30 years old =1.
$afiliacion =$	Dummy, whether the person has any kind of social affiliation (IESS, ISFA,

ISSPOL) =1.

$estab =$ Dummy, If the person works in an establishment with more than 100 people =1.

$sector =$ Dummy, whether the person works in the branch of the sector concerned with electricity supply, financial activities and administration =1.

$grupo =$ Dummy, whether the person works as managerial, scientific, technical and mid-level professional =1.

$horas =$ Natural logarithm of working hours, in both primary and secondary work.

$IMR =$ Inverse of Mills Ratio.

$\mu =$ Model error.

Model probability of participating in the labor market:

$$pml = \alpha_0 + \beta_1 women + age_{18_{24}} + \beta_3 age_{25_{30}} + \beta_4\, head of\ household + \beta_5 etnicity + \beta_6\, level\ degree + \beta_7\, studie + \varepsilon\ (Equation\ 7)$$

Where:

$pml =$ Dummy, the person participates in the labour market =1.

$\alpha_0 =$ Coefficient representing a constant magnitude for the model.

$\beta_j, j = 1, \ldots, 7$ Coefficient representing a constant magnitude for the model.

$mujer =$ Dummy, women=1.

$edad\_18\_24 =$ Dummy, if the person is between 18 and 24 years old =1.

$edad\_25\_30 =$ Dummy, if the person is between 25 and 30 years old =1.

jefe = Dummy, Head of household =1.

$etnia =$ Dummy, ethnicity other than mestizo, white, or other =1.

titulo = Dummy, whether the person has a third or fourth level degree =1.

$estudia =$ Dummy, if the person is in education =1.

$\varepsilon =$ Model error.

4. Results

The INEC databases called the National Survey of Employment, Unemployment and Underemployment -ENEMDU-, accumulated (annual) for the years 2018, 2019 and 2021, were used. The year 2020 does not contain an accumulated base, this because, during the first months of the pandemic, ENEMDU surveys were not carried out periodically and in person. In the stage of greatest risk due to COVID contagion, telephone ENEMDU was carried out, which due to its design is not strictly comparable to face-to-face surveys. For this reason, the year 2021 is considered as the post-pandemic period, which has information comparable to previous years.

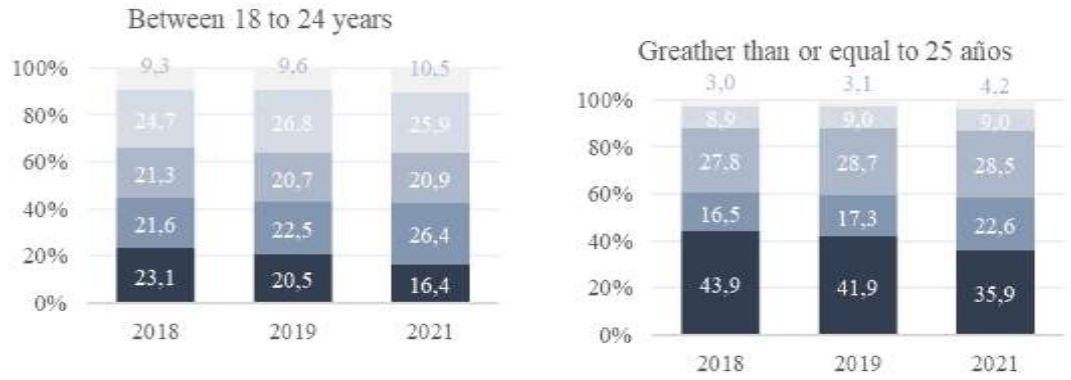
The domains of study of the annual ENEMDU are: national, urban and rural, 5 self-represented cities (Quito, Guayaquil, Cuenca, Machala and Ambato), as well as the 24 provinces of Ecuador. This database is built by INEC from monthly surveys, which are aggregated under a broken panel design that allows for greater representative domains at an adequate level of representativeness. It should be noted that INEC recalculates and calibrates the expansion factors to be annual. The databases, tabulations and technical documents are published on the official INEC website.

According to the information from the databases used, gross employment, which results from the division between employed population and working-age population, went from 64.3% in 2018 to 62.5% in 2021. The following figure shows the prevalence of activity status according to sex, youth and ethnicity; It can be observed that in all cases the percentage of people with full employment decreased, while the percentage of people with unemployment increased; taking into account that the percentage is calculated with respect to the economically active population -EAP-. Relative to the focus groups, the prevalence of women engaged in unpaid and unclassified work is at least 2.5 times higher than that of men. It is also noteworthy that the prevalence of adequate employment does not exceed 25% in people between 18 and 24 years old, or with indigenous ethnic self-identification, Afro-Ecuadorian, black, mulatto and montubio.

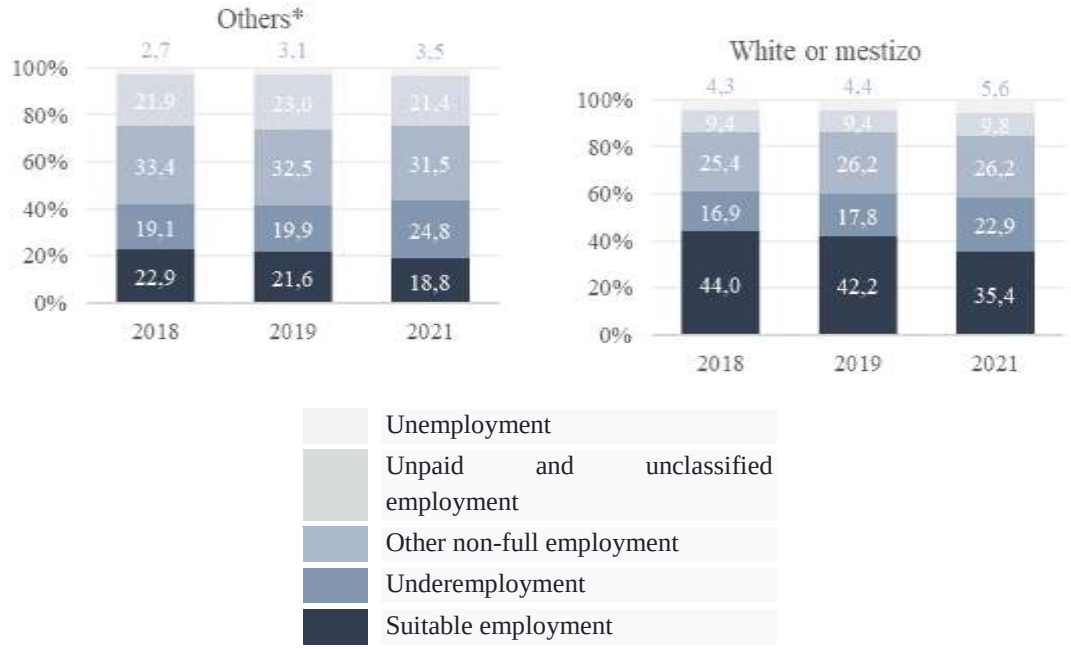
Figure 2. Activity status by sex, youth and ethnicity (% of EAP)

Panel A: Sex

Panel B: Youths



Panel C: Ethnic self-identification



Note: the percentages were calculated with respect to the Economically Active Population of each group and each year, considering the respective expansion factors. In ethnic self-identification others include: indigenous, Afro-Ecuadorian, black, mulatto and montubio.
Source: INEC, ENEMDU Annual 2018, 2019 and 2021. **Elaboration:** Authors.

Due to the variability of the data both in labor income and in hours worked in primary and secondary work, the following figure presents information on the median disaggregated by the different analysis groups, being a more appropriate measure compared to the mean. The value of labor income is presented in constant dollars with base year of 2007 to capture the effect of inflation, it should be noted that in current dollars the value of the highest median was 400 USD.

For women, for both 2018 and 2019, although the median hours of work were the same as for men, the median real labor income was lower. In 2021, both men's and women's incomes decreased, in this case the gender gap was greater than the other two years, although the median working hours were lower for women.

People aged 18 to 24 worked fewer hours per week and had a lower median labor income than people with more or equal to 25 years. It is observed that in the group of young people the reduction in working hours is less than the reduction in their real labor income. In another order of ideas, people with self-identification other than white or mestizo had a lower median income compared to other groups, although the hours of work are similar.

Panel A: Sex

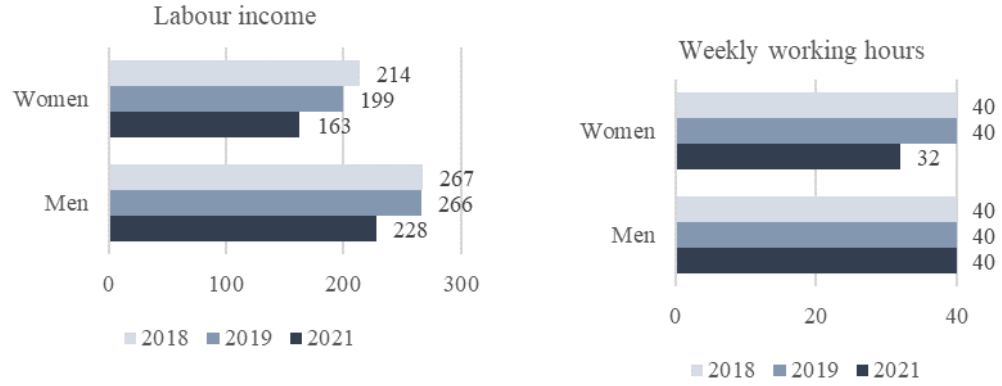
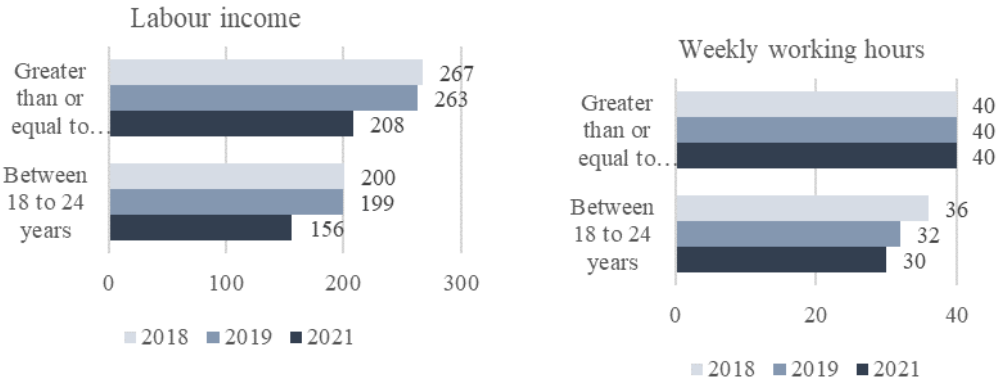
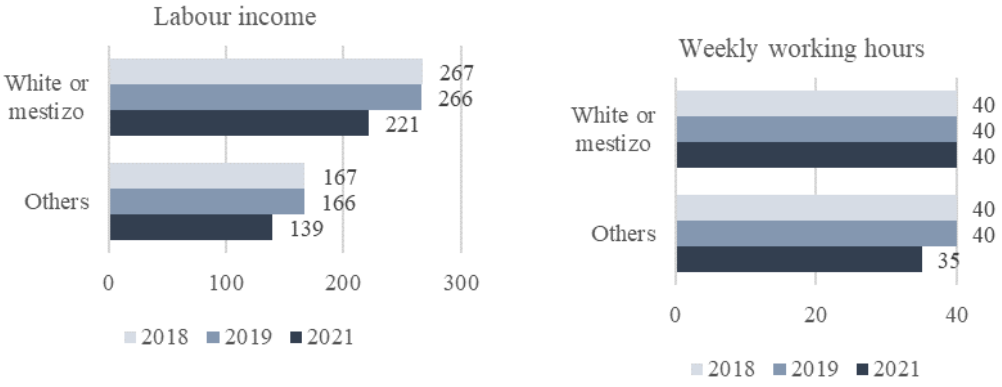


Figure 3. Median labor income (constant 2007 dollars) and weekly work hours

Panel B: Youths



Panel C: Ethnic self-identification



Note: Real labor income was calculated from the implicit deflator of the Gross Domestic Product, with base year of 2007, the expansion factors of the surveys were used. In ethnic self-identification others include: indigenous, Afro-Ecuadorian, black, mulatto and montubio.

Sources: INEC, ENEMDU Annual 2018, 2019 and 2021. Central Bank of Ecuador, Quarterly National Accounts of Ecuador No.119. **Elaboration:** Authors.

In percentage terms, the decrease in income between the pre- and post-pandemic period was greater in women, where labor income decreased 18.4%, about 4 percentage points more than in men. In the case of young people between 18 and 24 years old, the decrease in pre- and post-pandemic income was 21.7%, being a reduction of 1 percentage point greater compared to people with 25 years or more. On the other hand, white and mestizo people had a somewhat greater decrease (16.8%), compared to the decrease of people who self-identify in ethnic minorities (16.2%).

The following table indicates the median labor income according to sex and ethnicity in each year of study, in current dollars the highest value was 441 dollars, however, to compare considering the effect of inflation, the values with base year 2007 were deflated. Note that in all ethnic groups income decreased in 2021. In the case of women, the group with the greatest reduction in median income were mestizo women (20.5%), followed by Afro-Ecuadorians and blacks (19.1%) and mulatto women (18.7%). While, in the case of men, those who presented a greater percentage reduction in income, were Afro-Ecuadorians and blacks (21.4%), followed by montubios (20.5%) and mulattos (16.1%).

The median income of women is lower than that of men in all groups and years; This difference was more pronounced in absolute terms in the group of Afro-Ecuadorians or blacks in 2018; On the other hand, the difference was greater in the group of mestizos for the year 2021. Finally, it is observed that the groups with the lowest median real labor income are the indigenous and montubios; who earn about half the income of people with mestizo or white self-identification.

Table 1. Median real labor income (2007) by sex and ethnicity

	Men			**Women**		
	2018	**2019**	**2021**	**2018**	**2019**	**2021**
Indigenous	167	166	148	100	100	91
Afroecuadorian and black	267	253	198	197	203	164
Mulato	257	233	195	194	173	141
Montubio	174	180	143	134	100	91
Mestizo	281	271	254	234	213	169
White	295	279	260	253	253	215

Note: Real labor income was calculated from the implicit deflator of the Gross Domestic Product, with base year of 2007, the expansion factors of the surveys were used.
Sources: INEC, ENEMDU Annual 2018, 2019 and 2021. Central Bank of Ecuador, Quarterly National Accounts of Ecuador No.119. **Elaboration:** Authors.

For the econometric model, at first it was considered to analyze the wage differences taking into account both the public and private sectors, however, the results were not consistent, so it was decided to focus the analysis on the private sector. In turn, this choice is argued in the sense that people working in the public sector should not face discrimination based on gender or ethnicity when being hired by the contracting mechanisms that exist in that sector. Merit and competitive examinations consider these factors to promote inclusion.

In order to have groups that can be comparable with their labor income, a process similar to that carried out by Carrillo et. Al (2018), building various filters in databases. Thus, people under 18 and over 65 years of age were excluded, as well as those who worked less than 20 hours in the week. Two sectors and one occupation group that had only 1 observation in the three years of study were also eliminated. It should be mentioned that,to make the estimates and construction of filters to the databases, the econometric package Stata was used.

The process carried out by Jones (2007) and Adkins & Hill (2011) to identify if there are problems by sample selection consists of estimating the "Inverse Mills Ratio" which results from the quotient between the standard normal function of equation 1, and the equal cumulative normal distribution function from equation 1. This is

done from the probit model, which in each year had a pseudo R2 adjustment greater than 0.22. By incorporating the "Inverse Mills Ratio" in the MCO model of equation 4, it was identified that it is significant, therefore, the model must be estimated using what Heckman proposed.

The following table presents the results of the estimation performed by the two-stage method. For the years 2018 and 2019, the total number of people analyzed is around 140 thousand; figure that is lower in 2021 because in that year there are fewer observations (122 thousand less compared to the other two years). Both model 1 and model 2 have a significance of at least 1% in all variables, these results are also consistent when estimating for maximum likelihood. Also, the sign is expected in all study variables.

The likelihood of participating in the private sector labour market is reduced for women, ethnic self-identification other than mestizo or white, and young people aged 18-24. In the case of age, when people are between 25 and 30 years old, the probability of being hired is higher, but the income is lower compared to other age groups (note the sign in model 1). People who are heads of household are more likely to participate in the labour market. Also, having a third or fourth level degree implies greater chances of being hired. Conversely, an adult studying during the analysis period is less likely to be working.

In the model that estimates the determinants of the natural logarithm of labor income, it indicates that being female, being young and belonging to an ethnicity other than mestizo or white, is associated with lower levels of income. Among these groups, being young between 18 and 24 years old has the greatest negative impact on income, in part this is explained by the experience of people. For both women and young people, the magnitudes of the estimated coefficients are higher in 2021, which implies that after the pandemic people from these groups who are working in the private sector have lower incomes.

Being head of household, being affiliated to social security, possessing a third or fourth level degree, working in a company with more than 100 workers, and working more hours, is associated with higher levels of labor income. Likewise, if people work in the sectors of electricity supply, financial activities and administration they have higher incomes. Finally, those who have an occupation group such as managerial staff, scientific, technical and mid-level professionals, have higher incomes compared to other groups.

Table 2. Results of Heckman's two-stage estimate

Variable	Model 2018	Model 2019	Model 2021
Model 1 (Natural logarithm of labor income)			
Woman	-0.16330049***	-0.1513297***	-0.16962075***
Ethnic group	-0.07849197***	-0.05938861***	-0.07937906***
Head of household	0.15208747***	0.13355206***	0.16116545***
Title	0.26410141***	0.26490815***	0.24526755***
Age_18_24	-0.24233939***	-0.25798138***	-0.27514489***
Age_25_30	-0.08931765***	-0.09789604***	-0.0749259***
Afiliation	0.53089588***	0.59265603***	0.68675892***
Establishment	0.12509908***	0.07821153***	0.08651153***
Sector	0.15869448***	0.14766466***	0.18998879***
Group	0.34076641***	0.31185967***	0.28429824***
Hours	0.53592827***	0.52806696***	0.67144674***
Constant	3.6021688***	3.6535275***	2.9174497***
Model 2 (Probability of participating in the labor market)			
Woman	-0.9294368***	-0.91978994***	-0.88788832***
Age_18_24	-0.07942333***	-0.10862323***	-0.12051932***
Age_25_30	0.4234776***	0.41714795***	0.39957167***
Head of household	0.57679227***	0.54913243***	0.57553387***
Ethnic group	-0.15373788***	-0.12725027***	-0.14439152***
Title	0.55870283***	0.57503674***	0.52750001***

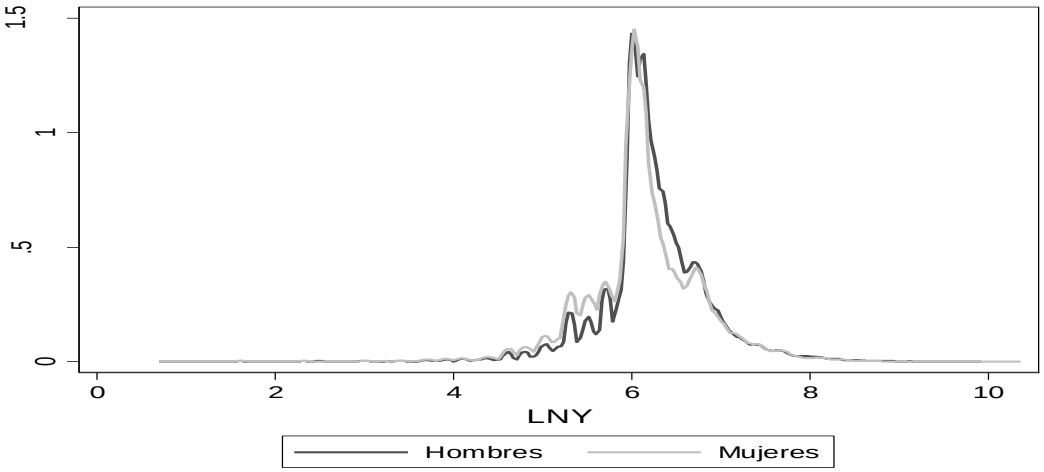
Variable	Model 2018	Model 2019	Model 2021
Studies	-0.93736056***	-0.94146612***	-0.72530989***
Constant	0.26357774***	0.26256444***	0.08585769***
Mills (Lambda)	0.0854325***	0.06222506***	0.116596***
N	140.830	141.088	104.466
N	77.670	78.442	63.210

*Significance: * p<0.10; **p<0.05; ***p<0.01.* **Source:** INEC, ENEMDU Annual 2018, 2019 and 2021. **Elaboration:** Authors.

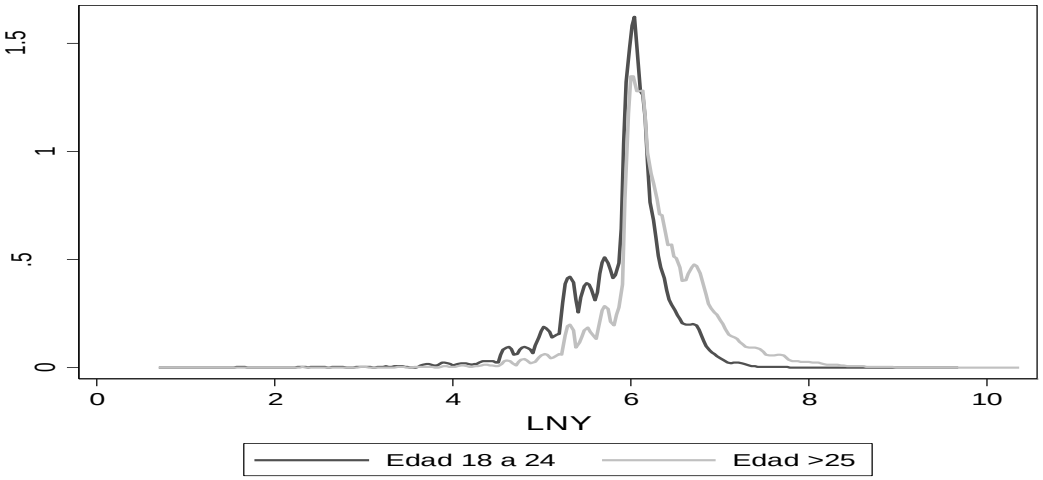
By plotting the Kernel density functions of the natural logarithm of labor income, it is evident in the following graphs that income distributions have a better fit (with more concentrated values up and right of the graph) for men, non-young people and people with mestizo or white self-identification. This implies that women, youth and people from ethnic minorities are more likely to have lower incomes, being consistent with descriptive and econometric analysis. The difference is most noticeable among people aged 18 to 24. The differences in distributions according to sex and ethnicity have some points in common, starting with the fact that women and people from ethnic minorities have a more pronounced distribution to the left; and less pronounced to the right.

Figure 4. Kernel density function by analysis group

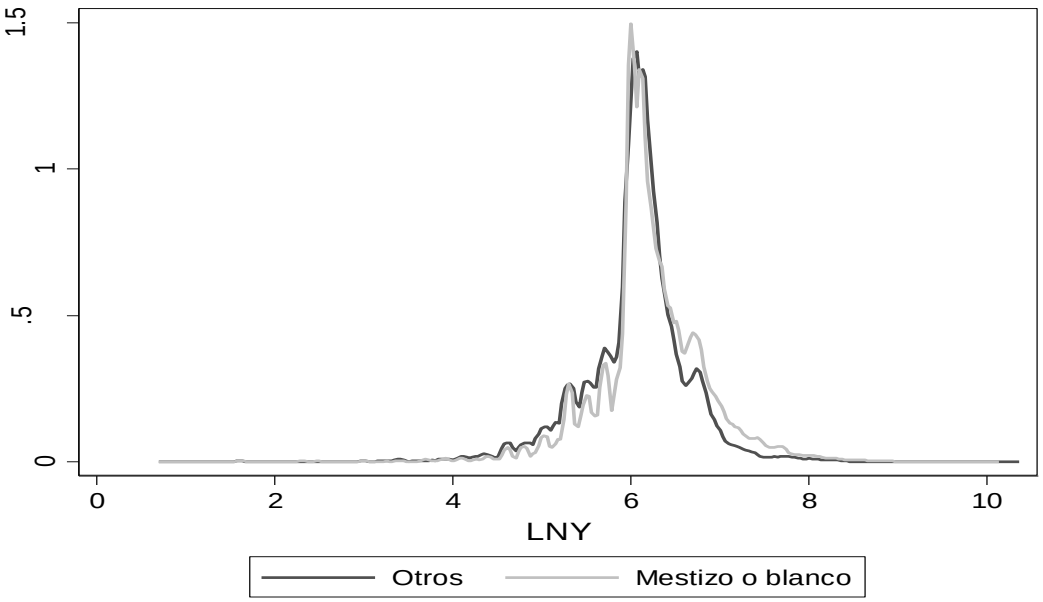
Panel A: Sex



Panel B: Youths



Panel C: Ethnic self-identification



Source: INEC, ENEMDU Annual 2018, 2019 and 2021. **Elaboration:** Authors.

The results obtained from the Oaxaca-Blinder decomposition show that the gap in the logarithm of labor income between men and women increased after the pandemic. This difference is significant at 1% in 2018, and 5% in 2019 and 2021. In 2019 the endowments component is significant, this value indicates that, if women had the same characteristics as men, they would have a lower value in their income. The component of coefficients is significant in all years, this indicates the change in the labor income of women when applying the coefficients of men in the characteristics of them. Finally, in the interaction component, the simultaneous effect of endowments and coefficients is low.

In the case of young people, it is observed that the gap in labor income estimates has decreased, however, the prediction of their income also turned out to be lower after the pandemic. From the decomposition, it is identified that only the endowment component is significant in all years. This implies that the differences in the labor income of young people between 18 and 24 years old with people older than or equal to 25 years are explained by the observable characteristics defined in the model, and is not necessarily due to discrimination. A similar case occurs when performing the analysis according to ethnic self-identification, although in the years 2018 and 2019 a high coefficient component was identified, which would indicate discrimination factors.

Table 3. Oaxaca-Blinder decomposition results

Panel A: Men and women

	Model 2018	**Model 2019**	**Model 2021**
Differences			
Prediction men	6.204476***	6.203155***	6.046913***
Women prediction	5.973049***	6.054828***	5.720907***
Difference	0.2314266***	0.1483266**	0.3260068**
Decomposition			
Endowments	/	-0.0163542**	/
Coefficients	0.2107407***	0.1369152**	0.3283549**
Interaction	0.0146403**	0.0277657***	/

Panel B: Age 18 to 24 years, and over 24 years

	Model 2018	**Model 2019**	**Model 2021**
Differences			
Prediction Y (age 18 to 24 years)	6.049493***	6.103572***	5.776379***

	Model 2018	Model 2019	Model 2021
Prediction Y (age over 24 years)	5.703227***	5.68642***	5.517362***
Difference	0.3462662***	0.4171518***	0.2590168**
Decomposition			
Endowments	0.3234264***	0.3395475***	0.4006005***
Coefficients	/	/	-0.1815022*
Interaction	/	/	/
Panel C: Ethnic self-identification			
	Model 2018	**Model 2019**	**Model 2021**
Differences			
Prediction Y (mongrel, white or other)	6.120413***	6.130945***	5.964014***
Prediction Y (indigenous, Afro-Ecuadorian, black, mulatto and montubio)	5.872636***	6.004644***	5.659964***
Difference	0.2477764***	0.1263006**	0.30405***
Decomposition			
Endowments	0.0924193***	0.1220632***	0.1500012***
Coefficients	0.1295437**	/	0.1464188
Interaction	0.0258135***	/	/

*Significance: * p<0.10; **p<0.05; ***p<0.01; / not significant. Note: The prediction was made with Heckman's estimation in two stages.* **Source:** INEC, ENEMDU Annual 2018, 2019 and 2021. **Elaboration:** Authors.

5. Conclusions

In the determination of wage gaps between men and women, two methodological visions have been manifested. The first, which has to do with the theory of human capital, which explains the differences in human capital (seen as educational level achieved) that determines the difference between the wages of men and women. The second, which considers other unobservable factors such as discrimination, which has not only led to women having less human capital, but access to work is restricted by this gender condition, as well as access to training and quality at work. The percentage of people with full employment decreased and the percentage of people with unemployment increased, between the pre- and post-pandemic periods. The prevalence of women engaged in unpaid and unskilled work is at least 2.5 times higher than the prevalence of men. It is also noteworthy that the prevalence of adequate employment does not exceed 25% in people between 18 and 24 years old, or with indigenous ethnic self-identification, Afro-Ecuadorian, black, mulatto and montubio.

In all ethnic groups, incomes decreased in 2021, and the probability of participating in the private sector labor market is reduced for women, ethnic self-identification other than mestizo or white, and young people between 18 and 24 years old. In the case of age, when people are between 25 and 30 years old, the probability of being hired is higher, but the income is lower compared to other age groups.

Being female, young, and belonging to an ethnicity other than mestizo or white is associated with lower income levels. For both women and young people, the magnitudes of the estimated coefficients are higher in 2021. This implies that after the pandemic, people in the analysis groups who are working in the private sector have lower incomes. There are conditions for having higher incomes, such as being affiliated to social security, having a third or fourth level degree, working more hours a week, and working in sectors and occupational groups that are generally more remunerated.

Finally, the gap in the logarithm of labor income between men and women increased after the pandemic. This difference is significant at 1% in 2018, and 5% in 2019 and 2021. Income gaps are explained by discriminatory factors and observable factors for women and ethnic minorities; while for young people it is due only to

observable factors. Only in 2019 the endowments component is significant in women, this value indicates that, if women had the same characteristics as men, they would have a lower value in their income. In the case of young people, it is highlighted that the gap in labor income estimates has decreased, although the prediction of their income also turned out to be lower after the pandemic.

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Credit risk management and its impact on the profitability of Algerian banks: An applied study using Panel –Data model during the period 2009-2020

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Abstract

This study aims to investigate the relationship between credit risk management and the profitability of commercial banks by testing the impact of credit risk indicators on assessing the profitability of a sample of Algerian commercial banks during the period 2009-2020 by using a panel-data model. The results of the applied study indicate that: the ratio of loan loss provisions to total loans and capital adequacy ratio are the most important indicators of credit risk management that affect and contribute to evaluating the profitability of Algerian commercial banks.

1. Introduction

The role of banks as financial intermediaries is crucial in financing economic growth by borrowing from savers and lending to companies that need resources for investment. The success of this role depends primarily on their efficiency and performance. Bank lending is a key function, it determines future profitability and reflects the banks' performance; banks recently have become more aware of customer selection to avoid the negative effects of poor and non-performing loans. Credit risk management is becoming increasingly important as an effective tool in assessing banks' performance and profitability, owing to the extent of losses that banks can bear as a result of the non-performing loan problem, where credit risk is a serious problem facing banks in their business. It can freeze an important portion of bank funds because of the inability of borrowing customers to pay their premiums and interests in due time. This may attenuate their profits. This study aims to emphasize the importance of credit risk management and its role in supporting actions and measures to improve the profitability and performance of banks. It also attempts to link the effect of credit risk indicators with profitability indicators in Algerian commercial banks by analyzing how credit risk management indicators help assess Algerian commercial banks' performance and identify factors affecting profitability the most.

1.1. The study objectives

Accordingly, the study seeks to achieve the following objectives:

- To clarify the importance of credit risk management on banks' performance.
- To examine the relationship between credit risk management and the profitability of Algerian banks.
- To determine the indicators and measures that illustrate the relationship between Algerian banks' profitability and credit risk management.

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1.2- Problem of the study:

This research paper attempts to answer the following question:

*How do credit risk management indicators influence the assessment of Algerian commercial banks profitability during the period 2009-20**20**?*

1.3- The hypothesis of the study

To answer this question, the following hypotheses have been formulated:

Hypothesis 1: Increasing the ratio (loans loss allocations / total loans) accrues the level of non-performing loans along with the risk of credit, which has a negative impact on the profitability and performance of banks.

Hypothesis 2: Increasing capital adequacy reduces the level of non-performing loans and credit risk. That positively reflects on the profitability and performance of banks.

Hypothesis 3: The high ratio (total loans / total deposits) increases the level of non-performing loans besides the risk of credit. That negatively affects the profitability and performance of banks.

1.4- Study methodology and tools used

To achieve the objectives of the study, to address the problem, to analyze the results, as well as to test the validity of hypotheses, the study relied on the descriptive approach to describe and analyze aspects of the topic, drawing the theoretical aspect of the most important studies, theses and scientific articles on the subject. In practice, the study relied on a case study method by examining the case of a sample of Algerian commercial banks, using data collected from the sample banks' reports during the period 2009-2022. Using Panel-data model with some statistical programs include spss 22, eviews 9, and EXCEL version 2007.

2. The theoretical framework:

Credit risk has a great impact on banks' safety. The extent of the credit risk relies on the quality of assets held by banks. The types and quality of assets refer to a specific risk exposure. Aburime (2008) asserts that a bank's profitability is primarily based on its potential to foresee, keep away from, reveal risks, and cover losses by loans losses allocations. Hence, in decision making of resources allocation of assets distribution, a bank should consider the degree of risk to the assets (Olweny & Shipho, 2011, p. 5). Loans are the largest investment component of assets and the largest source of income for banks. If a loan defaults, the ability of banks to make new loans will be constrained, interest income on those loans will drop, and banks will have to put loan loss provisions in place, ultimately reducing their profitability. The credit risk or credit quality of a bank is expressed as non-performing loans (NPLs). Therefore, non-performing loans can be adopted to measure a bank's ability to deal with the risk of defaulting on debtor repayments (Buchory, 2015, p. 58).

Declining asset quality and low liquidity are also reasons for bank failures, as poor asset quality caused many banks to default after the last banking crisis. According to Waweru and Kalani (2009), many of the financial institutions that failed in 1986 were due to non-performing loans (NPLs). However, Koch (1995) argues that a good measure of credit risk or asset quality is the ratio (loan loss reserve / total loan) because it translates management's expectations of loan performance. Hempel et al (1994) observed that banks with high loan growth generally took more risk because of less stringent credit analysis and review procedures, but the rate of return on such loans was high, suggesting a trade-off between risk and return (Olweny & Shipho, 2011, p. 5).

Credit risk management is a key function of financial institutions (especially banks). The main activity of commercial banks is lending, which exposes loans to risk of non-repayment. Nonperforming loans can lead to a bank failure and jeopardize the financial system's stability. Bernanke (2003) said that, in the Great Depression of 1930, customers defaulted on loans taken from banks; the rise in non-performing loans reduced banks' profit margins, and was predicted that profitability would be negatively correlated with NPLs. Miller and Noulas (1997) studied the credit risk position in American banks in 1980, concluding that the banks' performance was weak by their low-quality loan portfolios. The study revealed the severe impact of loan loss allocations on bank profitability in 1980 (Ahiabor, 2013, p. 16). Athanasoglu et al (2005) study, found that credit risk is an important factor of Greece banks profitability. Similar result was reported by Garza-Garcia (2012) for Mexican banks; however, the results were not strong across the models employed in the first study (Athanasoglou & all, 2005, pp. 22-25).

3. Review of research literature:

Many researchers have studied the extent of the impact of credit risk on banks' financial performance, we try to summarise a set of such studies as follow:

Nawaz & Munir (2012), evaluates the effect of credit risk on Nigerian banks profitability. Bank performance and credit risk are measured using financial ratios. Data are derived from a sample of bank annual reports and accounts from 2004 to 2008. The ratio of non-performing loans to total loans and the ratio of total loans to total deposits are used as credit risk indicators, while return on assets (ROA) is a performance indicator. The analysis used the correlation coefficient and the multiple regression model. The results show that credit risk management has a significant effect on the profitability of Nigerian banks.

The study of Musyoki & Kadubo (2012) aimed to assess the various variables of credit risk management that affect banks' financial performance. These variables were: default rate (non-performing loans to total loans) ratio, (bad debt expenses to total costs) ratio and (operating costs to total loans) ratio. For seven years (2000-2006), financial records from ten banks were used to examine profitability ratios, comparing the profitability ratio (return on assets) with the default ratio, the cost of bad debt, and the cost of loans. The data was analyzed using a regression model and a correlation coefficient. The findings showed that while all of these variables have an inverse relationship with bank financial performance, the default rate is the best predictor of bank financial performance when compared to other credit risk management indicators.

Kolapo & all (2012) investigated the impact of credit risk on commercial bank performance in Nigeria throughout the period (2000-2010). On the basis of eleven years of cross-sectional data, five commercial banks were chosen. The return on assets (ROA) is a profitability measure. As measures of credit risk management, three ratios are used (total non-performing loans to total loans), (total loans to total deposits), and (loan loss provisions to loans classified). To assess profitability determinants, the fixed effect of Panel model was used. According to the results, the increase in non-performing loans impacted profitability.

Also, Onaolapo & Olufemi (2012) examined the effects of capital adequacy on financial performance of selected banks within the Nigerian banking sector. The data used for a ten-year period from 1999 to 2008. The results of the model indicated that the parameters examined inclusive of Efficiency Ratios, Return on Capital Employed and Returns on Assets had no impact on Capital Adequacy Ratio (CAR).

The study of Kaya & Pastory (2013) aims to research the relationship between credit risk and the bank's performance of a sample of 11 banks in Tanzania during the period 2005-2011. Credit risk is measured by: The ratio of loans losses to gross loans, the ratio of loans losses to net loans and the ratio of non-performing loans to total loans. The association between credit risk indicators and bank performance (measured by return on assets) was investigated using a regression model. The results demonstrated that credit risk indicators caused a negative relationship through high credit risk, and low bank performance.

While Ogboi & Unuafe (2013) used time series and cross sectional data from 2004 to 2009 to investigate the effect of credit risk and capital adequacy on bank financial performance in Nigeria. The influence of loan loss provisions, loans and advances, non-performing loans and capital adequacy on return on asset was also estimated using a panel data model. According to their results, credit risk management and capital adequacy ratio have a positive effect on bank profitability, but loans and advances have a negative effect on financial performance.

Samuel (2014) searched the impact of credit risk on the top five Nigerian commercial banks' performance from 2008 to 2012. Non-performing loan, loans and Advances ratios is employed as a credit risk indicator and return on assets as a profitability indicator. Using a simple regression model, the results revealed that the ratio of loans and advances to total deposits is negatively; but not significantly, related to profitability. and that the ratio of non-performing loans to total loans is correlated with a significant negative relationship to profitability.

Muthaher & M.Si (2014) examined the effect of Risk Financing (non-performing loans) and Capital Adequacy Ratio (CAR) to Profitability of Islamic banks in Indonesia. The financial ratios of Islamic banks are calculated from the statistical report of the Islamic Banks published by Bank of Indonesia from 2009 to 2012. The results of multiple linear regression showed that CAR had a positive relationship, and a significant impact on return on asset; the non-performing loans ratio is negatively correlated with return on assets and is not significant. The test results indicate that $R^2 = 0.121$ shows the explanatory power of two independent variables at 12.1% of the return on assets; Profitability is affected by 87.9 % due to other indicators not included in the regression model.

Abiola & Olausi (2014) examined the impact of credit risk management on banking sector performance in Nigeria for a sample of 7 banks from 2005 to 2011. The data was analyzed using the fixed effect panel model. The results showed that non-performing loans ratio and capital adequacy ratio is significantly correlated with the banks performance indicators (Return on Equity and Return on Asset).

Kayode & all (2015) studied the effect of credit risk on Nigerian commercial banks' performance. A panel analysis of six banks during the (2000- 2013) period. Credit risk measured by non-performing loans to total loans ratio and loans-loss provisions to total loans ratio have a negative and statistically significant effect to bank performance (return on assets). This shows that a higher credit risk exposure affects bank profitability. As for credit risk measured by total loans to total assets ratio, that has a positive and statistically significant effect on the bank's performance.

Kutum (2017) investigated the influence of credit risk on the profitability of 5 banks listed on the Palestine Securities Exchange during the period 2010-2015. Return on equity and return on assets were used to determine profitability, while net charge-offs to total loans and advances, non-performing loans to total loans and advances, and pre-provision profit to total loans and advances were used to determine credit risk. Other variables such as bank size, leverage, and net income growth were added. Using the regression model, credit risk (non-performing loans to total loans and advances) and profitability (return on assets) had a weak positive correlation. The study also discovered that bank size has a positive effect on profitability.

Poudel (2018) examined the basic indicators of credit risk in Nepalese commercial banks from 2002 to 2014, involving 15 commercial banks. The data was analyzed using the Fixed Effect Model. The findings indicated that credit risk has a negative and a significant influence on commercial banks profitability in Nepal. Furthermore, profitability is negatively impacted by the solvency ratio, interest spread rate, and inflation, but there is no statistically significant relationship. Capital adequacy ratio, total assets, and GDP growth have a positive and significant effect on commercial banks profitability in Nepal. Finally, the study found a positive statistically insignificant relationship between the interbank interest rate, and profitability.

There has been a discussion and controversy about the impact of credit risk management on the financial performance of banks. Extensive studies were carried out on this subject, and led to different results concerning the impact of credit risk on the performance and profitability of banks. Some studies confirmed the existence of a negative correlation between credit risk and bank profitability, while others showed a positive relationship. Other studies found that there was no relationship between them, such as Onaolapo & Olufemi (2012). Others pointed out other factors different from the effects of credit risk management.

4. Methods and Materials:

4.1. Population and Sample of Study: The study population consists of Algerian banks, which numbered 20 public and foreign banks. Eight banks were selected as a sample for the study, which included three public banks: (Algerian National Bank BNA, Algerian External Bank BEA, Algerian People's Loan CPA) and five foreign private banks: (Arab Banking Corporation ABC, Societe Generale Bank SGA, BNP Algerians, Trust Bank of Algeria TRUST and Gulf Bank of Algeria AGB). The data were collected from the banks' annual reports, in addition to the data of the BankScope and Data Stream database. The study period covered 12 years, from 2009 to 2020.

4.2. Study variables:

- The dependent variable: is represented by the profitability indicator, which is: the rate of return on assets (ROA).
- Independent variables: are represented by credit risk measure indicators, which are: the ratio of loan loss provisions to total loans CR1; Capital adequacy ratio CR2 and the ratio of total loans to total deposits CR3 which used as a controlling variable.

In order to build the model, we have identified the study variables, using the most important previous studies to select these variables, Table 1. summarizes the study variables.

Table 1. Variables used to study the impact of credit risk indicators on profitability indicators

variable	Explanation	Expected effect	Studies and research
Ratio of loan loss provisions to total loans CR1	An indicator that measures management's outlook for future loan losses. A rough indicator of the quality of a portfolio is also considered to compensate for the risk of default in the loan portfolio.	(-)	(Ogboi & Unuafe, 2013) ; (Kaya & Pastory, 2013) ; (Kayode & all, 2015); (Kutum, 2017)
the capital adequacy ratio CR2	Measures the ability of the banking sector to absorb any risk losses or some macroeconomic imbalances. The high percentage indicates high profitability and the lower proportion causes the lower profitability.	(+)	(Onaolapo & Olufemi, 2012); (Ogboi & Unuafe, 2013) ; (Muthaher & M.Si, 2014); (Abiola & Olausi, 2014); (Poudel, 2018)
the ratio of total loans to total deposits CR3	This ratio measures bank liquidity and the bank's ability to make loans from deposits collected.	(-)	(Kolapo & all, 2012); (Nawaz & Munir, 2012); (Ogboi & Unuafe, 2013); (Samuel, 2014)

Source: prepared by the researchers

4.3- Panel data model

The correlation between credit risk management and profitability of Algerian commercial banks is investigated using a panel data analysis approach. A panel data set is a longitudinal or cross-sectional set of economic entities that are tracked over time. In this study we use a balanced panel data model of nine banks covered 12 years, from 2009 to 2020. The model used is:

$$ROA_{it} = \beta_0 + \beta_1 CR1_{it} + \beta_2 CR2_{it} + \beta_3 CR3_{it} + \varepsilon_{it}$$

ROA_{it} = Profitability of bank *i* at time *t.*

$CR1_{it}$ = Ratio of loans loss provisions to total loans of bank *i* at time *t.*

$CR2_{it}$ = Capital adequacy ratio of bank *i* at time *t.*

$CR3_{it}$ = Ratio of total loans to total deposits of bank *i* at time *t.*

ε_{it} = The error term.

5. Results and Discussion

5.1- Empirical Results:

To test the problem of multicollinearity, we set up the correlation matrix on the Pearson test, and, according to Gujarati, there is a problem of strong linearity. If the correlation coefficient between two independent variables is 0.8 or higher, there is a correlation between them (Gujarati, 2004, p. 359). Table No. (02) indicates that the correlation values between the variables used in the study, and the correlation matrix has revealed that there is no problem of linear duplication between the explained variables because each of them did not exceed 0.80. All variables can be used in the model, and the findings show a link between credit risk indicators and profitability indicators (return on assets), where we find the following:

- A positive statistically significant correlation exists between the CR2 indicator and the ROA variable, where the correlation coefficient obtained between the two variables is estimated to be 0.632.

- There is a positive statistically significant relationship between CR3 and ROA, where the correlation coefficient obtained is estimated at 0.439.
-

Table 2. Correlation Matrix

Corrélations

		ROA	CR1	CR2	CR3
ROA	Pearson correlation	1	,035	,632**	,439**
	Sig. (two-tailed)		,736	,000	,000
	N	96	96	96	96
CR1	Pearson correlation	,035	1	,159	-,003
	Sig. (two-tailed)	,736		,122	,980
	N	96	96	96	96
CR2	Pearson correlation	,632**	,159	1	,777**
	Sig. (two-tailed)	,000	,122		,000
	N	96	96	96	96
CR3	Pearson correlation	,439**	-,003	,777**	1
	Sig. (two-tailed)	,000	,980	,000	
	N	96	96	96	96

**. The correlation is significant at the 0.01 level (two-tailed).

Source: Prepared by the researchers based on spss 22

To estimate the impact of credit risk indicators on bank profitability, we use three longitudinal data models and to perform the tests, we need to choose the correspondent model among the three models. With the help of Eviews 9 program, we estimate the parameters of the three models and the results are shown in Table (03).

Table 3. Results of estimating panel models using the ROA indicator

Variables	**the Pooled Regression Model.**	**the fixed individual effects model**	**the random individual effects model.**
C	0.016397(*)	0.006374	0.011607(*)
CR1	-0.064423	-0.159781(*)	-0.114332
CR2	0.067544(*)	0.067039(*)	0.061462(*)
CR3	-0.007995	0.003555	-0.001360
R^2	0.413698(*)	0.576021(*)	0.282296(*)

parameter significance at 0.05

Source: Prepared by the researchers based on Eviews 9

For comparison, we use the Redundant Fixed effects Tests, and through Table (04) we note that the probability of testing is less than 0.05 and that the calculated F value is estimated at 4.648996 which is greater than the *tabulated values*: F tab (0.05,07,85) = 2.11929643. This means rejecting the null hypothesis and accepting the hypothesis that there are fixed individual effects, i.e., the best model is the fixed individual effects model compared to the Pooled Regression Model.

Table 4. Redundant Fixed Effects Test Results Using the ROA Indicator

Redundant Fixed Effects Tests
Equation: EQ02
Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	4.648996	(7,85)	0.0002
Cross-section Chi-square	31.118663	7	0.0001

Source: Prepared by the researchers based on Eviews 9

To do this, we test the Breusch-Pagan test. This test gives the results shown in Table (05), where we note that the probability of Breusch-Pagan testing is less than 0.05, which means rejecting the null hypothesis and accepting the hypothesis of the existence of random individual effects. Which is the best model compared to Pooled Regression Model.

Table 5. Breusch-Pagan test results using the ROA Indicator

Lagrange Multiplier Tests for Random Effects
Null hypotheses: No effects
Alternative hypotheses: Two-sided (Breusch-Pagan) and one-sided (all others) alternatives

	Test Hypothesis		
	Cross-section	Time	Both
Breusch-Pagan	12.81892	2.144945	14.96386
	(0.0003)	(0.1430)	(0.0001)

Source: Prepared by the researchers based on Eviews 9

a) Hausman test for the comparison between the random effects model and the fixed effects model: to compare between the two models (the random-effects model and the fixed- effects model), the Hausman test gives the results obtained in Table No. (06). Note that the calculated $\chi 2$ value is ($\chi 2$= 8.339545) and it is greater than the *tabulated values* ($\chi 2$= 7.81472776) and the significant is less than 0.05, so we reject the null hypothesis and say that the appropriate model is the fixed effects model.

Table 6. Results of the Hausman test using the ROA Indicator

Correlated Random Effects - Hausman Test
Equation: EQ03
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	8.339545	3	0.0395

Source: Prepared by the researchers based on Eviews 9

b) Wald test: We use a Wald test to ascertain the fixed effect of each bank is not null. The test results shown in Table (07) indicate that F Value Calculated is (258.7731) at degrees of freedom 4 and 85 at the significance level 05 percent greater than the tabulated value: F (2.47901547). The calculated value of $\chi 2$ is ($\chi 2$= 1035.092) at the level of statistical significance 0.05 and the degree of freedom 4 is greater than the tabulated ($\chi 2$ = 9.48772904), as a result, the null hypothesis is rejected, and we adopt the alternative hypothesis that the parameters are not zero, which confirms the validity of previous tests, including the appropriate model which is the fixed effect model.

Table 7. Wald's Test Results Using ROA Indicator

Wald Test:
Equation: EQ02

Test Statistic	Value	df	Probability
F-statistic	258.7731	(4, 85)	0.0000
Chi-square	1035.092	4	0.0000

Source: Prepared by the researchers based on Eviews 9

5.2. Credit Risk Indicators and Bank Profitability Relationship:

The analysis of the results of fixed effect model revealed that two variables were selected for the credit risk management indicators with a statistical significance that has an impact on the performance and profitability of Algerian commercial banks, in explaining the trend of the dependent variable (ROA): the ratio of loan loss provisions to total loans (CR1) and Capital adequacy ratio (CR2). These independent variables contribute to the explanation of 57.60% changes in the dependent variable (ROA). The inverse relationship between the ratio of loan loss provisions to total loans CR1, and the dependent variable ROA explains that a higher value of loan loss provisions translates into a growth in size of no-performing loans, which leads to an increase in credit risk. This will reflect negatively on the profitability and performance of banks. Accordingly**, hypothesis1 is accepted**. This result is consistent with the findings of (Kolapo & all, 2012), (Musyoki & Kadubo, 2012), (Kaya & Pastory, 2013) and the study of (Kayode & all, 2015).

The positive and significant correlation between CR2 and the dependent variable ROA, explains that the high capital adequacy ratio translates into a decrease in the volume of no-performing loans; thus, a decrease in credit risk which reflects positively on the profitability and performance of banks; and thus, **hypothesis 2 is accepted**. These results are in accordance with the study of (Ogboi & Unuafe, 2013) and the study of (Muthaher & M.Si, 2014). However, they contradict the study of (Onaolapo & Olufemi, 2012), which concluded that there is no relationship of the capital adequacy ratio to the return on assets and the study of (Abiola & Olausi, 2014) which concluded that there is a positive relationship without statistical indication.

The analysis also revealed a negative relationship without statistical significance between the ratio of total loans to total deposits and the dependent variable, which indicates that CR3 does not affect or explain the dependent variable. So **hypothesis 3 is rejected.** This result is consistent with the findings of (Samuel, 2014), (Nawaz & Munir, 2012) and (Ogboi & Unuafe, 2013) Studies, and contradicts the study of (Kolapo & all, 2012) that arrived at a positive relationship. Table No. (08) summarizes the results of hypotheses testing.

Table 8. Results of hypothesis testing for the ROA model

Hypothesis	**code**	**Expected effect**	**results obtained**	**decision**
Hypothesis 1	CR1	(-)	(-) (*)	accepted
Hypothesis 2	CR2	(+)	(+) (*)	accepted
Hypothesis 3	CR3	(-)	(-)	rejected

(*) : parameter significance at 0.05 **Source:** prepared by the researchers

6. Conclusion

The study examined the effect of credit risk management on the profitability of a sample of Algerian commercial banks during the period 2009-2020, using a fixed Panel data model. Among the economic theories, the focus was on the determination of most important indicators that reflect credit risks, and through the applied study, we accessed the following results:

- The analysis of the results of the fixed effect model shows the selection of two variables: the ratio of loan losses provisions and the capital adequacy ratio as explanatory variables for commercial banks' profitability.
- The ratio of loan losses provisions and the capital adequacy ratio are the main variables in determining the quality of the Bank's assets.
- Variable CR3 (ratio of total loans to total deposits) does not affect the profitability of Algerian commercial banks.

Finally, the study recommends that Algerian banks devise and implement solutions that would not only reduce their exposure to credit risk but also enhance their profitability and competitiveness through three main policies:

- Diversification of banking products;
- Increasing banking competition by adopting Islamic banking formulations; and
- Extending policy by setting up international subsidiaries.

Based on the study, other indicators not studied in this research have a 42.40% contribution to the assessment of the profitability of Algerian commercial banks and therefore require further research to manage credit risks to improve the profitability and performance of Algerian banks.

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The way to the healthy and effective consumption at the foundation of functional equivalence theory

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Abstract

To consume it is to fulfill the needs arisen. It is supposed that every need is development of an imbalance caused by an overflow of informational, physical, and chemical factors that emerges over the course of life and cannot be eliminated by the organism independently without the risk of structure disturbance. Satisfaction of each need is a search for "channels" of equivalence establishment including consumption, in other words, increased or decreased number of informational, physical, and chemicals stimulus for elimination of this overflow. Elimination of each imbalance is limited by individual potential. Modern society interested in creation of a "qualified consumer" forms additional imbalances that are often unnecessary, within a person via means of mass media. At the same tame, advertisement offers "channels" of eliminating these artificially-created imbalances through purchase of goods and services. If needs are not fulfilled, a stress appears accompanied by negative emotions. Prolonged lack of possibility to eliminate imbalances in case a person is out of individual potential, leads to such consequences as neurosis, psychosomatic diseases, and finally, lifespan shortening. As a result, development of economy through growth in sales volume can lead to degradation in population health and cause considerable economical loses. That is why a healthy and efficient consumption suggests mutual responsibility of seller and customer, and means not only sales promotion but also health promotion to provide adequate conditions to satisfy needs in future. It is proved that with the help of psychotherapy the ways of consumption could be made healthier.

1. Introduction

For ages the development of the economy implies a continuous increase in the volume of goods and services consumed. Ideally, everything that is produced should be consumed with a subsequent increase in production for even greater consumption. This scheme assumes a constant increase in the amount of consumed resources of the Earth with the risks for their complete exhaustion. This situation is of great concern to the defenders of nature. In developed countries, there is a constant talk of responsible consumption. At the same time ideology of “consumerism” is wide spread though new consumption schemesmore safe for nature are being proposed and evaluated. It should be noted that although the growth in consumer activity may lead to the formation of dependence on the purchase of goods and services, any restriction of consumption is considered an attempt on personal freedom (Reith, 2004). But now there are the talks about “consumer detox” have started. One of the most authoritative people calling for the restriction of consumption can be called the Dalai Lama. In one of his interviews, he wrote: "Some desires are positive – for example, the desire for happiness... Some desires are very useful. However, at some point, desires may become unreasonable. As a rule, this leads to trouble. So, for example, now I sometimes visit super-markets. I really like it there, as I see so many beautiful things. When I look at all this variety of objects, I have a desire and an initial impulse like "oh, I want this; I want that" Then, thinking about it, I ask myself: "Do I really need this? The answer is usually no. If we follow this first wish, our pockets will quickly empty. Reasonable desires, that belong to another level and are based on primary needs – the need for food, clothing and a roof over your head..." According to the Dalai Lama, there are two methods of

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achieving inner satisfaction. The first is to get everything we want and desire-money, houses, cars, a perfect partner, a perfect body. The Dalai Lama points out the disadvantages of this approach; if we lose control of our desires, sooner or later we will stumble upon something that we want but cannot get.

The second, more reliable method of achieving satisfaction, is not to have what we want to have, but to both want and appreciate what we have. (Dalai-Lama, 2004).

Is the Dalai Lama right? Is it possible to find scientific confirmation of the correctness of his reasoning? What to buy? How much to buy? How long could we buy safely? We should not forget that economic development requires, on the one hand, that consumption be optimal in terms of resource use especially in the situation of starting Deglobalization we have now. On the other hand, a person must consume goods and services produced for as long as possible, which requires certain efforts to preserve his or her health and extend the life expectancy. In this article, I offer approaches to answer the questions mentioned, and propose how to optimize human consumption and consumer behavior according to the theory of functional equivalence.

2. Definition of need in terms of the theory of functional equivalence.

The basis of consumer behavior has traditionally been the presence of needs. At the same time, usually, under the necessity is understood both what a human being needs in order to provide vital activity, and specific force of living organisms, and deviation of organism indices from normal values. What is the meaning of needs? We try to find the answer to this question within the framework of the theory of functional equivalence, which I am developing. I believe that information, physical, and chemical effects on the body should be equivalent to the sum of information, physical, and chemical components of vital activity transformed in the body and isolated from the body (Avilov, 2019). Thus, in my opinion, the need is the development of imbalance of different degree of severity, caused by the excess of information, physical and chemical factors formed in the process of vital activity, which cannot be removed by the organism independently, without the risk of structure disturbance. And satisfaction of needs is a search of "channels" of equivalence establishment, that is increased or decreased quantity of information, physical and chemical stimuli for elimination of this excess. The final result of needs satisfaction is equivalence establishment due to transformation of information, physical and chemical components surplus of vital activity into functional and structural changes in organism. These include, for example, the excretion or synthesis of certain substances, cellular renewal, mass and volume changes in organs and tissues, and changes in motor activity and behavior of a person. The process of establishing equivalence can go in stages. In this case, the sum of physical, chemical and informational changes in the body after meeting the needs is equivalent to that before meeting. Only ratios between physical, chemical and information components of vital activity process change.

Formation and elimination of imbalances occurs continuously during a life course. From the point of view of my theory the imbalance exists already at the level of zygote, and is defined by initial level of disequilibrium. The step-by-step process of equivalence formation allows slowing down the process of approaching the full equilibrium - death. Elimination of imbalances, including such a greatest imbalance as the meaning of our life, without consequences for vital activity processes is possible only in that volume and pace, which are mainly determined by genetic features of the organism with the main aim to change the time of death. In fact, death is the realization of an individual's potential in full. At the same time, the potential cannot but be realized in the process of development of a living organism. It's just a matter of how fast it happens, how quickly the body "self-actualizes" due to potential (Avilov, 2021). A life in society assumes that the disequilibrium and, consequently, the severity of the imbalances will increase constantly. For example, society imposes to the population that time of the beginning of the work and its duration, which absolutely do not correspond to the possibilities of the majority of society members to eliminate imbalances without risk for health. The fatigue after a work shows that imbalances appeared, and equivalence is not established. The need to follow fashion and a certain style of consumption activity in order to maintain one's position and income level may lead to the same consequences. Daily contact with sources of information such as close people and work colleagues, the Internet, television and radio can increase the imbalance in our body. The list of such examples can be continued. In my opinion, it is worth noting the role of consciousness in the process of forming and eliminating imbalances. On the one hand, consciousness at the expense of concentration of attention on significant, in the opinion of an individual, individual problems and goals is able to increase the information consequences of life processes, that is, the degree of imbalance development. On the other hand, a person can consciously avoid those situations which increase individual disequilibrium and, especially in preliminary preparation, can quickly find "channels" for establishing equivalence. Needs are formed in the fetus as early as the womb. After birth, further development of the needs system takes place on both the unconscious and the conscious level.

In the process of education in the family and in educational institutions of different levels, the individual learns the skills to eliminate emerging imbalances through the formed "channels" of equivalence. Modern society, which is interested in creating a "qualified consumer", creates additional imbalances in a person through the

mass media, most often completely unnecessary imbalances. At the same time, with the help of advertising, "channels" are imposed to eliminate artificially created imbalances by purchasing goods and services. In case individual potential is great, increased consumption could not lead to health problems. Moreover, consumption could help to use additional part of the potential, if a person has no other “channels” to spend it. In case there is a lack of individual potential compared with new imbalances created in society that are to be eliminated both physical and mental health might be affected.

As a result, economic development through sales incentives may lead to a reduction in health and life expectancy (Avilov, 2020). In addition, constant participation in the consumer race may prevent a person from satisfying the metaphysical needs according to A.H. Maslow, as well as finding his meaning of life. At the same time, it is very important to know which needs could be most easily formed by the mass media. In order to preserve a person's health, one should know one’s individual potential, which imbalances are most likely to be corrected by means of consumer behavior, which imbalance most likely could lead to exceeding the individual potential of the prevailing part of the population. There is, so to say necessity to follow not only healthy lifestyle but “mental hygiene” and “consumer wisdom.”

3. A main reason for most consumer behavior is a need for safety

One of the most important needs that define many aspects of human consumption is the need for safety. I believe that the fear of death in its various manifestations is the imbalance that is the basis of the need for security. The satisfaction of this need, which manifests itself in the form of a search for" channels" for establishing equivalence, depends on the cultural and psychological characteristics of the individual, the level of his education and the degree of success of previous experience in eliminating imbalances. At the same time, the intensity of activities to eliminate imbalances is determined, as it was said, by the potential of a person (Avilov , 2019). The search for" channels" for establishing equivalence can be seen at the individual, group, and population level. We have identified several main "channels" to eliminate the imbalance associated with a lack of a sense of security. At the same time, the data of the "channel" can be determined by the characteristics of the individual's behavior. The first such" channel" is the desire to belong to a certain group of people, in particular like-minded people, or relatives. The meaning of the association was very clearly expressed in one of the poems of Russian poet V. V. Mayakovsky (1948): "It is bad for a person when he is alone. Woe to one, one is not a warrior, - each is a stout master to him, and even the weak, if two… One is nonsense, one is zero, one, even if it is very important, will not raise a simple five-peaked log, especially a five-story house... " In my opinion, human reproductive behavior also reflects the process of establishing equivalence in order to ensure personal safety. Since ancient times, the large number of children in a family has meant an increase in the strength of the family and, therefore, in personal safety. High fertility in developing countries confirms that old traditions are longstanding, especially when the State is not performing its functions.

Material well-being in developed countries has been accompanied by a decline in the number of children in the family. Although conditions for the birth and upbringing of children are improving considerably, and an increase in fertility could be expected. But the opposite situation can be observed. In my opinion, this is largely due to the fact that the sense of security is achieved through the work of state structures: the army, police, health care system, social protection system, the more children it has, the safer each family member is. Judging by this safety criterion, it can be understood that readers of developing countries, who usually have many children, feel less safe than residents of developed countries, where families are much smaller. This can be explained, in particular, by the fact that in developed countries, the state, with the help of a system of laws, the army, and the police, assumes the function of ensuring the safety of citizens.

The second" channel " of establishing equivalence with a lack of a sense of security can be called imitation, in one form or another, of those whom a person considers stronger. Imitation can be expressed in the form of training in the gym to become stronger to counter possible dangers. Some people start practicing certain martial arts, so that, if necessary, they can behave like movie characters. Part of the population believes that only the possession of cold or firearms, and the skills to use them, can help, as it follows from films and novels, to ensure personal safety. You can also imitate the manners and clothing of the inhabitants of those countries that are considered strong and influential. Since ancient times the time many people of Asia and Africa have been forced to believe that, in comparison with them, the inhabitants of Europe are more intelligent, skilled, and successful. Therefore, initially there was an imitation of the Dutch and Germans in everything then the French, the British, and finally the Americans. Imitation can be seen in the use, even without the need, of a foreign language. This is expressed in particular in the use of English for the names of shops, business centers, and neighborhoods of the city. At the population level, imitation of the "strong" can be seen in the transition of a number of countries of the former USSR from Cyrillic to Latin.

The third" channel " of establishing equivalence, in my opinion, is the creation of different stocks. This includes the accumulation of food and medical supplies for a "black" day or the acquisition of more and more new properties. To a certain extent constant shopping is made to feel more sure and safe. The desire for as much money as possible, even if it does not seem necessary, is also an attempt to eliminate the lack of a sense of security. Nevertheless considering the features of modern society speaking about production and consumption, it is possible to find not only the “channels” to get safety but also a certain order of both the formation of imbalances and their elimination. The imbalance of the first level is associated with the need to constantly be in a safe, comfortable environment. The imbalance of the second level occurs when a person has to look for objects, things, food necessary for a safe life. If a person is unable to provide himself with everything he needs for a safe existence, there is an imbalance of the third level – the desire for money. The need to do something, to get something, to study something in order to get money is an imbalance of the fourth level. At the same time, we can earn money as employees, or we can independently create something for subsequent sale. In the latter case, an imbalance of the fifth level is formed – the desire to sell manufactured goods or services. The elimination of this imbalance is possible only if we are able to create imbalances related to the demand for our goods or services from potential buyers. Advertising can make unnecessary things necessary and, in case of its excessive impact on a person, lead to additional, not natural imbalances. But advertisers, sellers usually do not care much about possible health problems of buyers who are eager to buy something. The main thing is to sell! Sales of manufactured goods and services are the elimination of the imbalance of the fifth level. Receiving money after the sale –it is eliminating the imbalances of the fourth and third levels. The purchase of necessary goods and services with the help of money, including after stimulation by advertising, means the elimination of the imbalance of the second level. And only the feeling of being safe, in a state of physical and mental comfort can talk about eliminating the imbalance of the first level and establishing full equivalence. Getting rid of imbalances of different levels is always accompanied by the development of positive emotions.

The fourth "channel" of establishing equivalence is the acquisition of power. Many people think that the more power they have, the safer they are. Judging by the numerous examples of power struggles at different levels, this “channel "of establishing equivalence is considered very effective.

And, finally, the "fifth channel” This “channel” is to get a sense of security by obtaining new and new knowledge. It is well known that a knowledgeable, prepared person can ensure their safety in various situations, and be an example for others in difficult times. Knowledgeable, competent specialists are also most in demand in the labor market.

Satisfying the need mentioned (or, according to my theory, correcting an appropriate imbalance) always comes at the expense of changing behavior in general and consumer behavior in particular. The purpose of consumption change is to establish equivalence. So, the need for security in many cases determines expected consumption. At the same time, in order to make consumption more optimal, it is necessary to know what “channels” at what levels are used to establish equivalence, to know the indicators of both the emergence of needs and their satisfaction,

4. The role of emotional stress as an indicator of needs satisfaction.

In all situations when the human body encounters something new, unusual or dangerous, stress occurs, which may lead to serious changes in the functional state of the person (Selye ,1952; Kozlowska , 2013).From the point of view of functional systems theory, emotional stress is formed in all conflict situations in which the subject cannot satisfy his needs (Sudakov , 1993). But according to the theory of functional equivalence, the view on the causes of stress can be somewhat different. In my opinion, the meaning of a stress reaction is an answer to a situation when the rate of imbalance development due to the impact or sudden absence of impact of informational, physical or chemical factors exceeds the rate of establishing equivalence. In this case there is an attempt of emergency formation of equivalent response through different "channels". As a result there is a change in functioning of practically all systems of an organism. But in connection with the fact that organism's response is urgent, stress in this phase of development is accompanied by significant disintegration in the work of functional systems and negative emotions (Sudakov, Yumatov, Tarakanov , 1996). This type of stress, also called acute stress, occurs when the imbalance is very pronounced and forms suddenly, for example, when trying to escape in a fire. If the imbalance exists for a long time, chronic emotional stress develops in order to find “channels” to establish equivalence. In my opinion, its manifestations against the background of negative emotions can be described as a state of frustration, anxiety, cognitive dissonance.

If we are talking about imbalances connected with attempts to satisfy higher demands (Maslow, 1963) or to find meaning of life, we can speak about "existential vacuum" according to V. Frankl (Frankl, 1966), or even about remorse. I believe that it is the prolonged absence of elimination of imbalances through the establishment of equivalence that leads to such consequences as emotional burnout syndrome, chronic fatigue syndrome, neurosis, psychosomatic diseases, and, as a result, to shorter life expectancy. But needs can be met, and the

meaning of life is found. In case of establishment of equivalence in full positive emotions are formed in the person, and there is a transition from disorganization to coordination in work of functional systems. At the same time, positive emotions conceal a certain danger. These emotions are capable to push the person to statement of new and new purposes, to conscious formation of imbalances, not so much to receive desirable, as to receive positive emotions after elimination of imbalances. A kind of dependency may arise with the risk of exceeding a person's capacity to establish equivalence. "Addictive consumption" is a significant problem for developed countries (Reith, 2004). Such suboptimal consumption may be an important factor in generating of family stress (Boss, Bryant, Mancini, 2017).

Is it possible to change a style of consumption? To answer this question, I investigated the consumer behavior of three married couples aged 30-36 years. All three women complained about overwhelming dependence on shopping and constant problems with the family budget. Measuring the stress levels of all six people using the methods of K.V. Sudakov and co-authors (Sudakov , Yumatov , Tarakanov , 1996) showed that emotional stress reached high values. All three married couples were also studied for their specific consumer behavior. Further, based on the recommendations of A.T. Beck (Beck ,1970) three sessions of cognitive therapy were conducted with all married couples within a month, a new hierarchy of needs was constructed, and more optimal models of consumer behavior were recommended. From the point of view of functional equivalence theory, I evaluated the severity of imbalances in families, determining the level of such an emergency equivalence mechanism as stress. I then individually selected the "channels" for establishing equivalence, checking their compliance with the task of eliminating imbalances associated with consumption. A month after the start of cognitive therapy sessions, it turned out that all six people (men and women) had reduced their emotional stress levels, changed their consumption preferences, significantly improved their mood, and lost an overwhelming desire to make new and new purchases. I believe that this was a sign of the elimination of imbalances and the establishment of equivalence (Avilov, 2020).

In our previous study 157 students of higher educational institutions were asked to make a rating of needs based on their subjective significance (Avilov, 2021). Students also subjectively assessed their emotional stress as well as, severity of the feeling of joy and happiness (with the help of specially developed scales) in connection with the needs put on the first place in rating. The students with the need to have a broad outlook, deep professional values, constantly developing their creative abilities as the main need showed the least degree of emotional stress and the greatest degree of positive emotions. At the same time it was shown that the largest number of students (63) with severe emotional stress, and, at the same time, the smallest number of students who experienced feelings of joy and happiness, was observed under the assumption of such a need as the need to have a large amount of money and (or) movable and immovable property. It is obvious that these students chose the third “channel” mentioned above, they thought best one, of establishing equivalence to get sense of safety. I suppose that these students were stimulated by advertising without a possibility to establish equivalence due to too many additional imbalances or to the lack of individual potential. This situation, as was said before, could lead to some consequences for students’ health. After restrictions of COVID19 had been canceled students of this group were asked to come to decrease the level of emotional stress they were still suffering from. Only 17 students out of 63 agreed to come. Other I believe decided that there is nothing to change in their list of needs. To make corrections in the rating of needs for students, who felt excessive emotional stress, there were conducted three sessions of group cognitive psychotherapy within one month. Testing with the same scales was made before and after sessions. I managed to change significance of needs of 15 students. They started to put the need to find meaning of life, to have deep professional knowledge, to develop their creativeness on the first place. Moreover, they have made real efforts to meet this need. As a result in a month the stress level of 14 persons significantly decreased, and level of happiness increased. I believe it was caused by right found “channels’ of equivalence establishment that were in accordance with students’ individual potentials and optimal ratio between “higher” and, so to say, “lower” needs.

Therefore, in my opinion, consumer behavior and needs can be corrected and "addictive consumption" can be eliminated. In my opinion, the risk of psychosomatic pathology in three families as well as in 14 students has been significantly reduced. Their models of consumption became more healthy and effective. They got “consumer wisdom.” So I could agree with Dalai Lama to much extent.

5. Conclusion.

So, the theory of functional equivalence helps to change the point of view on the cause of needs. Needs are constantly arising imbalances in the body that cannot be eliminated by one's own efforts and require a change in the action of information, physical and chemical factors of the human environment. The individual potential influences the possibility to meet needs. Under the potential of a living system, I understand the innate capabilities of the organism and its individual systems determined by the initial disequilibrium, to eliminate the

manifestations of imbalance that arise in the course of life. The potential cannot fail to be realized in the process of individual development. It's just a matter of how fast this happens, how quickly the body "self-actualizes" due to the potential. In the case when the severity of the imbalance is minimal, that is, when the excess of information, physical and chemical manifestations of the results of functioning is removed with the necessary speed with the help of stimuli coming from the external and internal environment of the body, the reduction of the potential, in my opinion, is minimal. That is, the movement from disequilibrium to equilibrium slows down.

In the case of a decrease in the flow of information, physical and chemical stimuli for some time, due to the potential of the body, the functioning is maintained at the same or even increased level, including for the search for missing stimuli, but always equivalent to the situation and (or) its significance, which is determined subjectively. If the stimulation of the body remains reduced, or completely stops, either the death of the body occurs, as for example, in the absence of air oxygen supply or a compensatory, equivalent decrease in the volume and mass of the body's tissues, as well as a change in the nature of functioning. Such a variant of establishing equivalence can be observed, for example, in patients who stay in a supine position for a long time. On the other hand, with an excessive supply of information, physical and chemical stimuli from the external and, sometimes, also the internal environment of the body, the potential is additionally spent on achieving equivalence by gradually forming an increased volume and mass of tissues, which in this case represent the main "channels" for establishing equivalence. Such changes can be observed, for example, during sports training. In addition, it is well known that drowsiness occurs when a large amount of food is received, this fact we regard as an emergency provision of equivalence by removing the information component of the results of vital activity. And with insufficient and excessive input of incentives, an increased level of spending potential can lead to both diseases and death of the body. Since, the movement from disequilibrium to equilibrium occurs at an accelerated pace. But, in general, the establishment of equivalence is a form of slowing down the movement to the equilibrium state, and not working against the equilibrium. At the same time, by increasing "abilities" (by establishing equivalence through a particular "channel"), we lose "capabilities" to a certain extent (by reducing the level of disequilibrium, or the potential of the body and its individual organs and systems). In my opinion, people with a high level of potential are more likely to suffer from an insufficient supply of incentives. In this regard, they are looking for different ways to realize their potential, very often they are what we call "engines of progress". People with a medium or low level of potential are most likely to experience problems associated with excessive input of stimuli from the external environment.

The process of Advertising could make these people try to "be like everyone else", even at the risk of health. With the help of advertising, the need to buy new and new goods and services is imposed on a person. Advertising can further reinforce the imbalances associated with a lack of a person's sense of security. Because of this, the desire to be in someone's "team", the desire to accumulate something, to imitate, to get money, the power, or knowledge can be sharpened. At the same time, the desire for knowledge may be the main imbalance easily eliminated, or it may be only a step by which other imbalances can be removed. Modern society, with the help of mass media, is creating more and more imbalances in the human body that are the cause of consumer behavior. I suppose that majority of the motives for consumption are related to attempts to correct imbalances caused by a lack of sense of security. At the same time, on the one hand, thanks to advertising, "channels" of establishment of equivalence, in other words, the goods and services with the help of which it is possible to eliminate the imbalances and to form an equivalent response become known. On the other hand, also thanks to advertising, a person is under constant emotional stress caused by the consumer race.

Stress is, in my opinion, a mechanism with the help of which the organism tries to urgently find "channels" to establish equivalence. But if the person does not know, what exactly purchases can eliminate available imbalances, or if he or she knows what exactly he or she would like to buy, but experiences shortage of financial resources for making purchases, chronic emotional stress develops. As a result, the risk of psychosomatic pathology increases significantly especially in case individual potential is not high. The degree of emotional stress in consumers can indicate both the presence of imbalances and their full or partial elimination, in other words, the establishment of equivalence through consumption. When working with families experiencing emotional stress associated with shopping addiction, as well as students with not optimal ratio of needs, it has been shown that cognitive therapy can optimize consumption with subsequent reduction of stress levels. Society should be interested not only in short-term improvement of economic indicators related to the stimulation of consumption of goods and services. If consumption exceeds a person's individual capacity to establish equivalence, there may be serious health consequences and even a reduction in life expectancy, leading to significant economic losses. In this regard, society should be interested in ensuring that individual consumption lasts as long as possible. This is possible if producers of goods and services as well as advertisers act responsibly. They should warn people about the risks of "Addictive consumption", to train them to have optimal, healthy and durable consumption. Forming a motivation to maintain healthy behavior and “mental hygiene” also could help to solve this problem (Baccman, Wastlund, 2022). We suppose that schools for “wise consumers” could be recommended. Active teaching and learning practices that proved to be effective (Bileti, 2022), could

be good for the purpose mentioned. One should be able to know there potential, to know there imbalances (needs), to know when emotional stress appears and what are its manifestations, to know how to decrease stress level finding right "channel" to eliminate imbalances , and this way to help themselves to keep healthy, avoiding aggressive advertisement. It can be assumed that the use of resources with mutual responsibility of producers and consumers of goods and services could also be optimized. Thus, I suppose that concerning necessity of effective consumption theory of functional equivalence could be used as a tool to consider the problem from different distances helping to provide the way of healthy consumer behavior.

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An institutional economic perspective on management in Chinese cultural contexts

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Abstract

The aim of this paper is to examine various theoretical approaches used to manage in Chinese cultural settings, with a particular emphasis on cultural theories from institutional economics. Institutional economics offers explanations that are well-suited to understanding the rapid growth of the Chinese economy since the 1980s, when market-led economic reforms were introduced. This chapter provides a rigorous economic analysis that makes a strong contribution to the handbook, demonstrating the impact of economic institutional arrangements on the fast-growing Chinese economy. A significant contribution here is to highlight the complexity of managing in Chinese cultural settings. This complexity arises from the constantly changing soft institutions, such as the cultural practices of guanxi, which can vary significantly across different regions and communities. For instance, personal networks or guanxi are less important in overseas private Chinese businesses, Hong Kong, and Singapore. Due to economic activity, growth, and labor migration, there is a considerable cultural difference between different Chinese communities. Hong Kong, for example, has a distinct management culture compared to mainland China, as it has a long history of British administration and is an international trade and financial hub. This is evident in differences related to governance, the influence of the central government, relationships with foreign firms, human resources, and line management. The working language is predominantly English in Hong Kong, whereas Mandarin Chinese is the sole working language in mainland China.

1. Introduction

This paper tries to illustrate the theoretical framework from institutional economics and how it can be used to understand and manage a business in a Chinese context. A strong emphasis is on institutions. The term "institution" commonly applies to both informal institutions such as customs, or behaviour patterns important to society and to formal institutions created by law and having a distinctive permanence in ordering social behaviours. Primary or soft institutions are institutions such as the family culture that are broad enough to encompass and permeate other institutions.

In order to comprehend the institution within this context, the present chapter employs the theoretical framework of institutional economics, which centres on comprehending the impact of institutional evolution on economic behaviour. Institutional economics has arisen as a dominant economic paradigm within academia and has significantly influenced our comprehension of developmental processes, organizational structures, and transformations in economic institutions.

An economic institution is defined as “the constraints placed by law and social norms on human behaviour” or in North’s words “the rules of the game”. The purpose of the constraints is there to help reduce transaction costs. In the North’s (1992) introduction to his seminal book, for example, he defined that “Institutions are the rules of the game in a society or, more formally, are the / humanly devised constraints that shape human interaction. In consequence, they structure incentives in human exchange, whether political, social, or economic. Institutional

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change shapes the way societies evolve through time and hence is the key to understanding historical change. - That institutions affect the performance of economies is hardly controversial. That the differential performance of economies over time is fundamentally influenced by the way institutions evolve is also not controversial."

As such, there has been a strong focus from economists on institutions and transaction costs in different economies. An example is from the Ease of doing business index compiled by the World Bank[1] (Djankov, 2016). Higher rankings (a low numerical value) indicate better, usually simpler, regulations for businesses and stronger protections of property rights. The implication is that the economic growth impact of improving these regulations is strong. A nation's ranking on the index is based on an average of 10 subindices such as starting a business; dealing with construction permits, getting electricity, registering property, getting credit, protecting investors, paying taxes, trading across borders, enforcing contracts and resolving insolvency. In general, the index provides a good approximation of how much time and effort (in other words transaction costs) is needed when doing business in such a country. For example, a very illustrative sample was given in North's work (page 4) in which he used the example of a sports match to explain institutions:

"Institutional constraints include both what individuals are prohibited from doing and, sometimes, under what conditions some individuals are permitted undertake certain activities. As defined here, they therefore are the framework within which human interaction takes place. They are perfectly analogous to the rules of the game in a competitive team sport. That is, they consist of formal written rules as well as typically unwritten codes of conduct that underlie and supplement formal rules, such as not deliberately injuring a key player on the opposing team. And as this analogy would imply, the rules and informal codes are sometimes violated and punishment is enacted. Therefore, an essential part of the functioning of institutions is the costliness of ascertaining violations and the severity of punishment."

The implications of transaction costs on an economy's development are evident when defined as previously described. A reduction in overall transaction costs within an economy is expected to improve its economic performance, as has been observed in China's economic ascent since the 1980s. Similar patterns can also be seen in peripheral areas such as Japan, Korea, Taiwan, Hong Kong, and Singapore, where successive governments have implemented measures to decrease transaction costs, resulting in unprecedented economic growth. This paper delves deeper into this theoretical framework and illustrates how it can be applied to management in a Chinese cultural context, as outlined below.

Institutional economic theories and cultural changes

This part discusses the main institutional economic theories and institutional changes. It deliberates the implication on culture because of economic institutions and cultural changes.

The prominent characteristics of Chinese business

This section outlines some of the prominent characteristics of Chinese business such as Guanxi. As a result of the rapid changes in the Chinese economy in recent decades, the accompanying culture has also changed dramatically compared to the pre-1970s. Since then, there is a convergence towards Western management and culture. However, there remains a distinctive difference when comparing the two. This part discusses some of these divergences and their implications. Although China is by far the largest economy to have Chinese businesses, a substantial population and expatriates are running businesses under distinctively different institutional settings such as Hong Kong, Taiwan, and Singapore. In this case, the cultural settings are very different due to different laws and social norms.

The Rise of China and Its Implications

This part concludes the chapter. The focus is on the rise of China. Perhaps like the rise of the Japanese economy in the 1970s and 1980s, Japanese management was exported to other countries and succeeded to some degrees. This part contemplates the managerial implications and the possible future development.

2. Institutional economic theories and changes

2.1. China's economic growth

At the time of writing, China's economy ranks as the world's second largest, with its tremendous growth since the 1970s market reforms being attributed as the primary driver of its phenomenal growth over the subsequent 50 years. The country's gross domestic product (GDP) stands at $14.72 billion. Consider these seven nations - the USA, China, Japan, Germany, UK, India, and Russia, while all have experienced GDP growth since the 1960s, their rates of growth have varied significantly. The USA has exhibited steady growth since the 1960s, with only two minor setbacks in 2008 and 2020 due to the financial crash and the pandemic. China, which holds the second

[1] https://www.doingbusiness.org/en/rankings

spot, experienced an acceleration in growth in the early 1990s, reaching an average of 10% annually, and then again in the late 2000s, before plateauing in 2020. By contrast, Japan's economy has stagnated since the late 1990s following the financial crash, while a distinct group of Western European economies - including Germany, UK, France, Spain, and Italy - have exhibited growth, albeit at a slower pace, since the early 2000s. India's growth trajectory is similar to China's, with an acceleration in the early 2000s, although growth has since decelerated. Finally, Russia experienced a profound transformation in its institutions and culture following the collapse of the Soviet Union in 1991, resulting in a resumption of growth in the early 2000s, albeit through a different path than other countries, with negative growth observed recently.

2.2. Institutional Economics and Development

The explanation of the significant growth and divergent development paths of different economies is a matter of importance. Institutional economics is particularly relevant in demonstrating and explaining the resulting growth and divergences among countries. As such, it is a major contribution to the research on understanding development and growth, as noted by several scholars (Bardhan, 1989; Nabli & Nugent, 1989; North D. C., 1993; Ménard & Shirley, 2005; Tamanaha, 2015; Gray, 2016; Roland, 2016; Hodgson, 2017; Acs et al, 2018; Prasetyo & Kistanti, 2020; Bradley, 2021).

Institutions, which can be simply understood as the rules of the game, determine the costs involved in pursuing business and transactions in the economy. The ease or difficulty of such transactions, such as purchasing properties, building materials, setting up private businesses, and exporting to local and foreign customers, is determined by the country's institutions. For instance, China in the 1970s was still running a state-led planned economy in which the China Communist Party (CCP) controlled all economic decisions. This model proved to be inefficient and prone to continuous market failures, as observed in numerous planned economies.

Under such institutional arrangements, economic transactions were difficult or impossible to carry out. Property rights did not exist, investment predictions were uncertain, and private property was not the norm. Such institutional arrangements led to corruption and favoritism, which hindered development. However, the economic reforms of the 1970s in China brought about massive institutional changes in which capitalist concepts and ideas were gradually introduced. This institutional transformation had significant effects on economic growth, as changes in property rights, market development, the existence of private enterprises, and legal protection of investments were introduced.

3. Main theories in institutional economics

This section discusses two aspects of intuitions – formal institutions such as laws and informal intuitions such as culture.

3.1. Property rights

Property rights are the centre of research in institutional economics. The term property is very expansive, though the legal protection for certain kinds of property varies between jurisdictions. In general, the property is owned by individuals or a group such as companies.

Property rights are defined as the expected ability of an economic agent to freely use an asset (Barzel, 1997). It represents a social institution that creates incentives to use, maintain, and invest in assets. The rights of property ownership can be extended by using patents and copyrights to protect. Legal instruments such as property laws are part of the formal institution to protect the rights of property.

The enforcement of property rights is normally associated with the formal legal institution. However as demonstrated in the literature it is also possible to maintain rights by custom, norms and markets (see, for example, Ellickson 1991). Compared to costly legal resolutions, the custom is a cheaper way in addition to law and regulations for markets to process repeated transactions.

Property rights remain one of the strongest intrinsic motivations for humans to work. The reforms of the 1970s in China saw the government allowing private ownership for the first time. This gradual introduction of the property laws saw massive economic growth as the population began to reap benefits from small to medium enterprises as entrepreneurs. Under strict governance of the CCP, private property rights did not exist until the reforms.

In this first sweeping reform, the household responsibility system (HRS) has been widely adopted in rural areas which saw contracting and restructuring of state-owned enterprises (SOEs) have taken place in cities. Private

enterprises re-emerged as self-employed and other forms, and foreign-invested companies cropped up in coastal cities such as Shanghai and Tianjin etc. Property rights under the new reforms allowed the ownership of property again which has since spurned the continuous growth. Since then, a new form and structure of property rights have been added to the constitution to reflect later changes to accommodate a mixed economy (Zhou, 2020).

3.2. Transaction cost

A concise and distinctive definition was given by the dictionary (Niehans , 2018) – "Transaction costs arise from the transfer of ownership or, more generally, of property rights. They are a concomitant of decentralised ownership rights, private property, and exchange. In a collectivist economy with completely centralised decision-making, they would be absent; administrative costs would take their place." Note that transaction cost would be absent in a completely centralised economy. However, there was never one that was completely centralised due to the information required to properly assess all components within the economy in real-time. As such, transaction cost was extremely high in such an economy not only due to the costly method of the planned economy but also the absence of property rights. In its absence, rent dissipation happened rapidly and social norms and customs were developed organically to contain the waste (see section Rent dissipation and culture).

Transaction cost is a concrete concept that we encounter in everyday business dealing. National insurance payment by the employer is an extra transaction cost when hiring a new employee. Value-added tax (VAT) is a transaction cost that consumers are required to pay when specified by the tax authority. However, other transaction costs are difficult to observe as they are implicit. For example, discount or instant access to clubs for females is often done to attract more male customers. This is done so that more females will go into the said club at lower or no cost. As such the club will have a higher number of females which in turn attracts more males. As such, there is a higher transaction cost to male customers for the entrance. This is a case of classic price discrimination in which optimised revenue can be obtained. Transaction costs also occur within the state. For example, the regulations imposed may deter businesses to create too much carbon waste as there will be higher carbon tax and fines. While a transaction cost increase can distort the agent's intention to conduct a business, it does not imply that it is always good or bad for its overall well-being. A keynote here is that transaction cost exists and should be examined when understanding institutions.

Different economies have different levels of the transaction cost. One of the strongest arguments for the performance of a market economy over a planned economy is the much lower cost of transactions. A planned economy requires the planner to possess all information such as the precise and changing nature of supply and demand. This has greatly increased the cost compared to a market-based one in which this function is outsourced to the market by competition.

3.3. Rent dissipation and culture

Rent dissipation is an important concept in institutional economics. In a city centre like London, parking is a valuable public good that can be sold or transferred like a property deed. However, if parking is free and unrestricted, it can lead to rent dissipation where it will be used until no space is left. Rent dissipation occurs when a public good is accessed with no restrictions, and its value dissipates at the margin under competition. To avoid this outcome, restrictions such as rights to a parking lot backed by a property deed can be established to maintain its value.

Another classic example of rent dissipation is the overfishing and over-farming of public spaces, resulting in a reduction of rent to zero and waste capital known as the tragedy of the commons. Rent dissipation can also occur under communist regimes when no private ownership is established, leading to undesirable economic outcomes. Informal institutions can be established autonomously to reduce rent dissipation, such as the order of access based on seniority or family prestige for shared resources like fertile farmland. While culture is a by-product of hard institutions, it can also serve as a constraint to the action of agents. Feeny et al (1990) note that informal institutions can sometimes reduce rent dissipation, leading to a lesser extent of depletion of public resources.

3.4. Rent dissipation and culture

As demonstrated in the example of 'rent dissipation and culture', hierarchy emerges naturally in all human and animal organizations. Cheung (2010, p.47) made an intriguing observation regarding news reports of corruption and bribery during China's capitalist reforms in the 1980s. The author considered this a positive development because during the communist era, access to resources was strictly based on party rank, with higher-ranked officials having access to better quality goods than lower-ranked officials. This resource allocation was a

deliberate system created in a property-less economy to minimize rent dissipation. Thus, reports of corruption and bribery were seen as indications of the gradual shift from a rank-seniority system to a market-based system during the capitalist reforms.

3.5. Market-Based Economic Reform in the 1980s

On September 9, 1976, Chairman Mao Zedong, who had long been ill with Lou Gehrig's disease, died. Internal political struggles continued not until Deng Xiaoping had risen to supreme power in 1978. It was perhaps the most important event in modern Chinese history as Deng represented the ideas and political friction for economic reform. The goal of Deng's economic reform was simply to raise China's standard of living from dire poverty. Although the reform was led by the CCP, it did not have a clear master plan on how to achieve this. As such it was very open to new ideas and even capitalist ideology was gradually tolerated and accepted as a part of the regime of "socialism with Chinese characteristics". The reform was so novel and drastic. It was completely different compared to the rigid adherence to the Marxist and Communist ideology of the previous leadership. As a result, many popular quotes of this era captured the experimental nature of such reform such as "no matter if it is a white cat or a black cat; as long as it can catch mice, it is a good cat" and "across a river by groping for stones".

Due to the liberalisation and the general acceptance of the market reforms, many local initiatives in agriculture took place before gaining approvals from the government. In 1979, one commune responded to a drought situation by drawing up individual contracts and basing pay on productivity. Despite some criticism from local government leaders, the effect of the private contracts worked and quickly spread into other places in the country. It quickly turned into a general nationwide abandonment of the communes and a return to the family farm, or individual household, as the basic agricultural unit. Under this new institutional arrangement, property rights were assigned not to the land itself which was remained collectively owned. Rights were given to the farmers who tilled the land. Harvests and profits were achieved by the output of such individual farms. As such there was a strong incentive for farmers to outperform each other and obtain the highest yield with the most efficient input. This was drastically different to the commune farm in which farmers performed according to a set quota requested by the state and did have no profit sharing (see Coase and Wang, 2016 for a full account of the change). Soon the reform was spread into the state-run industrial sector. The most unproductive state-run factories were shut down and the responsibilities were passed onto the private market and the state encouraged entrepreneurship. By about 1992, China had become a predominantly market economy. Within a few years beginning in 1997 the state laid off more than twenty-five million workers from state-owned enterprises. By the early twenty-first century, the former China bureau chief of the Financial Times could marvel that "China today is a great deal less socialist than any country in Europe" (Holcombe, 2017).

The wholesale institutional economic reform was not matched in any economy by its scale and depth. This is one of the reasons for China's rapid economic take-off as it allowed relaxation of central controls and a widespread and obsessive focus on economic growth. A relentless pursuit of economic growth and money-making was completely endowed to the state from the top bureaus to the local office. Effectively local state officials were given a profit share if they manage to bring in new investments and improved output. Under such a competitive institutional arrangement, China can be seen as a giant corporation with tens of thousands of local sales offices each competing against each other and each developing its businesses. On top of this competition, there was a huge, relatively well-educated and unlimited supply of comparatively low-wage labour (although this supply is dwindling as of writing, partly due to the one-child policy in the 1970s, though the upper limit is three now).

Traditional confusion ethics and culture have returned as the main values subscribed by the state and population. Again, this is a deep institutional change from the Marxist and Communist values of the 1940s to 1980s which did not provide a culture that was suitable for entrepreneurship. The traditional values of hardworking, respecting parents and valuing education have greatly provided the soft institutions as a backbone of China.

Under Deng Xiaoping, China opened to foreign investments again compared to the previous isolated regime. One significant sign of the Chinese reform is its willingness to accept foreign investments. When comparing Japan and Korea, foreign direct investments contributed up to 30% of China's GDP when it is only a few per cent in other prosperous East Asian countries. To attract outside capital and to spurn the export-led growth, four Special Economic Zones (SEZs) were initially approved in 1979 (Shenzhen, Shantou, Zhuhai, and Xiamen, all in the southeast), on the model of export processing zones elsewhere in East Asia (such as those established in Taiwan beginning in 1966), offering low taxes and other economic incentives. The SEZ at Shenzhen, near Hong Kong, in particular, then exploded from rural rice paddies into a bustling city that is now home to perhaps twenty

million people. In addition to the SEZs, new coastal cities are also opened to investments. More than 100 ports, free trade zones, economic and development zones are in China now. To put things in perspective, 40% of the top 50 largest ports are in China while the rest of 30% is shared by other countries in East Asia such as Taiwan, Singapore, Korea and Japan.

4. The prominent characteristic of Chinese business - Guanxi

Chinese business encompasses all businesses located in Greater China, which includes Hong Kong, Taiwan, Singapore, as well as other areas dominated by foreign individuals of Chinese ethnicity. Variations in historical processes and institutional backgrounds result in significant differences between a state-owned bank in China and a large global bank in Hong Kong or Singapore. Distinctions among jurisdictions are also evident at the local level, particularly for small and medium enterprises (SMEs) that are frequently family-run. Nevertheless, it is essential to acknowledge that Chinese businesses possess unique qualities that differentiate them from businesses in other regions.

The rapid economic growth of East Asian economies, including Japan, South Korea, Taiwan, Hong Kong and Singapore, is not solely Chinese but rather shares a common culture due to historical reasons. Although not Chinese, Japan and South Korea have been significantly influenced by ancient Chinese culture for several hundred years. Despite differences in language and institutional settings, all these East Asian countries have a strong Confucian culture, with Christianity dominant in South Korea, Shintoism in Japan, and a mix of atheism, Buddhism, and Taoism in China. Confucianism's salient features, such as familism, obedience, perseverance, and thrift, have explained the region's economic growth, despite 20th century wars and ideological struggles (Kahn, 1979; Clegg et al., 1990; Clegg, 1990; Silin, 1976).

Of all the characteristics or features that are shared by East Asian countries, the one that is most prevalent in organisational decision making is the concept of Guanxi (关系). It is similar to the concept of customer relationship but it is a lot more involved and personal. Guanxi refers to having personal trust and a strong relationship with someone and can involve moral obligations and exchanging favours. Below is an example of how Guanxi is more than just a customer relationship, taken from a Singaporean example (p.42, Tong and Yong, 2014)

“We Chinese are very flexible. We can change to suit the situation. Even though we may not

have agreed on a certain dateline, if you (the supplier) cannot make it, you can ask, Can

postpone? My shipping is not ready. And it’s possible. After the contract, you can still ask

for amendments, to change this and that…If there is a good relationship, then we can make

changes. If you make a request, we can oblige.”

The above example illustrates the significance of a customer's "above and beyond" approach towards building a good relationship. In this scenario, a customer firm with good Guanxi enjoys a stronger position and advantages in business. Guanxi can be defined as a network of contacts that an individual can leverage to accomplish tasks and exert influence on behalf of another. As a result, these networks can significantly impact business transactions with Chinese firms. However, this can pose a challenge for foreign entities entering the Chinese market as pre-existing Guanxi networks often hold strong influence. To navigate this challenge, it is important to recognize the reciprocal nature of Guanxi, which entails an informal obligation to reciprocate favours. Once a strong and long-lasting relationship has been established, new opportunities may emerge from a favourable Guanxi network.

There exist also a few related concepts such as Renqing (人情) and face (Mianzi, 面子). Renqing is considered to be the moral obligation to maintain a relationship. This is not only done in business but also in everyday life in which families visit each other during major holidays or festivals. These meetings are considered to be obligatory rather than causal. As a result, it is part of building Guanxi that Renqing is also considered. Face or the collective concept of social status, propriety and prestige is also very prominent in daily life and business. This concept has been so frequently understood and became part of a standard repertoire in business and everyday speech in English (e.g., saving face).

4.1 Institutional contexts

It is worth noting that Guanxi operates as an informal institution within the Chinese business landscape. In contrast to developed economies, China's formal institutions are subject to significant flux, with market reforms in the 1980s representing the most prominent institutional change. As a result, regulatory rules, government attitudes towards business, and the implementation of central guidance have all undergone substantial transformation in the space of a few decades. Against this backdrop, it is unsurprising that Guanxi has remained a pivotal factor in doing business in China. This informal institution serves to secure future business opportunities and, crucially, the livelihoods of many small enterprises. The frequent changes to formal institutions that arise from reforms can generate long-term economic benefits but also short-term disruptions and inefficiencies. As such, Guanxi functions as an informal institution that mitigates transaction costs, such as information gathering on forthcoming changes, regulatory compliance, new business organization, and guidance. Consequently, Guanxi has remained a vital component of the organic governance structure in China, as well as in Hong Kong, Taiwan, and Singapore to a lesser extent.

4.2 The bases of Guanxi

Continuing the previous institutional analysis that Guanxi serves as an autonomous mechanism to lower transaction costs in a changing business environment, we now examine what constitutes Guanxi and the form it occurs in. In a comprehensive survey by (p.41, Tong and Kong, 2014), the author interviewed business executives and owners of Chinese businesses on what constitutes the basis of Guanxi. The author noted the categories are: 1) locality; 2) kinship; 3) workplace and 4) friendship.

4.3 Locality / Dialect / Associations / Club

In the earlier stages of Chinese capitalism such as the 1960s in Singapore / Hong Kong, Guanxi was particularly important for new immigrants from China to their new hosts. The new arrivals often depend on members from the same regions in China. The local groups are often established based on the specific areas or dialects that they used in China. For example, in Hong Kong, the clans from Shanghai had a strong regionalism and formed their organisations in competition with the local Hongkonger businesses. This distinction is possible due to the mutual unintelligibility among different Chinese dialects. As such the local population, in general, cannot understand the dialects spoken by different clans from other areas of China. The same can be said of the Chinese immigrants to Singapore in the early 1960s to 1990s. Many Chinese immigrants came from South-East China such as Fujian and other parts of China. Similarly, clans and organisations are formed based on their origins. However, the author noted that the interviewees mentioned that this relation is much weaker now. This can also be said in Hong Kong and Taiwan where the local official languages such as Cantonese and English (Hong Kong), Mandarin Chinese (Taiwan) have become the main languages therefore standardised communication. As such this base of Guanxi is waning in influence when compared to an earlier time. This is also expected from an institutional perspective as formal institutions take a stronger hold, informal institutions such as membership-based on origin are likely to have less influence.

4.4 Kinship

Kinship is another important base for Guanxi. Jobs and opportunities are more likely to be given to immediate kin. There is another unusual perspective of this base, for example, people who share the same surname are more likely to gain favours. However, this is getting less important as the possibility to change surnames and travels made this selection less relevant.

4.5 Workplace

The workplace is another major of cultivating Guanxi. Years of working together provided opportunities to establish or strengthen guanxi people often get to know one another intimately. This source is common in other countries as well such as the alumni or ex-employee network.

4.6 Friendship

The last base for Guanxi is based on friendship. Friendship is often a base to further existing relationships. This often does not equate to Guanxi as Guanxi is often the criteria by which friendship can be established on.

4.7 Disadvantages

The close-knit nature of guanxi is now evident, but its patron-client relationships can also pose significant challenges for businesses. Members are often obliged to repay favours to others, leading to issues when they cannot adequately do so. Guanxi networks may also breach bureaucratic norms, resulting in corporate corruption. The line between business and social life can be blurred, as individuals rely heavily on their close relationships, potentially leading to nepotism and cronyism in the workplace. Authoritative figures often draw from family and close ties to fill employment opportunities, rather than assessing talent and suitability. Regulators are aware of the inherent disadvantages of guanxi and have created policies to counter unfair discrimination against non-members.

5. Managerial implications - Finding the Middle Way

Guanxi undoubted remain the main obstacle for new businesses looking to get into the Chinese market. This is however achievable given the appropriate strategy. Doing business in China and building Guanxi is like a catch 22 problem –to build Guanxi, you need an existing Guanxi network. This poses obstacles for many foreign businesses wanting to do business in China. For example, Hong Kong is a much easier base to begin a business often acts as a gateway to China. The Hong Kong administration for example operates based on the common law system which is like that in the UK. It also requires much less Guanxi to establish new businesses and conduct transactions. The same can be said for Singapore as well as it operates in a similar model attracting foreign investors. As such the business environments of Hong Kong and Singapore constitute a blend of East and West which make them the prime candidates for breaking into the China market. The strategy to build Guanxi however remains a long-term approach which can be done in several ways.

As previously discussed, Guanxi places importance on cultivating close relationships among business partners. An initial requirement is a basic understanding of Chinese culture, including language and history, which can help to reduce unfamiliarity with the market. Such knowledge can aid in establishing rapport with new Chinese contacts.

Chinese businesses often prefer to conduct business with established networks, making it important to have introductions to key networks. For instance, Hong Kong is a more business-friendly location as the working language is English and the network has less emphasis. This advantage can be leveraged for future networks and business in mainland China. Being part of a trade organization that facilitates a network for international trade flows, such as the China-Britain Business Council or similar associations for other geographies, can also be helpful. Generally, the higher the social status of your connection, the more likely you are to be successful in being introduced to the right people and key decision-makers.

The need to entertain and gift in order to establish relationships in Chinese business culture is a stark contrast to Western approaches. Personal gifts, entertainment events, and dining are often seen as necessary to foster meaningful relationships with new clients. However, this practice runs counter to Western governance, where many companies have a "no gift" policy. The ethics of gift-giving also depend on the relationship between the patron and client, and the regulatory environment of a particular region. The intricacies of gift-giving etiquette can be challenging to navigate, and regulations can vary. For example, while China's official policy in 2021 prohibits gift-giving as it can be construed as bribery, this practice still persists in lower-level business where hosting dinners or providing personal gifts are still acceptable.

6. Conclusion

Throughout this paper, it has been argued that Guanxi and other characteristics are autonomous products that were formed as a type of informal institution. This informal institution is a fusion of traditional values and the prevailing formal institutions such as laws and regulations at the time. Therefore, a strong implication is that institutions will change. The rapid changes of the Chinese economy from the 1970s to the present time have been outlined. The accompanying intuitions have shifted from a Communist/Marxist ideology to a market-based one. The rise of the Chinese economy raises the question of what it means for the rest of the world. Two points stand out: firstly, the Guanxi network is likely to gradually reduce as globalization and online businesses dominate, and secondly, the re-recognition of Chinese identity among the trend of the surging East Asian identity.

The traditional Guanxi network, which was sorted by origins, dialects, and regions, is likely to diminish due to the effects of globalization that have reduced cultural differences. Furthermore, existing Chinese organizations, which were previously formed based on local identity, now have the ability to travel to remote provinces with ease, effectively reducing the distance between different regions. Despite this, Guanxi has not disappeared but

has taken on a different form, with less emphasis on origins and more on commonalities. Research by Dahles (2004) has shown that ethnic Chinese people often gain an advantage when conducting business in China, regardless of whether they are from Hong Kong or Singapore, which are considered foreign by mainland Chinese businesses due to their different legal jurisdictions and cultures. This shift from regionalism to a broader concept of ethnicity has resulted in a move towards individual relationships beyond the family and ethnic group, in favor of professional and institutional linkages. This shift is reinforced by the fact that many younger Chinese citizens have studied abroad and brought overseas relationships into China, thus reducing the dependence on regional and ethnic identities.

A second emerging trend concerns self-identification outside of China, as many ethnic Chinese in Southeast Asia are re-identifying themselves as Chinese. These populations have been present in Southeast Asia since the 19th century, but local politics and nationalist policies at times have led to a re-understanding of their history. With China's emergence as a rapidly growing market, ethnic background is now often flaunted, and nearby countries such as Thailand, Malaysia, Korea, and Indonesia are encouraging the teaching of Mandarin Chinese in schools. As long as the Chinese economy continues to grow, this trend is likely to persist. While Chinese businesses prioritize profitability, ethnic and cultural affinities can facilitate relationships, and this chapter has shown how to analyze the economic basis of such relationships.

Profitability and economic opportunities are the primary considerations for many Chinese businessmen when making investment decisions. However, effective personal and business relationships with the China Chinese can be facilitated by cultural affinities. Chinese ethnicity is utilised as a means of ethnic networking to conduct business with co-ethnics in China.

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Dynamics of financial inclusion and capital formation in Nigeria

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Abstract

This study tested econometrically derived hypotheses concerning the link between financial inclusion and capital production in Nigeria using annual data from 1992 to 2021. Cointegration analysis and the vector error correction model (VECM) were used to capture both long- and short-term relationships between variables. Johansen co-integration tests were used to perform cointegration, and VECM was required for the result. Ex-ante and ex-post forecasting utilizing variance decomposition and impulse response were utilized to assess the research duration. The VECM Granger causality approach was utilized in the study to examine short-run causality correlations between series using an F-/Wald test simulation. According to the VECM estimation, both loans from commercial banks to rural areas and credit from commercial banks to SMEs had a somewhat favorable impact on capital creation. On the other hand, capital formation in Nigeria was significantly and diminishingly impacted by both rural commercial bank deposits and the quantity of commercial bank branches. Further evidence that the system was dynamic came from the variance decomposition and impulse response, which revealed that the impact of financial inclusion on capital formation changed over time. According to the study's findings, the government should change the lending environment to accommodate the financing needs of smaller economic entities, such as rural communities, in order to ensure their financial inclusion.

1. Introduction

Due to its perceived significance as a driver of investments and economic growth, financial inclusion[1] has recently taken on a larger level of prominence. The United Nations Conference on Trade and Development (UNCTAD) asserts that granting access to the hundreds of millions of men and women (worldwide) who are currently denied access to financial services would open up opportunities for the establishment of a sizable depository of savings, investable funds, investment, and consequently the creation of global wealth (UNCTAD, 2020). In other words, having access to financial services that are suitable for those with modest incomes encourages massive capital accumulation, the production of credit, and an investment boom. Since they often make up the greatest section of the population, low-income earners are in charge of a sizable portion of the economy's idle funds, even though each of the several million members of this category only holds a small portion of the total. Utilizing and gathering these resources opens up a sizable source of inexpensive long-term investable cash. Therefore, financial inclusion is attained when people have simple access to a wide array of financial products that are created to meet their needs and are offered at reasonable prices. Among other things, these goods include pensions, insurance, savings, and payments. People's welfare has typically been seen as a by-product of growth rather than the main goal of economic policy.

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[1] The National Financial Inclusion Strategy was introduced by the Central Bank of Nigeria on October 23, 2012, in conjunction with stakeholders, in an effort to further reduce the exclusion rate to 20% by the year 2020.

Prior to the concept of financial inclusion, there was financial exclusion, which, according to Kama and Adigun (2013), encompasses all categories of people who use financial services infrequently or not at all. Physical access is a result of the shifting topography of financial services. Financial exclusion is the inability of people to obtain or use financial items successfully so they can engage in the variety of social activities that make up life (Tok and Heng, 2022). Financial inclusion is multifaceted and includes having access to and knowledge of a variety of financial services. The Center for Financial Inclusion offers a rather comprehensive definition (Tissot and Gadanecz, 2017). Financial inclusion, according to the center, is a condition in which everyone who can use them has access to a comprehensive range of high-quality financial services that are offered in easily accessible locations at reasonable prices. It is a state where a variety of service providers, the majority of them private sector, deliver financial services to all those who can utilize them, including the underprivileged, the disabled, rural areas, and other excluded populations (Rekha, Rajamani and Resmi, 2021; Ratnawati, 2020). It is impossible to overstate the growing significance of financial inclusion as a driver of capital formation. Today, financial inclusion is frequently viewed as a tool for enhancing the economic ability and capabilities of the disadvantaged in a country, a right of all people to social inclusion, and a means of improving quality of life (Mulungula and Nimubona, 2022).

Financial inclusion is now recognized on a worldwide scale as a powerful tool for promoting development. It stands for the procedure that guarantees that formal financial services are easily accessible, readily available, and reasonably priced for all participants in an economy (Zulfiqar, Chaudhary and Aslam, 2016). Separating between deliberate and involuntary exclusion is crucial, though. Deliberate exclusion, according to the Central Bank of Nigeria (CBN), is when a group of people or businesses decides not to use financial services because they do not need them or for cultural or religious reasons (CBN, 2018). In contrast, involuntary exclusion results from low income, a high risk profile, or from discrimination, as well as from flaws in the market. Since involuntary exclusion can be addressed by suitable economic programs and policies that are intended to raise income levels, alleviate poverty, close the income inequality gap, and solve market failures and defects, policy and research activities must therefore concentrate on this issue.

Despite this consensus, the World Bank's report on global financial inclusion in 2022 reveals that achieving financial inclusion has remained a difficulty because up to 54.0% of individuals globally are financially excluded, which was made worse by the COVID-19 pandemic in 2020. (World Bank, 2022; Ozili, 2022). For an equitable recovery from the extraordinary COVID-19 pandemic, the World Bank recommended that financial inclusion programs be supported in every nation. The issue is considerably worse in emerging economies like Nigeria, which has financial exclusion rates of more than 60%. (Olusegun, Evbuomwan and Belonwu, 2021). Nigeria is one of the nations in Sub-Saharan Africa with the lowest share of households with access to banking services, according to the African Development Bank (AfDB), despite having a sizable economy (Sarpong and Nketiah-Amponsah, 2022). Additionally, it appears that relatively few Nigerian households have deposit accounts with reputable financial institutions (Oluwasegun et al., 2021). Capital generation and economic growth in Nigeria face significant challenges as a result of the alarmingly high level of financial inclusion and access to financing.

However, relative to other countries, Nigeria's level of financial inclusion is likely to have a minimal impact on capital formation and economic growth given the nation's declining economic activity. This assumption is founded on the widely held belief that a nation's vulnerable and unbanked populace will experience capital accumulation, business expansion, and economic growth. While some research concentrated on the impact of financial access on poverty reduction and income inequality, the majority of studies examined the proper measures of financial inclusion at the household and national levels (Ifediora et al., 2022; Ozili, 2022; Migap, Ngutsav and Andohol, 2020; Onaolapo, 2015). Other publications (Sarpong and Nketiah-Amponsah, 2022; Kuznyetsova et al., 2022) have discussed the varied degrees of financial inclusion and economic growth in both advanced and emerging economies. Omojolaibi and Popogbe (2017) and Emezie (2021) are two studies that looked at the impact of financial inclusion on capital formation and investments in Nigeria. The inspiration for this study came from the conflicting opinions expressed in previous studies on financial inclusion regarding whether it is advantageous or not. By examining the dynamics of financial inclusion and capital accumulation in Nigeria, the current study fills this gap.

2. Literature Review

2.1. Financial Inclusion in Nigeria

The importance of financial inclusion has continued to grow among researchers, politicians, and development-focused organizations all around the world. Its significance stems from the potential it offers as a tool for economic growth, especially in the areas of poverty reduction, job creation, wealth creation, and enhancing welfare and general standards of living.

A development finance organization called Enhancing Financial Innovation and Access (EFInA) performed a survey in Nigeria in 2008 and found that roughly 53.0% of adults there were not able to access financial services. Nigeria saw a good impact from the worldwide push for financial inclusion as a means of economic development, with the exclusion rate falling from 53.0% in 2008 to 46.3% in 2010. Encouraged by the positive development, the Central Bank of Nigeria launched the National Financial Inclusion Strategy on October 23, 2012, in partnership with stakeholders, with the goal of further lowering the exclusion rate to 20% by 2020 (EFInA, 2021; CBN, 2018). In particular, the percentage of adult Nigerians having access to payment services is expected to rise from 21.6% in 2010 to 70% in 2020, while the percentage of adults with access to savings should rise from 24.0% to 60% over the same period.

The channels used to deliver the aforementioned financial services were equally targeted for improvement, with deposit money bank branches targeted to increase from 6.8 per 100,000 adults in 2010 to 7.6 per 100,000 adults in 2020, microfinance bank branches targeted to increase from 2.9 to 5.5 units, ATMs targeted to increase from 11.8 to 203.6 units, POSs targeted to increase from 13.3 units to 850 units, and mobile agents targeted to increase from 0 to 62 units, all per 100,000 adults between 2010 and 2020. (EFInA, 2021).

The major tools for driving the Strategy include the following:

1) Agent Banking
2) Tierred Know-Your-Customer Requirements
3) Financial Literacy
4) Consumer Protection
5) Linkage Banking
6) Implementation of the MSME Development Fund
7) Credit Enhancement Programmes such as:
   - Agricultural Credit Guarantee Scheme (ACGS)
   - Commercial Agricultural Credit Scheme (CACS)
   - Nigeria Incentive-Based Risk Sharing System for Agricultural Lending (NIRSAL)
   - Refinancing and Rediscounting Facilities for SMEs
   - Small and Medium Enterprise Credit Guarantee Scheme
   - Entrepreneurship Development Centres

2.2. Theoretical Underpinning

According to early economic growth theories, a financial system that can tap into savings and direct funds into a wide range of corporate operations must be built and effective. However, according to contemporary development theories, financial development is essential for economic growth to take place. Modern development theories have also demonstrated that persistent income disparity and a slower rate of economic expansion are mostly caused by a lack of access to financing. Access to funds will increase when the economy has a developed financial system, and access to funds will be restricted when there is a poorly established financial system since people will be limited by the amount of money they have on hand (Kodan and Chhikara, 2013).

Although the efficiency with which saved resources are put to productive use can be improved by financial liberalization and inclusion, the impact on the amount of savings is theoretically unclear (Omojolaibi and Popogbe, 2017). Improved savings opportunities, such as better deposit interest rates, savings with a wider range, and frequently more banks and bank branches, as well as other financial intermediaries, will naturally characterize a liberalized financial sector that is competitive.

According to Campbell and Mankiw (1990), it is reasonable to assume that not all households have access to the credit markets. As a result, consumers may find it difficult to smooth their spending across time. For such households with limited liquidity, consumption choices are therefore based on current income. Theoretically, it

has been demonstrated that loosening liquidity restrictions will lead to a surge in consumption and a decline in overall saving. More specifically, it was proposed by Campbell and Mankiw (1990) that there are two categories of households in the economy: One household type λ, has limited liquidity and their intertemporal consumption is totally dictated by the evolution of their present income. The other household type (1-λ), has unrestricted access to capital markets. The implicit Mckinnon-Shaw assumptions, which were based on a homogenous household set and assumed that all relevant households had unrestricted access to capital markets within the domestic economy, were challenged by these authors as a result of this type of theoretical development (Gemech and Struthers, 2003).

According to the McKinnon-Shaw hypothesis, the growth of the economy as a whole will be threatened if financial intermediaries do not operate to their full potential and funds are not invested effectively (mostly due to government rules and constraints). Savings are influenced by interest rates; if high interest rates are encouraged, savings will rise, boosting investment and, ultimately, promoting economic growth (McKinnon, 1973). Additionally, credit constraints will be loosened as a result of financial liberalization measures, which will also increase commercial banks' efficiency and competition.

The advantages of lessening the effect of financial repression on domestic financial systems, particularly in emerging nations, were examined by McKinnon and Shaw in 1973. Interest rates in these nations will rise toward their competitive market equilibrium once financial constraints are lifted. Interest rate ceilings that are artificial will cause savings to decline, capital accumulation to slow down, and inefficient resource allocation. Other clearing methods that are not "non-market" will occur if interest rates are not permitted to move automatically so that the market can be cleared. Some of these "non-market" forms of credit rationing include quantitative limitations, auctions, and even various bidding systems, which are frequently susceptible to dishonest tactics and bias. Not only will there be little or irregular savings and investments, but there will also be low-quality activities at all levels. It follows that if interest rates aren't permitted to fluctuate freely in the market, overall savings and investment levels will be constrained. Early McKinnon and Shaw hypotheses presuppose that liberalization will be accompanied by increased real interest rates, which will encourage saving. The core premise is that savings respond to interest rates; higher saving rates will finance a higher level of investment, which will result in faster growth. Accordingly, when financial liberalization occurs, one should anticipate seeing higher saving rates together with higher levels of investment and growth.

Schumpeter (1912), quoted by Kodan and Chhikara, disputed the idea that effective banks encourage technical innovation by finding and supporting promising entrepreneurs. As a result, the development of the financial sector contributes to the achievement of finance-led industrialization in addition to the promotion of total investment and output. Therefore, the financial market determines how much access bright poor people have to outside funding in theories that emphasize entrepreneurship.

According to Banerjee and Newman (1993), a person's employment options are constrained by the basic endowments they possess. The structure of the occupations individuals choose determines the amount they can save and the risks they may take, which has long-term effects on economic growth and wealth inequality. As a result, these models demonstrate that a lack of financial access may be a key factor in the generation of poverty traps or persistent income disparity, along with low investment levels and slow economic growth rates.

2.3. Empirical Literature

Ene, Amoke, Archibong, Eduno, and Ogwumu (2022) looked into how financial inclusion affected the expansion of small and medium-sized businesses in Cross River State. Purposive sampling was used in the study's cross-sectional survey of small and medium-sized companies in the Calabar Metropolitan Area. One thousand two hundred and ninety-four (1294) SMEs in the state made up the study's population, and 306 people were chosen as the sample size. The data were analyzed using the Pearson Correlation technique, and the results showed a statistically significant correlation between the growth of small and medium-sized businesses in Cross River State and financial inclusion in the form of bank loans and advances, ATM access, and internet banking. As a result, the study's policy recommendation is that banks should lower their lending rates to encourage more SMEs operators to obtain bank loans for their companies. Additionally, commercial banks and microfinance organizations must to see to it that more bank branches are opened in order to increase bank penetration and give numerous SMEs operators access to ATMs for conducting business.

Using a panel of 46 nations for the years 2004–2018, Sarpong and Nketiah-Amponsah (2022) investigated the quantitative link between financial inclusion and inclusive growth in sub-Saharan Africa. The data revealed that, in contrast to availability and knowledge of financial services, consumption of financial services, among other

factors, has a quantifiable and perceptible impact on inclusive growth. Specifically, in sub-Saharan Africa, a unit increase in the use of financial products and services boosts inclusive growth by 0.03 units. The paper made a contribution to the literature by first creating a more comprehensive index of inclusive growth and then using the Arellano-Bover/Blundell-Bond system Generalized Method of Moment estimator to estimate the distinct quantitative effects of three categories of financial inclusion indicators on inclusive growth. The conclusions emphasized the necessity for policymakers to create financial institutions that are creative, sustainable, and inclusive and are capable of dispersing growth advantages fairly.

Ifediora et al. (2022) used panel data from 22 Sub-Saharan African (SSA) nations between the years of 2012 and 2018 to assess the effect of financial inclusion on economic growth. The GMM system was used in the investigation. It was determined, using a composite index of financial inclusion as well as individual financial inclusion indicators, that the financial inclusion dimensions of availability, penetration, and composite financial inclusion (all indicators combined) have a significant and positive impact on economic growth, while the financial inclusion dimension of usage has a small but positive impact on economic growth. Additionally, bank branches and ATMs had a favorable and large impact on economic growth, although outstanding loans, deposit accounts, and ATMs had a marginally negative impact on it.

Ozili (2022) used information from the global FINDEX indicators to examine the extent of financial inclusion in Nigeria. The results showed that Nigeria had development in a number of financial inclusion measures in the first years of the initiative in 2014, but the advantages were not maintained in the following years, particularly in 2017. In comparison to the global average, Nigeria's degree of financial inclusion is extremely low. In the population group analysis, it was shown that all indices of financial inclusion in 2017 were worse for women, the poorest men, older men, and people without college degrees. The implications of the reported fall in financial inclusion in 2017 point to obstacles to financial inclusion in the years following 2014.

In order to ensure financial stability, Kuznyetsova et al. (2022) concentrated on the development features of financial inclusion and offered recommendations to Ukraine. Through cross-country analysis, the idiosyncrasies of the growth of financial inclusion are investigated while taking into account various financial system models and degrees of economic development. The weak points of financial inclusion in Ukraine are a sevenfold difference in assets between banks and non-bank financial institutions, as well as 37% of the adult population who lack access to a bank account. Additionally, there is a critical level of distrust in banks (70%) with a respectably high share of users of payment applications (58%), as well as a significant gap between the levels of human capital readiness and information security of banks' digitalization compared to EU banks (by 2.5 and 1.3 times, respectively).

In the context of G20 countries, Khan et al. (2022) examined the impact of financial inclusion on financial sustainability, financial efficiency, gross domestic product, and human development. For the years 2004 to 2017, this analysis used yearly data from 15 developed and rising economies. The study used primary composite analysis to create a single index for financial inclusion, financial sustainability, and financial efficiency (PCA). The results of the ARDL Model showed that, while there was no correlation between financial inclusion and financial sustainability in the short term, inclusive finance had a significant impact on sustainability over the long term. Long-term financial efficiency was favourably impacted by financial inclusion, while short-term efficiency was unaffected. Additionally, the findings demonstrated that inclusive finance had a large long-term impact on poverty while having little immediate impact. Similar to inclusive finance, there was no correlation between GDP and GDP in the short term, but there was a strong correlation in the long run. Additionally, the results of the GMM demonstrated that inclusive finance significantly impacts financial stability, financial efficiency, poverty reduction, and economic growth.

Using panel data for the year's 2014Q1–2018Q4, Olusegun et al. (2021) investigated the relationship between financial inclusion and financial stability in Nigeria. A financial inclusion index was created to take into account usage, availability, and penetration. The study provided evidence that financial inclusion had a beneficial effect on financial stability, suggesting that more financial stability would result from having more financial inclusion. Regarding dimension, utilization was discovered to have a negative link with financial stability, whereas penetration and availability did. This suggested that policymakers had choose between concentrating on changes that would encourage financial inclusion, innovation, and financial access and concentrating on enhancing financial stability.

Oladele et al. (2021) employed time series data and the Autoregressive and Distributed Lag (ARDL) technique to assess financial inclusion, investment, and macroeconomic factors in Nigeria. The findings demonstrated that the long-term relationships between credit penetration, deposit penetration, and domestic investment and

unemployment rate were all positive and negligible. In the near term, the unemployment rate was adversely but significantly correlated with credit penetration, deposit penetration, and domestic investment penetration. In the long run, unemployment was adversely correlated with bank branch penetration, but the unemployment rate was positively correlated. This suggests that while bank penetration did not reduce unemployment in the short term, it did so over the long term. Therefore, financial inclusion has a big impact on unemployment in the short term but not so much in the long term.

The impact of financial inclusion on deposit mobilization in Nigeria was examined by Emezie (2021). Time series secondary data from 1987 to 2019 were used in the study. Due to its many benefits, the Autoregressive Distributed Lag model was used as the regression model to examine the data for rural deposits, loans to rural areas, and loans to small businesses on various deposits with commercial banks. The study's conclusions showed that loans to small businesses had a negative and substantial influence on deposit mobilization in Nigeria, whereas deposits from rural areas and loans to rural areas had a positive and significant impact. The findings of the causality test, which demonstrated a unidirectional causal relationship between deposits from rural areas and loans to rural areas and various deposits with commercial banks, highlight the critical need for banks to direct their service-providing strategies toward rural areas in order to increase their deposit base. The study came to the conclusion that financial inclusion has improved the simple access to and use of financial services in Nigeria over the study period and has a favorable long-term impact on deposit mobilization in Nigeria.

In order to investigate the potential for a causal relationship between financial inclusion and capital market expansion as well as between the capital market and economic growth in Nigeria from 1986 to 2017, Migap et al. (2020) used a vector autoregressive (VAR) model. The outcome demonstrated that there is no causal link between capital market and financial inclusion. However, it revealed a one-way causal relationship between fund mobilization through the capital market and economic expansion in Nigeria.

The effects of financial inclusion on economic growth in Zimbabwe from 2011 to 2017 were explored by Maune, Matanda, and Mundonde (2020). Financial services, information and communication technology, and mobile network variables were utilized as proxies for financial inclusion while gross domestic product was employed as a measure of economic growth in order to understand the breadth and depth of financial inclusion in Zimbabwe. The G20 Financial Inclusion, Global Financial Development, and World Development Indicators 2019 databases were used to gather secondary data for these variables. The empirical results of this study demonstrated a beneficial relationship between financial inclusion and economic growth in Zimbabwe. These findings are pertinent notwithstanding Zimbabwe's economic difficulties.

Shihadeh (2020) looked into how banks' performance and risk varied across MENAP nations based on several financial inclusion variables. The sample consists of 271 banks spread over 24 connected nations in the region, as well as micro- and macro-variables that influence the operation and risk profile of these banks. The findings suggested that raising the region's degree of financial inclusion can improve bank performance and lower risk. In terms of lowering their risks, they also identified areas where these institutions may gain more from financial inclusion.

In 20 Asian nations between 2004 and 2015, Banjere, Donato, and Maruta (2020) investigated the impact of financial inclusion on economic development, including economic growth, education, health, and income inequality. The overall financial inclusion index was created using a hybrid methodology. The findings demonstrate that overall financial inclusion positively affects all development outcomes, and that this effect is stronger in nations with lower political risk. Utilization and access both have an impact on education and income inequality at the dimension level, even though usage is the sole factor affecting economic growth and access is the only factor affecting health outcomes. Additionally, compared to the second-highest ranking indicators, the top indicators in each dimension had a much stronger positive impact on development outcomes. The results demonstrated that implementing a single overarching policy might not be suitable to fully attain financial inclusion in a less developed country. To maximize the beneficial impact on development outcomes, certain financial inclusion dimensions and indicators should be the focus of policy recommendations.

Using historical data on a few selected factors from the years 1986 to 2015, Okoye, Adetiloye, Erin & Modebe (2020) assessed the impact of financial inclusion on economic growth and development in Nigeria. The technique of Ordinary Least Squares regression was used. Loan to deposit ratio (LDR), financial deepening indicators (FDI), loan to rural areas (LRA), and branch network were used in the study to quantify financial inclusion (Bbranch). The ratios of broad money supply to GDP and private sector credit to GDP were used in the study as indicators of financial deepening. Gross domestic product (GDP) growth over time was used as a proxy for economic growth, and per capita income (PCI) was chosen as a proxy for poverty and, consequently, as a

measure of development. The major conclusions were that financial inclusion had facilitated poverty reduction in Nigeria through rural credit distribution whereas credit delivery to the private sector (a measure of financial inclusion) had not materially supported economic growth in Nigeria.

Prior research was expanded upon by Pujiharjanto & Astuti (2020) by examining the three facets of financial inclusion: access, depth, and stability. This study sought to examine the impact of financial stability, financial access, and financial depth on economic growth in 34 Indonesian provinces from 2014 to 2018. All of the financial inclusion variables utilized in this study appeared to have an impact on economic growth, according to the Fixed Effect Model of panel data. Access to finance has a detrimental impact, although financial stability and depth have beneficial impacts. This demonstrated the applicability of Indonesia's dilemma of thrift.

Anisiuba, Ezeaku, and Emengini (2020) used quarterly data from the World Bank's World Development Indicators and the Central Bank of Nigeria to determine the impact of financial inclusion on entrepreneurial growth (EG) in the retail and wholesale sub-sectors in Nigeria. Correlation analysis and an error-correcting methodology were used to analyze the data. The findings showed that FI significantly improved EG, especially when seen in the context of the contributions of the retail and wholesale subsectors to GDP (GDP). The findings also showed that whereas commercial bank branches (CMB) were found to had a substantial influence on the growth rate of the retail and wholesale sub-sectors, account ownership (ACN) did not have a significant impact on either.

In Nigeria between 2000 and 2018, Enueshike & Okpebru (2020) investigated the impact of financial inclusion on economic growth. For the estimation of the variables, historical data from the Central Bank of Nigeria Statistical Bulletin was used. The explanatory variables of loan to small and medium businesses (LSME), rural bank deposit (RBD), and control variable of inflation were regressed on the dependent variable of financial inclusion, which was measured by the contribution of financial institutions to gross domestic product (GDP) (INF). The results of Wald tests show that the loan to small and medium-sized enterprises (LSME), rural bank deposits (RBD), and inflation (INF) had a significant impact on economic growth in Nigeria. The statistical estimation of the explained and explanatory variable was carried out using auto-regressive distribution lag. The report suggested, among other things, that the Central Bank of Nigeria should promote rural bank deposits (RBD).

Van & Linh (2019) assessed how financial inclusion indicators affected economic growth. The outcome demonstrated that there are relationships between the abundance of bank branches, ATMs, domestic credit in the private sector, and the accelerated rate of economic growth. This growth will lead to a more prosperous existence for people. The article also makes suggestions for strengthening financial inclusion for governments of emerging nations.

Uruakpa, Kalu & Ufomadu (2019) looked into the effect of financial inclusion on Nigeria's economic growth from 2003 to 2015. The study used multiple regression analysis and the Ordinary Least Squares Technique (OLS). ATM transactions (ATM), deposits from rural branches of commercial banks (DRBCB), loans to rural branches of commercial banks (LRBCB), and real gross domestic product (RGDP), a proxy for economic growth, were chosen as the explanatory variables. The empirical findings demonstrated that, over the time period under research, the economic growth of Nigeria was positively and significantly impacted by deposits made at rural branches of commercial banks and by ATM activities, but negatively and insignificantly by loans made at those same branches. As a result, the study made the suggestion that rural branches of commercial banks come up with more creative ways to entice deposits from rural residents while simultaneously encouraging them to maintain effectively using ATM cards in part of their transactions due to their many advantages.

Omojolaibi & Popogbe (2017) looked at the connection between investment and financial inclusion in Nigeria. For the years 1981 through 2015, annual time series data were gathered from the CBN statistical bulletin. The autoregressive distributed lag (ARDL) bound cointegration test and error correction model are used in the investigation. The study's findings demonstrated that none of the three financial inclusion requirements—availability, accessibility, and affordability—guaranteed investment in the Nigerian economy.

Onaolapo (2015) examined the effects of financial inclusion on the economic growth of Nigeria from 1982 to 2012. The data spanning were analyzed using the Ordinary Least Squares (OLS). Deposits from rural areas as surrogate for financial inclusion was influenced by loans to rural areas and loans to small scale enterprise as surrogates for financial intermediation. The overall results of the regression analysis showed that inclusive bank financial activities greatly influenced poverty reduction but marginally determined national economic growth

and financial intermediation through enhanced bank branch networks, loan to rural areas, and loan to small scale enterprise given about 50% relatedness between variables on either sides of the equations.

According to the empirical studies evaluated, only Emezie (2021) and Omojolaibi & Popogbe (2017) sought to determine whether or not financial inclusion is promoting capital formation. The majority of the studies reviewed primarily focused on the impact of financial inclusion on economic growth. Therefore, while financial inclusion is crucial, capital formation—which is a requirement for economic growth and development—should receive more attention.

Rashid & Intartaglia (2017) claimed that endowed households will be able to borrow from the credit market when they desire to carry out investment projects, if optimal market conditions exist. Since this isn't always the case, financial services should be made available to the underprivileged so they can borrow money they couldn't before. Unfortunately, because of the danger, banks choose lending to corporations rather than individuals in order to lower the risks associated with investment initiatives.

3. Methodology

The Central Bank of Nigeria's (CBN) statistical bulletin served as the primary source for all of the secondary data used in the study. The time period covered by the study was from 1992 to 2021. All data were transformed to a natural-log equation for time series processing. The coefficient can therefore be viewed as elasticity. The a priori expectation for the independent variables (components of financial inclusion) is projected to be positive since it is anticipated that capital formation would be stimulated by making money available and inexpensive. The variables, their measurements, and a priori predictions are listed in Table 1.

Table 1. Measurement of Variables

S/N	Variable	Measurement	*a priori expectation*
1.	GFCF	This is the total value of a producer's acquisitions of fixed assets during the accounting period, less disposals, plus specific additions to the value of non-produced assets realized by the productive activity of institutional units.	Nil
2.	RCBLS	The amount of loans given by commercial banks to Nigerian rural residents serves as a proxy for this.	Positive (+)
3.	RCDPS	This is the process by which banks obtain cash or money from rural areas using their current, savings, fixed, recurring, and other specialized accounts.	Positive (+)
4.	NCOMB	The term "commercial bank branch" refers to a location that performs the functions of a commercial bank, offers customers financial services, and is physically distinct from the main office but not set up as a legally independent subsidiary.	Positive (+)
5.	CRSMES	This is determined by adding together the total amount of credit that commercial banks have given to small and medium-sized businesses.	Positive (+)

Source: Compilation of Researchers

3.1. Model Development

The assumption that financial inclusion secured as a result of financial liberalization will lead to higher levels of investment and growth is the inspiration for this study, which borrows from McKinnon-liberalization Shaw's hypothesis as a trigger for higher saving. According to the idea, banks grant credit to people based less on predicted investment returns than on perceived transaction costs and default risk. The McKinnon-Shaw model also showed that whereas savings (S) are a positive function of real interest, investment (I) has a negative connection with a real interest rate (r). The investment ratio will rise along with the demand for money if the real return on bank deposits rises.

The long-term association between the variables was estimated using the vector error correction model (VECM). Variables stationary at the first difference can be used with this technique, but not those stationary at levels or

the second difference. VECM models have been used in econometrics for a long time, but recently they have become more widely used as a technique for analyzing cointegrating interactions between variables.

According to the literature, as the majority of those who are financially excluded live in rural regions, financial inclusion is frequently measured by bank loans and deposits there (Amakor and Eneh, 2021; Okoye et al., 2020). Additionally, the number of bank branches and the financing available to SMEs have been regarded as elements of financial inclusion (Emezie, 2021 and Anisiuba et al., 2020). Equation 1 thus presents a functional model that describes gross fixed capital formation (GFCF) as a function of financial inclusion:

$$GFCF = f(RCBLS, RCDPS, NCOMB \text{ and } CRSMES) \quad (1)$$

Equation 1 can be written in the econometric model and in its natural log form as thus;

$$LNGFCF = \beta_0 + \beta_1 LNRCBLS + \beta_2 LNRCDPS + \beta_3 LNNCOMB + \beta_4 LNCRSMES + \mu \quad (2)$$

Where,

LN = natural logarithm

β_0 = constant

$\beta_1 - \beta_4$ = coefficients of elasticities

GFCF = gross fixed capital formation

RCBLS = rural commercial banks' loans

RCDPS = rural commercial banks' deposits

NCOMB = number of commercial banks' branches

CRSMEs = commercial banks' credit to SMEs

μ = error term

4. Analysis and Discussion

4.1. Descriptive Statistic

A descriptive statistic of the study's variables served as the foundation for the data analysis. From Table 2, the sample averages, medians, maximums, minimums, standard deviations, skewness, kurtosis, and p-values for the Jarque-Bera tests are included in the summary statistic in Table 2. One of the presumptions of a normal distribution is that the mean and median values of the data are averages of the same value. Additionally, the findings of the standard deviation, which indicates how widely the series deviate from their mean, show that all the series in the distribution, with the exception of LNRCDPS, deviate sparingly from the mean and most of the variables exhibit characteristics of a normal distribution. The skewness, which indicates that the distribution of the series is slightly skewed either positively or negatively but roughly normal in distribution and is within the acceptable threshold of -1 and +1, further supports the normal distribution of the variables. Also, the null hypothesis that "the series is normally distributed" cannot be rejected because all of the Jarque-Bera test's -values are higher than the significant level of 0.05. The findings of the standard deviation, skewness, and Jacque-Bera tests, in conclusion, support the normality of the series in the distribution.

Table 2. Descriptive Statistic

	LNGFCF	LNRCBLS	LNRCDPS	LNNCOMB	LNCRSMES
Mean	8.612472	3.296376	2.182072	8.231072	3.405772
Median	8.890338	2.900861	2.794859	8.250535	3.593569
Maximum	10.97325	6.896280	6.057837	8.841882	4.819717
Minimum	5.982950	0.471378	-3.912023	7.689371	2.374906
Std. Dev.	1.272379	1.591426	2.904630	0.405539	0.717561
Skewness	-0.214455	0.655208	-0.954095	-0.161614	0.147193

Kurtosis	2.376874	3.012554	3.260803	1.352778	1.793774
Jarque-Bera	0.715312	2.146685	4.636510	3.522272	1.927053
Probability	0.699314	0.341864	0.098445	0.171849	0.381545
Observations	30	30	30	30	30

Source: Authors computation using EViews 10

4.2. Series Trend Analysis

In time series data, there are also increasing or falling trends as well as fluctuations. In order to identify whether the series has a unit root, trend analysis is required before unit root testing. The series appear to exhibit a random walk with drift and trend, according to the graphical representation in Figure 1, proving their non-stationary nature.

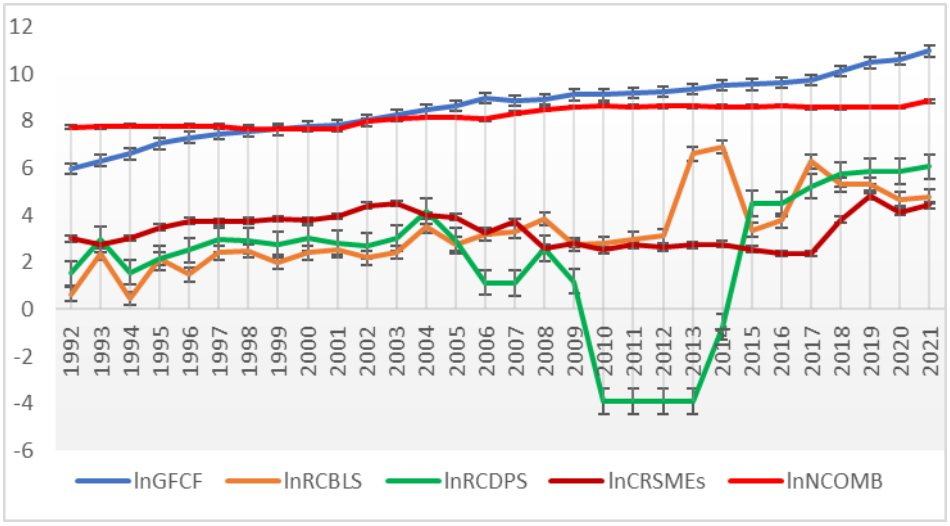

Figure 1. Trend Plot of the Series

Source: Plotted by Researchers

4.3. Unit Root Tests

The results of the level, constant & trend, and first difference tests using the Augmented Dickey-Fuller (ADF) and Phillip-Perron (PP) tests are presented in Table 3.

Table 3. Unit Root Tests Result

	ADF Test		**PP Test**		
Variable	**Level**	**First Diff.**	**Level**	**First Diff.**	**Remark**
LNGFCF	-2.552831 {0.3026}	-3.733181 {0.0090}***	-1.011165 {0.7357}	-3.667456 {0.0105}**	I(1)
LNRCBLS	-1.615537 {0.4612)	-6.417646 {0.0000}***	-2.564176 {0.1117}	-14.75286 {0.0000}***	I(1)
LNRCDPS	-1.919927 {0.3188}	-3.975070 {0.0050}***	-1.578547 {0.4804}	-4.021854 {0.0045}***	I(1)
LNNCOMB	-0.344410 {0.9061}	-4.042175 {0.0043}***	-0.344410 {0.9061}	-4.042175 {0.0043}***	I(1)
LNCRSMES	-1.548923 {0.7882}	-5.310106 {0.0010}***	-1.629777 {0.4551}	-5.402783 {0.0001}***	I(1)

Note: Figures in parenthesis are the probability values of the t-Statistics of the ADF and PP. Asterisks *** and ** denote significance at 1% and 5% levels

Source: Authors computation using EViews

All of the variables are non-stationary when examined at the level of the ADF and PP tests. In light of the fact that data is stationary when ADF test statistics are less than critical values at the critical point of 5%, we draw the conclusion that the series for all variables are non-stationary. However, as indicated by the asterisk, the series for all the variables are stationary at the first difference. Data is stationary when the probability values of the ADF and PP test statistics are lower than the test critical values at the first difference at 0.05. Therefore, based on the results of the ADF and PP tests, it can be said that all series are non-stationary at the level but stationary at the first difference.

4.4. Determination of Optimal Lags

The outcomes of the lag-order selection are shown in Table 4. The criteria for SC, FPE, HQIC, LR, and AIC all point to a one-step lag sequence. As a result, an analysis was conducted with a one-lag period.

Table 4. VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-152.6478	NA	0.053468	11.26056	11.49845	11.33328
1	-34.18236	186.1600*	6.97e-05*	4.584454*	6.011816*	5.020813*
2	-15.29252	22.93766	0.000130	5.020894	7.637724	5.820885

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Source: Authors computation using EViews 10

4.5. Cointegration Test

The cointegration test is the following step after all variables have been integrated to order I(1). Since the time series are multivariate, the multivariate cointegration technique developed by Johansen (1995) is used to ascertain if the relationship is stable over the long term. The result of the Johansen co-integration test is presented in Table 5:

Table 5. Johansen Cointegration Results

Hypothesized No. of CE(s)	Trace Stat.	Critical Value (5%)	Max-Eigen Stat.	Critical Value (5%)
None	84.23728	69.81889**	36.21256	33.87687**
At most 1	48.02472	47.85613**	24.65837	27.58434
At most 2	23.36636	29.79707	17.21514	21.13162
At most 3	6.151213	15.49471	6.149063	14.26460
At most 4	0.002150	3.841466	0.002150	3.841466

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level

Source: Authors computation using EViews 10

Table 5 demonstrates the long-term relationships between the variables. The trace and Max-Eigen statistics, for the Trace and Eigen statistics, respectively, showed 2 and 1 cointegrating equation among the variables. The link between the variables is then implied to have a long-term trajectory.

Table 6 presents the normalized cointegrating coefficients that illustrate the long-term effects of financial inclusion on capital formation. From normalized cointegrating coefficients, it was observed all the components of financial inclusion such as LNRCBLS, LNRCDPS, LNNCOMB and LNCRSMES had negative effects on LNGFCF, implying that the level of financial inclusion in the long-run did not favour capital formation in Nigeria. Also, the variables were statistically significant following their high t-values, indicating the financial inclusion has a significant effect on capital formation in the long-run. The observed decline in the level of financial inclusion suggests that there could be barriers to financial inclusion such as insufficient loans to rural

dwellers even when the banks mobilize deposits from them, poor branch network and the neglect of SMEs in credit extension by the commercial banks (Ozili, 2022).

Table 6: Normalized Cointegrating Coefficient

Cointegrating Eq:	**CointEq1**
LNRCBLS(-1)	-0.300200
	(0.05414)
	[-5.54532]***
LNRCDPS(-1)	-0.051242
	(0.01684)
	[-3.04295] ***
LNNCOMB(-1)	-1.955546
	(0.37986)
	[-5.14811] ***
LNCRSMES(-1)	-0.475011
	(0.07013)
	[-6.77327] ***
C	10.32621

Note: Standard errors in ( ) & t-statistics in [ ]
Source: Authors computation using EViews 10

4.6. Vector Error Correction Model (VECM)

The VECM model was computed to detect the short- and long-term dynamics of the used variables.

In Table 7, the error correction term (ECT) is equal to -0.287605 which demonstrates how the imbalance between the short and long runs ultimately disappears. As a result, with an annual adjustment of roughly 29%, the short-run output values will progressively converge to the long-run direction. The ECM's outcome also shows that the estimated model is generally good, with an R-squared of 0.631642. It suggests that LNRCBLS, LNRCDPS, LNNCOMB, and LNCRSMES (independent variables) can account for around 63% of the total variation in LNGFCF (dependent variable), with other factors not included in the model accounting for the remaining 37%. Similarly, the whole model was statistically significant at a 5% level of significance, as indicated by the F- statistic value of 4.736712 and probability (F-statistic) of 0.000736. This suggests that several aspects of financial inclusion collectively have a considerable impact on Nigeria's gross fixed capital formation (LNGFCF).

Table 7. VECM

	Coefficient	**Std. Error**	**t-Statistic**	**Prob.**
ECT(1)	-0.287605	0.110727	-2.597419	0.0168
D(LNGFCF(-1))	-0.024060	0.229392	-0.104888	0.9175
D(LNRCBLS(-1))	0.036753	0.024499	1.500228	0.1484
D(LNRCDPS(-1))	-0.642361	0.219072	-2.932195	0.0080
D(LNNCOMB(-1))	-0.153369	0.038761	-3.956752	0.0007
D(LNCRSMES(-1))	0.023213	0.055101	0.421289	0.6778
C	0.190040	0.051390	3.698005	0.0013
R-squared	0.631642			
Adjusted R-squared	0.540682			
F-statistic	4.736712			
Prob(F-statistic)	0.000736			
Durbin-Watson stat	1.863738			

Source: Authors computation using EViews 10

According to the ECM results, all of the variables' short-run coefficients of D(LNRCBLS(-1)) were positive but statistically insignificant, suggesting that loans from rural commercial banks in Nigeria only had a minimal impact on capital creation. The computed coefficient of D(LNRCDPS(-1)) shows that capital formation significantly decreased as deposits from the rural population rose. Additionally, even as the number of commercial banks' branches increased, the calculated coefficient of D(LNNCOMB(-1)) is negative and substantial, demonstrating that capital generation declined dramatically. Once more, D(LNCRSMES(-1))

showed a favorable but statistically insignificant effect on capital creation, indicating that the effect of commercial banks' credit to SMEs very slightly influenced capital formation in Nigeria.

4.7. Analysis of Short-Run Causality

The results of the short-run causality test are presented in Table 8:

Table 8. Wald Tests and Short-run Causality

Dependent variable: D(LNGFCF)			
	Chi-sq.	**df**	**Prob.**
D(LNRCBLS)	2.186369	2	0.3351
D(LNRCDPS)	14.82581	2	0.0006
D(LNNCOMB)	3.876860	2	0.1439
D(LNCRSMES)	5.614197	2	0.0604
All	18.23269	8	0.0195

Source: Authors computation using EViews 10

Since the null hypothesis was rejected, there is a short-run association between LNGFCF and LNRCDPS as evidenced by its probability value (0.0006), which is less than 0.05. The other explanatory variables, LNRCBLS, LNNCOMB, and LNCRSMES, do not contribute to LNGFCF in the short run. As shown in Table 8, there is a short-term relationship between the explanatory variables and the dependent variable based on the Chi-square joint statistics probability values. Since the chi-square test's p-value for the explanatory variables (LNRCBLS, LNRCDPS, LNNCOMB, and LNCRSMES) is less than 0.05, the null hypothesis (H0): 4=0 would be rejected. It was determined that the changes in LNCFCF were collectively explained by the explanatory variables in the short run since the overall chi-square test was 18.23269 and its probability value was 0.0195 < 0.05. This suggests that the combined effect of LNRCBLS, LNRCDPS, LNNCOMB, and LNCRSMES was immediate and significant within a short-term period. The following phase is *ex-ante* forecasting utilizing tests for variance decomposition and impulse response.

4.8. Impulse Response Function

The impulse response function was used to quantify the impact of independent variable shocks on the dependent variable. The complicated effects of a one-standard-deviation shock from the independent variables on LNGFCF in Nigeria over a ten-year period are shown in the set of graphs contained in Fig. 2.

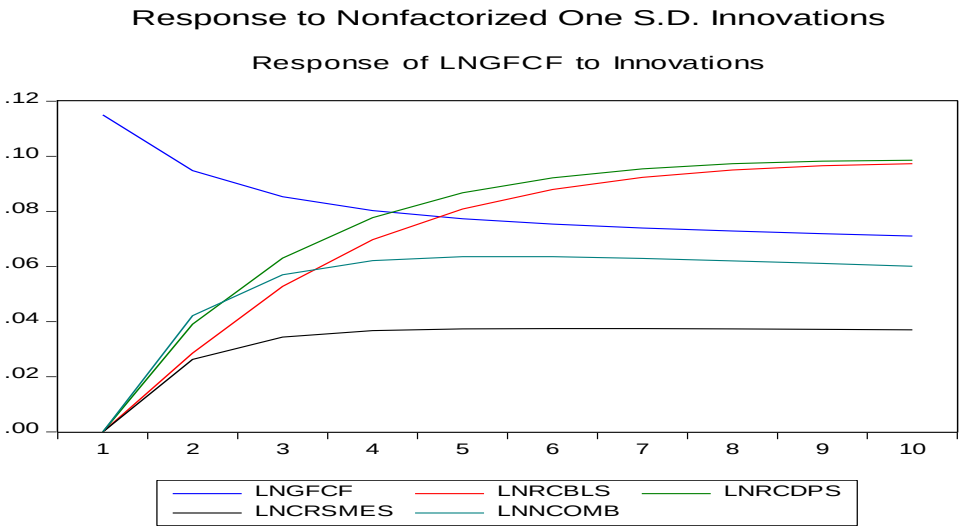

Figure 2. Response of LNGFCF to components of financial inclusion

Figure 2 shows that the response of LNGFCF (denoted by the blue line) to its own shock was decreasing over the 10-year period, implying that capital formation reacted negatively to its own shocks. It was also observed

that during the first-four period, the responses of LNGFCF to LNRCBLS and LNRCDPS (denoted by the pink and thick green lines respectively) was rising but slowed down from the fifth to the tenth period. Also, the responses of LNGFCF to LNCRSMES and LNNCOMB (denoted by the ash and light green lines respectively) trended upwards for the first – three periods but slowed down for the rest of the period. The decline in the responses of LNGFCF to the various components of financial inclusion indicates that the responses did not last for a long time probably due to the series of economic crisis such as the global financial crisis in 2008, change in government policies due to the change in governance, the 2016 economic recession and the COVID-19 pandemic that may hindered the commercial banks from serving the rural populace by closing many of their branches in a bid to reduce the cost operation. This also indicates that the expected positive impact of financial inclusion on capital formation could be undermined in the long-run if proper policies are not put in place. Also, this justifies the negative normalized cointegrating coefficients obtained in the long-run analysis (see Table 6).

4.9. Variance Decomposition

For each endogenous variable in the system, the error variance effects are predicted using variance decomposition. A straightforward linear equation demonstrates that any change in a dependent variable corresponds to a change in one variable at a time. Based on the Monte Carlo approach and Cholesky's ordering, the projection in this study will be classified into three categories: short-term (two years), medium-term (five years), and long-term (ten years) (ten years). Gross fixed capital formation (LNGFCF), loans from commercial banks to rural areas (LNRCBLS), deposits from commercial banks in rural areas (LNRCDPS), the number of commercial banks' branches (LNNCOMB), and commercial banks' credit to SMEs are all logged numbers (LNCRSMES).

Table 9. Variance Decomposition of LNGFCF and Financial Inclusion

Period	S.E.	LNGFCF	LNRCBLS	LNRCDPS	LNNCOMB	LNCRSMES
1	0.141422	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.218963	95.89693	0.093947	0.419824	2.440604	1.148697
3	0.317141	92.90007	0.585888	0.268221	3.891574	2.354246
4	0.388005	92.38737	1.169067	0.690558	3.457466	2.295542
5	0.442950	90.92733	2.127063	1.013232	3.101785	2.830588
6	0.495441	89.97490	3.032102	0.872910	2.692192	3.427898
7	0.542727	89.03428	3.925548	0.731194	2.308694	4.000282
8	0.583462	88.16906	4.729607	0.661980	2.041991	4.397357
9	0.618849	87.22960	5.529250	0.649657	1.859275	4.732218
10	0.653085	86.39330	6.265248	0.642700	1.696088	5.002662

Source: Authors computation using EViews 10

The outcome of Table 9 demonstrates the variance decomposition of the forecast error variance in LNGFCF explained by its innovations and innovations in rural commercial bank deposits, number of commercial bank branches, rural commercial bank loans (LNRCBLS), and commercial bank credit to SMEs (LNCRSMES). An analysis of LNGFCF's variance decomposition reveals that, while its shock accounts for 100% of the variation in the first period, it steadily diminishes to 86.39% of the variation by the end of the horizon. LNRCBLS makes a marginally increasing contribution from the first to the tenth period. The LNRCDPS's contribution decreased during the third period of the time horizon, but it climbed during the fourth and fifth, after which it started to slightly drop until the end of the horizon. Up to the fifth period, when it stood at roughly 2.69 percent, the contribution of LNNCOMB marginally increased. After that, it started to decline until the conclusion of the period. Meanwhile, LNCRSMES negligibly follows an upward trend through the end of the horizon.

4.10. Checking VAR Models

The endogenous variables were transformed to the first difference using the error correction mechanism, and the model was estimated using the VECM. Before discussing the findings, the VECM model was tested for serial correlation and stability.

Autocorrelation residual LM test: The autoregressive model's serial correlation was examined using the LM test. Using an auxiliary regression of the anticipated regression's residuals, the LM test statistic calculates lag order under the null hypothesis that there is no serial correlation from lag one. Table 10 displays the results of the serial correlation test.

The Godfrey LM test for 1 lag accepts the null hypothesis of serial autocorrelation since both of their p-values are greater than the significance threshold of 0.05, while the Godfrey LM test for 1 lag rejects it. As a result, we can deduce that there is no serial autocorrelation because the lag accepts the null hypothesis.

Table 10: VEC Residual Serial Correlation LM Tests

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	21.04221	25	0.6903	0.813132	(25, 46.1)	0.7066
2	26.90683	25	0.3606	1.097942	(25, 46.1)	0.3821

Source: Authors computation using EViews 10

Stability is assessed using the recursive coefficient stability test and the CUSUM test. The final performance is depicted in Figures 3a and 3b. Both tests show that the system's equation is accurate and that the results are sufficient for economic analysis. The results imply that there is no instability because the recursive coefficients and the CUSUM plot test statistics are verified to be within the 5% crucial bounds of parameter stability. As a result, we determine that our parameters are stable and, therefore, free of misspecification, and we reject the null hypothesis.

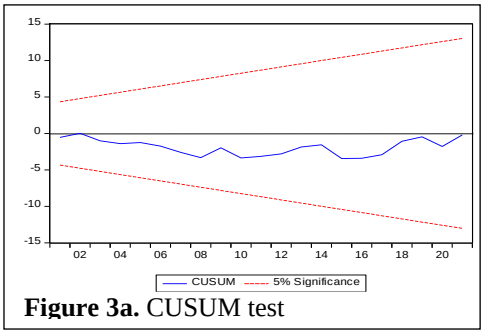

Figure 3a. CUSUM test

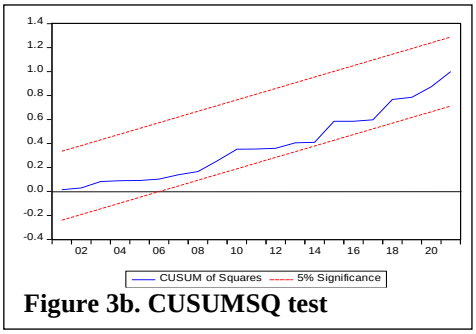

Figure 3b. CUSUMSQ test

4.11. Discussion of Findings

According to the ECM's findings, the observed positive but negligible impact of LNRCBLS on LNGFCF indicates that as the gross fixed capital formation grows slightly, so would the credit extended by rural commercial banks. This is true because, in theory, government measures aimed at bringing the economically excluded people into formal financial institutions should have a direct impact on capital formation. The lack of impact of LNRCBLS may indicate that rural residents do not receive enough loans from commercial banks, or that these loans are not sufficiently large to result in the expected rise in capital formation in Nigeria. This outcome is consistent with Okoye et al. (2020), but it varies with Emezie (2021), who discovered that LNRCBLS had a beneficial effect over time.

The estimated LNRCDPS coefficient, which was statistically significant and turned out to be negative, demonstrates that the capital formation was significantly reduced as a result of the deposits that rural residents mobilized. This might be the case since Nigeria's commercial banks were able to collect deposits from rural areas without providing the required interest. In contrast to the findings of this study, studies like Enueshike and Okpebru (2020) and Uruakpa, Kalu and Ufomadu (2019) revealed that rural deposits mobilized by commercial banks boosted capital formation. The period covered and the methods utilized by the various research, which happen to be different from that used in this study, may be the cause of this discordant result.

As shown by the positive and statistically significant coefficient LNNCOMB, the growth of commercial bank branches did not increase capital formation during the study period. According to the LNNCOMB's negative coefficient, a rise in the number of commercial banks' branches resulted in a decrease in capital formation. This could indicate that the commercial banks were ineffective in providing the general public with financial services. Additionally, this outcome may indicate that the distribution of these commercial banks' branches was uneven, i.e., that they were likely more concentrated in urban than rural areas, undermining capital accumulation and financial inclusion. This conclusion was contrary to Okoye et al. (2020) agrees with Anisiuba et al (2020).

From the findings, it was concluded that capital formation in Nigeria was marginally but positively impacted by commercial banks' lending to SMEs (LNCRSMES). It means that capital production has not been much aided by commercial banks' lending to SMEs. This might be explained by the difficulty of obtaining financing and the high interest rates charged by commercial banks. This finding contrasts with that of Enueshike and Okpebru (2020), who found that LNCRSMES had a significant influence on money mobilization and economic growth in Nigeria. Emezie (2021) also made a similar observation.

5. Conclusion

The study's objective was to determine how Nigerian capital formation will be affected by financial inclusion using annual data from the time (1992 - 2021). To do this, it was first necessary to establish the existence of cointegrating vectors and the existence of a long-term relationship between the cointegrating series. The results utilizing the trace test statistic and the Max-Eigen test statistic show that vectors indeed cointegrate. The normalized cointegrating coefficients were used to interpret the long-term relationship between the series. The results show that there is a long-term association between series.

The authors also investigated any potential short-term connections between the series. The long- and short-run links between the episodes were described in the first portion using a cointegration analysis. The outcomes show that the series are cointegrated in the same order (1), indicating a long-term link between the variables under investigation. The VECM systems model was used to validate the long-run relationship that was explained by the normalized coefficients of the cointegration simulation even if there was a transient correlation between the factors.

To achieve the goals of the study, a VECM simultaneous systems model with four endogenous variables was created. After modeling the aforementioned VECM system model, an error correction term portion indicates the long-run relationship, and the second part indicates the short-run relationship. Before the results were evaluated, the VECM systems model was validated for stability and the absence of serial correlation. The outcomes demonstrate the applicability of the VECM model for policy analysis. Gross fixed capital formation (dependent variable) and the independent variables of rural commercial bank loans, rural commercial bank deposits, commercial bank branch count, and total credit to SMEs are shown to have a long-run relationship according to the results of error correction term coefficients. The error correction term's (ECT) t-statistic value of 2.597 and associated probability value of 0.0168 suggest that the explanatory variables had an absolute long-run association.

Recommendations

The following suggestions were offered in light of the study's findings:

1) To enhance financial inclusion through commercial bank loans to rural dwellers, the lending environment needs to be changed to accommodate the financing needs of smaller economic units like rural communities. However, in order to improve the efficiency of the commercial banks at the local level and boost capital formation, it is important to thoroughly study how they operate, including their roles in financial intermediation and the monetary environment.
2) To increase the amount of loanable funds available for on-lending, banks should step up their efforts to mobilize deposits in rural areas. This would encourage capital development in both the country's rural and urban sectors.
3) Bank branches should be staffed with energetic customer service representatives who can teach the general public financial literacy, especially in rural areas, in order to increase capital formation. The branches should also offer several discounts, promotions, and special banking services to entice people to visit their many locations through its branch network.
4) The monetary authorities should require banks to raise the amount of credit they are willing to extend to SMEs in the nation in order to boost funds mobilization. Banks should then implement the necessary safeguards to prevent these loans from being used for unproductive purposes. To increase capital formation in Nigeria, the government must find a means to entice banks to lend to SMEs by offering guarantees, subsidized interest rates, and other incentives.

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Foreign direct investment in Algeria: A theoretical and applied study

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Abstract

This paper studies the most important determinants of foreign direct investment in Algeria in a theoretical and practical framework (using the co-integration test and the causality test). Foreign direct investment has become very important, because it has become the object of competition between countries, whether developed or underdeveloped. Algeria, like the countries of the world, tries to take advantage of it as well, but this comes up against obstacles that this study has tried to identify, the most important of which are inflation (-0.0203) and administrative corruption (-1.2821), with the weakness of other determinants to attract it, such as market size (0.0113) or public spending (0.0527).Thus, according to the results of the study, Algeria still remains unattractive for foreign direct investment.

1. Introduction

The importance of foreign direct investment is no different, but it is okay to mention some of its aspects, which are: Increasing economic growth rates, according to the classical growth theories, economic growth requires an increase in the volume of invested capital, which may not be possible, especially in developing countries that suffer from declining national savings and low per capita GDP; Hence, FDI inflows can improve the rate of economic growth. Transfer and localization of technology in the host country; This leads to an increase in the competitiveness of the economy infrastructure development and human capital development through training local labor and providing them with advanced technological skills and modern management methods; Which ultimately leads to the transfer of these experiences to national companies. Reducing unemployment rates and creating job opportunities directly or indirectly through the creation of forward and backward links in the form of complementary industries or services. Improving the balance of payments and the exchange rate of the national currency by increasing the foreign exchange earnings of the host country and increasing exports. As a result, countries have striven to remove all investment obstacles, provide financial and non-financial guarantees and incentives, and implement economic policies to simplify procedures, improve the business environment, and create an attractive climate for investment.

The most important feature of the relationship between the investment climate and environment and foreign direct investment is the change in its characteristics and content in Algeria since its independence until today. Where there have been transformations in three important stages, each stage has been characterized by distinctive features, both in economic, political and legal terms. It was the first stage, which began immediately after Algeria's independence. Where he pursued a development policy based on the rules of the planned economy, and this type of economic system clearly affected the inflow of foreign direct investment in Algeria. Where there was a kind of reserve of this type of investment, which undoubtedly affected negatively. Algeria was clear at the time that this type of investment creates dependency and political interference, and the possibility of weakening public companies.

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As for the second phase, it began in the early 1990s, under the effect of the drop in oil prices and the increase in the severity and weight of the external debt. This situation led to a state of imbalances in the economic and social balances in Algeria, and it began to enter a phase of economic instability. Algeria was forced to reschedule its external debts (Paris Club and London Club), while Algeria was entering the phase of implementing the IMF prescription. One of the effects is Algeria's recognition of the need to open up to the market economy and gradually abandon the previous economic system, which opened the door to foreign direct investment and treated it differently.

The third stage comes with the beginning of the third millennium, and was marked by the emergence of Algeria from its isolation thanks to political and security stability. This coincided with the improvement that characterized most economic indicators from low inflation and positive real growth rates. This has resulted positively in the improvement of the investment climate in Algeria, the adoption of foreign direct investment in the development process and the emphasis placed on the importance of this type of investment. This was evident by providing all possible measures to attract him.

Thus, the evolution of the management of foreign direct investments in Algeria since its independence until today is linked to two factors. The first is the development of conditions in international economic relations, which had a clear reflection on the development of the importance of foreign direct investment in international finance; the second factor is the orientations adopted by Algeria on the political and economic levels. Accordingly, we will try, through this research paper, to shed light on foreign direct investment in Algeria and its importance, by raising the following problem: What are the determinants of foreign direct investment in Algeria?

2. Literatures review

The theoretical analysis of the phenomenon of attractiveness of a country for foreign direct investment is vast and is characterized by many aspects. The economic literature in this area brings together issues closely related to foreign firms investing abroad, and other issues related to the particularities of the investment climate in the host country for foreign direct investment.

The "organizational theory" is based on industrial organization and goes a long way to explaining the work of multinational enterprises and the mechanisms of international production. We are talking here about multinational companies, which are considered one of the most important forms of internationalization of production, which began to appear since the end of the sixties, where it clearly developed in the United States of America and Great Britain. Its scope expanded so that these companies acquired multiple and extensive geographical shares in the world and expanded their activities and specializations at a rapid pace, and this was evident since the late eighties.

The first theoretical analyzes of the phenomenon of multinational enterprises, which endeavored to explain the imperfect competition and the monopoly which characterized these enterprises, date back to the end of the 1950s. The most important of these are the «product life cycle» theory, (Vernon, 1966), the «universal» theory, (Hymer , 1968), and the «product diversity» theory, (Caves , 1974). What is notable about the content of these discussed theories is that they share two main points, the first of which is the explanation and analysis of why a company is a multinational company. The second point was the adoption of American companies as a model.

From the seventies appeared more serious and effective attempts to explain the phenomenon of foreign direct investment, and in this regard we find the Eclectic theory or Paradigm OLI (O « Ownership », L « Localization », I «Internationalization »), which came from (Dunning, 1974)

This has allowed us to better understand the phenomenon of location and displacement of multinational companies, whether in developing or developed countries. The central idea that emerges from this theory is that a multinational company has a qualitative advantage will choose to invest in a stimulating and attractive geographical area or area, in order to be able to take advantage of this advantage to raise awareness of the most possible lows globally. On the basis of all that we have just mentioned, how to identify an attractive and stimulating location or geographical area for foreign direct investment? The attractiveness of a particular region for foreign direct investment is linked to a set of variables and cannot be limited to one factor or one variable.

In general, current studies in this area have focused on the cost and quality of labor, as well as the quality of infrastructure and public institutions. She was also interested in the role played by national economic policies (trade policy, exchange rate policy, fiscal policy, monetary policy.). He also paid great attention to market size. The work of (Root & Ahmed, 1979), consisting of a set of variables that explain the attractiveness of foreign direct investment in countries, are the size of the market (from the work of Goldberg 1972), the quality of infrastructure, trade openness, level of economic integration and political stability. Like the work of (Wheeler & Mody, 1992), they depended on a set of variables that explain the phenomenon, as well as a large market size,

low labor costs, an industrial fabric (presence of industrial zones) and the latter depends mainly on the availability of advanced infrastructure and rapid industrial development.

Wheeler and Mody add that these variables are closely linked to the level of economic development of the country receiving foreign direct investment, as well as to the productive sector that the multinational will choose. For developing countries, foreign direct investment in electronics industries is strongly correlated with the quality of infrastructure and labor costs. As for developed countries, it is closely related to market size and industrial readiness, and it is humbling that the quality of infrastructure is not seen as a barrier to foreign direct investment in developed countries, because multinational companies will be established there, benefiting from a better quality of services compared to developing countries, As for the work of (Axarloglou , 2005) which relied on the method of panel data, it was found that the attractiveness of a particular country for foreign direct investment is largely related to labor productivity, as well as real spending on higher education and social stability.

With the expansion of globalization, economic activities have tended to specialize and fragment into global market sectors, as well as the theories of the strategy of productive market sectors, proposed by (Jones & Kierzkowski, 2001) in order to shed more light on the phenomenon the location of multinationals and their choices for the areas of their activities in the world, particularly in developing countries. And the theories show the existence of models of foreign direct investment of the vertical type, which are based on the reduction of the costs of the factors of production.

Foreign direct investment was more necessary when there were customs restrictions between countries, and for multinational companies to avoid these customs barriers and capture the market of a region particular, they have chosen to establish themselves and carry out their activities at their level, and this is called the tariff jump. Protected and closed economies are more attractive and attractive to foreign direct investment than economies open to the world. In other words, the degree of protectionism of a particular economy and the size of its internal market are considered to be one of the most important determinants for attracting foreign direct investment and choosing between it and export. So here occurs a relationship of substitution between foreign direct investment and export, and this is what generates another model of foreign direct investment, which is of the horizontal type. More, the openness of countries has been frequently studied using the trade share (as a percentage of GDP) (Cleeve, 2008); (Mhlanga, Blalock, & Christy, 2010), showing a positive correlation between openness and FDIs. As such, one could expect tarifs and other trade barriers to be negatively correlated with FDI. This must be balanced with the fact that if companies are experiencing high trade barriers with a market they want to operate in, they could be tempted to invest or relocate it to avoid those costs. In a study published in 2020, Ghodsi demonstrated how FDIs were motivated by tarif- jumping motives (Ghodsi 2020). He argues that both tarif 's and technical trade barriers are positively correlated with FDI enters in European countries. As long as companies can relatively freely relocate it seems hence plausible to see a positive correlation between costs of trade and FDIs. (Delabarre, 2021)

In addition to what we have mentioned, what is related to foreign direct investments of the vertical type is also known as North-South investments, that is, they are directed from the countries of the North, which are mostly developed and industrially advanced and technological countries, to southern countries, which are mostly developing countries that have material and human resources at low cost. In other words, there is a clear discrepancy between the countries of origin of the investment and the countries which receive it with regard to natural resources (Dunning 1993). In addition to owning the factors of production, labor costs and the extent of its qualification, these elements remain among the most important determinants and influencing the flows of foreign direct investment of the vertical type. (Helpman, 1984).Without forgetting the work of (Feinberg & Keane, 2001), (Yeaple, 2003), , (Hanson, Mataloni, Matthew, & Slaughter, 2001), they showed on the basis of data from the United States of America that vertical foreign direct investment remains more concentrated in certain sectors, such as the mechanical and electronics, and these works were based on the comparison of some factors controlling the investment such as labor cost, transport costs and factor abundance between the host country and the origin country of the investing company (they based their work on OLI and Dunning's 1993). And in the economic literature of FDI, there are those whose analysis is based on the horizontal type, such as (Brainard, 1997), and there are those which rely on the vertical type, (Hanson, Mataloni, Matthew, & Slaughter, 2001) , as well as (Head, Ries, & Spencer, 2004). There are econometric studies that have attempted to analyze the attractiveness of countries for foreign direct investment, generally using data specific to the host countries (macroeconomic data) or data linked to institutions operating in the host countries (microeconomic data). All of these studies have attempted to measure the effects of foreign direct investment on host countries and to determine its determinants. In order to analyze the explanatory factors of foreign direct investment, analysts use FDI as a percentage of GDP to determine the size of the market, following the example of the works of (Akinkugbe, 2003), (Asiedu, 2003), (Singh & Jun, 1995).

In recent economic literature, we find the work of (Blonigen, 2005) centered around two hypotheses, one based on microeconomic models from which the decision of a global company to produce or operate in a foreign country is abroad, has been explained. The second hypothesis is based on macroeconomic models, through which the most important factors that help attract foreign direct investment flows have been identified. This study highlighted the importance of the exchange rate in particular and tax deductions in addition to laws and legislations related to business transactions.

It remains that the question of measuring the attractiveness of a particular country to foreign direct investment flows poses several problems and complications mainly related to the presence of several variables that control the degree of attractiveness. This difficulty has been demonstrated by applied and theoretical studies that have focused on this subject, and the economic literature mentions the work of (Loewendahl & Ertugal, 2001), where this study identified more than 20 determinants of foreign direct investment arranged on the basis of economic, legal, institutional and political considerations. We also find the work of (Lim, 2002), (Basu, 2002), where these studies have confirmed the importance of the traditional determinant and main determinant of foreign direct investment, which is the market size, the cost of labor and wages.

3. Foreign direct investment in Algeria

3.1. Planned economy stage

At this stage, the investment rate, which was a majority public investment, was of paramount importance, it was between 40 and 50%, which, given the long period of recovery, led to a deficit financial; In addition to neglecting the results caused by the investment process, whether direct, such as economic growth and increased exports, or indirectly related to the creation of harmony and integration between the different sectors of the national economy. The Central Bank of Algeria also played a formal role, which contributed to the increase in the size of the money supply compared to the real flows of goods and services. This has caused clear imbalances in the overall economic balance due to high inflation and the deterioration of the purchasing power of Algerians.

Also, the rate of coverage of exports from the non-hydrocarbon sector by imports from the same sectors did not exceed 5%, which indicates the failure of the economic policy adopted, which has largely failed to effectively involve the agricultural and industrial sectors in the national development process. This was due to low labor efficiency, poor control of technology, slow production and long completion period of projects, which forced the state to bear burdens additional and growing financial resources. From this economic situation stems a significant weakness in the share of foreign direct investment in Algeria's external financing structure due to its dependence on borrowing and subsidies as alternatives. In addition to decisions resulting from political choices and ideological orientations, they have played a decisive role in determining the volume of foreign direct investment inflows into Algeria.

Moreover, in 1971, a negative record was recorded in the value of flows due to the liquidation of foreign direct investment following the nationalization operations. After this year, Algeria opened the only hydrocarbon sector in the fields of exploitation, refining and production with foreign capital in the form of joint ventures, of which Algeria holds 51%. (Benbitour , 1998)

The flows of foreign direct investments have remained between the rise and the fall, and it is certain that what distinguishes them is that they are low flows compared to other international sources of financing. Their cumulative value for this period has been estimated at around 1663 million dollars and compared to the external indebtedness of 1980, which amounted to 17 billion dollars, it represents only 9.8%. Even in the hydrocarbons sector, the activity of foreign companies has been restricted by numerous norms and conditions, which indicates that had it not been for the necessary need for research, exploration and exploitation technology, Algeria would not have allowed foreigners to participate in this sector during this period. (ONS, 1980)

The beginning of the 1980s coincided with the continuation of the rise in oil prices, and the aim of the reforms adopted by Algeria was to achieve two objectives: The first is to correct the excesses of the economic policy of the 1970s by eliminating all resulting imbalances. Algeria has provided for this purpose two five-year plans, amounting to The value of the first was 500 billion DA for the period 1980 to 1984, and the value of the second amounted to 828 billion DA for the period 1985 to 1989. The planners' goal was to achieve a balance between the different economic sectors, production and services, and so the gradual change was to abandon the policy of unbalanced growth that had been adopted during the sixties- ten. (ONS, Statistics on the Algerian economy 1970-2002, 2002) With regard to investments, the share of industry in total investments fell from 56% to 24% between 1980 and 1984, while investments in infrastructure rose from 30% to 55% during the same period. , and the share of agriculture remained between 3% and The State budget also went from a surplus position in 1980 to a deficit position at the end of 1984, due to the increase in expenditure for 'equipment. As for the trade balance, it remained in surplus until 1985, despite the drop in the external debt to 41.1 billion dollars. In 1984, the debt service ratio as a percentage of exports was 37% (Mutin , 1988).

The balanced growth policy pursued by involving the agricultural sector in the development process has failed due to the low share of investments, which has widened the gap with respect to food dependence on the outside, especially with the increase food imports compared to Algeria's total imports from 10% in 1970 to 22% in 1985. To all this is added the predominance of the hydrocarbons sector in the Algerian production structure, due to the increase of 98% of its contribution to total exports, which implies the focus of economic policy on this as the main factor in achieving growth, and due to the lack of control of oil prices and the reduction in coverage of world demand by the Organization of the Petroleum Exporting Countries from two-thirds in 1974 to one-third in 1984, this sector has played a major role in transmitting external shocks to the national economy.

In terms of monetary policy, the Treasury intervened directly in the management of monetary affairs. The Central Bank of Algeria was only an organization responsible for issuing the liquidities necessary to finance the planned public investments. As for the Algerian banks, they were only a tool for the financing of public institutions, because it is enough that any investment project be approved by the State to obtain the necessary financing from the banks without regard to the financial capacity, payment terms, borrowing risks…

As for the weak points of the indicators of the Algerian economy until the middle of the 1980s, which coincided with the beginning of the implementation of the second five-year plan, these were great difficulties due to the fall in oil prices, which has hit hard the depth of the Algerian economy because of its association with hydrocarbon revenues and oil rents. The sharp decline in oil prices on international markets from $27 per barrel to $14 per barrel between 1985 and 1986 led to the collapse of Algeria's hydrocarbon revenues. The deterioration in the value of the dollar during this period also contributed to the decline in Algerian revenues and the increase in the severity of external debt. This deterioration of the situation led to real economic problems, in particular a reduction in the employment opportunities created from 194,000 in 1986 to 62,000 in 1988, and consequently unemployment increased and its burden increased, the number of unemployed falling from 650,000 in 1986 to 1.8 million in 1989; The quality of social services provided by the state has also declined, worsening the social crisis. (Madjdoub , 2003) The economic growth rate decreased from 5.2% in 1985 to -2.9% in 1989, and the external debt rose and became aggravated and limited the credibility of the Algerian economy in the international financial markets, reaching a value of 25.3 billion dollars in 1989, which was reflected The increase in the debt service index as a percentage of exports to 75.25% for the same year.

The attempt to adopt decentralization in the running of the national economy and the attempt to get closer to the capitalist approach and work to involve the national and foreign private sector, was marked in the eighties by the issuance of Law 82/11 of August 21, 1982, which worked to achieve integration between the national public and private sectors, and The foreigner by giving the latter more space and freedom to contribute to the process of economic growth (Ordinance No. 82/13, 1982).

In addition to Ordinance 86/13, which complements the previous law and stipulates allowing the transfer of profits, guaranteeing compensation in the event of nationalization, and partial transfer of workers' wages. But in practice, the Algerian reservation continued during this period on all forms of foreign interference, including foreign direct investment. In view of the lack of success of the development programs established by Algeria during this period and their failure to advance the economic development of the country, while maintaining clear control of the state over the various economic sectors; This reflected negatively on attracting foreign direct investment. (Ordinance N° 86/13, 1986)

As a result of weak economic growth, high unemployment rates and the deterioration of purchasing power to a large extent, in addition to the exacerbation of external debt, the collapse of the socialist system and the increase in the spread of globalization; It was necessary for Algeria to introduce deep and comprehensive reforms, using the directives of international financial institutions, starting in March 1989, within the framework of stabilization and structural adjustment programs, and all of what we mentioned has contributed to changing Algeria's view of foreign direct investment. During this period of time, foreign direct investment inflows were weak. (see figure 1)

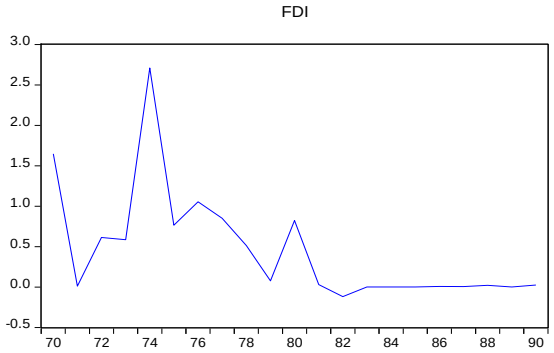

Figure 1: Foreign direct investment inflows to Algeria for 1970-1990

Source : http://www.unctad.org/fdistatistics

3.2.The economic reforms stage

The global indicators of economic and financial balance in Algeria have improved, as inflation rates have decreased to acceptable levels as a result of activating the role of monetary policy in the Algerian economy, which worked to curb the growth of the money supply to acceptable limits as a result of reducing the coverage of the state budget deficit through monetary issuance and activating tools different monetary policy.

The state budget balance shifted from a surplus during the period from 1995 to 1997 due to the pressure of public spending (reducing salaries and wages and the state's abandonment of the subsidy policy) to a deficit in the years 1998 and 1999 as a result of the decline in public revenues due to the drop in oil prices. Beginning in 2000, the state budget continued to record a surplus and real positive and high growth rates were achieved, except for the significant decline recorded in the years 1997, 2000, 2001 as a result of the drop in oil prices and the recording of a negative growth rate in other sectors outside the hydrocarbon sector, especially in the agricultural sector**.**

Unemployment rates decreased after they were very high during the period of implementing the economic program and supporting growth, which aimed to reduce the negative social effects of the programs of the international financial institutions that lent Algeria, headed by the International Monetary Fund. As a result of the prepayment of debts in 2006, which explains the rise in the debt service index as a percentage of exports to 25.3%, the Algerian foreign debt and debt service burdens as a percentage of exports decreased in 2007 to 5.606 billion US dollars and 2.49%, respectively. And from the beginning of the liberation of the Algerian economy from the burden of indebtedness that Algeria has suffered for a long time, and exchange reserves rose to record levels that Algeria had not previously known, and the balance of payments improved greatly to reach at the end of 2007 to 29.55 billion US dollars. (UNCTAD, FDI statistics, 2013)

There is an improvement in the economic situation in Algeria, a situation that will play a major role in improving the business and investment climate in Algeria. This leads us to ask about the evolution of Algeria's share of foreign direct investment.

Although Algeria adopted the policy of open door to foreign direct investment, at the beginning of the nineties through the issuance of legislation that provides guarantees and the necessary advantages. It is noticeable that the attractiveness of Algeria until the end of the first half of the nineties was characterized by weakness and did not know a significant difference compared to the planning stage.

This is mainly due to a group of factors, foremost of which is the lack of improvement in economic performance and the deterioration of the political situation, whose features were evident in the manifestations of violence in Algeria and the deterioration of the security situation during that period. As for the second half of the nineties, which coincided with Algeria's restoration of its financial and monetary balances as a result of the application of the structural adjustment program, Algeria has experienced an increase in inflows of foreign direct investment.

However, the observer of these flows notes that they were mostly directed towards the hydrocarbon sector, where Algeria knew the entry of several companies, including American companies such as PETROFAC RESOURCES INTERNATIONAL and European ones, especially French, Italian and Spanish, including CEPSA, AGIP, ELF/TOTALFINA. During the period between 1992 and 1999, the total inflows of foreign direct investment amounted to 1.601 billion US dollars (see figure 2), the share of the hydrocarbons sector of which amounted to 1.534 billion dollars, and it is clear to the eyes that other economic sectors know clear limitations and that the lion's share is attracted by hydrocarbons. This is justified by the high profitability of this sector globally. (CNES, 2006)

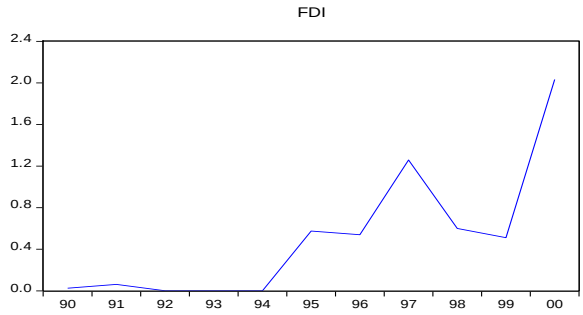

Figure 2: Foreign direct investment inflows to Algeria for 1990-2000

Source : http://www.unctad.org/fdistatistics

Therefore, this increase inflows of foreign direct investment cannot be adopted as a reference to improve the investment climate in Algeria, and the question that arises is where is the problem and where does the defect lie? The improvement of some indicators of the Algerian internal and external economy would not have persuaded foreign investors to practice their activities in other economic sectors in addition to the hydrocarbons sector, and this can be explained by the continued political instability and security turmoil in that period. A stage known as remnants that negatively impacted the attraction of foreign direct investment and the stability of foreign companies present in you, as it witnessed the destruction of many public and private national and foreign productive projects as a result of terrorist acts, and the closure and suspension of many productive institutions due to the departure of the workforce in addition to the threat of foreigners and target their property.

On the basis of what we have mentioned, the security situation was very turbulent, which made investment in Algeria fraught with great risks during the nineties, compared to the neighboring Maghreb countries such as Tunisia and Morocco, which had security stability that made them the station for most of the investments directed to this region.

Since the year 2000, Algeria has formed an area of attraction for foreign direct investments, especially after the reforms that affected various aspects, especially the legislative aspect, through the issuance of the 2001 law related to investment development, aimed at creating an investment climate and establishing special bodies to receive and direct local and foreign investors, the most important of which are the National Agency for Investment Development (ANDI) and the National Investment Council (CNI).), in addition to the partnership agreement with the European Union in 2001 as a prelude to joining the World Trade Organization, in addition to the rise in fuel prices in global markets, which encouraged foreign investors to invest in the sector .

In 2009, direct foreign investments reached their highest value since independence, amounting to 2.75 billion US dollars. 2015 witnessed a decrease in the inflow of foreign direct investment (see figure 3), after which it recovered its positive development significantly by the year 2016 until the year 2020. However, Corona disease (Covid-19) has clearly affected the inflows, which are very limited and did not exceed the threshold of two billion dollars. However, the Covid-19 pandemic is not the only factor that will change the reality of matters with regard to foreign direct investment. The new industrial revolution and the policy shift towards more economic nationalism and sustainability trends are all factors that have a far-reaching impact on the composition of international production in the decade separating us from 2030. (UNCTAD, World Investment Report 2020, 2020) .

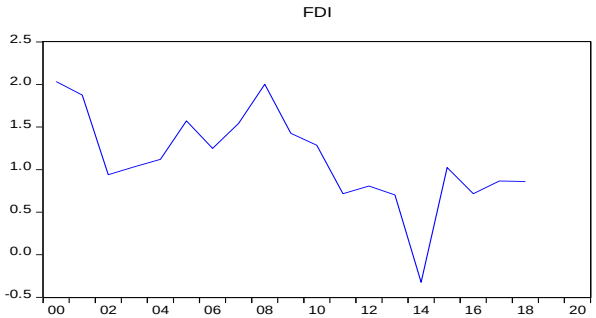

Figure 3: Foreign direct investment inflows to Algeria for 2000-2020

Source: http://www.unctad.org/fdistatistics

4. Empirical Investigation

4.1.Estimation technique

Classical economic modeling consists of several structural equations, and several criticisms of (Granger, 1969) and (Sims, 1980) have been known for the imbalances contained in their content that have failed to explain a very volatile economic environment. VAR models (Vector Auto Regressive) are a generalization of AR models (Auto Regressive) in highly variable situations, where they were able to statistically respond to most of the criticisms of classical models.

In the VAR model, two variables change and each of these variables is a function of its own past values as well as the values of other variables. For example, the VAR model of p = 4 can be written on the following mathematical formula:

$$y_{1t} = a_1 + \sum_{i=1}^{4} b_{1i} y_{1t-i} + \sum_{t=1}^{4} c_{1i} y_{2t-i} - d_1 y_{2t} + \varepsilon_{1t}$$
$$y_{2t} = a_2 + \sum_{i=1}^{4} b_{2i} y_{1t-i} + \sum_{t=1}^{4} c_{2i} y_{2t-i} - d_2 y_{1t} + \varepsilon_{2t}$$

The variables, which are stable variables, fluctuations and (regenerations and shocks) represent white noise of fixed variations and are not self-associated**.**

The structural form of the VAR model can be written as the following matrices:

$$By_t = A_0 + \sum_{i=1}^{4} A_1 y_{t-i} + \varepsilon_t$$

With:

$$A_i = \begin{bmatrix} b_{1i} & c_{1i} \\ b_{2i} & c_{2i} \end{bmatrix}, \quad B = \begin{bmatrix} 1 & d_1 \\ d_2 & 1 \end{bmatrix}, \quad y = \begin{bmatrix} y_{1t} \\ y_{2t} \end{bmatrix}, \quad \varepsilon = \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix}$$

$$Y_t = A_0 + A_1 Y_{t-1} + A_2 Y_{t-2} + \ldots\ldots\ldots + A_p Y_{t-p} + \upsilon_t$$

With:

$$\upsilon_t = \begin{bmatrix} \upsilon_{1t} \\ \upsilon_{2t} \\ . \\ . \\ \upsilon_{kt} \end{bmatrix}; \; A_0 = \begin{bmatrix} a_1^0 \\ a_2^0 \\ . \\ . \\ a_k^0 \end{bmatrix}; A_p = \begin{bmatrix} a_{1p}^1 \ldots\ldots\ldots a_{1p}^2 \ldots\ldots\ldots a_{1p}^K \\ a_{2p}^1 \ldots\ldots\ldots a_{2p}^2 \ldots\ldots\ldots a_{2p}^k \\ . \\ . \\ a_{kp}^1 \ldots\ldots\ldots a_{kp}^2 \ldots\ldots\ldots a_{kp}^k \end{bmatrix}; \; Y_t = \begin{bmatrix} y_{1t} \\ y_{2t} \\ . \\ . \\ y_{kt} \end{bmatrix}$$

Then the number of delays in the model is determined in order to determine the degree of p for the VAR model where the number of delays is determined based on the criteria Akaike and Schwarz.

The values of the criteria Akaike and schwarz are calculated as follows:

$$AIC_{(p)} = Ln\left[\det\left|\sum_e\right|\right] + \frac{2k^2 p}{n}$$
$$SC_{(p)} = Ln\left[\det\left|\sum_e\right|\right] + \frac{2k^2 Ln_{(n)}}{n}$$

K: Number of form variables

N: Number of observations

P: The number of delays, p must be the lowest value of the AIC and SC coefficients (Bourbonnais, 2002)**.**

The sample study consists of 36 yearly observations; the data in this study was obtained from the statistics the Algeria's ONS (national statistics office), the international financial statistics of IMF, UNCTAD, world developing indicators of the World Bank WDI, transparency international and ICRG. All the variables are in logs, the data used is annual covering the period 1984 to 2020. The variables used for fundamentals were determined by two considerations, theory and availability of data.

The variables of study are:

- FDI: Foreign direct investment inflows
- RER: Real exchange rate of Algerian Dinar
- TRAD : Trade openness
- GDP: Real Gross domestic product (Market size)
- G : Public spending (State size)
- INF: Inflation
- OIL: Oil prices
- CORRUP: Corruption and Quality of administrative procedures

In order to studies and explained the determinants of FDI (Foreign direct investment), we can build the following specification due to the discussion in the former literature:

$$FDI = f\ (RER\ , TRAD\ , GDP, G, INF, OIL, , CORRUP\ )$$

$$FDI = \alpha_0 + \alpha_1 RER + \alpha_2 TRAD + \alpha_3 GDP + \alpha_4 G + \alpha_5 INF + \alpha_6 OIL + + \alpha_7 CORRUP + \varepsilon$$

We will use the co-integration test, which allows us to study the long-term relationship between unstable and integrated time series of the same degree.

4.2.Test of Stationary

The first step of our methodology is to test the order of integration, that it is the stationary of our variables, with the ADF (Augmented Dickey Fuller) test.

Table 1. Unit root test ADF (Test of Stationary)

V	**level**			**1st difference**			**decision**	**lags**
	Intercept	Trend & intercept	None	Intercept	Trend & intercept	None		
FDI	-2.7141 (0.0815)	- 3.3914 (0.0684)	-1.9503 (0.1497)	-8.0005 (0.0000)	-7.8941 (0.0000)	-8.0744 (0.0000)	I(1)	2
TRAD	-3.8885 (0.0050)	-4.0012 (0.0173)	-3.9030 (0.0003)	-8.5367 (0.0000)	-8.5343 (0.0000)	-8.6736 (0.0000)	I(1)	2
GDP	-3.8613 (0.0053)	-3.9080 (0.0213)	-1.6803 (0.0874)	-9.7104 (0.0000)	-9.5810 (0.0000)	-9.8354 (0.0000)	I(1)	2
G	-2.8167 (0.0659)	-3.1075 (0.1199)	-2.4900 (0.0143)	-7.5404 (0.0000)	-5.1167 (0.0011)	-7.6196 (0.0000)	I(1)	2
INF	-1.7812 (0.3838)	-2.0470 (0.5576)	-1.1999 (0.2066)	-5.3140 (0.0001)	-4.4427 (0.0059)	-5.3893 (0.0000)	I(1)	2
RER	1.1220 (0.9970)	-0.7680 (0.9598)	3.5226 (0.9998)	-5.2642 (0.0001)	-5.4269 (0.0004)	-4.1826 (0.0001)	I(1)	2
OIL	-1.0647 (0.7196)	-2.3907 (0.3782)	0.0188 (0.6826)	-5.1228 (0.0002)	-5.0934 (0.0010)	-5.1166 (0.0000)	I(1)	2
CORRUP	-3.7707 (0.0073)	-2.5184 (0.3178)	-1.9867 (0.0463)	-1.6410 (0.4510)	-6.9846 (0.0000)	-1.3826 (0.1518)	I(1)	2

Critical value 5%: ADF:-1, 950394, ( ) prob

Source: Eviews program outputs

The results of unit root tests analysis according to the ADF (Augmented Dickey Fuller) test are showed in the table 1. Results of test of stationary show that most of those time series are integrated of order one. The number of lags in this form is estimated to two terms periods of time, through the Figure 1, it is clear that the estimated

model achieves stability conditions (VAR satisfies the stability condition) as all transactions smaller than one, and all the roots are located inside the unit circle, which means that the model does not suffer from the problem of errors in the link or the instability of the contrast.

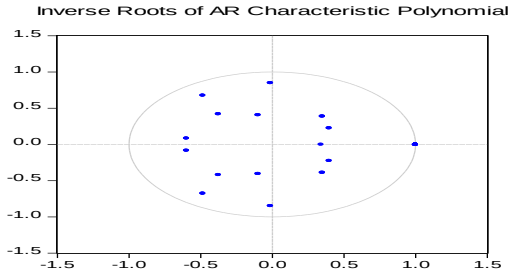

Figure 4. Estimated model achieves stability conditions

Source: Eviews program outputs

4.3. Co-integration analysis (Long- run):

The co-integration test of Johansen 1988 makes it possible to calculate the number of co-integration relationships between the variables of the model by calculating the number of co-integration vectors. This test is based on the estimation of the following model:

$$\Delta Y_t = A_0 + A_1 \Delta Y_{t-1} + A_2 \Delta Y_{t-2} + \ldots\ldots\ldots + A_P \Delta Y_{t-P+1} + \prod Y_{t-1} + \varepsilon.$$

Where the matrix Π it is formulated as follows:

$$\Pi = \sum_{i=1}^{P} A_{i-1}$$

P : The number of lags in the model

$r = R(\prod_P)$: Matrix rank, which represents the number of co-integration relationships. From the eigenvalues of the matrix Π, we calculate the following λ_{trace} to test the null hypothesis according to which there exist at most *r* co-integrating vectors. (Johansen, 1988)

$$\lambda_{trace} = 2(log(L_{nc}) - log(L_c)) = -T \sum_{i=r+1}^{M} log(1 - \hat{\lambda} i)$$

$r = 0,1,2,\ldots\ldots\ldots\ldots, M-2, M-1$; *T*: Sample size

Table 2. Johansen co-integration test

Hypothesized No. of CE(s	Eigenvalue	Trace Statistic	Critical Value 0.05	Prob**
None *	0.918231	227.5844	125.6154	0.0000
At most 1 *	0.797538	142.4533	95.75366	0.0000
At most 2 *	0.725807	88.14833	69.81889	0.0009
At most 3	0.531994	44.15492	47.85613	0.1068
At most 4	0.258164	18.33963	29.79707	0.5411
At most 5	0.212181	8.186333	15.49471	0.4457

Trace test indicates 3 co-integrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Source: Eviews program outputs

From table 2 above, it is clear that λ_{trace} (which is reported in the fourth column of the output table 2) is smaller than the critical values at the level of significance of 5% and thus accept the hypothesis nihilism H_0, a relationship to integrate simultaneous, where the number of vectors integration Concurrent is $r = 3$ when a significant 5% level, which indicates that the structure of FDI integrated with the rest of the determinants in the model, which indicates the existence of a long-run equilibrium relationship between variables, that is they do not stray too far from each other in the long term so that they appear similar behavior.

Engle and Granger 1987 proposed a two-stage method of testing the co-integration relationship, the first of which is to estimate the following regression relationship using the least squares method.

$$X_t = \beta + \alpha Y_t + \varepsilon_t$$

Whereas the second step; is based on testing the stability of the random error limit for the previous regression equation number 1. If the latter is stable at the level I(0), it means that there is a co-integration relation between the two variables X and Y.

Table 3. Engle & Granger test

Variables	Coefficient	t-Statistic	Std. Error	Prob
constant	0.6326	**3.10305	0.46794	0.0288
RER	0.011082	4.280159	0.002589	**0.**1922
G	0.052785	**1.285828	0.041052	0.0335
GDP	0.011382	**0.246147	0.046242	0.0393
INF	-0.020337	***-1.709226	0.011898	0.0977
OIL	0.064201	*0.202905	0.003166	0.0019
TRAD	0.090350	**0.865290	0.010442	0.0102
CORRUP	-0.031407	***-0.405478	0.077457	0.0880
R-squared		0.599243		

* significant at 1 % ** significant at 5**%** *** significant at 10**%**

Source: Eviews program outputs

Based on the results in Table 3, and the co-integration regression equation it is clear to us that there are variables that are related to the FDI positive relationship (RER, G, GDP, OIL, TRAD). There are variables associated with a negative relationship such as INF and CORRUP.

4.4. Error correction model (Short- term)

In this regard, Engle and Granger 1987 demonstrated the possibility of estimating the true relationship between time series that have a co-integration relationship by representing it with an ECM error correction model. A model can be represented to correct errors between two variables, for example, by the following formula: (Engle & Granger, 1987)

$$\Delta X_t = \alpha_0 + \alpha_1 e_{t-1} + \sum_{i=1}^{m} \alpha_i \Delta X_{t-i} + \sum_{j=1}^{n} \alpha_j \Delta Y_{t-j} + \varepsilon_t .$$

Table 4: Error correction model test

Variables	Coefficient	t-Statistic	Std. Error	Prob.
constant	5.209449	**2.71302	1.92017	0.0154
ECT	-0.513388	** -1.8064	0.31449	0.0211
DGDP	-0.067102	***-0.87000	0.07713	.0**0**975
DINF	-0.033038	**-1.26888	0.02604	0.0406
DOIL	0.876094	0.70949	0.00859	**.0**6527
DTRAD	0.025967	***1.38405	0.01876	0.0650
DCORRUP	0.213745	0.24745	0.86377	0.1256
DGDP(-1)	0.012790	**0.16630	0.07691	0.0038
DINF(-1)	-0.016201	*-0.70956	0.02283	0.0064
DOIL(-1)	-0.032791	***-0.34007	0.00821	0.0871
DTRAD(-1)	-0.000866	-0.03719	0.02329	0.5971
DCORRUP(-1)	-1.282182	**-1.68069	0.76289	0.0472
DFDI	-0.0501	* -0.46700	0.10738	0.0028
R-squared		0.700904		

* significant at 1 % ** significant at 5**%** *** significant at 10**%**

Source :Eviews program outputs

Through Table 4 R-squared was 0.7009, this coefficient show is evidence that the quality reconcile the model and its ability to interpret the changes that occur in the value of the FDI remains linked to other variables have not been incorporated in the model, as the changes in the independent variables explain 70% of the fluctuations that occur at the level of the FDI. It was there are other variables outside the model which affect 30%.

It appears somewhat accented error correction ECT Statistically significant at level of 5%, and a negative signal -0.5133 and is proof that the behavior of the FDI may take in the event of any shock nearly five years until it reaches the equilibrium position in the long term. And if we talk about the speed of the adjustment, we say that it is in each period (during the years of data) modified more than 51% of the imbalance of the FDI in the long term, and this is what explains the co-integration hypothesis.

4.5. Causality test

Theoretically, showing the causal relationships between economic variables helps explain and explain economic phenomena in a good and effective way, and this helps to activate economic policies, more than that, the direction of the causal relationship between economic variables explains the best economic phenomenon under study. Granger proposed concepts of causation and external verbs, explaining it as follows, the variable causes a change in the variable if the predictability of the evolution of the variable will improve when the information or data for the variable are included in the analysis.

The composition of the variables y_{2t-1}, y_{2t-2},, is considered external to the composition of the y_{2t-P} **.....** variables**....** y_{1t-2} , y_{1t-1} , y_{1t-P} if the increase in the combination does not significantly improve the identification of the variables. This requires a test of constraint parameter variables to be VAR (to become RVAR: Restricted VAR). Determination of delay or delay periods p is based on the AIC and SC criteria where if:

y_{2t} It does not cause if the next nihilistic hypothesis is acceptable $H_0 : b_1^1 = b_2^1 = ... = b_P^1 = 0$

y_{1t} It does not cause if the next nihilistic hypothesis is acceptable $H_0 : a_1^2 = a_2^2 = ... = a_P^2 = 0$

If we come to accept the two nihilistic assumptions together, that is, cause and cause, in the case of what is known as the effect feedback loop. The Granger Causality Test is used to confirm the extent to which there is a feedback or reciprocal relationship between two variables. (Granger, 1969)

Table 5: Granger Causality Test

Null Hypothesis	Obs	F-Statistic	Prob
G does not Granger Cause FDI	36	0.23499	0.7920
FDI does not Granger Cause G		3.33231	0.0493
GDP does not Granger Cause FDI	36	0.41467	0.6643
FDI does not Granger Cause GDP		2.01081	0.0515
INF does not Granger Cause FDI	36	0.45681	0.0064
FDI does not Granger Cause INF		1.62155	0.2144
OIL does not Granger Cause FDI	36	0.25466	0.7768
FDI does not Granger Cause OIL		1.18953	0.3183
TRAD does not Granger Cause FDI	36	0.31351	0.7332
FDI does not Granger Cause TRAD		2.91868	0.0695
INF does not Granger Cause FDI	36	0.45681	0.6376
FDI does not Granger Cause INF		1.62155	0.2144
CORRUP does not Granger Cause FDI	36	7.64068	0.0021
FDI does not Granger Cause CORRUP		1.31472	0.2836

Source :Eviews program outputs

5. Results and discussion

5.1. Significant positive effects

- Positive effect of public spending on the FDI, public expenditure in Algeria has had a positive impact through the proposed model, but the positive impact of this remains a little weak in the Long-term (0.052785). Public spending in Algeria has a very limited role in attracting foreign direct investment. Its positive role in the long term, albeit very weak, is due primarily to public investment spending on infrastructure that would encourage an increase in Algeria's attractiveness.

- Positive effect of oil prices on the FDI, the price of oil positively affects foreign direct investment in Algeria in the long run (0.064201), and its impact is very weak. While its effect is negative in the short term (-0.032791). This result can be explained by the fact that Algeria relies on an expansionary fiscal policy as soon as oil prices rise, this measure contributes to stimulating internal demand and increases the size of the market in Algeria, thus increasing the attractiveness of Algeria. However, these prices are unstable and transmit shocks, as when oil prices fall, Algeria tends to implement an austerity financial policy that puts pressure on demand, which negatively affects foreign direct investment flows to Algeria, especially in the short term.

- Positive effect of GDP for the FDI, in the long run (0.011382), its impact remains negative in the short run (-0.067102), this is due to the nature of the structure of the Algerian economy, which is essentially an economy based on oil and gas wealth at the expense of manufacturing and weak exports outside the hydrocarbons. Through the results, it is clear that the gross domestic product does not contribute much to the attractiveness of Algeria, and does not contribute much to increasing the size of the market, because it is closely related to the hydrocarbon revenues, which are characterized by instability and limitedness. This is reflected in the income of the state and the per capita income and purchasing power.

- Positive effect of trade openness on the FDI, trade openness positively affects foreign direct investment in the long (0.090350) and short (0.025967) term. Trade openness has a positive impact on economic growth and social progress, when it is accompanied by policies to develop the infrastructure of information and communication technology, financial development, human capital development, and research and development. And it contributes to increasing the country's attractiveness to foreign direct investment.

5.2. Significant negative effects

- Negative effect of inflation on the FDI, inflation negatively affects foreign direct investment in the long (-0.020337) and short (-0.033038) term. This is due to the ineffectiveness of monetary policy in Algeria in limiting the money supply and the exacerbation of the monetary nature to cover the budget deficit, in addition to the weakness of the productive structure, the rise in imports, and the deterioration of the

values of the Algerian dinar, which exacerbated inflation in Algeria. The high rate of inflation affects the domestic demand and thus affects the size of the market, which is one of the most important determinants of attracting foreign direct investment.

- Negative effect of corruption on the FDI, administrative corruption negatively affects Algeria's attractiveness in the short (-1.282182) and long (-0.031407) term. The risks of corruption have increased in Algeria as a result of the weakness of public institutions in the state, the absence of transparency in public and administrative administration, the absence of accountability and deterring corruption. All these factors make the reforms undertaken by the state useless in mitigating corruption.

5.3. Insignificant effects

RER had an insignificant effect on the FDI, the results of the study revealed the absence of a long-term equilibrium relationship between them, given that foreign direct investment in Algeria does not contribute to explaining the changes in the real exchange rate, but was mainly linked to the legislation adopted by the authorities to encourage investment policy and provide an appropriate climate for it. The dinar, which was in the years 1994 and 2001, were not sufficient to explain the behavior of foreign direct investment flows, since the first contributed to bringing the official price of the dinar closer to the equilibrium level, while the second was mainly aimed at limiting the development of the monetary mass circulating in the parallel markets. Therefore, we see the lack of foreign investor reaction towards it reduction process.

5.4. Granger Causality Test

Using the Granger causality results, we found**:**

- One-way causal relationship between foreign direct investment and economic growth rate in Algeria means that foreign direct investment increases the economic growth rate, while the reverse is not true**.**

- Causal relationship between foreign direct investment and inflation in one direction, inflation negatively affects foreign direct investment in Algeria**.**

- Causal relationship between foreign direct investment and trade openness in a one-way fashion, foreign direct investment stimulates Algeria's trade openness and external exchanges**.**

- Causal relationship between foreign direct investment and corruption in a unique sense, corruption negatively affects foreign direct investment in Algeria.

6. Conclusion

The contribution of foreign direct investment in bridging the local resource gap and the skills gap is an important criterion for measuring the feasibility of this investment, as it is an important source of financing and a successful means for exploiting untapped natural resources. This impact is measured through its role in bridging the technical skills gap and training workers and national leaders. An effective way to transfer modern technology and what it entails in developing production methods and developing modern technological methods and methods for economic management, as foreign direct investment is the carrier of the latest technologies and modern innovations, whether products or technical means.

Foreign direct investment is very important, because it has become the object of competition between countries, whether developed or underdeveloped. Algeria, like the countries of the world, tries to take advantage of it as well, but this comes up against obstacles that this study has tried to identify, the most important of which are inflation and administrative corruption, with the weakness of other determinants to attract it, such as market size or public spending. Thus, according to the results of the study, Algeria still remains unattractive for foreign direct investment.

Algeria is called upon to increase its attractiveness of foreign direct investment and to strengthen its competitive position in this context, because foreign direct investment is an important source of diversification of financing and expansion of its circle, to gradually get out of financing linked only to the state budget and oil revenues, in addition to the other advantages that we have already mentioned. From what has been done, Algeria must work to improve the business climate and promote investment in Algeria through the development of economic diplomacy, economic openness and financial liberalization, with the improvement of the institutional

environment, the fight against all forms of corruption, the promotion of governance in Algeria, and the reduction of investment risks.

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The impact of financial technology on financial stability in the MENA zone

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Abstract

This article attempts to determine the influence of financial technology (Fintech) on the stability of financial systems in 19 countries of the Middle East and North Africa (MENA) zone; observed over a period of 17 years (2004- 2020). Therefore, our research is based on the panel vector auto regression models (Panel VAR) that are analyzed using the Eviews 12 statistical program. The results show that the fixed effects models are the most significant for estimating the relationship between the fluctuations of financial stability index (FS) and the changes of the explanatory variables selected in our empirical model. At the same time, these results indicate a significant positive relationship between the economic growth (GDPR), the level of financial concentration (BSC) and the volume of banking crises (CPS, LL) on the financial stability index. While, they also confirm the absence of a significant relationship between the dependent variable and financial technology indexes (MPBR, ATM, IU) and the levels of demographic growth (POPG). This may be explained by the fact that the financial systems of the sample countries are mainly traditional and can be attributed to the low level of financial culture of their societies.

1. Introduction

The financial sector is facing recently radical transformations that have led to the emergence of several fintech applications's, which aimed to develop a new financial services and providing them in an easy, fast and inexpensive way, such as: electronic payment systems, blockchain, crowdfunding, cryptocurrency and artificial intelligence systems. With this technological development, digital transformation has become essential to cope with the diversity of remote financial transactions, especially in light of the conditions that most of the financial systems in the world knew with the Covid-19 pandemic. In this context, the MENA zone suffers from a digital paradox, as the region is witnessing a wide use of social media accounts compared to the gross domestic product (GDP) per capita. In addition, the per capita share of using social media in the MENA zone outweighs its counterparts in countries that have the same GDP per capita, however, the level of dependence of the MENA's countries on digital payment systems remains lower than the targeted levels. This disparity in the use of financial technology for social versus economic purposes, characterized the most countries in the MENA zone, which can threat the stability of the financial systems of the region. Accordingly, in this article, we will examine the various repercussions of adopting financial technology on financial stability in a sample of 19 countries in the MENA zone during the period 2004-2020, relying on the panel vector auto regression models (Panel VAR) and the outputs of Eviews 12 statistical program. In order to achieve our research objective, the present paper is organized as follows: The first section develops a review of literature on the subject, the second section presents

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the characteristics of the sample, as well as the specifications of the model to be tested. Finally, in the third section, we interpret the obtained results.

2. Literature review

The use of financial technology is witnessing a wide spread in many countries in recent years, which has accelerated the pace of digital transactions and may put the stability of their financial systems at risk.

2.1. Financial stability

Financial stability plays an important role as one of the main pillars to ensure the macroeconomic stability of countries. In this regard the bank of Korea defines financial stability as a condition in which the financial system can facilitate real economic activities smoothly and is capable of unraveling financial imbalances arising from shocks. The same bank adds that financial stability can also mean a condition in which the three components of the financial system (financial institutions, financial markets and financial infrastructure) are stable where: (Bank of Korea, 2022)

- Stability of financial institutions refers to a condition in which individual financial institutions are sound enough to carry out their financial intermediation function adequately, without assistance from external institutions including the government.
- Stability of financial markets means a condition in which there is no major disruption of market transactions, with no significant deviation of financial asset prices from economic fundamentals, thereby enabling economic agents to raise and operate funds with confidence.
- Stability of financial infrastructure refers to a condition in which the financial system is well structured to ensure smooth operation of market discipline, and both the financial safety net and the payment and settlement system are running effectively.

Furthermore, according to the World Bank a stable financial system is capable of efficiently allocating resources, assessing and managing financial risks, maintaining employment levels close to the economy's natural rate, and eliminating relative price movements of real or financial assets that will affect monetary stability or employment levels. A financial system is in a range of stability when it dissipates financial imbalances that arise endogenously or as a result of significant adverse and unforeseen events. In stability, the system will absorb the shocks primarily via self-corrective mechanisms, preventing adverse events from having a disruptive effect on the real economy or on other financial systems. (World Bank)

Based on what we have presented, we can say that financial stability is a property of a system that allows the detection of various financial imbalances at the level of financial institutions, financial markets and financial infrastructure. It also refers to the effective and efficient use of available resources near to the monetary stability rates. So that, financial stability is about resilience of financial systems to absorb these financial imbalances and correct them in order to prevent negative impact on the overall real economy.

2.2. Financial technology

Financial technology (fintech) as a concept is derived from the combination of two words: finance and technology, where fintech in its broad sense refer to the application of technology for providing financial services and products in the different areas of finance such as: banking, payments, data analysis, capital markets and financial management. While, in a more precise sense, we can say that there is no standard definition of fintech, but most of researches associate it with information technology and innovation in the financial sector. Thereby, fintech is identified as a technology that applies information technology in the financial world and consists of new technological solutions that will even initiate a revolutionary transformation in the world of finance. (Nakashima, 2018, pp.61-66) On the other hand, according to the financial standard board, fintech is a technological financial innovation that could result in new business models, applications, processes, or products with an associated material effect on financial markets and institutions and the provision of financial services. (Basel committee on banking supervision, 2018)

Fintech's origin can be traced back to the early 1990s, when Citigroup established the "Financial Services Technology Consortium" as a project to facilitate technological cooperation efforts. But, it was only in 2014 that the sector started to attract the increased attention of regulators, industry and consumers (Anyfantaki, 2016) and it refers now to a large and rapidly growing industry representing by 105,3 billion dollars as a global investment in fintech around the word for 2020. For more detailed, the next table records the volume of global fintech investments around the word for the period of 2014-2020:

Table 1. Global fintech investments for the period of 2014-2020

Years	2014	2015	2016	2017	2018	2019	2020
Global investments (Billion dollars)	51,2	64,9	73,7	54,4	141	135,7	105,3
Deals	1628	2123	2173	2629	3145	2693	2861

Source: pulse of fintech reports, KPMG, 2019, 2020 et 2021.

From this table and according to KPMG's fintech reports for the years 2019, 2020 and 2021, we can observe the fluctuation in total global fintech investments during the period of 2014-2020, Sometimes it increased, especially in 2015, 2016 and 2018, due to the strong activity of financial innovations witnessed by various countries of the world, and at other times it decreased, especially in 2017,2019 and 2020, due to the decline in the volume of internet lending and in merger deals and big data. However, in total, they achieved rapid growth in the past six years, as their value increased by 105,67% in the year 2020 compared to 2014, when the volume of global investment in fintech companies has reached 105,3 billion dollars in 2020 compared to 51,2 billion dollars in 2014. The same reports indicated that the year 2020 witnessed the conclusion of 2861 versus 1628 deals in 2014, noting that the geographical diversity of venture capital funded for financial technology investments contributed significantly to enhancing the volume of deals. It is expected that the volume of investments and the number of transactions in the field of financial technology will increase in the coming years, despite the increasing geopolitical uncertainty and trade concerns, which may place a greater burden on investment in financial technology.

2.3. Financial technology influence on financial stability: benefits and risks

With the vast literature dedicated to financial technology and stability separately and with the important growth in global fintech investments around the word, at this time the question arises on the impact of this technological development on the stability of the financial sector in shade of limited literature on whether or not financial technology can strengthen or weaken the financial systems, which most of them has treated this matter trough analytical researches that concerned risks and benefits of financial technology on the financial sector's stability. Thereby, fintech can offer many opportunities for governments, from making their financial systems more efficient and competitive to broadening access to financial services for the under-served populations. However, it can also pose potential risks to consumers and investors and, more broadly, to financial stability and integrity.

2.3.1. Benefits of fintech on financial stability

Fintech can enhance the financial stability through many ways which are summarized in financial stability board report's (2017) as following: (Financial stability board, 2017)

- Decentralisation and diversification: fintech may lead to greater decentralisation and diversification in a number of areas. In lending, technological advances, such as big data processing and automation of loan originations, have reduced barriers to entry. Some business models in this space may also be benefiting from lighter regulation associated with the unbundling of lending from deposits. Another example would be robo-advice, where smaller firms can operate alongside bigger firms given relatively low barriers to entry, including fixed costs.
- Efficiency in operations: innovations in financial services have the potential to lead to greater efficiencies. In fact, adoption of productivity enhancing technologies, such as robo-advice, regulatory technology or applications of technology that streamlines back-office functions, could strengthen business models of incumbent financial institutions. Machine learning and artificial intelligence could facilitate improvements in decision-making processes, by improving the models that financial institutions and investors use. At the same time, the business models of marketplace lenders and robo-advisors have less need for a physical presence than banks, and the use of algorithms to assess creditworthiness and investment opportunities appears to allow platforms to operate with relatively low costs. Fintech lending platforms could also reduce search and transaction costs and lead to better allocation of capital.
- Transparency : increased uses of fintech's applications could reduce information asymmetries in many areas of fintech and enables risks to be more accurately assessed and better priced.
- Access to, and convenience of financial services: the spread of financial transactions within the framwork of fintech improved access to a range of financial services across all of the economic functions for regions where there are a large unbanked population. In this case, the share of cell phone ownership equals or exceeds the share of the population with access to a bank account, particularly in rural areas with little or no access to physical banks. Thereby, Mobile banking allows consumers to quickly and efficiently obtain credit and make purchases. More generally, robo-advisory services increase access to wealth management for households who could not access similar traditional asset management services.

Meanwhile, (Lu et al., 2022) add that financial technology is beneficial for financial stability in term of:

- Risk transfer and diversification, which could stimulate the diversified development of financial institutions' businesses, improve fund allocation and operation efficiency of financial institutions. As a result, it could effectively optimize the financial market system, improve the market's capability to defend and deal with risks and crises, reduce the likelihood of systematic financial crisis and strengthen the stability of economic growth.

- Achieving coordinated development with technological innovation systems via the technicalization of new industries, thereby achieving the goal of stabilizing the macro-economy.
- Encouraging diversification of commercial banks' business and customers and reduce bad loan ratios and systematic risks.

2.3.2. Risks of fintech on financial stability

Compared to finteck's benefits of financial stability, fintech development could produce serious negative effects on financial stability. According to the financial stability board fintech undermines financial stability through two main categories of risks : micro-financial risks and macro-financial risks, where micro-financial risks occur from financial and operational sources and are those that make individual firms, financial market infrastructures or sectors particularly vulnerable to shocks. Thereby, the crystallisation of such risks could have a systemic impact on the financial system if it triggers firm or sector-wide distress, with possible knock-on implications for either the provision of critical functions or services, or systemically important markets or counterparties. They include Maturity mismatch, Liquidity mismatch, Leverage, Governance or process control, Cyber risks, Third-party reliance, Legal or regulatory risk and Business risk of critical financial market infrastructures. As for, macro-financial risks are system-wide vulnerabilities that can amplify shocks to the financial system and therefore raise the likelihood of financial instability. These risks are largely related to the interactions between firms, investors and clients that can create important transmission channels. They regroup contagion, procyclicality, excess volatility, and entities that are systemically important. (Financial stability board, 2017) Against this background, we will center our interest now to explicit the implications of each type of risks on financial stability in the subsequent table:

Table 2. Influence of micro and macro financial risks on financial stability

Micro-financial risk	
Type of risk	**It's link to financial stability**
Maturity mismatch	Appears when a loan is extended for a longer period than the financing is contracted for, creating rollover risk. Systemic impacts could arise if the sector provides critical functions or services.
Liquidity mismatch	Arises when assets and liabilities have different liquidity characteristics, resulting in "run risk" and the need to liquidate quickly relatively illiquid assets, disrupting markets.
Leverage	Higher leverage suggests less equity available to absorb any losses materialising from the realisation of market, credit, or other risks. Potentially exposes systemically important counterparties to losses.
Governance or process control	Poor governance or process control can lead to increased risk of direct disruption in the provision of financial services or critical infrastructure.
Cyber risks	The susceptibility of financial activity to cyber-attack is likely to be higher the more the systems of different institutions are connected.
Third-party reliance	Systemic risks may arise when systemically important institutions or markets are dependent on the same third parties.
Legal or regulatory risk	Legal risk may be greater when activities are evolving, or where regulatory arbitrage is sought.
Business risk of critical financial market infrastructures	Financial market infrastructures may be sensitive to external factors that could adversely impact its balance sheet, and, consequently, lead to a withdrawal of financial services, impairing its function as a critical infrastructure.
Macro-financial risk	
Type of risk	**It's link to financial stability**
Contagion	The distress experienced by a single financial institution or sector can be transmitted to other institutions or sectors – owing either to direct exposures between them, or commonalities that lead to a general loss of confidence in those institutions or sectors.
Procyclicality	Market participants can act in a way that exacerbates the degree and impact of fluctuations in economic growth and market prices over the short and/or long term. Examples include: the excess provision of credit by banks during upswings in the economy, and the extreme degree of deleveraging that tends to take place once the economy turns into a downswing; the low pricing of risk in financial markets during good

	times, and the high risk premium demanded by investors during bad times.
Excess volatility	The financial system can overreact to the news. This can lead to adverse outcomes if, for example, any such overreaction creates solvency or liquidity problems that can spiral through the financial system, impairing the functioning of asset and credit markets. This is most likely to occur when there is homogeneity of business models or common exposures.
Systemic importance	Entities that are viewed as being systemically important (or too highly connected to fail) may amplify risks through moral hazard. For example, they may be more inclined to take on excessive risk, given that the downside to doing so may be limited by the implicit guarantee of public support. Predatory pricing of services could also stifle competition ("the winner takes all"), reducing the likelihood of other service providers stepping in when the entity suffers distress.

Source: Financial stability board. (2017)

Additionally, in order to support the above analyze, (Lu Shen, Guohua He and Huan Yan, 2022) affirm that fintech development could lead to more financial turmoil in times of disorderly and excessive innovation. Thus, technological enterprise, due to its inherent instability, may increase the credit risks of financial institutions, whereas the mobility and conductivity of these risks would make financial systematic risks escalate. Furthermore, information asymmetry of the market as well as the high uncertainly of technological enterprises' sustainable profitability, financial institutions lead to an inaccurate evaluation of asset quality what would entrain industrial default risks and economic turbulence. As the same time, the imbalance of functional structure in the development of technological finance could be manifested as an imperfect loan model of policy- which is mainly direct loans that would worsen the risks of currency mobility within banks. (Lu et al., 2022)

Finally, it is important to point out that the research of Lu Shen, Guohua He and Huan Yan (2022) who has tried to modeling the impact of technological finance on financial stability based on the panel data of 30 Chinese provinces (including autonomous regions and municipalities) between 2005 and 2017. The analysis of results demonstrated that, in the eastern region, technological finance has an obvious negative shock effect on financial stability within a short period, but the effect gradually dwindles as time goes by. While neither western nor middle regions have displayed an obvious shock impact on financial stability. Such regional difference suggests that financial stability is related to the level of regional development and the nature of trade. In fact, enterprises in the middle and western regions in China are mostly of the traditional industry, with relatively little financial investment into the technological enterprises. Therefore, the risk, thus incurred would not affect the region's overall financial system much. On the contrary, the eastern region is keen on technological innovation, with much financial investment on enterprises of technological innovation, which leaded to the escalating financial risks in the region. (Lu et al., 2022)

3. Data, specification of the empirical model and methodology

The study's sample consists of annual observations of 19 countries in the MENA zone, during the period 2004-2020. Where this sample was chosen based on the availability and consistency of data for all the variables restrained in our empirical model. The data was taken from the World Development Indicators (WDI) database supplied by the World Bank, in addition to the Bankscope international banking database. It concerns the countries listed in the table below.

Table 3. Sample countries

Algeria	Georgia	Malta	Saudi Arabia
Armenia	Iraq	Mauritania	Tunisia
Azerbaijan	Jordan	Morocco	Turkey
Cyprus	Kuwait	Oman	United Arab Emirates
Egypt	Lebanon	Qatar	

Source: Author's based on the availability of information required in the MENA zone

These countries will be adopted in our empirical study to estimate and analyze the impact of financial technology use's on their financial stability, where the Z-score index provided by Bankscope database has been considered as a measure of the financial and banking stability variable, which is used to measure financial stability on a large scale in the financial and economic literature and is considered an unbiased indicator to measure the

financial activities risk's of banks, especially Ahamed and Mallick (2019) and Banna et al. (2021). Therefore, the *z*-score index is determined through the following formula:

$$Z - score_{it} = \frac{ROA_{it} + EQA_{it}}{\sigma(ROA)_{it}}$$

Here, ROA_{it}, EQA_{it} and $\sigma(ROA)_{it}$ means the return on average assets, the equity to asset ratio, and the standard deviation of the return on average assets of the bank 'i' in the year 't' respectively. If banks 'profitability is normally distributed, the inverse proxy of Z-score can be considered as the bank's probability of insolvency. Thereby, higher returns and capitalisation would increase bank stability, while volatile returns would decrease the stability of banks. (Ahamed and Mallick, 2019)

In terms of the study model, a modified approach is adopted for the proposed models in the works of Mohd Daud et al. (2022) and Feghali et al. (2021) to analyze the impact of financial technology on financial stability, taking account of several explanatory variables such as levels of financial concentration, banking crises, financial inclusion, economic growth and population size. Thus, the study model can be formulated as follows:

$$FS_{i,t} = \beta_0 + \beta_1 GDPR_{i,t} + \beta_2 MPBR_{i,t} + \beta_3 ATM_{i,t} + \beta_4 IU_{i,t} + \beta_5 BSC_{i,t} + \beta_6 CPS_{i,t} + \beta_7 LL_{i,t} + \beta_8 POPG_{i,t} + \gamma_i + \varepsilon_{i,t}$$

Where:

FS represents the financial stability index using the Z-score, **GDPR** indicates the economic growth index which represents the macroeconomic variables that affect the financial sector of countries, **MPBR, ATM and IU** represents the financial technology indexes, **BSC** represents financial concentration, **CPS and LL** indicates banking crises indexes that are opposite to financial stability. Finally **POPG** is the level of demographic growth of the sample countries which reflects the extent of access to financial technology services. Accordingly, the next table presents indications and measurements of variables used in this research:

Table 4. Indication and measurement of the variables

Variables	Type	Indication	Measurement	Data Sources
FS		Financial stability	BANK Z-SCORE	Bankscope
GDPR	Macro	GDP growth rate	(ΔGDP/Current GDP) *100	World Bank Data (WBD)
MPBR	Fintech	Mobile Phone Banking (MPB)	Mobile cellular subscriptions (per 100 people)	World Bank Data (WBD)
ATM	Fintech	Automated Teller Machines (ATM)	Automated teller machines (ATMs) (per 100,000 adults)	World Bank Data (WBD)
IU	Fintech	Internet Use	Individuals using the Internet (% of population)	World Bank Data (WBD)
BSC	Concentration	Banking system concentration	Bank concentration: percent of bank assets held by top three banks	Bankscope
CPS	Banking Crises	Credit to Private Sector to GDP (CPS/ GDP)	The ratio of domestic credit to private sectors to Gross Domestic Product	World Bank Data (WBD)
LL	Banking Crises	Liquid Liability to GDP (LL/GDP)	The ratio of liquid liability to Gross Domestic Product	World Bank Data (WBD)
POPG	Control	Population	Population growth (annual %)	World Bank Data (WBD)

Source: Author's compilation based on theoretical and empirical literature review

As for the econometric study, we adopted in our research the panel data models, considering that our sample includes observations of variables related to 19 countries in the MENA zone during the period 2004-2020. Then, based on statistical test results explained later, the panel vector autoregression models (Panel VAR) have been selected. The data was processed and analyzed statistically using the Eviews 12 statistical program. In this regard, the economic theoretical literature shows that the (Panel Var) models are relatively recent in use compared to the vector autoregression (Var) models where many researchers rely on (Panel Var) models in their empirical studies. We mention, for example, the study of Carstensen et al. (2009), which analyzed the effects of structural factors on the transmission of monetary policy to the mortgage markets in the countries of the Organization for Economic Cooperation and Development (OCDE), In addition to the study of Beetsma and Guiliadori (2011); and Lane and Benetrix (2010), who have adopted in their works (Panel Var) models in order to analyze the transmission of shocks of public expenditures. (Ramde, 2018, p.15) Thus, the descriptive statistics for empirical variables are indicated in the next table:

Table 5. Descriptive statistics of the variables

Variables	Mean	Maximum	Minimum	Std. Dev.	Jarque-Bera	Observations
FS	21.34599	70.97000	0.910000	12.47278	381.1116	323
GDPR	4.123782	53.38179	-25.9077	6.231676	3490.089	323
MPBR	102.0485	212.6390	2.181362	41.42712	0.036439	323
ATM	35.51723	90.89000	0.700000	22.79876	13.76863	323
IU	46.28446	100.0000	0.481470	28.42984	17.26906	323
BSC	70.97851	100.0000	37.10000	18.00314	21.20852	323
CPS	59.17380	255.3103	1.266927	45.01738	559.9268	323
LL	78.34526	256.8967	3.304430	60.25284	121.7676	323
POPG	2.528021	17.51221	-0.88818	2.860814	1521.275	323

Source: Author's calculations using Eviews 12.

The above table shows the descriptive statistics of the variables used in the study, where the average value of the financial stability (FS) index was about 21.35, with an important standard deviation of 12.47. It can be explained by the presence of a large variation across the countries of the MENA zone in terms of the level of banking stability. As for the standard deviations of financial technology indicators (MPBR, ATM, IU), they were large compared to their averages, with values of 41.43, 22.80 and 28.43, respectively. This may be due to the great disparity between the MENA countries in terms of technological progress.

At the same time, these descriptive statistics can be presented in the following figure:

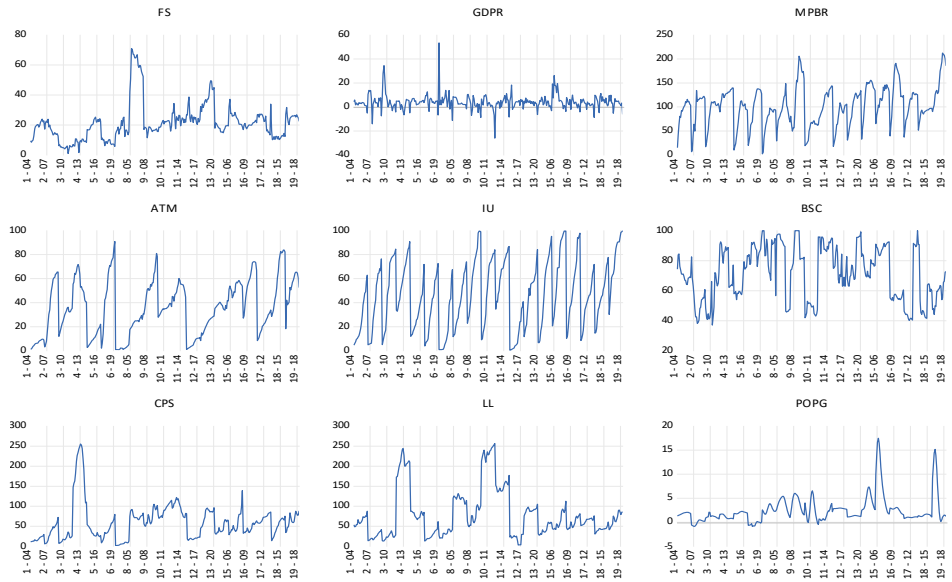

Figure 1: Panel time series of the variables

Source: Author's calculations using Eviews 12.

4. Estimated model

After specifying the econometric model to be estimated using multiple regression methods on panel data applied to the statistical program (Eviews 12). Our results concerning the various tests and regressions carried out are reported as follows:

4.1. Panel Unit Root tests

Panel unit root tests outperform individual time-series tests, as they include both sectional and temporal informational content, which leads to more accurate results compared to individual time-series stability tests. But on the other hand, the panel data witnesses a fundamental problem related to the association between units or individuals, where it is possible to distinguish between two generations of tests; the first generation is characterized by the independence between the units, while the second generation includes the link between the units. (Hurlin and Mignon, 2005, p.256). In this regard, the results issued from the Im, Pesaran, Shin (IPS) test are better than those provided by other time-series stability tests for the panel data, as Hurlin & Mignon (2005) demonstrated that is the most consistent test for small size samples (T<30). (Hurlin and Mignon, 2005, pp.266-270)

The current study used four basic types of panel unit root tests, which are: Levin-Lin-Chu (LLC) test, Im, Pesaran, Shin (IPS) test, (ADF-Fisher) test, and (ADF-Fisher test). PP-Fisher). The results in Table 6 demonstrate that the Panel time series of the MENA zone, whether related to the financial stability index (FS), or those related to independent variables (GDPR, MPBR, ATM, IU, BSC, CPS, LL, POPG), is unstable at the 5% level of significance, while the results of the unit root tests showed that all these variables became stable at first-degree differences, even at 1% significance level I(1).This means that it is very likely that there will be a cointegration between the financial stability index (FS) on the one hand, and the financial, economic and social variables representing financial technology indicators on the other (GDPR, MPBR, ATM, IU, BSC, CPS, LL, POPG). These results are reported in the next table:

Table 6. Panel unit root test results

Variables	LLC		IPS		ADF-Fisher		PP-Fisher	
	Level	First Difference	Level	First Difference	Level	First Difference	Level	First Difference
Individual Intercept								
FS	-4.262	-16.67***	-4.081	-15.02***	80.341	236.14***	71.499	274.36***
GDPR	-3.279	-9.963***	-2.211	-11.76***	74.794	189.81***	72.684	253.25***
MPBR	-9.135	-7.459***	-5.563	-4.895***	98.486	92.248***	158.37	95.748***
ATM	-2.457	-4.788***	-0.360	-4.507***	54.083	91.429***	49.138	122.87***
IU	0.358	-7.954***	6.342	-6.916***	17.849	123.30***	30.332	143.67***
BSC	0.466	-10.67***	0.797	-8.442***	29.385	142.03***	33.843	161.27***
CPS	1.405	-0.298	2.510	-6.226***	34.598	105.26***	276.61	123.21***
LL	2.252	-7.964***	3.902	-6.363***	19.351	109.64***	14.000	105.70***
POPG	-5.830	-6.233***	-4.431	-5.812***	96.394	133.73***	22.817	44.207
Individual Intercept and Trend								
FS	-7.364	-15.93***	-5.395	-13.47***	97.383	197.40***	93.466	240.14***
GDPR	4.694	-8.780***	-3.973	-9.239***	82.464	144.55***	66.781	209.80***
MPBR	-1.828	-9.143***	2.776	-6.287***	29.155	106.06***	54.143	135.61***
ATM	3.134	-9.238***	4.760	-6.332***	17.164	104.05***	17.259	116.50***
IU	0.187	-8.382***	1.918	-7.056***	36.271	116.29***	31.878	140.61***
BSC	-2.047	-10.08***	0.439	-6.017***	30.612	109.66***	33.159	145.28***
CPS	4.926	-0.201	-1.409	-4.634***	56.841	86.134***	57.046	105.57***
LL	-1.819	-6.205***	-0.652	-4.404***	47.137	82.899***	24.300	75.286***
POPG	12.886	-25.09***	5.550	-17.16***	11.039	222.54***	27.406	30.379
None								
FS	0.064	-19.77***			30.302	340.40***	29.968	353.48***
GDPR	-7.002	-17.65***			115.01	295.68***	111.76	311.19***
MPBR	2.036	-8.709***			14.622	140.08***	6.000	158.37***
ATM	5.795	-6.060***			12.622	104.10***	5.034	147.61***
IU	11.273	-2.562***			1.689	42.799***	0.259	85.063***
BSC	0.730	-14.74***			19.810	240.20***	22.334	245.04***
CPS	5.264	-8.619***			14.602	128.17***	26.577	141.12***
LL	3.959	-10.74***			7.381	166.53***	6.146	154.33***
POPG	-3.919	-7.555***			147.88	133.53***	40.049	94.162***

Note: ∗, ∗∗and ∗∗∗ represent, respectively, passing 10%, 5%, and 1% significance level test.
Source: Author's calculations using Eviews 12.

4.2. Panel Cointegration test

There are several panel cointegration tests, such as pedroni test, Kao test and Fisher test, however, in the current research, the Kao test has been preferred as it gives more effective results for panel data with a weak time dimension (T<30). (Hurlin and Mignon, 2007, p.256) The results showed that there is no cointegration, at a significant level of 5%, between the fluctuations in the financial stability index (FS) and the economic growth index (GDPR), the financial technology indexes (MPBR, ATM, IU), the financial concentration index (BSC), the banking crises indexes (CPS, LL) and the demographic growth index (POPG). These results mean also that there are no long-term equilibrium relationships between changes in the financial stability index (FS) and the other external variables, including the changes taking place in the financial technology determinants in the MENA zone. In this case, (panel Var) models are most suitable for estimating the relationship between financial technology and the financial stability index. These cointegration results are presented in the table below:

Table 7. Panel cointegration test results

Modele	FS=f(GDPR, MPBR, ATM, IU, BSC, CPS, LL, POPG)	
Kao Cointegration Test	t-Statistic	Probability
	-1.519306	0.0643*
Decision	No cointegration	
The appropriate Model	Panel Var Model	

Note: ∗, ∗∗and ∗∗∗ represent, respectively, passing 10%, 5%, and 1% significance level test.

Source: Author's calculations using Eviews 12.

4.3. Panel VAR lag order selection criteria

Under several criteria adopted in determining the optimal number of delays for the estimated model, such as Akaike information criterion-AIC, Schwarz information criterion-SC and Hannan–Quinn information criterion-HQ. We will use the Schwarz Information Standard (SC) like the Miller & al (2011) study to identify the optimum delays for the estimated models. (Ramde, 2018, p.23) Therfore, we note from the results shown in the table below that the optimal number of delays for the study model is two years (Lag*=2) which is the same number of delays also for the Hannan–Quinn information criterion-HQ.

Table 8. Lag selection optimal results

Lag	AIC	SC	HQ
0	73.86374	73.99161	73.91522
1	50.44690	51.72562	50.96172
2	48.84712	51.27670*	49.82529*
3	48.59014*	52.17056	50.03164
4	48.81079	53.54207	50.71564

Note: AIC—Akaike information criterion, SC—Schwarz information criterion, HQ—Hannan–Quinn information criterion. * signifies optimal lag length.

Source: Author's calculations using Eviews 12.

4.4. Panel VAR model

The Panel VAR methodology requires, at a first stage, the estimation of both fixed effects models (FEM) and random effects models (REM). In a second stage, the comparison between these two models will be done using the Hausman test, although the results of the standard analysis often indicate that the fixed effects models are the most appropriate for panel data across countries (Greene, 2012, pp.419-420). In this context, the Hausman's test results were similar to the literature of econometric, and confirm that the fixed effects models are the most suitable for estimating the relationship between the fluctuations of financial stability index (FS) and the changes in each economic growth index (GDPR), financial technology indicators (MPBR, ATM, IU), financial concentration index (BSC), banking crisis indicators (CPS, LL) and demographic growth index (POPG) in the MENA zone. These results are summarized in the table below:

Table 9. Estimated Panel Var coefficients

Variable	Fixed Effects Models (MG Estimation)		Random Effects Models (PMG Estimation)	
	Coefficient	**Prob.**	**Coefficient**	**Prob.**
C	3.893162*	0.0973	-0.069981	0.9442
FS(-1)	0.587568***	0.0000	0.890853***	0.0000
FS(-2)	-0.082472	0.1805	0.073672	0.1933
GDPR(-1)	0.096512**	0.0269	0.064066	0.1180
GDPR(-2)	-0.005127	0.8891	-0.048185	0.1730
MPBR(-1)	-0.002465	0.8955	0.000722	0.9667
MPBR(-2)	0.008272	0.6533	-0.001189	0.9436
ATM(-1)	0.001267	0.9853	-0.042102	0.4646
ATM(-2)	-0.025297	0.7001	0.025957	0.6691
IU(-1)	-0.028199	0.5523	-0.016148	0.7255
IU(-2)	0.011751	0.8022	0.012319	0.7872
BSC(-1)	0.054312**	0.0344	0.049445**	0.0385
BSC(-2)	0.009997	0.6979	-0.029536	0.2162
CPS(-1)	-0.038177	0.1195	-0.010174	0.6553
CPS(-2)	0.059896**	0.0187	0.013006	0.5607
LL(-1)	0.044292	0.1647	0.033037	0.2596
LL(-2)	-0.026822	0.4212	-0.030712	0.3036
POPG(-1)	-0.126055	0.6286	-0.472066*	0.0601
POPG(-2)	0.212127	0.4123	0.417704*	0.0866
R-squared	0.957501		0.939934	
Adjusted R-squared	0.951331		0.935869	
F-statistic	155.2048***	0.000000	231.2463***	0.000000
Prob(F-statistic)		0.000000		
Hausman Test	*Chi*2=102.509***		0.0000	
Wald Test	*F-statistic*=1.939**		0.0178	
	*Chi*2=31.025**		0.0134	

Note: ∗, ∗∗and ∗∗∗ represent, respectively, passing 10%, 5%, and 1% significance level test.

Source: Author's calculations using Eviews 12.

At the same time, the results of Fisher's test for fixed effects models (FME) in the above table prove the significance of the model as a whole at the level of significance of 1% and the quality of the model estimated statistically, where the coefficient of determination reached 95.75%. The results demonstrate also the existence of a positive and statistically significant relationship relating to the effect of fluctuations in the financial stability index for the previous period (t-1) and its current values in the MENA zone at a significant level of 1%, which explains the dynamic of the time relationship in the short term between the movements of the financial stability index and its past fluctuations, and corresponds to the economic and financial literature, where the general trend of the real values of macroeconomic and financial variables does not change in the short term, unlike the nominal variables. On the other hand, the significance of the impact of the rest variables that determine the effect of financial technology on financial stability varied in the short term, as the results showed the existence of a short-term significant relationship between changes in the financial stability index and each of the fluctuations in the economic growth index for the previous period. (GDPR(-1)), fluctuations in the financial concentration index for the previous period (BSC(-1)), variations in the volume of credits granted to the private sector for the past two years (CPS(-2)), in addition to the absence of a statistically significant relationship between the levels of financial stability for MENA zone and financial technology indicators (MPBR, ATM, IU).

As for the significance and relationship of the independent variables to the dependent variable, the results of estimating the fixed effects models (FME) showed a significant positive relationship between economic growth (GDPR), the level of financial concentration (BSC) and the volume of loans granted to the private sector (CPS), on the one hand, and the financial stability index (FS), on the other hand; This contradicts many studies in this field, as this can be explained in the MENA zone due to the traditional activity of the financial and banking systems, in addition to the weak financial competition between banks and the increase in banking concentration, which relates the performance level of the banking system using the Z-Score scale to the activity, profitability and stability of major banks, that are mostly public or governmental banks. As these banks are not private, they are looking primarily at reducing levels of risk rather than maximizing the level of profitability, which reflects

the focus of their activity around less profitable and less risky operations, what affect positively the financial stability index.

In addition, the same results confirm the absence of a significant relationship between the level of financial stability and financial technology indicators. This could be due to the occurence that the financial and banking systems in the MENA zone are mostly traditional, which limits their ability to offer financial and banking services that include the use of financial technology techniques due to the weak digital infrastructure, which reflects the shrinking volume of electronic financial and banking operations in the MENA zone compared to other regions of the world. This non-proliferation of financial technology in the banking systems of the MENA zone can be explained by the low level of financial culture of their societies, that affects negatively the level of financial inclusion in the region. These results can also be confirmed by the absence of significant relation for the levels of demographic growth and the financial stability index, meaning that the increase in the population does not reflect the increase in their access and intensification of their use of financial technology services in particular and financial and banking services in general.

4.5. Panel Causality test

With regard to short-term relationships, the results of the Panel Causality Tests using the Pairwise Dumitrescu Hurlin test, confirm the existence of a significant causal relationship, at the level of significance 1%, in one direction for economic growth index (GDPR), financial technology indexes (MPBR, ATM, IU), financial Concentration index (BSC), banking crisis indicators (CPS, LL) and demographic growth index (POPG) towards the financial stability index (FS). On the other hand, the results showed that there was no causal relationship in the reverse trend from the financial stability index towards the financial technology indexes (MPBR, ATM, IU); which is consistent with the various studies and theoretical literature on the subject. The results are provided in the next table:

Table 10. Panel Causality test results

Null Hypothesis:	W-Stat.	Zbar-Stat.	Prob.
GDPR does not homogeneously cause FS	3.77264	1.71878	0.0857
FS does not homogeneously cause GDPR	2.53676	0.04964	0.9604
MPBR does not homogeneously cause FS	6.18271	4.97371	7.E-07
FS does not homogeneously cause MPBR	2.81824	0.42980	0.6673
ATM does not homogeneously cause FS	8.00941	7.44076	1.E-13
FS does not homogeneously cause ATM	2.69112	0.25812	0.7963
IU does not homogeneously cause FS	7.67415	6.98798	3.E-12
FS does not homogeneously cause IU	2.66463	0.22234	0.8241
BSC does not homogeneously cause FS	6.30997	5.14558	3.E-07
FS does not homogeneously cause BSC	4.84282	3.16411	0.0016
CPS does not homogeneously cause FS	4.65682	2.91290	0.0036
FS does not homogeneously cause CPS	6.67254	5.63525	2.E-08
LL does not homogeneously cause FS	4.03352	2.07110	0.0383
FS does not homogeneously cause LL	3.12359	0.84220	0.3997
POPG does not homogeneously cause FS	8.96359	8.72943	0.0000
FS does not homogeneously cause POPG	8.74856	8.43902	0.0000

Note: ∗, ∗∗and ∗∗∗ represent, respectively, passing 10%, 5%, and 1% significance level test.
Source: Author's calculations using Eviews 12.

4.6. Robustness Test:

In order to test the strength of the previous results, we will analyze the effects of the occurrence of structural shocks in the dependent variables on financial stability index, so that the shock analysis depends on two main dimensions. The first dimension includes the analysis of impulse response functions, IRFs) and the second dimension consist of the analysis of variance (Forecast-error variance decomposition, FEVDs), which reflects the relative importance of an independent variable in explaining the variance of prediction errors for the dependent variable.

Thus, according to the estimates of the 10-year immediate response functions (IRFs), shown in Figure 2 below, a single positive structural shock in the components of the financial stability index (FS), amounting to 1%, has a positive impact in the short term on the crisis index itself, with very weak impact complications that do not exceed 3% in the first year after the shock, while the impact of the shock decreases in the long term to settle at levels ranging from 2 to 2.5%. The results also showed the weakness of the shocks that occur in the rest of variables, including the indexes of financial technology on financial stability index in the MENA zone, whether in the short or long term.

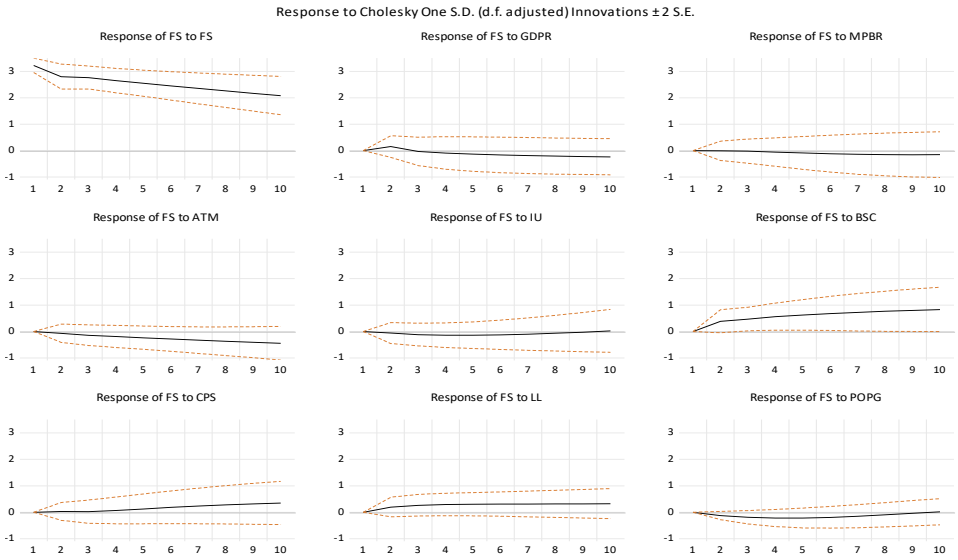

Figure 2: Pulse response graphs

Source: Author's calculations using Eviews 12.

The results of variance analysis's (FEVDs) summarized in Table 11 below indicate that the shocks that most explain the index of financial stability in the MENA zone in the short term are shocks that occur in the components of the index itself by more than 98%, while the remaining percentages of fluctuations are explained through the shocks that occur in the independent variables, including the financial technology indexes. The results also show that the explanation of shocks that occur in the components of the index itself in the medium and long term has decreased to varying rates, reaching the lowest of 90% in the last year, where the diminishing role of shocks that appear in the components of the indicator necessarily leads to an increase in the role of shocks that occur in the other independent variables of these fluctuations, especially the financial concentration index, however, the contribution of financial technology indicators in explaining these changes remains weak in the medium and long terms. This supports the results of the assessment reached previously.

Table 11. Variance decomposition

Period	FS	GDPR	MPBR	ATM	IU	BSC	CPS	LL	POPG
1	100.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2	98.71	0.128	0.000	0.023	0.018	0.812	0.004	0.204	0.086
3	97.74	0.093	0.001	0.092	0.064	1.400	0.005	0.404	0.196
4	96.71	0.097	0.010	0.175	0.106	2.015	0.018	0.563	0.294
5	95.71	0.123	0.027	0.280	0.135	2.615	0.054	0.687	0.359
6	94.72	0.162	0.052	0.407	0.149	3.210	0.117	0.789	0.386
7	93.74	0.208	0.079	0.555	0.150	3.800	0.206	0.875	0.382
8	92.75	0.258	0.107	0.723	0.142	4.388	0.316	0.952	0.359
9	91.74	0.3107	0.1336	0.9094	0.1304	4.9719	0.441	1.023	0.330
10	90.7	0.363	0.155	1.112	0.121	5.551	0.574	1.092	0.305

Source: Author's calculations using Eviews 12.

5. Conclusion

The current paper has developed an econometric study using the panel vector auto regression models (Panel Var) to estimate the impact of financial technology on financial stability in the MENA zone. The results showed that factors such as: economic growth, financial concentration and banking crises constitute the most significant variables to explicit the levels of financial stability in the MENA zone compared to the financial technology indexes. This can be attributed to the weak digital infrastructure of banking systems and the marginalization of banking competition in many countries of the zone. While, other factors, such as the lower levels of financial literacy in the societies of the zone, play a crucial role in explaining the decline in the levels of financial inclusion in the MENA zone, which limits its use of financial technology services and ties the financial stability index in the MENA zone to traditional banking activities, rather than banking activities related to the use of financial technology.

Therefore, we can say that financial technology companies in many countries in the MENA zone have witnessed an important development in recent years, especially in the sector of communications and information technology, which has contributed to the improvement in the rates of individuals and companies' use of internet networks. The increase in the number of smart phone users also contributed to the acceleration of electronic payment applications in the MENA zone, in light of the support of the supervisory authorities in terms of electronic signature, cyber security and data protection. However, despite the progress in this field over the past decades, the MENA zone faces many challenges in order to achieve the necessary compatibility between the development of financial technology services to enhance the financial stability and reducing the risks of digital transformation in the region, such as the insufficiency of electronic systems for identifying costumers, the need to develop the regulatory and supervisory environment and facilitate the licensing process in line with the activities of financial technology companies, the low levels of financial culture in some MENA countries, the need to strengthen the capabilities of these companies in the face of cyber attacks that threaten digital financial services, in addition to the increasing reliance on money in some countries in the MENA zone due to the large size of the informal economy.

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